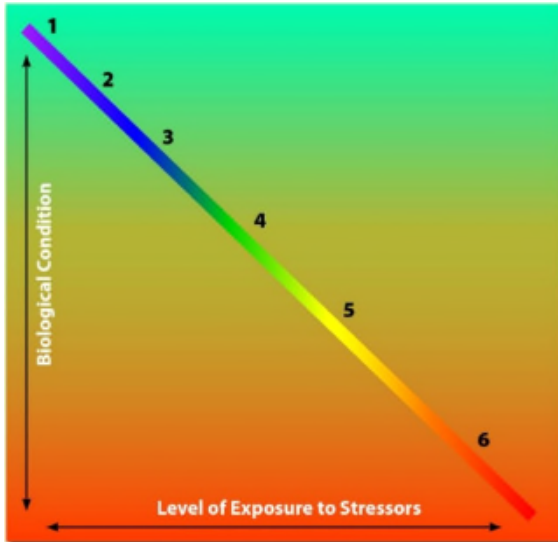


# Calibration of the Biological Condition Gradient (BCG) for Benthic Macroinvertebrate Assemblages in Indiana Streams



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## EXECUTIVE SUMMARY

The objective of the Clean Water Act is to “restore and maintain physical, chemical and biological integrity of the Nation’s waters.” To meet this goal, we need a uniform interpretation of biological condition and operational definitions that are independent of different assessment methodologies. These definitions must be specific, well-defined, and allow for waters of different natural quality and different desired uses. The USEPA has outlined a condition gradient (the Biological Condition Gradient, or BCG) that describes how ecological attributes change in response to increasing levels of human-caused disturbance or stress. The Biological Condition Gradient is a conceptual model that describes changes in aquatic communities. It is consistent with ecological theory and has been verified by aquatic biologists throughout the United States.

Specifically, the BCG describes how ten biological attributes of natural aquatic systems change in response to increasing pollution and disturbance. The ten attributes are in principle measurable. However, a few of the attributes (e.g., ecosystem function, organism condition) are typically not measured by monitoring programs, but rather are inferred from other, more readily available measures. The gradient represented by the BCG has been divided into six BCG levels of condition that biologists think can be readily discerned in most areas of North America, ranging from “natural or native condition” (level 1) to “severe changes in structure and major loss of ecosystem function” (level 6).

This report summarizes the findings of a panel of aquatic biologists from the Indiana Department of Environmental Management (IDEM), Ivy Tech Community College of Indiana, Illinois Natural History Survey (INHS), Eastern Kentucky University, Muncie Bureau of Water Quality, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Army Corps of Engineers (USACE), Commonwealth Biomonitoring and Midwest Biodiversity Institute (MBI), who applied and calibrated the general BCG model to macroinvertebrate assemblages in Indiana streams. This project builds upon an earlier phase of work during which BCG models were calibrated for fish assemblages in Indiana streams and rivers (Stamp et al. 2016).

When developing the macroinvertebrate BCG models, the panel was challenged to 1) assign BCG attributes to macroinvertebrate taxa recorded in the dataset and 2) to achieve consensus in assigning stream reaches to BCG levels using the macroinvertebrate assemblage data. The rules used by the panelists were compiled, tested, and refined, and vetted with the panel through a series of meetings and webinars. The end products were two quantitative BCG models to predict the BCG level of a stream based on the rules developed by the panel, calibrated to stream size and regional site classes. The macroinvertebrate panel assessed 106 calibration samples and an additional 22 samples to confirm the model. The macroinvertebrate BCG models performed well, predicting the expert ratings within a half BCG level for 98% of the calibration samples and 91% of the confirmation samples. The Indiana macroinvertebrate BCG models are suited to supplement and enhance traditional assemblage level data analysis used for water quality assessments.

## ACKNOWLEDGEMENTS

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Photographs were provided by IDEM. The cover photo is of Big Pine Creek at CR 50 West in Warren County Indiana (2016).

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# 1 INTRODUCTION

This document describes the calibration of assessment models for macroinvertebrate assemblages in the framework of the Biological Condition Gradient (BCG) for streams and rivers in Indiana. The models incorporate multiple attribute decision criteria to assign streams to levels of the BCG. The models were developed using macroinvertebrate monitoring data from the Indiana Department of Environmental Management (IDEM). Participants included scientists from IDEM, Ivy Tech Community College of Indiana, Illinois Natural History Survey (INHS), Eastern Kentucky University, Muncie Bureau of Water Quality, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Army Corps of Engineers (USACE), Commonwealth Biomonitoring and Midwest Biodiversity Institute (MBI). The macroinvertebrate BCG models build upon an earlier phase of work, during which BCG models were calibrated for fish assemblages (Stamp et al. 2016). BCG models are now available for both fish and macroinvertebrate assemblages in streams across Indiana. The Indiana macroinvertebrate BCG models can be used to supplement and enhance the Indices of Biotic Integrity (IBI) and other measures that the IDEM currently uses to assess stream health. The macroinvertebrate IBIs were recently updated and were evaluated in a comparison between BCG Levels and IBI scores (Jessup and Stamp 2017). Through such comparisons and direct application, the BCG could improve the rigor of IDEM's biological assessment program, which recently underwent review (USEPA 2013).

## The Biological Condition Gradient

“The Biological Condition Gradient (BCG) is a conceptual, scientific framework for interpreting biological response to increasing effects of stressors on aquatic ecosystems” (USEPA 2016). The framework was developed based on common patterns of biological response to anthropogenic stressors observed empirically by aquatic biologists and ecologists from different geographic areas of the United States (Davies and Jackson 2006). It describes how measurable characteristics of aquatic ecosystems change in response to increasing levels of stress, from a natural condition (undisturbed or minimally disturbed by modern human activities) to severely altered conditions (highly disturbed). In the BCG framework, these measurable characteristics are defined as “attributes” of the biological communities and the physical habitat that reflect the condition of an aquatic ecosystem (USEPA 2016). The attributes (Table 1) include properties of the system and communities (e.g., richness, structure, abundance, system functions) and organisms (e.g., tolerance, rarity, native-ness, organism condition).

The BCG framework defines levels of biological condition that increasingly differ from biological integrity (or natural condition) as defined above, as a response to increasing human disturbance. The levels were deemed to be both discernible (detectable) and to reflect biologically meaningful differences by the original expert panels that developed the conceptual BCG (Davies and Jackson 2006).

Throughout this document, our use of “disturbance” refers exclusively to human-caused or anthropogenic disturbance. We follow the definition of disturbance in the BCG Practitioner's

Guide: “Human activity that alters the natural state and can occur at or across many spatial and temporal scales” (USEPA 2016). Stressors are “Physical, chemical, or biological factors that adversely affect aquatic organisms” (USEPA 2016). Accordingly, human disturbance creates stressors in a system, which in turn may (or may not) cause stress in the exposed organisms or ecosystem. Natural events and processes also result in stressors and stress on organisms, but these are considered part of the natural background of the system.

In practice, the BCG is used to first identify the critical attributes of an aquatic community and then describe how each attribute changes in response to stress. Practitioners can use the BCG to interpret biological condition along a standardized gradient regardless of assessment method and apply that information to different state or tribal programs. An increasing number of programs are using the BCG to address watershed-specific management needs such as detailed biological descriptions of designated aquatic life uses (ALUs), identification of high quality waters and impaired waters, and documentation of incremental improvements due to controls and best management practices (BMPs). For example, Minnesota and Pennsylvania are using a BCG calibrated to its streams to identify exceptional and high-quality waters based on biological condition (exceptional waters may also be identified with other criteria- i.e., scenic or recreational value) (Bouchard et al. 2016, USEPA 2011). The Pennsylvania example is described in greater detail in the BCG Practitioner’s Guide (USEPA 2016), which also contains case studies on water quality programs in Minnesota, Alabama, Maryland, Maine and Ohio that have used the BCG for assessment and in some cases, for setting tiered aquatic life uses (TALUs) in water quality standards (WQS).

The BCG is divided into six levels of biological condition along the stress-response curve, ranging from observable biological conditions found at no or low levels of stress (level 1) to those found at high levels of stress (level 6) (Figure 1):

**Level 1.** Native structural, functional, and taxonomic integrity is preserved; ecosystem function is preserved within range of natural variability. Level 1 describes waterbodies that are pristine, or biologically indistinguishable from pristine condition.

**Level 2.** Virtually all native taxa are maintained with some changes in biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability.

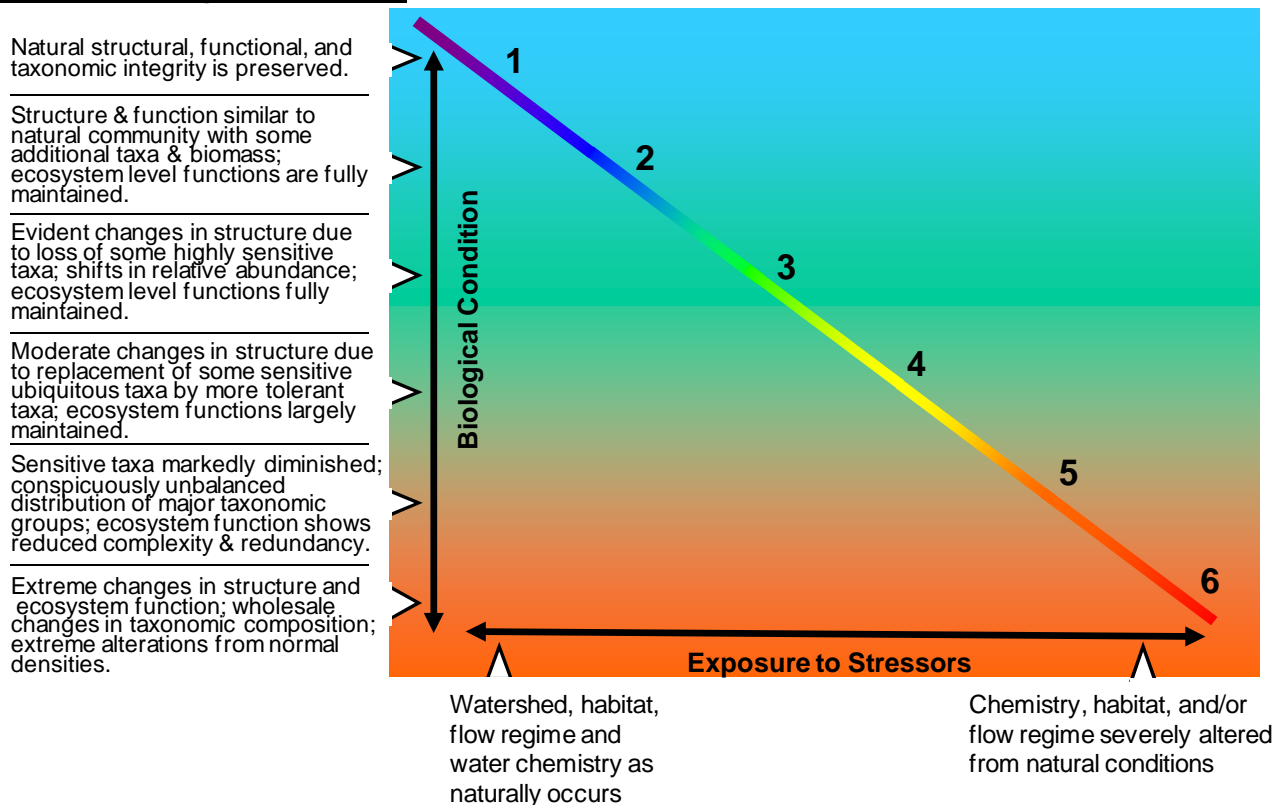
**Level 3.** Some changes in structure due to loss of some highly sensitive native taxa; shifts in relative abundance of taxa but intermediate sensitive taxa are common and abundant; ecosystem functions are fully maintained through redundant attributes of the system, but may differ quantitatively.

**Level 4.** Moderate changes in structure due to replacement of intermediate sensitive taxa by more tolerant taxa, but reproducing populations of some sensitive taxa are maintained; overall balanced distribution of all expected major groups; ecosystem functions largely maintained through redundant attributes.

**Level 5.** Sensitive taxa are markedly diminished; conspicuously unbalanced distribution of major groups from that expected; organism condition shows signs of physiological stress; system function shows reduced complexity and redundancy; increased buildup or export of unused organic materials.

**Level 6.** Extreme changes in structure; wholesale changes in taxonomic composition; extreme alterations from normal densities and distributions; organism condition is often poor (e.g., diseased individuals may be prevalent); ecosystem functions are severely altered.

### Levels of Biological Condition



**Figure 1.** The Biological Condition Gradient (BCG), modified from Davies and Jackson 2006. The BCG was developed to serve as a scientific framework to synthesize expert knowledge with empirical observations and develop testable hypotheses on the response of aquatic biota to increasing levels of stress. It is intended to help support more consistent interpretations of the response of aquatic biota to anthropogenic stressors and to clearly communicate this information to the public, and it is being evaluated and piloted in several regions and states.

The scientific panels that developed the original BCG conceptual model identified 10 attributes of aquatic ecosystems that change in response to increasing levels of stressors along the gradient, from level 1 to 6 (see Table 1 and Figure 2). The attributes include several aspects of community structure, organism condition, ecosystem function, spatial and temporal characteristics of stressors, and connectivity (Davies and Jackson 2006).

Each attribute provides some information about the biological condition of a waterbody. Combined into a model like the BCG, the attributes can offer a more complete picture about current waterbody conditions and also provide a basis for comparison with naturally expected waterbody conditions. All of the states and tribes that have applied a BCG used the first six attributes that describe the composition and structure of biotic community on the basis of the tolerance of species to anthropogenic stressors (Table 1). Some have also used attributes VII (organism condition), VIII (ecosystem function) and X (ecosystem connectivity), pending availability of data that characterize those attributes.

**Table 1. Biological and other ecological attributes used to characterize the BCG.**

| <b>Attribute</b>  | <b>Description</b>  |
|---|---|
| I. Historically documented, sensitive, long-lived, or regionally endemic taxa | Taxa known to have been supported according to historical, museum, or archeological records, or taxa with restricted distribution (occurring only in a locale as opposed to a region), often due to unique life history requirements (e.g., Pupfish, many Unionid mussel species).  |
| II. Highly sensitive (typically uncommon) taxa                                | Taxa that are highly sensitive to pollution or anthropogenic stressors. Tend to occur in low numbers, and many taxa are specialists for habitats and food type. These are the first to disappear with disturbance or pollution (e.g., most stoneflies, Brook Trout [in the east], Brook Lamprey).   |
| III. Intermediate sensitive and common taxa                                   | Common taxa that are ubiquitous and abundant in relatively undisturbed conditions but are sensitive to anthropogenic stressors. They have a broader range of tolerance than Attribute II taxa and can be found at reduced density and richness in moderately disturbed sites (e.g., many mayflies, many darter fish species).   |
| IV. Taxa of intermediate tolerance  | Ubiquitous and common taxa that can be found under almost any conditions, from undisturbed to highly stressed sites. They are broadly tolerant but often decline under extreme conditions (e.g., filter-feeding caddisflies, several midges, several minnow species).   |
| V. Highly tolerant taxa   | Taxa that typically are uncommon and of low abundance in undisturbed conditions but that increase in abundance in disturbed sites. Opportunistic species able to exploit resources in disturbed sites. These are the last survivors (e.g., tubificid worms, Black Bullhead).  |
| VI. Nonnative or intentionally introduced species                             | Any species not native to the ecosystem (e.g., Asiatic clam, zebra mussel, carp, European Brown Trout). Additionally, there are many fish native to one part of North America that have been introduced elsewhere.  |
| VII. Organism condition   | Anomalies of the organisms; indicators of individual health (e.g., deformities, erosions, lesions, tumors).   |
| VIII. Ecosystem function  | Processes performed by ecosystems, including primary and secondary production; respiration; nutrient cycling; decomposition; their proportion/dominance; and what components of the system carry the dominant functions. For example, shift of lakes and estuaries to phytoplankton production and microbial decomposition under anthropogenic eutrophication.  |
| IX. Spatial and temporal extent of detrimental effects                        | The spatial and temporal extent of cumulative adverse effects of anthropogenic stressors; for example, groundwater pumping in Kansas resulting in change in fish composition from fluvial dependent to sunfish.   |
| X. Ecosystem connectivity   | Access or linkage (in space/time) to materials, locations, and conditions required for maintenance of interacting populations of aquatic life; the opposite of fragmentation. For example, levees restrict connections between flowing water and floodplain nutrient sinks (disrupt function); dams impede fish migration, spawning. Extensive burial of headwater streams leads to cumulative downstream impacts to biota through energy input disruption, habitat modification, and loss of refugia and dispersing colonists. Some taxa are considered to be indicative of connectivity, especially migratory fish such as Sturgeon, American Eel, Skipjack Herring (their presence indicates unbroken connectivity). |

Source: Modified from Davies and Jackson 2006.

The last three BCG attributes of ecosystem function, connectivity, and spatial and temporal extent of detrimental effects can provide valuable information when evaluating the potential for a waterbody to be protected or restored. For example, a manager can choose to target resources and restoration activities to a stream where there is limited spatial extent of anthropogenic stressors or there are adjacent intact wetlands and stream buffers or intact hydrology versus a stream with comparable biological condition but where adjacent wetlands have been recently eliminated, hydrology is being altered, and stressor input is predicted to increase.

Existing indices tend to rely heavily on empirical, present-day reference conditions, as quantified from existing reference sites. The objective is to identify “minimally disturbed” reference sites that are representative of biological integrity (Stoddard et al. 2006); in practice however, most reference site datasets consist of “least disturbed” sites, that is, the most natural that are left, but nevertheless may be subject to substantial human disturbance. The distinction between “minimally disturbed” and “least disturbed” is important: “minimally disturbed” denotes fully natural biological conditions indistinguishable from pre-industrial or pre-European settlement; while “least disturbed” denotes an upper quantile of contemporary conditions (Stoddard et al. 2006). Most indexes are built from a statistically adequate sample of reference sites. In some cases (depending on the statistical technique that is used) one or two minimally disturbed sites (still maintaining natural biological integrity) in a reference data set might be treated as statistical outliers, which may cause them to have little influence on index scoring. In the situation where all reference sites are disturbed to some extent, the highest (most natural) score of a resultant index would be similar to the moderately disturbed reference sites, and could already be well down the biological condition gradient shown in Figure 1. Because the baseline has shifted away from pre-disturbance conditions in many locations, and knowledge of historical ecology is often limited, it can be difficult to set accurate expectations for least disturbed sites.

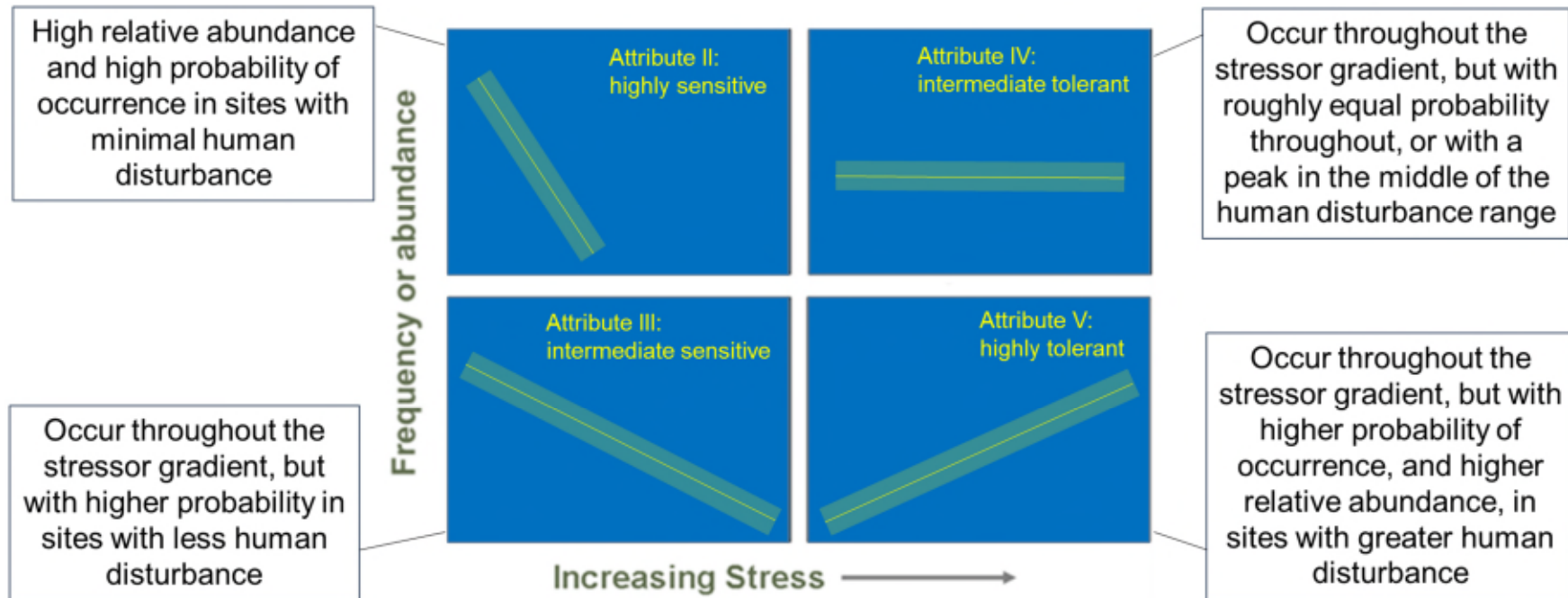


Figure 2. The frequency of occurrence and abundances of Attribute II, III, IV and V taxa are expected to follow these patterns in relation to the human disturbance gradient.



Part of the BCG process is to build a description of a fixed baseline: “minimally disturbed” conditions (*sensu* Stoddard et al. 2006) from a fixed, agreed-upon point in time (November 28, 1975, according to federal WQ regulations) (USEPA 2016). The description should be based on professional judgment, historical descriptions, paleo investigations, and museum records (to the extent available), as well as information from contemporary, empirical least disturbed sites. The description of minimally disturbed is necessarily incomplete, but its documentation is a defense against future baseline shifts, as well as identification of initial data and judgment for forming the baseline, should additional information become available. Careful use of the BCG identifies a natural or historic baseline that can be used to guard against “shifting baseline syndrome” (Pauly 1995). For regions or situations where all information on natural baseline is irretrievably lost, the BCG can assist in identifying an “Anthropocene baseline” for restoration and desired management (Kopf et al. 2015).

### The BCG:

- Creates a consistent interpretation of biological condition—the six defined BCG levels are intended to be consistent across aquatic ecosystem classes, such that BCG level 1 is equivalent to undisturbed, i.e., the biological integrity objective in the context of the US Clean Water Act.
- Describes a continuous scale of condition from undisturbed (level 1) to highly disturbed conditions (level 6).
- Synthesizes existing field observations and generally accepted interpretations of patterns of biological change within a common framework.
- Helps determine the degree to which a system has departed from undisturbed condition, based on measurable, ecologically important attributes.

The above properties enable federal, state, tribal and local agencies to:

- **Define goals for a waterbody**—Information on the composition of a naturally occurring aquatic community can provide a description of the expected biological condition for other similar waterbodies and a benchmark against which to measure the biological integrity of surface waters. A few states and tribes have used such information to more precisely define their designated aquatic life uses, develop biological criteria, and measure the effectiveness of controls and management actions to achieve those uses.
- **Report status and trends**—Depending on level of effort and detail, biological assessments can provide information on the status of the condition of the expected aquatic biota in a waterbody and, over time with continued monitoring, provide information on long-term trends.
- **Identify high-quality waters and watersheds**—Biological assessments can be used to identify high-quality waters and watersheds and support implementation of anti-degradation policies.

## 2 METHODS AND DATA

### 2.1 Calibrating the Conceptual BCG Model to Local Conditions

A multistep process is followed to calibrate a BCG to local conditions. BCG calibration begins with the assembly and analysis of biological monitoring data. Next, a calibration workshop is held in which experts familiar with local conditions use the data to define the ecological attributes and set narrative statements (for example, narrative decision rules for assigning sites to a BCG level on the basis of the biological information collected at sites). A quantitative decision model can then be developed that encompasses those rules and is tested with independent data sets.

For each BCG Level, rules are derived from the expert panel's rationale for assignments of samples to Levels. The rationale are usually semi-quantitative and vary among experts. Therefore, quantitative rules are defined using fuzzy logic, which allows for a range of values to describe partial membership for each Level. For each rule, a basic threshold describes the value of the metric at which membership in the Level is 0.5. A range of metric values around the basic threshold describe the boundaries between which membership is interpolated between 0 (not a member) and 1 (undisputed membership).

Once the quantitative rules for each BCG level have been developed, they work as a logical cascade from BCG level 1 to level 6. A sample is first tested against the level 1 rules; if the combined rule fails, then the level fails, and the assessment moves down to level 2, and so on (Figure 3). All required rules must be true (membership  $\geq 0.5$ ) for a site to be assigned to a level. The output of the inference model may include membership of a sample in a single level only, ties between levels, and varying memberships among two or more levels, depending on the membership function. The level with the highest membership value is taken as the nominal level. A more detailed description of the quantitative BCG decision models can be found in Stamp et al. (2016), which is excerpted in Appendix A.

### How does the BCG model work? Like a cascade...

Example: macroinvertebrate assemblages in streams < 15 mi<sup>2</sup> in the North of Indiana

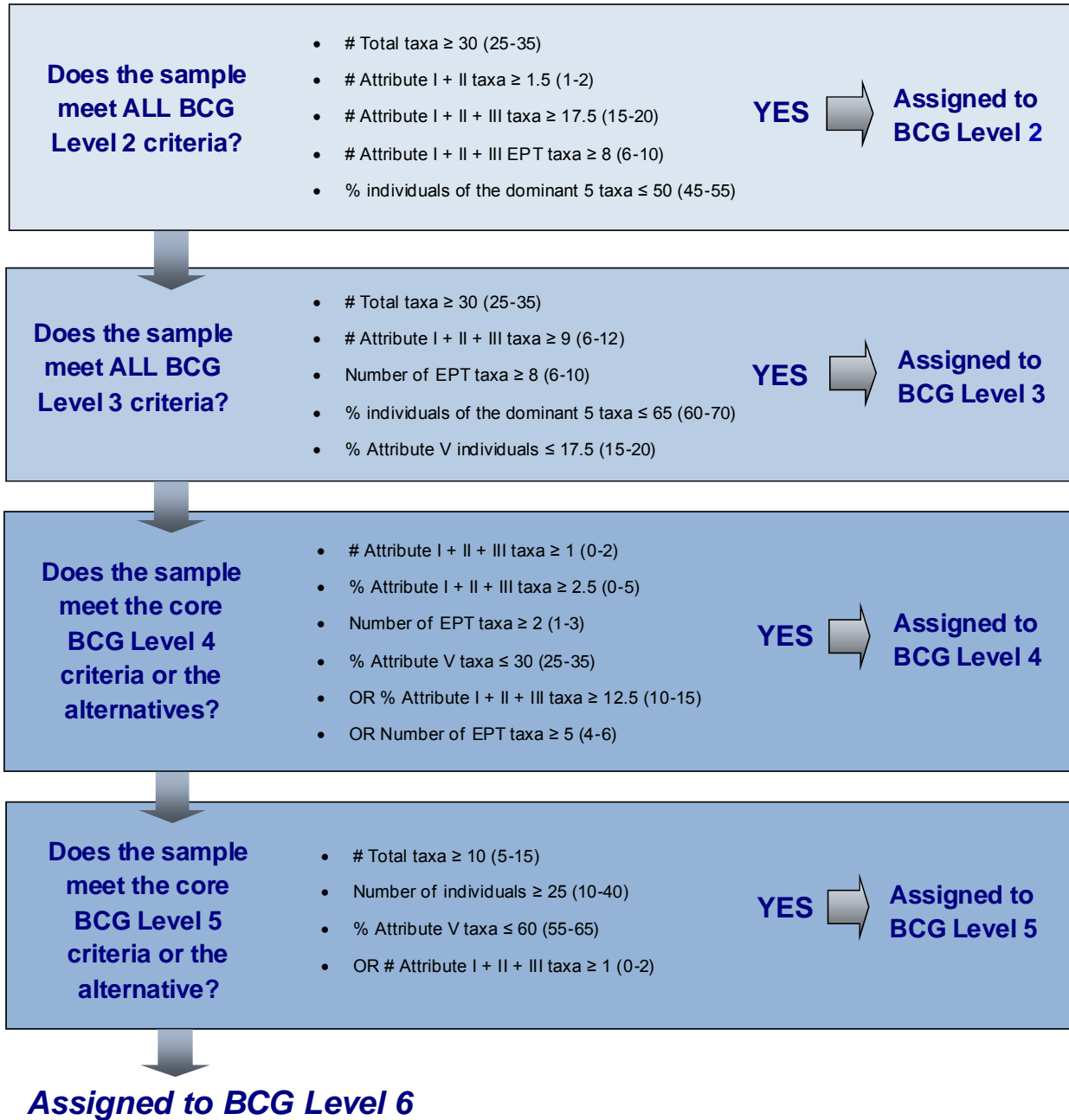


Figure 3. Example flow chart depicting how rules work as a logical cascade in the BCG model. This example is for macroinvertebrate assemblages in northern Indiana streams with catchments less than 15 square miles. The flow chart starts with BCG level 2 because panelists did not assign any samples in Indiana to BCG level 1.

## 2.2 Biological Data

The IDEM macroinvertebrate data set included 850 samples from 777 sites collected statewide between 2004 and 2013. This included 758 samples from sites with catchment sizes between 1 and 1000 square miles, which was the focus of the BCG calibration. The macroinvertebrate sampling reach is defined as a 50m length of stream that includes the designated X-point location (IDEM 2010). Within the reach, two sample types are collected and composited, including a one minute timed kick sample taken across three linear meters (roughly one square meter) of riffle/run habitat and a shoreline sweep sample of 25-30 sweeps/jabs along the 50m reach. Sweeps are from multiple habitats in proportion to the dominant habitat types.

The composited sample is picked for organisms at the sampling site. Any large debris is removed, visually inspected, and attached organisms are collected before discarding the debris. A minimum of 5 elutriations are completed until the water is clear. The sample is distributed in a white tray and the crew leader uses a pair of forceps to individually pick macroinvertebrates from the contents of the tray for 15 minutes. The objectives of the pick are to collect a sample that contains the greatest diversity of organisms and also reflects the relative abundance of organisms in the entire sample.

During laboratory processing, all macroinvertebrate individuals are counted with the exception of empty snail and clam shells, microcrustaceans (Ostracoda, Branchiopoda, Copepoda), larval and pupal insect exuviae, and terrestrial insects (including the terrestrial adults of aquatic insect larvae); invertebrate specimens missing their head are also excluded. The level of taxonomic resolution used in the identification of macroinvertebrates may depend in large part on the condition (instar and physical condition) of the specimens and the availability of taxonomic resources that are comprehensive and appropriate for Indiana's fauna. Specimens are generally identified to the "lowest practical" taxonomic level. Oligochaeta (aquatic worms, Hirudinea and Branchiobdellida), Planaria and Acari are only identified to family or a higher level; freshwater snails and clams are identified to genus; freshwater crustacea are identified to genus (Amphipoda and Isopoda) or species (Decapoda); aquatic insects are identified to family (Collembola and several Dipteran families) or genus and species (all other insects).

## 2.3 Classification

Experience has shown that biological classification is necessary to calibrate the BCG, because the natural biological class indicates the species expected to be found in undisturbed, high-quality sites. As an example, low-gradient prairie or wetland-influenced streams typically contain species that are adapted to slow-moving water and often to hypoxic conditions. These same species found in a high-gradient, forest stream could indicate habitat degradation and organic enrichment.

For the macroinvertebrate BCG exercise, the expert group concluded that macroinvertebrate samples collected from the southeast of the state were essentially different than those collected in the north and southwest. Therefore, BCG models were developed for North and South stream

classes (based on groupings of the classes that were developed for the macroinvertebrate IBI (Jessup and Stamp 2017) (Figure 4).

- **North** (includes the Northern [Ecoregions 54 and 56], North-Central [Ecoregions 55a, b, f, and d if it is in Great Miami. Also 57 and 71d if it is in the Great Miami], and Southwest [Ecoregion 72] macroinvertebrate IBI classes)
- **South** (includes the Southeast [Ohio Tributaries of ecoregions 71d and 55d] and South-Central [Ecoregions 71 and 55d in the EFWR] macroinvertebrate IBI classes)



Figure 4. Site classes for the macroinvertebrate BCG, based on site classes defined for the Indiana macroinvertebrate IBI (Jessup and Stamp 2017).

## 2.4 BCG Calibration Exercise

Calibration of the BCG for a region is a collective exercise among regional biologists to develop consensus assessments of sites, and then to elicit the rules that the biologists use to assess the sites (Davies and Jackson 2006). From April 4-6, 2016, regional biologists met at IDEM conference room facilities in Indianapolis, IN for a 3-day workshop. The biologists had expertise in stream ecology and macroinvertebrate community assessments, and included scientists from the Indiana Department of Environmental Management (IDEM), Ivy Tech Community College of Indiana, Illinois Natural History Survey (INHS), Eastern Kentucky University, Muncie Bureau of Water Quality, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Army Corps of Engineers (USACE), Commonwealth Biomonitoring and Midwest Biodiversity Institute (MBI). Fourteen panelists participated in the workshop. The goal was to develop a set of decision criteria rules for assigning macroinvertebrate samples to the BCG levels for streams in Indiana.

During this workshop, panelists first assigned BCG attributes to macroinvertebrate taxa (Table 2, Appendix B). Table 2 contains examples of taxa that were assigned to each attribute group. Prior to making attribute assignments, panelists reviewed stressor-response analyses that suggested taxa sensitivities and abundance in the IDEM data set. Plots showing the capture probabilities of macroinvertebrate taxa versus stress gradients with modeled response curves were reviewed to help inform their decisions (Appendix C).

Next, the panelists examined biological data from individual sites (from IDEM's historical dataset) and assigned those samples to levels 1 to 6 of the BCG. The intent was to achieve consensus and to identify rules that experts were using to make their assignments. The data that the experts examined when making BCG level assignments were provided in worksheets. The worksheets contained lists of taxa, taxa abundances, BCG attribute levels assigned to the taxa, BCG attribute metrics and limited site information, such as watershed area, gradient and ecoregion. After each panelist assigned a BCG level to a given sample, the panelist consensus was determined by calculating the median of all the panelists' BCG ratings. Participants were not allowed to view Station IDs or waterbody names when making BCG level assignments, as this might bias their assignments. A sample worksheet can be found in Appendix D.

In the final session of the workshop, panelists were asked to review decisions and notes, and identify the rules they used to make those decisions. Preliminary sets of decision rules were developed based on these calibration worksheets. These rules were later quantified and automated in an Excel spreadsheet and BCG level assignments were calculated for each sample. Panelists were asked to assess additional calibration worksheets during a series of follow-up homework assignments and webinars. During the webinars held after the workshop, panelists discussed samples that had the greatest differences between the BCG level assignments based on the model versus the panelists. Decision rules were then adjusted based on group consensus. Then the panelists worked individually to make BCG level assignments on additional samples to confirm the BCG models.

**Table 2. Descriptions of the BCG attributes assigned to macroinvertebrate taxa in Indiana streams. Number of taxa is based on the BCG dataset.**

| BCG Attribute |   | # taxa     | Example taxa   |
|---------------|---|------------|--|
| I             | Historically documented, sensitive, long-lived or regionally endemic taxa | 1          | Decapoda: <i>Orconectes indianensis</i>  |
| II            | Highly sensitive taxa, often occur in low abundance                       | 33         | Beetles: <i>Helichus basalis</i> , Mayflies: <i>Ephemera</i> , <i>Acentrella</i> , Stoneflies: <i>Leuctra</i> , <i>Pteronarcys</i> , <i>Acroneuria</i> Dragonflies: <i>Cordulegaster</i> , <i>Hagenius</i>   |
| III           | Intermediate sensitive taxa   | 188        | Beetles: <i>Optioservus</i> , <i>Psephenus herricki</i> Mayflies: <i>Ephemera</i> , <i>Isonychia</i> , <i>Hexagenia</i> , Midges: <i>Stempellinella</i> , <i>Microtendipes pedellus</i> group, <i>Tvetenia</i> , Caddisflies: <i>Nectopsyche</i> , <i>Hydropsyche</i> , Dragonfly: <i>Dromogomphus</i> , <i>Macromia</i>         |
| IV            | Taxa of intermediate tolerance  | 343        | Midges: <i>Cricotopus</i> , <i>Paratanytarsus</i> , <i>Polypedilum</i> , <i>Thienemannimyia</i> , <i>Ablabesmyia</i> , Beetles: <i>Berosus</i> , <i>Dubiraphia</i> , Dragonflies: <i>Boyeria</i> , <i>Enallagma</i> , Mayflies: <i>Baetis</i> , <i>Caenis</i> , <i>Stenacron</i> , Caddisflies: <i>Hydropsyche betteni</i> group |
| V             | Tolerant native taxa  | 111        | Worms: <i>Oligochaeta</i> , Midges: <i>Polypedilum illinoense</i> group, <i>Procladius</i> , Dragonflies: <i>Ischnura</i> , Gastropods: <i>Physidae</i> , <i>Planorbidae</i> , Beetles: <i>Haliplus</i>  |
| VI            | Non-native taxa   | 7          | Bivalves: <i>Corbicula</i> , <i>Dreissena</i>  |
| x             | No attribute assignment (insufficient information)                        | 127        | Coarse identifications and uncommon occurrences  |
| NA            | No attribute assignment (purposefully excluded)                           | 13         | Beetles: <i>Curculionidae</i> , Worms: <i>Lumbricidae</i>  |
| <b>Total</b>  |   | <b>823</b> |  |

### 3 COMPREHENSIVE DECISION RULES AND BCG MODEL FOR MACROINVERTEBRATES

The macroinvertebrate BCG models were calibrated using IDEM samples. During the calibration exercise, panelists made BCG level assignments for 106 samples. In order to confirm the model, panelists made BCG level assignments for 22 additional samples. BCG level assignments for all of the assessed samples are summarized in Appendix E.

### 3.1 BCG Level Assignments

The group assigned macroinvertebrate samples to 5 BCG levels (BCG levels 2-6) (Table 3). Locations of the assessed sites are shown in Figure 5. There was never a majority opinion for sites at BCG level 1, which is the least altered condition (Davies and Jackson 2006). Participants agreed that all sites in Indiana have some degree of disturbance, including legacy effects from agriculture and forestry from 100 to 200 years ago, so BCG level 2 samples represent the most natural waters in this exercise. Of the 128 samples that were assessed, 9 were assigned to BCG level 2. Nine samples were also assigned to BCG level 6, which represents the most altered condition. The greatest number of samples were assigned to BCG level 4, though in the north, an equal number were assigned to level 5 (Table 3).

**Table 3. Number of macroinvertebrate samples that were assessed, organized by BCG level (group consensus).**

| BCG level     | North       |              | South       |              |
|---------------|-------------|--------------|-------------|--------------|
|               | Calibration | Confirmation | Calibration | Confirmation |
| 2             | 2           | 1            | 5           | 1            |
| 3             | 10          | 4            | 13          | 4            |
| 4             | 23          | 2            | 14          | 3            |
| 5             | 24          | 2            | 10          | 1            |
| 6             | 4           | 2            | 1           | 2            |
| <b>Totals</b> | <b>63</b>   | <b>11</b>    | <b>43</b>   | <b>11</b>    |



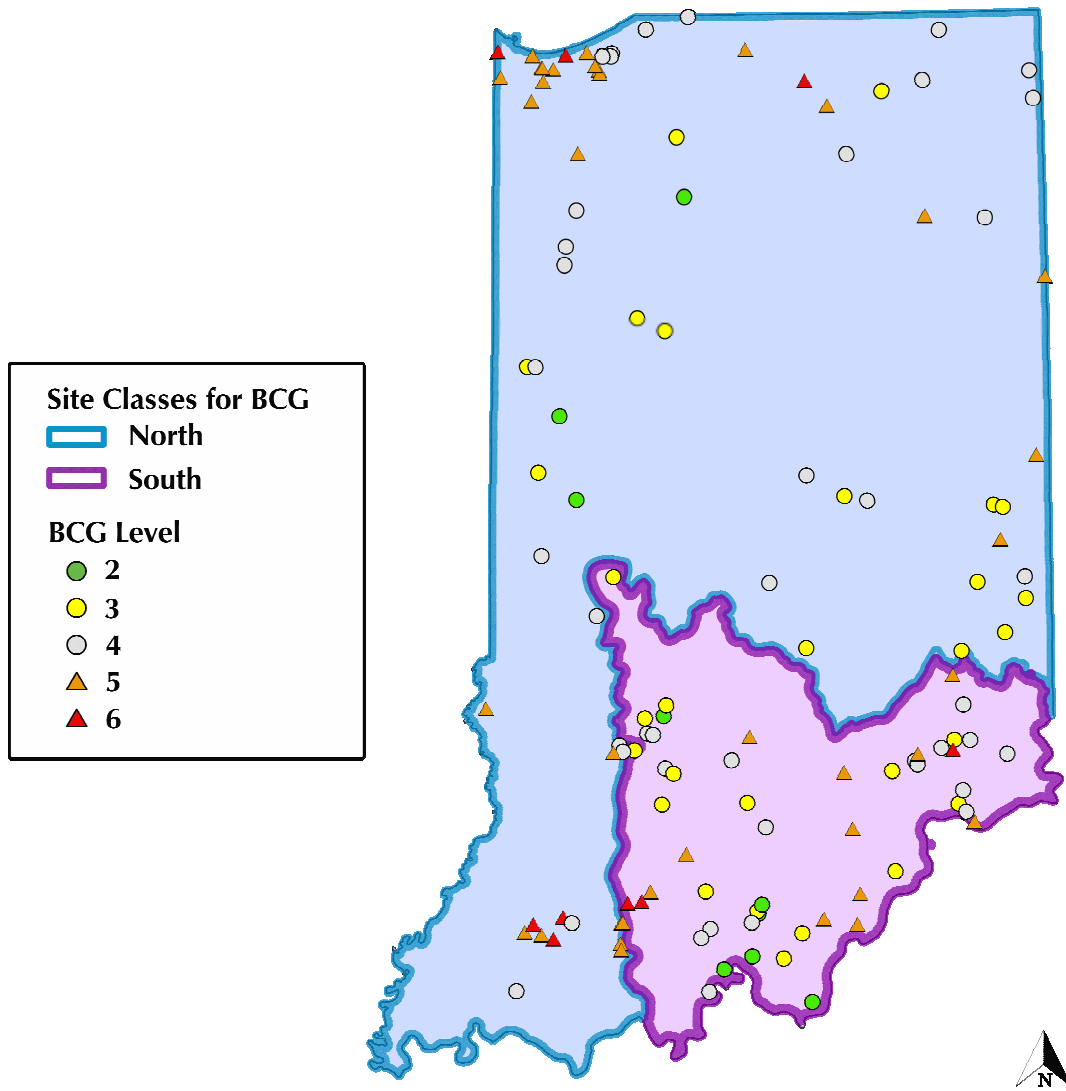


Figure 5. Locations of assessed macroinvertebrate samples, coded by panelist BCG level assignment (group median).

### 3.2 BCG Attribute Metrics

Examinations of taxonomic attributes among the BCG levels determined by the panel showed that several of the attributes are useful in distinguishing levels, and were used by the panel's biologists for decision criteria. The most important sample characteristics were related to total taxa richness, number and percent sensitive (Attribute I+II+III) taxa, number of mayfly (Ephemeroptera), stonefly (Plecoptera) and caddisfly (Trichoptera) (EPT) taxa, number of sensitive EPT taxa, percent individuals of the top 5 most dominant taxa, and the percentage of tolerant (Attribute V) taxa. A number of these metrics show relatively monotonic patterns, with number of total and sensitive taxa decreasing and percent tolerant taxa increasing as the assigned BCG level goes from 2 to 6 (Figure 6). There were differences between distributions of metrics in the North and South site classes, which were recognized by the expert panel, as well as differences expected by catchment size. The total taxa, sensitive taxa, EPT taxa and percent tolerant taxa metrics discriminate well across BCG levels 2 to 6. BCG levels 5 and 6 are discriminated from other BCG levels by the dominance of tolerant taxa and the loss or very limited presence of sensitive and EPT taxa (Figure 6). Figure 6 shows only a subset of metrics; box plots for all metrics that were considered in this exercise can be found in Appendix F.

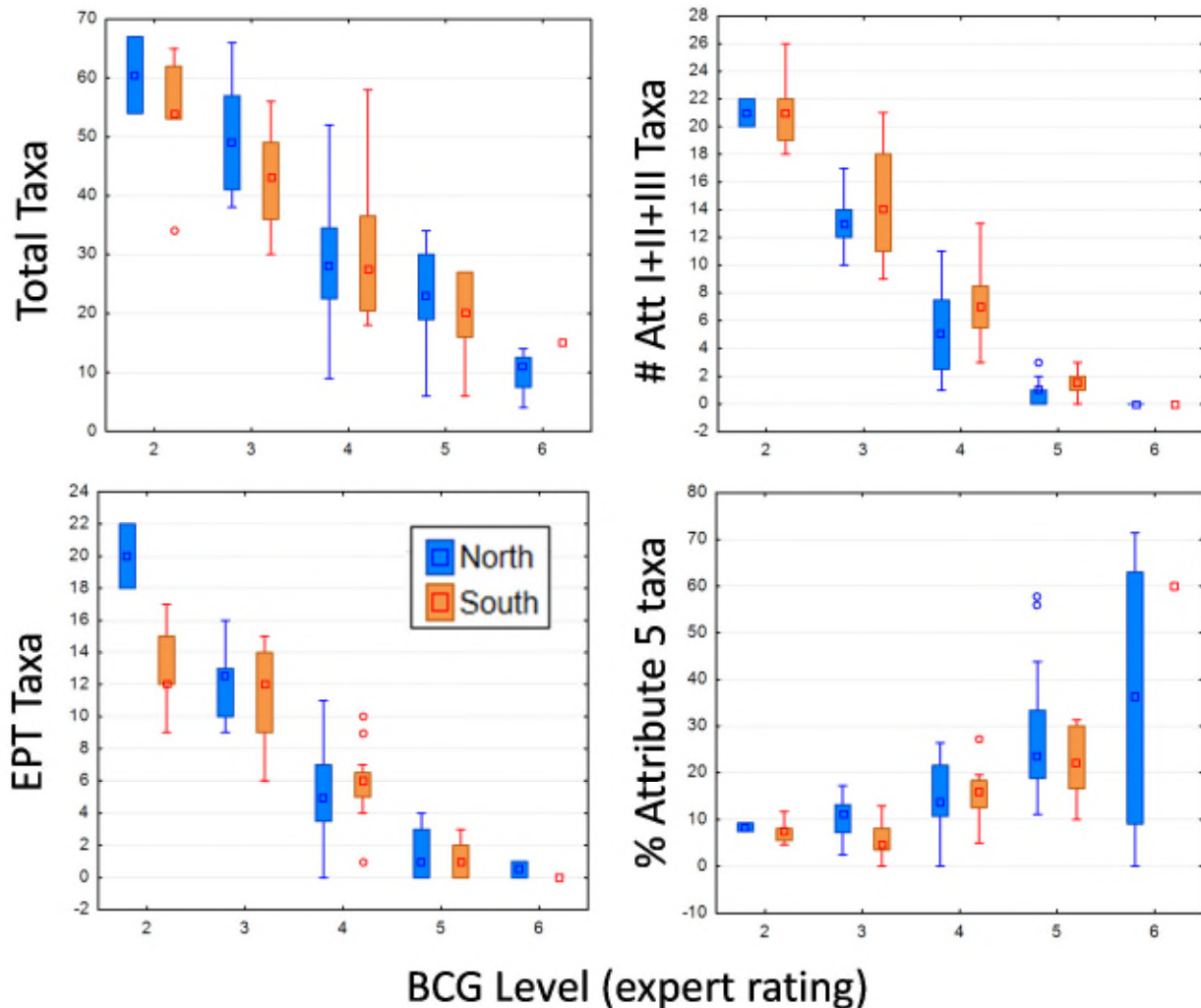


Figure 6. Box plots of total taxa, percent sensitive (Attribute I+II+III) taxa, number of EPT taxa and percent tolerant (Attribute V) taxa for assessed samples in the North and South site classes, grouped by BCG level (expert rating). Sample sizes for each BCG level are summarized in Table 3. Box plots for all macroinvertebrate metrics that were evaluated for this exercise can be found in Appendix F.

### 3.3 BCG Rule Development

During the April 2016 workshop, the macroinvertebrate panel developed a description of each level, along with preliminary rules that are expected to be met by each level, starting from the most natural condition observed in the data set and working down to the most severely altered condition (i.e., level 6). The initial rules were used as a starting point for the quantitative model. Following initial development of the quantitative model, the panel reviewed the draft model and the rules, and assessed additional sites. Some samples were used in refinement/recalibration of the rules and quantitative model, and 22 samples were reserved for testing model performance on independent samples.

The rules in Table 4 have been developed for distinguishing BCG levels for Indiana streams based on the macroinvertebrate assemblage. They were derived from discussions with the panelists on why individual sites were assessed at a certain level. The rules were calibrated and confirmed with the 106 calibration samples rated by the group, and were adjusted so that the model would replicate the panel's decisions as closely as possible. For each rule, a basic threshold describes the value of the metric at which membership in the Level is 50%. The range of metric values in parentheses (see Table 4), describe the boundaries between which membership is interpolated between 0 (not a member) and 1 (undisputed membership).

The basis of the decision rules (Table 4) is a general pattern of decreasing richness of total and sensitive taxa and increasing percent tolerant taxa as biological condition degrades (Figure 6). BCG level 2 samples, which represent the most natural waters in this exercise, have the highest thresholds for total and sensitive (Attribute I+II+III) taxa, requiring at least 30 or 45 taxa (depending on catchment square miles), two endemic or highly sensitive (Attributes I+II) taxa, 18 Attribute I+II+III taxa, and at least 6-8 sensitive (Attribute I+II+III) EPT taxa (depending on site class) (Table 4). BCG level 3 samples have a lower threshold for total taxa richness than BCG level 2 samples and lower thresholds for sensitive taxa metrics. Level 3 rules also require 6-8 EPT taxa, regardless of their sensitivity (depending on site class). The assemblage must be relatively balanced, with the top five most dominant taxa comprising less than 65% of the individuals, and the percentage of tolerant Attribute V taxa being less than 15-18%.

The transition to BCG level 4 is characterized by further reductions in thresholds for numbers of sensitive and EPT taxa, but sensitive taxa must still be present. However, alternative rules recognize that if higher numbers of sensitive and EPT taxa are present, then the sample can be recognized as a level 4 regardless of failure of other rules. In other words, in the North site class, if there are either  $\geq 12.5\%$  Attribute I+II+III taxa or  $\geq 5$  EPT taxa, then the other rules are disregarded and the sample is assessed as a level 4. Likewise, in the south site class, all rules are applied, but if there are at least 5 Attribute I+II+III taxa then the sample is assessed as a level 4. BCG level 5 has 3 rules and one alternative. Level 5 samples must have at least 10-15 taxa, 25 individuals, and less than 40-60% Attribute V taxa. If any of these rules fail, the sample is still assessed at level 5 if there is at least one Attribute I+II+III taxon. Samples that fail to meet the BCG level 5 requirements are assigned to BCG level 6.

**Table 4. BCG quantitative decision rules for macroinvertebrate assemblages. The numbers in parentheses define the boundaries for defining partial membership in the Level.**

| <b>BCG Level 2</b>                         |                         |                         |   |  |
|--|-------------------------|-------------------------|---|--|
| Total taxa richness                        | DA < 15<br>≥ 30 (25-35) | DA ≥ 15<br>≥ 45 (40-50) |   |  |
| Number of Attribute I + II taxa            | > 1.5 (1-2)             |                         |   |  |
| Number of Attribute I+II+III taxa          | > 17.5 (15-20)          |                         |   |  |
| Number of Attribute I+II+III EPT taxa      | North<br>≥ 8 (6-10)     | South<br>≥ 6 (4-8)      |   |  |
| Percent individuals of the dominant 5 taxa | ≤ 50 (45-55)            |                         |   |  |
| <b>BCG Level 3</b>                         |                         |                         |   |  |
| Total taxa richness                        | DA < 15<br>≥ 30 (25-35) | DA ≥ 15<br>≥ 35 (30-40) |   |  |
| Number of Attribute I+II+III taxa          | ≥ 9 (6-12)              |                         |   |  |
| Number of EPT taxa                         | North<br>≥ 8 (6-10)     | South<br>≥ 6 (4-8)      |   |  |
| Percent individuals of the dominant 5 taxa | ≤ 65 (60-70)            |                         |   |  |
| Percent Attribute V taxa                   | North<br>≤ 17.5 (15-20) | South<br>≤ 15 (10-20)   |   |  |
| <b>BCG Level 4</b>                         |                         |                         |   |  |
| Number of Attribute I+II+III taxa          | North<br>≥ 1 (0-2)      | South<br>≥ 2 (1-3)      | Alternative:<br><u>North</u><br>% Attribute I+II+III taxa<br>≥ 12.5 (10-15)<br>OR<br># of EPT taxa<br>≥ 5 (4-6) | Alternative<br><u>South</u><br># of Attribute I+II+III taxa<br>≥ 5 (4-6) |
| % Attribute I+II+III taxa                  | North<br>≥ 2.5 (0-5)    | South<br>≥ 15 (10-20)   |   |  |
| Number of EPT taxa                         | North<br>≥ 2 (1-3)      | South<br>≥ 2 (1-3)      |   |  |
| Percent Attribute V taxa                   | ≤ 30 (25-35)            |                         |   |  |
| <b>BCG Level 5</b>                         |                         |                         |   |  |
| Total taxa richness                        | DA < 15<br>≥ 10 (5-15)  | DA ≥ 15<br>≥ 15 (10-20) | Alternative:<br>Number of Attribute I+II+III taxa<br>≥ 1 (0-2)  |  |
| Number of individuals                      | ≥ 25 (10-40)            |                         |   |  |
| Percent Attribute V taxa                   | North<br>≤ 60 (55-65)   | South<br>≤ 40 (35-45)   |   |  |

DA = drainage area in square miles.

### 3.4 Panel variability and model performance

#### *Panel variability*

Expert panelists showed a high level of agreement in their decisions. The stations rated during the workshop were discussed and rated as a group, so that all panelists could see each other's decisions. Because of the discussions during the sessions, there was some convergence as panelists made arguments for one BCG level or another. Other ratings were assigned independently as homework assignments.

Panelists were allowed to rate stations as a single BCG number, and were allowed to apply a plus (+) or minus (-) to the level indicating somewhat better or worse condition, respectively (much as school letter grades can be modified, e.g., B+). This effectively meant that the panelists were rating stations in increments of one-third BCG level. Figure 7 (top) shows the distribution of individual panelist scores compared to the group median for each sample. For all samples, 88% of individual assessments were within 1/3 BCG level of the group median, and 97% were within 2/3 BCG level.

When the ratings were separated by those that were made within a group setting and those that were made independently as homework, differences from the median were greater for the independent ratings (Figure 7, bottom). For the workshop and webinar ratings, 96% of the ratings were within 1/3 of the median for the sample. When the experts worked independently (i.e. completing homework), 82% of the ratings were within 1/3 of the median for the sample. This suggests that when experts could hear the rationale of other experts as they were rating a sample, they might be influenced to arrive at a similar rating. However, the overall span of differences is similar for both the group and independent settings.

#### *Quantitative Model Performance*

To evaluate the performance of the calibration and confirmation datasets, we assessed the number of samples where the BCG decision model's nominal level exactly matched the panel's median ("exact match") and the number of samples where the model predicted a BCG level that differed from the median expert opinion ("mismatch" samples). Then, for the mismatched samples, we examined how large the differences were between the BCG level assignments, and also whether there was a bias (e.g., did the BCG model consistently rate samples better or worse than the panelists).

The BCG model output is reported as a relative membership of a site among BCG levels, from 0 to 1, where memberships of all levels must sum to 1. The model output can be 100% assigned to a single level (e.g., 1.00 membership in BCG level 4), partially assigned to two or more levels (e.g., 0.85 (primary) membership in BCG level 4 and 0.15 (secondary) membership in BCG level 5) and can also yield ties between adjacent levels (e.g., 0.50 membership in BCG level 4 and 0.50 membership in BCG level 5). As with the quantitative model, panelists can split among BCG levels (e.g., 6 panelists assign a sample to BCG level 4 and 6 panelists assign it to BCG level 5). To estimate concurrence between the quantitative model and the panel, we assigned scores as "clear majority" or "ties and near-ties" based on the panelists' votes and the model

membership outcomes. Ties and near-ties were assigned where either the model or the panel were divided:

- **BCG model ties**, where there is nearly equal membership in 2 BCG levels. BCG model assignments are considered to be a tie if the difference between the primary and secondary memberships is less than 0.2 (e.g., membership of 0.54 in BCG level 2 and membership of 0.46 in BCG level 3).
- **Panelist ties**, exact tie (e.g., 4-4) or within one vote of a tie (where a single vote could have flipped the decision, e.g., 5-4).

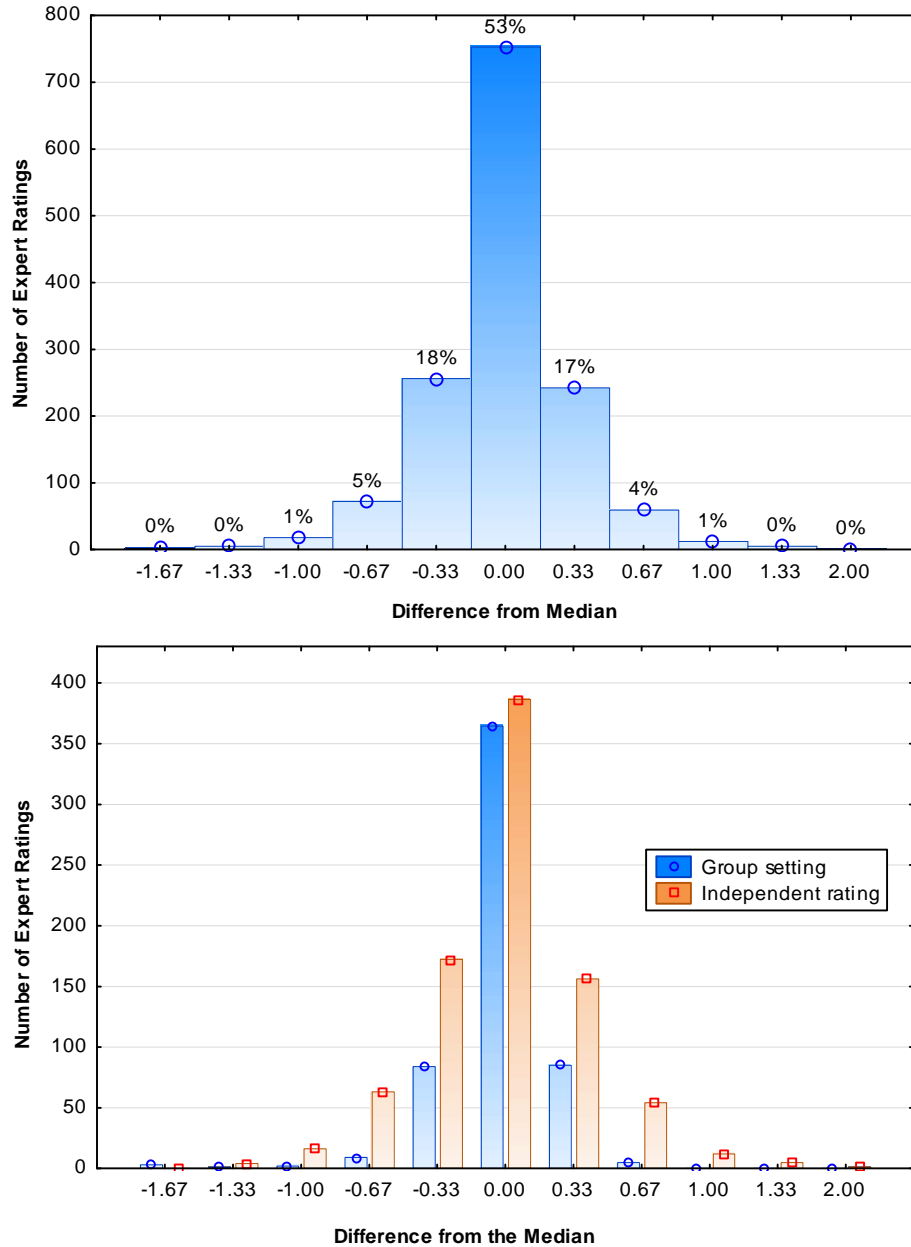


Figure 7. Distribution of macroinvertebrate expert BCG level ratings expressed as difference from the group median in 1/3 BCG level steps. All ratings (top) and ratings separated by the group setting (workshop and webinar) or independent setting (homework) (bottom).

If the BCG model assigned a tie, and that tie did not match with the panelist consensus, we considered this to be a difference of half a BCG level (e.g., if the BCG model assignment was a BCG level 2/3 tie and panelist consensus was a BCG level 2, the model was considered to be ‘off by a half BCG level’; or more specifically, the model rating was a ½ BCG level “worse” than the panelists’ consensus). The BCG model was also considered to differ by a half level if the panelists assigned a tie and the BCG model did not. To avoid cutting the differences too finely, we only considered mismatches by units of half a BCG level as follows: match (both panel and model a clear majority for the same level or the same tie); up to ½ level (panel and model mismatch by no more than ½ BCG level); up to 1 level (panel and model mismatch ½ but no more than 1 BCG level); and so on.

Model performance is summarized in Table 5, which shows number and percent of model assessments compared to panel assessments. The panel did not consider a half-level mismatch with their consensus to be a meaningfully different assessment, and a half level was similar to the spread in ratings among panel members. The quantitative macroinvertebrate model was 99% accurate in replicating the panel assessments within one-half BCG level for the calibration data set, and 91% accurate for the confirmation data. There was no mismatch greater than 1 BCG level. The BCG model did not appear to be biased towards better or worse predictions compared to the expert ratings. (Table 5).

Confirmation of the model by the same expert panel gives a sense of model replicability. The North BCG model correctly predicted the expert’s median ratings for 10 of 11 samples (91% correct prediction). There were no ties in the model or the expert ratings. The one sample that was not correctly predicted (Sample 29) had “large % *Tricorythodes* (indicating enrichment, algae)” and a “slightly high proportion of attribute 5 taxa” that drove some experts to rate the sample a 3 or 3+ instead of the 2- predicted by the model. A 91% correct prediction rate for the model is adequate to confirm the effectiveness of the model.

In the South site class, the median of expert BCG ratings agreed with model results for 7 samples. For two additional samples, the model resulted in a tie that included the expert rating. For one more sample, the expert group ratings were evenly divided between levels 4 and 5 and the model result was a level 5. Only one sample was given a median BCG level that differed from the model result by one level. In that case (Sample 241), the expert’s median rating was 3+ and the model result was 2-. The expert’s reasons that the sample was not a level 2 included a lack of stoneflies and dominance of *Elimia* and *Cheumatopsyche*. If comparisons between expert panel ratings and model results are not in error if one of the levels is a tie, then the confirmation for the South model is good with 10 of 11 samples accurately confirmed.

In our opinion, the distribution of errors (mismatches) combined with the panel consensus on the degree of error that is biologically meaningful, is the best statistical estimate of goodness-of-fit that we know at this time. Other measures do not yield interpretable results, for example, Cohen’s Kappa (e.g., Agresti 2013) estimates p-values compared to random independence and the resultant p-values are so small ( $10^{-100}$  and smaller) as to be meaningless; or Wilcoxon’s Signed rank (W) test estimates difference in the means (measurement of bias of the paired estimates).



**Table 5. Performance of BCG quantitative macroinvertebrate models for calibration and confirmation datasets, by Coastal Plain macroinvertebrate panel. “Better” and “worse” indicate model assessment of stream condition compared to panel (e.g., “better” if model assessed BCG Level 2, but panel assessed BCG Level 3, and so forth).**

| Site Class | Dataset   | Unit    | Difference           |                        |             |                       |                     | Total       |
|------------|-----------|---------|----------------------|------------------------|-------------|-----------------------|---------------------|-------------|
|            |           |         | Model 1 level better | Model 1/2 level better | Exact match | Model 1/2 level worse | Model 1 level worse |             |
| North      | Calibrate | Number  | 1                    | 4                      | 54          | 4                     | 0                   | <b>63</b>   |
|            |           | Percent | 2%                   | 6%                     | 86%         | 6%                    | 0%                  | <b>100%</b> |
|            | Confirm   | Number  | 1                    | 0                      | 10          | 0                     | 0                   | <b>11</b>   |
|            |           | Percent | 9%                   | 0%                     | 91%         | 0%                    | 0%                  | <b>100%</b> |
| South      | Calibrate | Number  | 1                    | 3                      | 36          | 4                     | 0                   | <b>43</b>   |
|            |           | Percent | 2%                   | 5%                     | 84%         | 9%                    | 0%                  | <b>100%</b> |
|            | Confirm   | Number  | 1                    | 2                      | 7           | 0                     | 1                   | <b>11</b>   |
|            |           | Percent | 9%                   | 18%                    | 64%         | 0%                    | 9%                  | <b>100%</b> |

## 4 DISCUSSION

The conceptual model of the BCG was derived from widespread empirical experience of working aquatic ecologists from across the country (Davies and Jackson 2006). The calibration process of the index is simultaneously conceptual, empirical, and quantitative. The BCG is calibrated using observations from a data set, but also requires ecological considerations with wide expert agreement from biologists familiar with the resources. The result is intended to be more general than a regression analysis of biological response to an anthropogenic stressor gradient. The BCG uses attributes (attributes I to VI) that are intended to apply in all regions. While specifics of the attributes (taxon membership, attribute levels indicating natural, moderate, highly altered, etc.) might vary across regions and stream types, the attributes themselves and their importance are consistent. The BCG requires descriptions of condition levels from pristine to severely altered. The standard narrative descriptions of taxonomic structure and ecosystem function were referenced while experts were assigning samples to the BCG levels, ensuring adherence to the biological characteristics. Documentation of the rationale for making BCG level determinations was recorded during the workshops, webinars, and homework exercises. The rationale provides the foundation for building robust quantitative models and ensures that future information and discoveries can be related back to the baseline level descriptions.

The BCG is compared to the reference condition after calibration, but is calibrated independent of information on reference site status. Although least disturbed sites may be used as a practical ground truth, it is recognized at the outset that these sites are typically less than pristine, and may be a lower level (e.g., 2, 3, 4). The levels of the BCG are biologically recognizable stages in the condition of waterbodies, in this case, streams. As such, they can form a biological basis for criteria and regulation of a state's streams. Thresholds of narrative biocriteria in some states may be relatively low (e.g., level 4-level 5), and fail to protect outstanding condition waters (levels 1 and 2), or even good condition waters (level 3). Low protection levels are often the result of low levels of rigor in monitoring and assessment (USEPA 2013). Thus, biocriteria set at a lower BCG level will allow incremental degradation of waterbodies to the regulatory level.

To develop the decision analysis system, we had to have a set of rules to which we could apply fuzzy logic. This may be the greatest single strength of the predictive decision model approach - development of a set of transparent rules that can, in principle, be followed by anyone in making an assessment of a site. The experts can describe the classes of the BCG in a very general way, but without the specific rules and their combination, there is no way to replicate their decisions or to effectively modify rules with new knowledge. The quantitative rules are transparent and can be followed by anyone with basic knowledge of aquatic organisms. The fuzzy model rules are fully explained and are not hidden in a statistical model or in artificial machine learning.

Aquatic biologists from IDEM, Ivy Tech Community College of Indiana, INHS, Eastern Kentucky University, Muncie Bureau of Water Quality, ORSANCO, USACE, Commonwealth Biomonitoring and MBI partnered to develop a common assessment system based on the BCG for macroinvertebrate assemblages in Indiana streams. This was a collective exercise among regional biologists to develop consensus on assessments of samples. The rules that the biologists used to assess the samples were used to develop a set of quantitative decision criteria rules for assigning samples to BCG levels. There was fairly high agreement among the biologists

performing the assessments (Figure 7), and very high concordance between the expert assessment and the quantitative BCG model (Table 5). The concordance increases our confidence in the consensus professional judgment to assess sites, and in the quantitative model to replicate that judgment.

A cursory comparison was made between BCG models and ratings for Indiana and Illinois (Appendix G). In many respects, the BCG ratings and model results were comparable across state lines, applying alternative IL or IN models, and when rated by independent expert groups. The models and ratings were always identical or within one BCG level difference. This concordance in interpreting samples along the BCG scale shows a high degree of consistency even though the comparisons were not comprehensive.

As new data are collected, IDEM and partners will be able to generate BCG model outputs using a Microsoft Access application that is being developed for this project. The upper extreme of the BCG gradient, BCG level 2, was not well represented in the data set, and any sites identified by routine application of the quantitative model as BCG level 2 should also be examined by professional biologists. There were no rules identified for BCG level 1, which is clearly an area for further investigation.

Moving ahead, IDEM could potentially use the BCG models to supplement and enhance the IBI assessment measures. If the BCG models are utilized, users should consider the limitations of the models. Results from the macroinvertebrate BCG models should be interpreted with caution and checked using professional assessment if they are applied to samples that were not collected using IDEM protocols or were from streams types that differ from those used in model calibration. Streams should be perennial wadeable streams in Indiana and samples should be collected using IDEM protocols.

The BCG can be an effective tool for communicating resource condition to the public and for informing management decisions to protect or remediate water resources. It can allow for practical and operational implementation of multiple aquatic life uses in a state's water quality criteria and standards. For example, some samples were considered to be BCG level 2, which, based on participants' input, represent the present-day most natural conditions in Indiana. Development of quantitative BCG models provides a technical tool for identifying and potentially protecting Indiana's highest quality streams, as well as developing realistic restoration goals for waters impacted by legacy activities, such as ditching, impoundments, and urban and agricultural land use.

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Paul McMurray (IDEM) sampling for macroinvertebrates at a stream margin.

## Appendix A

### BCG Calibration Details

The following sections are excerpts from the *Calibration of the Biological Condition Gradient (BCG) for Fish Assemblages in Indiana Streams & Large Rivers* (Stamp et al. 2016).

#### 2.1 Calibrating of the Conceptual BCG Model to Local Conditions

A multistep process is followed to calibrate a BCG to local conditions (Figure 3): describe the native aquatic assemblages under natural conditions; identify the predominant regional anthropogenic stressors; and describe the BCG, including the theoretical foundation and observed assemblage response to anthropogenic stressors. BCG development requires professional judgment and development of consensus (U.S. EPA 2016). Assessing condition of biological communities, including all common biotic indexes, involves professional judgment, even though such judgment may be hidden in apparently objective, quantitative approaches. Professional judgment is applied in the development of all assessment frameworks (e.g., Steedman 1994, Borja et al. 2004, Weisberg et al. 2008). Use of professional consensus has a long pedigree in the medical field, including the National Institutes of Health (NIH) Consensus Development Conferences to recommend best practices for diagnosis and treatment of diseases (NIH <http://consensus.nih.gov/>).

BCG calibration begins with the assembly and analysis of biological monitoring data. Next, a calibration workshop is held in which experts familiar with local conditions use the data to define the ecological attributes and set narrative statements (for example, narrative decision rules for assigning sites to a BCG level on the basis of the biological information collected at sites). Documentation of expert opinion in assigning sites to BCG levels is a critical part of the process. A decision model can then be developed that encompasses those rules and is tested with independent data sets. A decision model based on the tested decision rules is a transparent, formal, and testable method for documenting and validating expert knowledge. A quantitative data analysis program can then be developed using those rules.

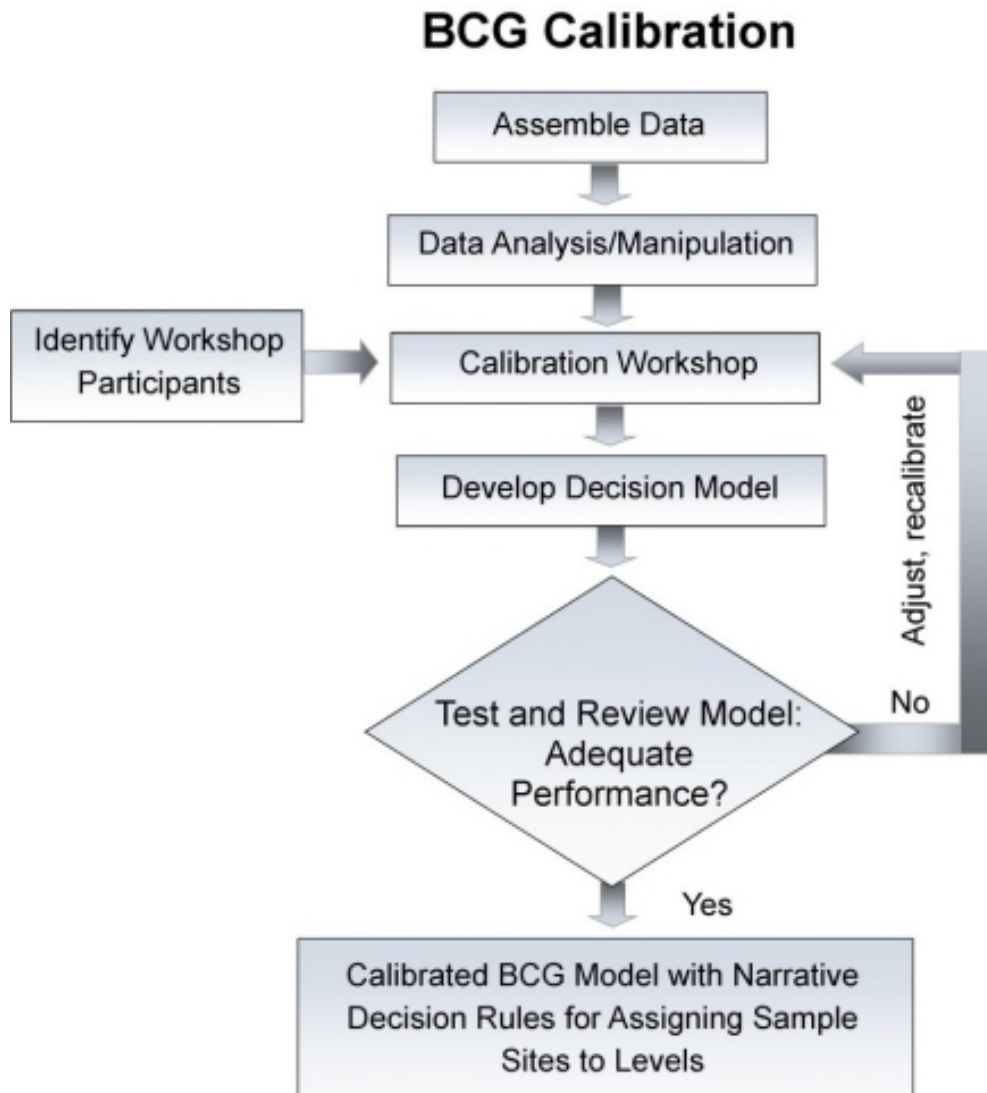


Figure 1. Steps in a BCG calibration.

#### 2.1.1 Assign Sites to Levels

The conceptual model of the BCG is intended to be universal (U.S. EPA 2016, Davies and Jackson 2006), but descriptions of communities, species, and their responses to the anthropogenic stress gradient are specific to the conditions and communities found in the sample region. Before assigning sites to BCG levels, the expert panel begins by describing the biological condition levels that can be discerned within their region. The description of natural conditions requires biological knowledge of the region, a natural classification of the assemblages, and, if available, historical descriptions of the habitats and assemblages.

The panelists examine species composition and abundance data from sites with different levels of cumulative stress, ranging from least stressed to severely stressed. The panel works with data tables showing the species and attributes for each sample. In developing assessments, the panel

works “blind”, that is, no stressor information is included in the data table. Only non-anthropogenic classification variables are shown (e.g., stream size, sample date). Panel members discuss the species composition and what they expect to see for each level of the BCG (e.g., “I expect to see more darter taxa in a BCG level 2 site”), and then assign samples to BCG levels. These site assignments are used to describe changes in the aquatic communities for a range of anthropogenic stress, leading to a complete descriptive model of the BCG for the region.

### **2.1.2 Quantitative Description**

BCG level descriptions in the conceptual model tend to be general (e.g., “reduced richness”). To allow for consistent assignments of sites to levels, it is necessary to formalize the expert knowledge by codifying level descriptions into a set of rules (e.g., Droesen 1996). If formalized properly, a knowledgeable person (with data) can follow the rules to obtain the same level assignments as the group of experts. This makes the actual decision criteria transparent to stakeholders.

Rules are logic statements that experts use to make their decisions (for example, “If taxon richness is high, then biological condition is natural”). Rules on attributes can be combined, for example: “If the number of highly sensitive taxa (Attribute II) is high, and the number of tolerant individuals (Attribute V) is low, then assignment is level 2.”

Numeric rule development requires discussion and documentation of level assignment decisions and the reasoning behind the decisions. During this discussion, it is necessary to record each participant’s level decision (e.g., vote) for the site, the critical or most important information for the decision (e.g., the number of taxa of a certain attribute, the abundance of an attribute, the presence of indicator taxa), and any confounding or conflicting information and how this was resolved for the eventual decision.

As the panel assigns example sites to BCG levels, the members are polled on the critical information and criteria they use to make their decisions. These form preliminary, narrative rules that explain how panel members make decisions. For example, “For BCG level 2, sensitive taxa must make up half or more of all taxa in a sample.” The decision rule for a single level of the BCG does not always rest on a single attribute (e.g., highly sensitive taxa) but may include other attributes as well (intermediate sensitive taxa, tolerant taxa, indicator species), so these are termed “Multiple Attribute Decision Rules.” With data from the sites, the rules can be checked and quantified. Quantification of rules allows users to consistently assess sites according to the same rules used by the expert panel, and allows a computer algorithm, or other persons, to obtain the same level assignments as the panel.

Rule development requires discussion and documentation of BCG level assignment decisions and the reasoning behind the decisions. During this discussion, we record:

- Each participant’s decision (“vote”) for the site
- The critical or most important information for the decision—for example, the number of taxa of a certain attribute, the abundance of an attribute, the presence of indicator taxa, etc.



- Any confounding or conflicting information and how this was resolved for the eventual decision

Following the initial site assignment and rule development, we develop descriptive statistics of the attributes and other biological indicators for each BCG level determined by the panel. These descriptions assist in review of the rules and their iteration for testing and refinement.

Rule development is iterative, and may require 2 or more panel sessions. Following the initial development phase, the draft rules are tested by the panel with new data to ensure that new sites are assessed in the same way. The new test sites are not used in the initial rule development and also should span the range of anthropogenic stress. Any remaining ambiguities and inconsistencies from the first iterations are also resolved.

### **2.1.3 Decision Criteria Models**

Consensus professional judgment used to describe the BCG levels can take into account nonlinear responses, uncommon stressors, masking of responses, and unequal weighting of attributes. This is in contrast to the commonly-used biological indexes, which are typically unweighted sums of attributes (e.g., multimetric indexes; Barbour et al. 1999, Karr and Chu 1999), or a single attribute, such as observed to expected taxa (e.g., Simpson and Norris 2000, Wright 2000). Consensus assessments built from the professional judgment of many experts result in a high degree of confidence in the assessments, but the assessments are labor-intensive (several experts must rate each site). It is also not practical to reconvene the same group of experts for every site that is monitored in the long term. Since experts may be replaced on a panel over time, assessments may in turn “drift” due to individual differences of new panelists. Management and regulation, however, require clear and consistent methods and rules for assessment, which do not change unless deliberately reset.

Use of the BCG in routine monitoring and assessment thus requires a way to automate the consensus expert judgment so that the assessments are consistent. The expert rules are automated in decision models. These models replicate the decision criteria of the expert panel by assembling the decision rules using logic and set theory, in the same way the experts used the rules. Instead of a statistical prediction of expert judgment, this approach directly and transparently converts the expert consensus to automated sample assessment. The method uses modern mathematical set theory and logic (called “fuzzy set theory”) applied to rules developed by the group of experts. Fuzzy set theory is directly applicable to environmental assessment, and has been used extensively in engineering applications worldwide (e.g., Demicco and Klir 2004) and environmental applications have been explored in Europe and Asia (e.g., Castella and Speight 1996, Ibelings et al. 2003).

Mathematical fuzzy set theory allows degrees of membership in sets, and degrees of truth in logic, compared to all-or-nothing in classical set theory and logic. Membership of an object in a set is defined by its membership function, a function that varies between 0 and 1. To illustrate, we compare how classical set theory and fuzzy set theory treat the common classification of sediment, where sand is defined as particles less than or equal to 2.0 mm diameter, and gravel is greater than 2.0 mm (Demicco and Klir 2004). In classical “crisp” set theory, a particle with

diameter of 1.999 mm is classified as “sand”, and one with 2.001 mm diameter is classified as “gravel.” In fuzzy set theory, both particles have nearly equal membership (approximately 0.5) in both classes (Demicco and Klir 2004). Very small measurement error in particle diameter greatly increases the uncertainty of classification in classical set theory, but not in fuzzy set theory (Demicco and Klir 2004). Demicco and Klir (2004) proposed four reasons why fuzzy sets and fuzzy logic enhance scientific methodology:

- Fuzzy set theory has greater capability to deal with “irreducible measurement uncertainty,” as in the sand/gravel example above.
- Fuzzy set theory captures vagueness of linguistic terms, such as “many,” “large” or “few.”
- Fuzzy set theory and logic can be used to manage complexity and computational costs of control and decision systems.
- Fuzzy set theory enhances the ability to model human reasoning and decision-making, which is critically important for defining thresholds and decision levels for environmental management.

### *Rule-based Inference Model*

People tend to use strength of evidence in defining decision criteria, and in allowing some deviation from their ideal for any individual attributes, as long as most attributes are in or near the desired range. For example, the definitions of “high,” “moderate,” “low,” etc., are qualitative (but ordinal) and can be interpreted and measured to mean different things. An important step in the BCG process is development of expert consensus defining these, or other, general terms and documenting the expert logic that is the basis for the decisions. The decision rules preserve the collective professional judgment of the expert group and set the stage for the development of models that can reliably assign sites to levels without having to reconvene the same group. In essence, the rules and the models capture the panel’s collective decision criteria.

An inference model is developed to replicate the panel decision process, and this section describes an inference model that uses mathematical fuzzy logic to mimic human reasoning. Each linguistic variable (e.g., “high taxon richness”) must be defined quantitatively as a fuzzy set (e.g., Klir 2004). For the BCG rules, we set lower and upper (“fuzzy set”) bounds for each metric based on information we gather from the calibration dataset. Each metric receives a membership value ranging from 0 to 1, depending on where the value falls in relation to the bounds. The rule threshold falls in the middle of these bounds. Metric values that are less than or equal to the lower bound receive a membership value of 0, while metric values that are greater than or equal to the upper bound receive a membership value of 1. In the example shown in Figure 4, the BCG rule for total taxa richness is  $\geq 20$  (15-25) (the lower bound is 15 and the upper bound is 25), which means –

- If there are 15 or fewer total taxa in the sample, the metric membership value is 0.
- If there are 25 or more total taxa in the sample, the metric membership value is 1.
- If the number of total taxa falls within the lower and upper bounds, the metric membership value will range from 0 to 1 (e.g., if there are 20 total taxa, the membership

value will be 0.5; if there are 17 total taxa, the membership value will be 0.2; if there are 23 total taxa, the membership value will be 0.8).

BCG rules for a given level are typically comprised of multiple metrics (which are considered in combination). To illustrate this, Figure 4 also shows a second metric – percent sensitive taxa. In this example, the BCG rule for percent sensitive taxa is  $\geq 10\%$  (5-15) (the lower bound is 5% and the upper bound is 15%). The metric membership value is derived using the same procedure described above for the total taxa metric. If the two rules are combined with an “AND” operator, then both metrics must meet the thresholds for a given BCG level (in this example, total taxa richness must be  $\geq 20$  AND percent sensitive taxa must be  $\geq 10\%$ ). The membership for the level will be the least of the membership levels for the two metrics. If the two rules are combined with an “OR” operator (referred to as an ‘alternate’ rule), then either can be true for a sample to meet the requirements (both conditions are not necessary). The membership for the level will be the greatest of the membership levels for the two metrics.

Together the rules for each BCG level work as a logical cascade from BCG level 1 to level 6, such that a sample is first tested against the level 1 rules; if the combined rule fails, then the level fails, and the assessment moves down to level 2, and so on (Figure 5). The BCG model evaluates metric membership values for all the metrics included in the rules for a given BCG level and considers the combination rules to derive the membership level for the sample. For example, if there are two rules (like shown in Figure 4) for BCG level 3 and they are joined with an “AND” operator, and the metric membership value for one metric is 0.8 and the metric membership value for the other is 0.6, the minimum membership value across the two metrics (0.6) is used to determine whether the requirements for a given BCG level are being met. If the two metrics are joined with an “OR” operator, then the BCG model considers the higher membership value (in this example, 0.8). The final BCG output may include membership of a sample in a single level only (e.g., probability of membership in BCG level 3 = 1.0), ties between levels (e.g., probability of membership in BCG level 3 = 0.5 and BCG level 4 = 0.5), and varying memberships among two or more levels (e.g., probability of membership in BCG level 3 = 0.8 and probability of membership in BCG level 4 = 0.2). The level with the highest membership value is taken as the nominal level.

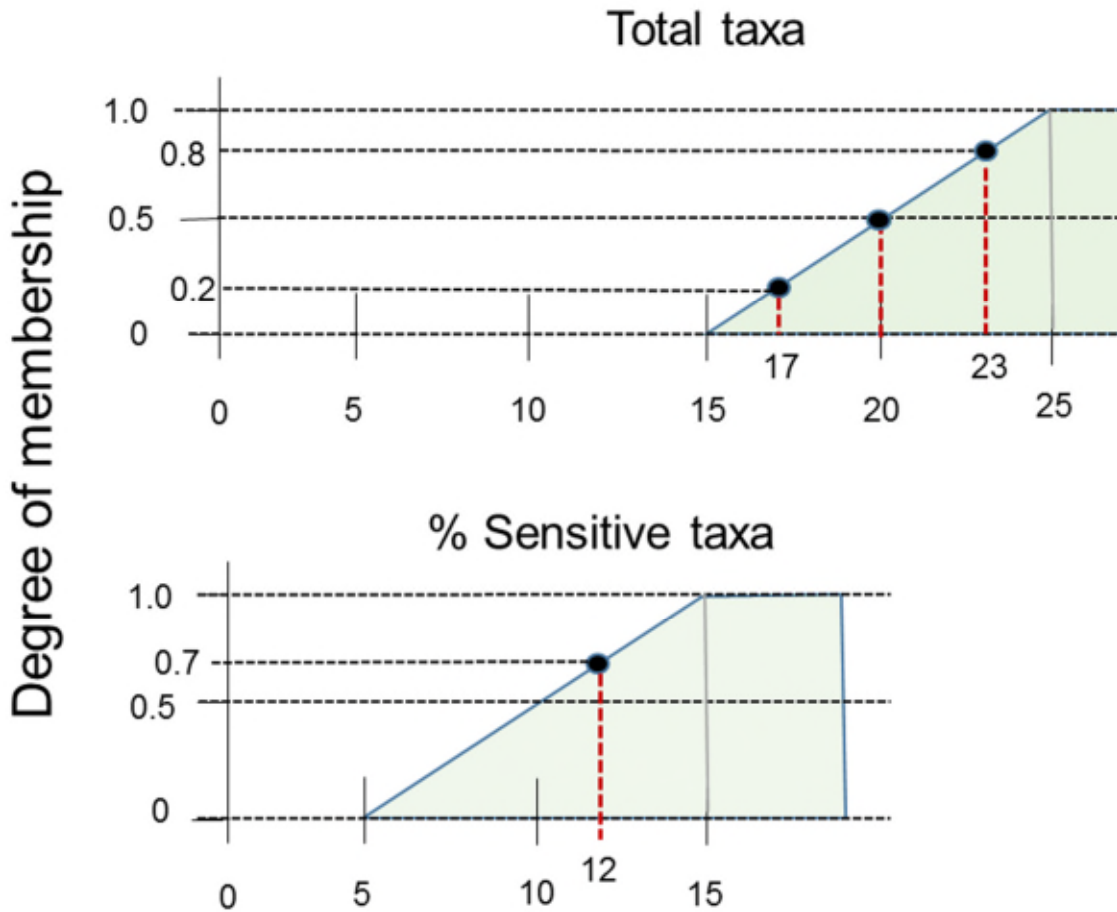


Figure 2. Illustration of the lower and upper (“fuzzy set”) bounds for two metrics (total tax richness and percent sensitive tax). Each metric receives a membership value ranging from 0 to 1, depending on where the value falls in relation to the bounds. In this example, the BCG rule for total tax richness is  $\geq 20$  (15-25) (the lower bound is 15 and the upper bound is 25), and the rule for percent sensitive tax is  $\geq 10$  (5-15). The black dots show examples of metric membership values assigned to different metric values (e.g., for the total tax metric, if there are 20 total tax, the metric membership value will be 0.5; if there are 17 total tax, the membership value will be 0.2; if there are 23 total tax, the membership value will be 0.8; for the percent sensitive tax metric, if the metric value is 12%, the membership value will be 0.7).

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## Appendix B

### Macroinvertebrate BCG Attributes for Indiana

| BCG Attribute              | FINAL ID             | Family          | Num Samps |
|----------------------------|----------------------|-----------------|-----------|
| <b>Annelida and others</b> |                      |                 |           |
| 4                          | Hirudinidae          | Hirudinidae     | 2         |
| 5                          | Erpobdellidae        | Erpobdellidae   | 124       |
| 5                          | Glossiphoniidae      | Glossiphoniidae | 122       |
| 5                          | Oligochaeta          |                 | 186       |
| x                          | Branchiobdellida     | Cambarincolidae | 150       |
| x                          | Cambarincolidae      | Cambarincolidae | 0         |
| x                          | Enchytraeidae        | Enchytraeidae   | 1         |
| NA                         | Lumbricidae          | Lumbricidae     | 16        |
| 5                          | Naididae             | Naididae        | 197       |
| 4                          | Branchiura           | Tubificidae     | 0         |
| 4                          | Branchiura sowerbyi  | Tubificidae     | 51        |
| 5                          | Tubificidae          | Tubificidae     | 200       |
| x                          | Lumbriculidae        | Lumbriculidae   | 62        |
| x                          | Dorylaimidae         | Dorylaimidae    | 0         |
| x                          | Nematoda             | Dorylaimidae    | 51        |
| NA                         | Chordodes morgani    | Chordodidae     | 3         |
| NA                         | Paragordius          | Chordodidae     | 0         |
| NA                         | Paragordius varius   | Chordodidae     | 10        |
| NA                         | Chordodidae          | Chordodidae     | 0         |
| 5                          | Turbellaria          |                 | 141       |
| 4                          | Porifera             |                 | 3         |
| <b>Mollusca: Bivalvia</b>  |                      |                 |           |
| 6                          | Corbicula            | Corbiculidae    | 189       |
| 6                          | Corbiculidae         | Corbiculidae    | 0         |
| 6                          | Dreissena            | Dreissenidae    | 1         |
| 6                          | Dreissena bugensis   | Dreissenidae    | 1         |
| 6                          | Dreissena polymorpha | Dreissenidae    | 11        |
| 6                          | Dreissenidae         | Dreissenidae    | 5         |
| 4                          | Musculium            | Pisidiidae      | 81        |
| 4                          | Pisidiidae           | Pisidiidae      | 46        |
| 4                          | Pisidium             | Pisidiidae      | 53        |
| 4                          | Sphaerium            | Pisidiidae      | 205       |

| BCG Attribute               | FINAL ID                           | Family         | Num Samps |
|-----------------------------|------------------------------------|----------------|-----------|
| <b>Mollusca: Gastropoda</b> |                                    |                |           |
| x                           | Gastropoda                         |                | 3         |
| 3                           | Campeloma                          | Viviparidae    | 18        |
| 6                           | Cipangopaludina chinensis malleata | Viviparidae    | 3         |
| x                           | Lioplax sulculosa                  | Viviparidae    | 1         |
| 4                           | Viviparidae                        | Viviparidae    | 28        |
| 4                           | Viviparus georgianus               | Viviparidae    | 1         |
| 4                           | Ancylidae                          | Ancylidae      | 12        |
| 4                           | Ferrissia                          | Ancylidae      | 70        |
| 4                           | Laevapex                           | Ancylidae      | 8         |
| 4                           | Rhodacme                           | Ancylidae      | 1         |
| 4                           | Fossaria                           | Lymnaeidae     | 55        |
| 4                           | Lymnaea                            | Lymnaeidae     | 2         |
| 4                           | Lymnaeidae                         | Lymnaeidae     | 8         |
| 3                           | Pseudosuccinea                     | Lymnaeidae     | 18        |
| 5                           | Stagnicola                         | Lymnaeidae     | 11        |
| 5                           | Physidae                           | Physidae       | 519       |
| 5                           | Gyraulus                           | Planorbidae    | 9         |
| 5                           | Helisoma                           | Planorbidae    | 69        |
| 5                           | Menetus                            | Planorbidae    | 4         |
| 5                           | Planorbella                        | Planorbidae    | 55        |
| 5                           | Planorbidae                        | Planorbidae    | 50        |
| 5                           | Promenetus                         | Planorbidae    | 2         |
| 4                           | Valvata                            | Valvatidae     | 1         |
| 4                           | Valvata bicarinata                 | Valvatidae     | 6         |
| 4                           | Valvata tricarinata                | Valvatidae     | 1         |
| 4                           | Valvatidae                         | Valvatidae     | 2         |
| 4                           | Amnicola                           | Hydrobiidae    | 1         |
| 4                           | Hydrobiidae                        | Hydrobiidae    | 19        |
| 3                           | Elimia                             | Pleuroceridae  | 162       |
| 3                           | Leptoxis                           | Pleuroceridae  | 3         |
| 3                           | Pleurocera                         | Pleuroceridae  | 39        |
| 3                           | Pleuroceridae                      | Pleuroceridae  | 13        |
| <b>Crustacea</b>            |                                    |                |           |
| 4                           | Amphipoda                          | Amphipoda      | 6         |
| 4                           | Crangonyctidae                     | Crangonyctidae | 0         |
| 4                           | Crangonyx                          | Crangonyctidae | 91        |
| 4                           | Gammaridae                         | Gammaridae     | 0         |
| 4                           | Gammarus                           | Gammaridae     | 114       |
| 4                           | Hyaella                            | Hyaellidae     | 300       |



| BCG Attribute     | FINAL ID                  | Family        | Num Samps |
|-------------------|---------------------------|---------------|-----------|
| 4                 | Hyalellidae               | Hyalellidae   | 0         |
| x                 | Cambaridae                | Cambaridae    | 0         |
| x                 | Cambarus                  | Cambaridae    | 14        |
| x                 | Cambarus diogenes         | Cambaridae    | 1         |
| x                 | Cambarus laevis           | Cambaridae    | 1         |
| x                 | Cambarus nebrascensis     | Cambaridae    | 17        |
| x                 | Cambarus ortmanni         | Cambaridae    | 1         |
| x                 | Cambarus polychromatus    | Cambaridae    | 4         |
| x                 | Cambarus robustus         | Cambaridae    | 2         |
| 4                 | Orconectes                | Cambaridae    | 174       |
| 5                 | Orconectes immunis        | Cambaridae    | 63        |
| 1                 | Orconectes indianensis    | Cambaridae    | 15        |
| 3                 | Orconectes juvenilis      | Cambaridae    | 10        |
| 3                 | Orconectes propinquus     | Cambaridae    | 89        |
| x                 | Orconectes putnami        | Cambaridae    | 1         |
| x                 | Orconectes ronaldi        | Cambaridae    | 1         |
| 4                 | Orconectes rusticus       | Cambaridae    | 70        |
| 4                 | Orconectes sloanii        | Cambaridae    | 49        |
| x                 | Orconectes theaphionensis | Cambaridae    | 2         |
| 4                 | Orconectes virilis        | Cambaridae    | 77        |
| 4                 | Procambarus               | Cambaridae    | 1         |
| 4                 | Procambarus acutus        | Cambaridae    | 4         |
| 4                 | Procambarus clarkii       | Cambaridae    | 1         |
| 4                 | Palaemonetes              | Palaemonidae  | 0         |
| 4                 | Palaemonetes kadiakensis  | Palaemonidae  | 9         |
| 4                 | Palaemonidae              | Palaemonidae  | 0         |
| x                 | Asellidae                 | Asellidae     | 5         |
| 5                 | Asellus                   | Asellidae     | 10        |
| 5                 | Caecidotea                | Asellidae     | 164       |
| 4                 | Lirceus                   | Asellidae     | 121       |
| x                 | Isopoda                   | Isopoda       | 1         |
| <b>Arachnida</b>  |                           |               |           |
| 4                 | Acari                     |               | 227       |
| <b>Collembola</b> |                           |               |           |
| x                 | Collembola                |               | 3         |
| x                 | Entomobryidae             | Entomobryidae | 1         |
| x                 | Isotomidae                | Isotomidae    | 101       |
| x                 | Poduridae                 | Poduridae     | 7         |
| x                 | Sminthuridae              | Sminthuridae  | 11        |

| BCG<br>Attribute  | FINAL ID                     | Family        | Num<br>Samps |
|-------------------|------------------------------|---------------|--------------|
| <b>Coleoptera</b> |                              |               |              |
| NA                | Curculionidae                | Curculionidae | 12           |
| 3                 | Dryopidae                    | Dryopidae     | 0            |
| 3                 | Helichus                     | Dryopidae     | 13           |
| 2                 | Helichus basalis             | Dryopidae     | 61           |
| 3                 | Helichus fastigiatus         | Dryopidae     | 5            |
| 3                 | Helichus lithophilus         | Dryopidae     | 190          |
| 4                 | Helichus striatus            | Dryopidae     | 11           |
| 5                 | Acilius fraternus            | Dytiscidae    | 3            |
| x                 | Agabetes                     | DYTISCIDAE    | 1            |
| 5                 | Agabus                       | Dytiscidae    | 18           |
| x                 | Bidessonotus                 | Dytiscidae    | 1            |
| x                 | Bidessonotus inconspicuus    | Dytiscidae    | 1            |
| 5                 | Copelatus                    | Dytiscidae    | 0            |
| 5                 | Copelatus chevrolati         | Dytiscidae    | 3            |
| 5                 | Copelatus glyphicus          | Dytiscidae    | 3            |
| 4                 | Coptotomus                   | Dytiscidae    | 1            |
| 4                 | Coptotomus lenticus          | Dytiscidae    | 1            |
| 4                 | Coptotomus longulus lenticus | Dytiscidae    | 3            |
| 4                 | Coptotomus loticus           | Dytiscidae    | 32           |
| 4                 | Coptotomus venustus          | Dytiscidae    | 1            |
| x                 | Desmopachria convexa         | Dytiscidae    | 1            |
| 4                 | Dytiscidae                   | Dytiscidae    | 5            |
| 3                 | Heterosternuta               | Dytiscidae    | 4            |
| 3                 | Heterosternuta ohionis       | Dytiscidae    | 24           |
| 3                 | Heterosternuta oppositus     | Dytiscidae    | 1            |
| 2                 | Heterosternuta pulcher       | Dytiscidae    | 24           |
| 4                 | Heterosternuta wickhami      | Dytiscidae    | 11           |
| 4                 | Hydaticus                    | Dytiscidae    | 2            |
| 4                 | Hydroporus                   | Dytiscidae    | 1            |
| x                 | Hydrotrupes palpalis         | Dytiscidae    | 1            |
| 5                 | Hydrovatus                   | Dytiscidae    | 2            |
| 5                 | Hydrovatus pustulatus        | Dytiscidae    | 5            |
| 4                 | Hygrotus                     | Dytiscidae    | 4            |
| 4                 | Hygrotus laccophilinus       | Dytiscidae    | 1            |
| 4                 | Hygrotus marginipennis       | Dytiscidae    | 1            |
| 4                 | Hygrotus nubilis             | Dytiscidae    | 1            |
| 5                 | Ilybius                      | Dytiscidae    | 2            |
| 5                 | Ilybius biguttulus           | Dytiscidae    | 1            |

| BCG Attribute | FINAL ID                  | Family     | Num Samps |
|---------------|---------------------------|------------|-----------|
| 4             | Laccophilus               | Dytiscidae | 12        |
| 4             | Laccophilus fasciatus     | Dytiscidae | 7         |
| 4             | Laccophilus maculosus     | Dytiscidae | 48        |
| 4             | Laccophilus proximus      | Dytiscidae | 4         |
| 4             | Liodessus                 | Dytiscidae | 8         |
| 4             | Liodessus affinis complex | Dytiscidae | 30        |
| 4             | Liodessus flavicollis     | Dytiscidae | 8         |
| 4             | Lioporeus                 | Dytiscidae | 7         |
| x             | Matus bicarinatus         | Dytiscidae | 1         |
| 4             | Neoporus                  | Dytiscidae | 21        |
| 4             | Neoporus carolinus        | Dytiscidae | 2         |
| 4             | Neoporus clypealis        | Dytiscidae | 37        |
| 4             | Neoporus dimidiatus       | Dytiscidae | 67        |
| 4             | Neoporus striatopunctatus | Dytiscidae | 15        |
| 4             | Neoporus sulcipennis      | Dytiscidae | 1         |
| 3             | Neoporus tennetum         | Dytiscidae | 28        |
| 4             | Neoporus undulatus        | Dytiscidae | 2         |
| 4             | Neoporus vitiosus         | Dytiscidae | 1         |
| 4             | Neoporus vittatipennis    | Dytiscidae | 2         |
| 4             | Neoporus vittatus         | Dytiscidae | 3         |
| 4             | Uvarus                    | Dytiscidae | 11        |
| 4             | Ancyronyx                 | Elmidae    | 0         |
| 4             | Ancyronyx variegatus      | Elmidae    | 203       |
| 4             | Dubiraphia                | Elmidae    | 288       |
| 4             | Dubiraphia bivittata      | Elmidae    | 26        |
| 4             | Dubiraphia minima group   | Elmidae    | 384       |
| 4             | Dubiraphia quadrinotata   | Elmidae    | 124       |
| 4             | Elmidae                   | Elmidae    | 17        |
| 4             | Macronychus               | Elmidae    | 0         |
| 4             | Macronychus glabratus     | Elmidae    | 272       |
| 2             | Microcylloepus            | Elmidae    | 0         |
| 2             | Microcylloepus pusillus   | Elmidae    | 5         |
| 3             | Optioservus               | Elmidae    | 19        |
| 3             | Optioservus fastiditus    | Elmidae    | 61        |
| 3             | Optioservus trivittatus   | Elmidae    | 17        |
| 4             | Stenelmis                 | Elmidae    | 283       |
| 4             | Stenelmis crenata         | Elmidae    | 207       |
| 4             | Stenelmis decorata        | Elmidae    | 3         |
| 4             | Stenelmis douglasensis    | Elmidae    | 2         |
| 4             | Stenelmis grossa          | Elmidae    | 38        |

| BCG Attribute | FINAL ID                     | Family        | Num Samps |
|---------------|------------------------------|---------------|-----------|
| 4             | Stenelmis quadrimaculata     | Elmidae       | 1         |
| 4             | Stenelmis sandersoni         | Elmidae       | 4         |
| 4             | Stenelmis sexlineata         | Elmidae       | 133       |
| 4             | Stenelmis vittipennis        | Elmidae       | 68        |
| 4             | Dineutus                     | Gyrinidae     | 59        |
| 4             | Gyretes                      | Gyrinidae     | 0         |
| 4             | Gyretes sinuatus             | Gyrinidae     | 6         |
| 4             | Gyrinidae                    | Gyrinidae     | 0         |
| 4             | Gyrinus                      | Gyrinidae     | 111       |
| 5             | Haliplidae                   | Haliplidae    | 0         |
| 5             | Haliphus                     | Haliplidae    | 2         |
| 5             | Haliphus blanchardi          | Haliplidae    | 1         |
| 5             | Haliphus borealis            | Haliplidae    | 18        |
| 5             | Haliphus fasciatus           | Haliplidae    | 1         |
| 5             | Haliphus immaculicollis      | Haliplidae    | 14        |
| 5             | Haliphus pantherinus         | Haliplidae    | 3         |
| 5             | Haliphus triopsis            | Haliplidae    | 1         |
| 5             | Peltodytes                   | Haliplidae    | 32        |
| 4             | Peltodytes dunavani          | Haliplidae    | 23        |
| 5             | Peltodytes duodecimpunctatus | Haliplidae    | 340       |
| 5             | Peltodytes edentulus         | Haliplidae    | 76        |
| 4             | Peltodytes lengi             | Haliplidae    | 110       |
| 5             | Peltodytes litoralis         | Haliplidae    | 8         |
| 5             | Peltodytes muticus           | Haliplidae    | 48        |
| 5             | Peltodytes pedunculatus      | Haliplidae    | 22        |
| 4             | Peltodytes sexmaculatus      | Haliplidae    | 66        |
| 5             | Peltodytes shermani          | Haliplidae    | 3         |
| NA            | Heteroceridae                | Heteroceridae | 20        |
| NA            | Heterocerus                  | Heteroceridae | 1         |
| NA            | Neoheterocerus longilobus    | Heteroceridae | 3         |
| x             | Gymnochthebius               | Hydraenidae   | 8         |
| x             | Hydraena                     | Hydraenidae   | 2         |
| x             | Hydraenidae                  | Hydraenidae   | 0         |
| 4             | Hydrochidae                  | Hydrochidae   | 0         |
| 4             | Hydrochus                    | Hydrochidae   | 31        |
| 4             | ANACAENA                     | Hydrophilidae | 25        |
| 4             | Berosus                      | Hydrophilidae | 101       |
| 4             | Berosus aculeatus            | Hydrophilidae | 4         |
| 4             | Berosus exiguus              | Hydrophilidae | 1         |
| 4             | Berosus fraternus            | Hydrophilidae | 1         |

| BCG<br>Attribute | FINAL ID                         | Family        | Num<br>Samps |
|------------------|----------------------------------|---------------|--------------|
| 4                | Berosus infuscatus               | Hydrophilidae | 8            |
| 4                | Berosus ordinatus                | Hydrophilidae | 1            |
| 4                | Berosus pantherinus              | Hydrophilidae | 3            |
| 4                | Berosus peregrinus               | Hydrophilidae | 235          |
| 4                | Berosus striatus                 | Hydrophilidae | 2            |
| 4                | Cymbiodyta                       | Hydrophilidae | 7            |
| x                | Derallus altus                   | Hydrophilidae | 1            |
| 4                | Enochrus                         | Hydrophilidae | 24           |
| 4                | Enochrus hamiltoni               | Hydrophilidae | 1            |
| 4                | Enochrus ochraceus               | Hydrophilidae | 15           |
| 4                | Enochrus perplexus               | Hydrophilidae | 1            |
| 4                | Enochrus pygmaeus                | Hydrophilidae | 17           |
| 5                | Helochares                       | Hydrophilidae | 5            |
| 5                | Helochares maculicollis          | Hydrophilidae | 3            |
| x                | Helocombus bifidus               | Hydrophilidae | 1            |
| 4                | Helophorus                       | Hydrophilidae | 32           |
| 4                | Hydrobius                        | Hydrophilidae | 5            |
| 4                | Hydrochara                       | Hydrophilidae | 4            |
| 4                | Hydrophilidae                    | Hydrophilidae | 4            |
| 3                | Laccobius                        | Hydrophilidae | 42           |
| 5                | Paracymus                        | Hydrophilidae | 69           |
| 3                | Sperchopsis                      | Hydrophilidae | 0            |
| 3                | Sperchopsis tessellata           | Hydrophilidae | 24           |
| 4                | Tropisternus                     | Hydrophilidae | 113          |
| 4                | Tropisternus affinis             | Hydrophilidae | 14           |
| 4                | Tropisternus blatchleyi modestus | Hydrophilidae | 2            |
| 4                | Tropisternus collaris            | Hydrophilidae | 14           |
| 5                | Tropisternus glaber              | Hydrophilidae | 65           |
| 4                | Tropisternus lateralis           | Hydrophilidae | 14           |
| 5                | Tropisternus mixtus              | Hydrophilidae | 15           |
| 4                | Tropisternus natator             | Hydrophilidae | 25           |
| 3                | Limnichidae                      | Limnichidae   | 0            |
| 3                | Limnichus                        | Limnichidae   | 2            |
| 3                | Lutrochus laticeps               | Limnichidae   | 4            |
| 5                | Hydrocanthus                     | Noteridae     | 2            |
| 5                | Hydrocanthus iricolor            | Noteridae     | 2            |
| 5                | Noteridae                        | Noteridae     | 0            |
| x                | Suphisellus                      | Noteridae     | 1            |
| 3                | Ectopria                         | Psephenidae   | 9            |
| 3                | Psephenidae                      | Psephenidae   | 0            |

|  | BCG<br>Attribute | FINAL ID           | Family      | Num<br>Samps |
|--|------------------|--------------------|-------------|--------------|
|  | 3                | Psephenus          | Psephenidae | 0            |
|  | 3                | Psephenus herricki | Psephenidae | 143          |
|  | 4                | Cyphon             | Scirtidae   | 310          |
|  | 4                | Scirtes            | Scirtidae   | 1            |
|  | 4                | Scirtidae          | Scirtidae   | 0            |

#### Diptera

|   |                            |                 |     |
|---|----------------------------|-----------------|-----|
| 3 | Athericidae                | Athericidae     | 0   |
| 3 | Atherix                    | Athericidae     | 5   |
| 4 | Atrichopogon               | Ceratopogonidae | 20  |
| 4 | Bezzia/Palpomyia           | Ceratopogonidae | 54  |
| 5 | Ceratopogon                | Ceratopogonidae | 27  |
| 4 | Ceratopogonidae            | Ceratopogonidae | 58  |
| 5 | Culicoides                 | Ceratopogonidae | 23  |
| 4 | Dasyhelea                  | Ceratopogonidae | 10  |
| 4 | Forcipomyia                | Ceratopogonidae | 3   |
| x | Mallochohelea              | Ceratopogonidae | 5   |
| 4 | Probezzia                  | Ceratopogonidae | 41  |
| 4 | Serromyia                  | Ceratopogonidae | 4   |
| 5 | Chaoboridae                | Chaoboridae     | 0   |
| 5 | Chaoborus                  | Chaoboridae     | 6   |
| 4 | Ablabesmyia                | Chironomidae    | 9   |
| 4 | Ablabesmyia (Ablabesmyia)  | Chironomidae    | 13  |
| 4 | Ablabesmyia (Asayia)       | Chironomidae    | 3   |
| 4 | Ablabesmyia (Karelia)      | Chironomidae    | 10  |
| 4 | Ablabesmyia aspera group   | Chironomidae    | 2   |
| 4 | Ablabesmyia mallochi group | Chironomidae    | 169 |
| 4 | Ablabesmyia monilis group  | Chironomidae    | 6   |
| 3 | Ablabesmyia rhapsode group | Chironomidae    | 71  |
| 4 | Ablabesmyia simpsoni group | Chironomidae    | 7   |
| x | Acricotopus nitidellus     | Chironomidae    | 2   |
| x | Apedilum                   | Chironomidae    | 2   |
| 3 | Axarus                     | Chironomidae    | 10  |
| 4 | Brillia                    | Chironomidae    | 0   |
| 4 | Brillia flavifrons         | Chironomidae    | 12  |
| 3 | Cardiocladius              | Chironomidae    | 2   |
| x | Chironomidae               | Chironomidae    | 227 |
| 4 | Chironominae               | Chironomidae    | 15  |
| 4 | Chironomini                | Chironomidae    | 309 |
| 5 | Chironomus                 | Chironomidae    | 230 |
| 5 | Cladopelma                 | Chironomidae    | 7   |

| BCG<br>Attribute | FINAL ID                     | Family       | Num<br>Samps |
|------------------|------------------------------|--------------|--------------|
| 4                | Cladotanytarsus              | Chironomidae | 179          |
| 5                | Clinotanypus                 | Chironomidae | 0            |
| 5                | Clinotanypus pinguis         | Chironomidae | 63           |
| x                | Conchapelopia                | Chironomidae | 1            |
| 3                | Corynoneura                  | Chironomidae | 42           |
| 4                | Cricotopus                   | Chironomidae | 25           |
| 4                | Cricotopus (cricotopus)      | Chironomidae | 76           |
| 5                | Cricotopus (Isocladius)      | Chironomidae | 2            |
| x                | Cricotopus elegans           | Chironomidae | 1            |
| 5                | Cricotopus sylvestris group  | Chironomidae | 11           |
| 4                | Cricotopus trifascia         | Chironomidae | 33           |
| 4                | Cricotopus/Orthocladius      | Chironomidae | 65           |
| 4                | Cryptochironomus             | Chironomidae | 204          |
| 4                | Cryptotendipes               | Chironomidae | 74           |
| 3                | Diamesa                      | Chironomidae | 2            |
| 3                | Diamesinae                   | Chironomidae | 1            |
| 4                | Dicrotendipes                | Chironomidae | 254          |
| 5                | Diplocladius cultriger       | Chironomidae | 1            |
| x                | Doithrix                     | Chironomidae | 1            |
| 4                | Doncricotopus bicaudatus     | Chironomidae | 1            |
| 4                | Endochironomus               | Chironomidae | 44           |
| 3                | Eukiefferiella               | Chironomidae | 38           |
| x                | Fittkauimyia                 | Chironomidae | 1            |
| 5                | Glyptotendipes               | Chironomidae | 116          |
| 5                | Goeldichironomus             | Chironomidae | 2            |
| 4                | Harnischia                   | Chironomidae | 9            |
| 4                | Hydrobaenus                  | Chironomidae | 4            |
| 5                | Kiefferulus                  | Chironomidae | 13           |
| x                | Krenopelopia                 | Chironomidae | 2            |
| 4                | Labrundinia                  | Chironomidae | 11           |
| 4                | Labrundinia becki            | Chironomidae | 2            |
| 4                | Labrundinia maculata         | Chironomidae | 2            |
| 4                | Labrundinia neopilosella     | Chironomidae | 2            |
| 4                | Labrundinia pilosella        | Chironomidae | 41           |
| 4                | Labrundinia virescens        | Chironomidae | 1            |
| 5                | Larsia                       | Chironomidae | 27           |
| 4                | Micropsectra                 | Chironomidae | 2            |
| 3                | Microtendipes                | Chironomidae | 0            |
| 3                | Microtendipes pedellus group | Chironomidae | 163          |
| 4                | Nanocladius                  | Chironomidae | 34           |

| BCG<br>Attribute | FINAL ID                             | Family       | Num<br>Samps |
|------------------|--------------------------------------|--------------|--------------|
| 4                | Natarsia                             | Chironomidae | 27           |
| 3                | Neozavrelia                          | Chironomidae | 1            |
| 4                | Nilotanypus                          | Chironomidae | 11           |
| 4                | Nilothauma                           | Chironomidae | 4            |
| 4                | Orthoclaadiinae                      | Chironomidae | 112          |
| 4                | Orthocladus                          | Chironomidae | 43           |
| 3                | Pagastia                             | Chironomidae | 3            |
| 5                | Parachironomus                       | Chironomidae | 23           |
| 4                | Paracladopelma                       | Chironomidae | 19           |
| 4                | Paracricotopus                       | Chironomidae | 1            |
| 4                | Parakiefferiella                     | Chironomidae | 17           |
| 4                | Paralauterborniella                  | Chironomidae | 0            |
| 4                | Paralauterborniella nigrohalterale   | Chironomidae | 29           |
| 4                | Paramerina                           | Chironomidae | 22           |
| 4                | Parametriocnemus/Paraphaenocladus    | Chironomidae | 25           |
| 4                | Paratanytarsus                       | Chironomidae | 156          |
| 4                | Paratendipes                         | Chironomidae | 0            |
| 4                | Paratendipes albimanus               | Chironomidae | 118          |
| x                | Paratendipes subaequalis             | Chironomidae | 1            |
| 4                | Pentaneura                           | Chironomidae | 15           |
| 4                | Phaenopsectra/Tribelos               | Chironomidae | 178          |
| 4                | Polypedilum                          | Chironomidae | 34           |
| 4                | Polypedilum (tripodura)              | Chironomidae | 20           |
| 4                | Polypedilum (Uresipedilum)           | Chironomidae | 1            |
| 3                | Polypedilum aviceps                  | Chironomidae | 16           |
| 4                | Polypedilum fallax group             | Chironomidae | 37           |
| 4                | Polypedilum flavum                   | Chironomidae | 257          |
| 5                | Polypedilum halterale/simulans group | Chironomidae | 65           |
| 5                | Polypedilum illinoense group         | Chironomidae | 418          |
| 3                | Polypedilum laetum group             | Chironomidae | 15           |
| 4                | Polypedilum scalaenum group          | Chironomidae | 96           |
| 5                | Polypedilum tritum                   | Chironomidae | 5            |
| 5                | Procladius                           | Chironomidae | 266          |
| 5                | Prodiamesa                           | Chironomidae | 4            |
| 4                | Psectrocladius                       | Chironomidae | 4            |
| 5                | Psectrotanypus                       | Chironomidae | 0            |
| 5                | Psectrotanypus dyari                 | Chironomidae | 14           |
| 4                | Pseudochironomus                     | Chironomidae | 23           |
| x                | Psilometriocnemus                    | Chironomidae | 1            |
| 4                | Rheocricotopus                       | Chironomidae | 29           |



| BCG Attribute | FINAL ID                 | Family         | Num Samps |
|---------------|--------------------------|----------------|-----------|
| 4             | Rheotanytarsus           | Chironomidae   | 193       |
| 3             | Robackia                 | Chironomidae   | 5         |
| 4             | Saetheria                | Chironomidae   | 7         |
| 4             | Saetheria tylus          | Chironomidae   | 22        |
| 3             | Stempellina              | Chironomidae   | 7         |
| 3             | Stempellinella           | Chironomidae   | 79        |
| 3             | Stenochironomus          | Chironomidae   | 21        |
| 5             | Stictochironomus         | Chironomidae   | 185       |
| 3             | Sublettea                | Chironomidae   | 0         |
| 3             | Sublettea coffmani       | Chironomidae   | 11        |
| 4             | Tanypodinae              | Chironomidae   | 122       |
| 5             | Tanypus                  | Chironomidae   | 2         |
| 5             | Tanypus neopunctipennis  | Chironomidae   | 18        |
| 5             | Tanypus punctipennis     | Chironomidae   | 1         |
| 4             | Tanytarsini              | Chironomidae   | 97        |
| 4             | Tanytarsus               | Chironomidae   | 367       |
| 3             | Telopelopia              | Chironomidae   | 0         |
| 3             | Telopelopia okoboji      | Chironomidae   | 8         |
| 4             | Thienemanniella          | Chironomidae   | 48        |
| 4             | Thienemannimyia          | Chironomidae   | 0         |
| 4             | Thienemannimyia group    | Chironomidae   | 318       |
| 3             | Tvetenia                 | Chironomidae   | 23        |
| 3             | Xenochironomus xenolabis | Chironomidae   | 4         |
| 3             | Xylotopus par            | Chironomidae   | 4         |
| x             | Zavrelia                 | Chironomidae   | 1         |
| 4             | Zavreliella              | Chironomidae   | 0         |
| 4             | Zavreliella marmorata    | Chironomidae   | 7         |
| 4             | Zavrelimyia              | Chironomidae   | 11        |
| 5             | Aedes                    | Culicidae      | 3         |
| 4             | Anopheles                | Culicidae      | 97        |
| 5             | Culex                    | Culicidae      | 8         |
| 5             | Culicidae                | Culicidae      | 6         |
| 3             | Dixella                  | Dixidae        | 56        |
| 3             | Dixidae                  | Dixidae        | 4         |
| 4             | Dolichopodidae           | Dolichopodidae | 4         |
| 3             | Empididae                | Empididae      | 6         |
| 3             | Hemerodromia             | Empididae      | 87        |
| 3             | Neoplasta                | Empididae      | 2         |
| 5             | Ephydra                  | Ephydridae     | 1         |
| 5             | Ephydridae               | Ephydridae     | 18        |

| BCG Attribute        | FINAL ID                    | Family         | Num Samps |
|----------------------|-----------------------------|----------------|-----------|
| 5                    | Muscidae                    | Muscidae       | 13        |
| x                    | Phoridae                    | Phoridae       | 2         |
| 5                    | Pericoma/Telmatoscopus      | Psychodidae    | 7         |
| 5                    | Psychoda                    | Psychodidae    | 4         |
| 5                    | Psychodidae                 | Psychodidae    | 5         |
| x                    | Ptychoptera                 | Ptychopteridae | 1         |
| 5                    | Sciomyzidae                 | Sciomyzidae    | 26        |
| 4                    | Prosimulium                 | Simuliidae     | 1         |
| 4                    | Simuliidae                  | Simuliidae     | 4         |
| 4                    | Simulium                    | Simuliidae     | 155       |
| 5                    | Hedriodiscus/Odontomyia     | Stratiomyidae  | 3         |
| 5                    | Myxosargus                  | Stratiomyidae  | 3         |
| 5                    | Nemotelus                   | Stratiomyidae  | 3         |
| 5                    | Stratiomyidae               | Stratiomyidae  | 1         |
| 5                    | Stratiomys                  | Stratiomyidae  | 38        |
| 5                    | Helophilus                  | Syrphidae      | 1         |
| 5                    | Syrphidae                   | Syrphidae      | 4         |
| x                    | Chlorotabanus crepuscularis | Tabanidae      | 3         |
| 4                    | Chrysops                    | Tabanidae      | 136       |
| 4                    | Tabanidae                   | Tabanidae      | 14        |
| 4                    | Tabanus                     | Tabanidae      | 39        |
| 3                    | Antocha                     | Tipulidae      | 20        |
| 4                    | Dicranota                   | Tipulidae      | 17        |
| 4                    | Erioptera                   | Tipulidae      | 4         |
| 4                    | Helius                      | Tipulidae      | 1         |
| 3                    | Hexatoma                    | Tipulidae      | 59        |
| 3                    | Limnophila                  | Tipulidae      | 4         |
| 4                    | Limonia                     | Tipulidae      | 3         |
| 4                    | Ormosia                     | Tipulidae      | 11        |
| 4                    | Pilaria                     | Tipulidae      | 7         |
| 3                    | Pseudolimnophila            | Tipulidae      | 4         |
| x                    | Rhabdomastix                | Tipulidae      | 1         |
| 4                    | Tipula                      | Tipulidae      | 102       |
| 4                    | Tipulidae                   | Tipulidae      | 18        |
| <b>Ephemeroptera</b> |                             |                |           |
| x                    | Ephemeroptera               |                | 8         |
| 2                    | Acentrella                  | Baetidae       | 15        |
| 3                    | Acerpenna                   | Baetidae       | 9         |
| 3                    | Acerpenna macdunnoughi      | Baetidae       | 1         |
| 3                    | Acerpenna pygmaea           | Baetidae       | 10        |

| BCG Attribute | FINAL ID               | Family         | Num Samps |
|---------------|------------------------|----------------|-----------|
| x             | Apobaetis              | Baetidae       | 1         |
| 4             | Baetidae               | Baetidae       | 78        |
| 4             | Baetis                 | Baetidae       | 48        |
| 3             | Baetis brunneicolor    | Baetidae       | 2         |
| 4             | Baetis flavistriga     | Baetidae       | 94        |
| 4             | Baetis intercalaris    | Baetidae       | 177       |
| 3             | Baetis tricaudatus     | Baetidae       | 3         |
| 4             | Callibaetis            | Baetidae       | 85        |
| 3             | Centroptilum           | Baetidae       | 86        |
| x             | Cloeon dipterum        | Baetidae       | 1         |
| 3             | Dipheter hageni        | Baetidae       | 3         |
| 3             | Heterocloeon           | Baetidae       | 3         |
| 3             | Heterocloeon/Plauditus | Baetidae       | 2         |
| 3             | Iswaeon                | Baetidae       | 3         |
| 3             | Paracloeodes           | Baetidae       | 5         |
| 3             | Paracloeodes minutus   | Baetidae       | 4         |
| 3             | Plauditus              | Baetidae       | 3         |
| 2             | Procloeon              | Baetidae       | 46        |
| 4             | Pseudocentroptiloides  | Baetidae       | 4         |
| 4             | Pseudocloeon           | Baetidae       | 67        |
| 2             | Baetisca               | Baetiscidae    | 1         |
| 2             | Baetisca lacustris     | Baetiscidae    | 3         |
| 4             | Caenidae               | Caenidae       | 6         |
| 4             | Caenis                 | Caenidae       | 464       |
| 3             | Sparbarus              | Caenidae       | 9         |
| 3             | Sparbarus lacustris    | Caenidae       | 3         |
| 2             | Attenella attenuata    | Ephemerellidae | 1         |
| 2             | Ephemerella            | Ephemerellidae | 2         |
| 2             | Ephemerellidae         | Ephemerellidae | 2         |
| 2             | Eurylophella           | Ephemerellidae | 6         |
| 2             | Serratella             | Ephemerellidae | 1         |
| 2             | Teloganopsis deficiens | Ephemerellidae | 1         |
| 3             | Ephemera               | Ephemeridae    | 44        |
| 3             | Ephemeridae            | Ephemeridae    | 3         |
| 3             | Hexagenia              | Ephemeridae    | 47        |
| 4             | Heptagenia             | Heptageniidae  | 3         |
| 4             | Heptageniidae          | Heptageniidae  | 130       |
| 3             | Leucrocuta             | Heptageniidae  | 66        |
| 3             | Maccaffertium          | Heptageniidae  | 56        |
| 3             | Maccaffertium exiguum  | Heptageniidae  | 26        |

| BCG Attribute | FINAL ID                         | Family          | Num Samps |
|---------------|----------------------------------|-----------------|-----------|
| 3             | Maccaffertium luteum             | Heptageniidae   | 8         |
| 3             | Maccaffertium mediopunctatum     | Heptageniidae   | 47        |
| 3             | Maccaffertium mexicanum integrum | Heptageniidae   | 9         |
| 3             | Maccaffertium pulchellum         | Heptageniidae   | 71        |
| 3             | Maccaffertium terminatum         | Heptageniidae   | 39        |
| 3             | Maccaffertium vicarium           | Heptageniidae   | 6         |
| x             | Maccaffertium/Stenonema          | Heptageniidae   | 3         |
| 4             | Stenacron                        | Heptageniidae   | 15        |
| 4             | Stenacron gildersleevei          | Heptageniidae   | 1         |
| 4             | Stenacron interpunctatum         | Heptageniidae   | 168       |
| 4             | Stenacron minnetonka             | Heptageniidae   | 1         |
| 4             | Stenonema                        | Heptageniidae   | 0         |
| 4             | Stenonema femoratum              | Heptageniidae   | 166       |
| 3             | Isonychia                        | Isonychiidae    | 126       |
| 3             | Isonychiidae                     | Isonychiidae    | 0         |
| 3             | Choroterpes                      | Leptophlebiidae | 0         |
| 3             | Choroterpes basalis              | Leptophlebiidae | 18        |
| 3             | Leptophlebia                     | Leptophlebiidae | 7         |
| 3             | Leptophlebiidae                  | Leptophlebiidae | 14        |
| 3             | Paraleptophlebia                 | Leptophlebiidae | 33        |
| 3             | Ephoron                          | Polymitarcyidae | 18        |
| 3             | Polymitarcyidae                  | Polymitarcyidae | 0         |
| 3             | Anthopotamus                     | Potamanthidae   | 23        |
| 3             | Potamanthidae                    | Potamanthidae   | 0         |
| 4             | Tricorythidae                    | Tricorythidae   | 0         |
| 4             | Tricorythodes                    | Tricorythidae   | 212       |

#### Hemiptera

|   |                        |                |     |
|---|------------------------|----------------|-----|
| x | Hemiptera              |                | 8   |
| 4 | Belostoma              | Belostomatidae | 105 |
| 4 | Belostomatidae         | Belostomatidae | 22  |
| x | Corisella edulis       | Corixidae      | 1   |
| 4 | Corixidae              | Corixidae      | 248 |
| 4 | Hesperocorixa          | Corixidae      | 3   |
| 4 | Hesperocorixa nitida   | Corixidae      | 2   |
| 4 | Hesperocorixa vulgaris | Corixidae      | 1   |
| 4 | Palmacorixa            | Corixidae      | 19  |
| 4 | Palmacorixa buenoi     | Corixidae      | 22  |
| 4 | Palmacorixa gillettei  | Corixidae      | 22  |
| 4 | Palmacorixa nana       | Corixidae      | 65  |
| 4 | Sigara                 | Corixidae      | 115 |

| BCG Attribute | FINAL ID                   | Family         | Num Samps |
|---------------|----------------------------|----------------|-----------|
| 4             | Trichocorixa               | Corixidae      | 12        |
| 4             | Trichocorixa calva         | Corixidae      | 222       |
| 4             | Trichocorixa kanza         | Corixidae      | 45        |
| 5             | Trichocorixa sexcincta     | Corixidae      | 14        |
| NA            | Gelastocoridae             | Gelastocoridae | 1         |
| NA            | Gelastocoris               | Gelastocoridae | 0         |
| NA            | Gelastocoris oculatus      | Gelastocoridae | 5         |
| x             | Aquarius                   | Gerridae       | 136       |
| x             | Gerridae                   | Gerridae       | 144       |
| x             | Gerrinae                   | Gerridae       | 38        |
| x             | Gerris                     | Gerridae       | 59        |
| x             | Limnopus                   | Gerridae       | 10        |
| x             | Metrobates                 | Gerridae       | 0         |
| x             | Metrobates hesperius       | Gerridae       | 38        |
| x             | Neogerris hesione          | Gerridae       | 1         |
| x             | Rheumatobates              | Gerridae       | 208       |
| x             | Rheumatobates palosi       | Gerridae       | 24        |
| x             | Rheumatobates rileyi       | Gerridae       | 11        |
| x             | Rheumatobates tenuipes     | Gerridae       | 12        |
| x             | Rheumatobates trulliger    | Gerridae       | 1         |
| x             | Trepobates                 | Gerridae       | 150       |
| x             | Trepobates inermis/knighti | Gerridae       | 64        |
| x             | Trepobates pictus          | Gerridae       | 38        |
| x             | Trepobates subnitidus      | Gerridae       | 58        |
| x             | Hebridae                   | Hebridae       | 0         |
| x             | Hebrus                     | Hebridae       | 3         |
| x             | Merragata                  | Hebridae       | 3         |
| x             | Hydrometra                 | Hydrometridae  | 0         |
| x             | Hydrometra martini         | Hydrometridae  | 5         |
| x             | Hydrometridae              | Hydrometridae  | 0         |
| x             | Mesovelia                  | Mesoveliidae   | 102       |
| x             | Mesoveliidae               | Mesoveliidae   | 1         |
| 4             | Naucoridae                 | Naucoridae     | 0         |
| 4             | Pelocoris                  | Naucoridae     | 1         |
| 4             | Pelocoris femoratus        | Naucoridae     | 13        |
| x             | Nepa                       | Nepidae        | 0         |
| x             | Nepa apiculata             | Nepidae        | 10        |
| x             | Nepidae                    | Nepidae        | 0         |
| x             | Ranatra                    | Nepidae        | 7         |
| x             | Ranatra australis          | Nepidae        | 5         |

| BCG<br>Attribute | FINAL ID             | Family       | Num<br>Samps |
|------------------|----------------------|--------------|--------------|
| x                | Ranatra buenoi       | Nepidae      | 41           |
| x                | Ranatra fusca        | Nepidae      | 39           |
| x                | Ranatra kirkaldyi    | Nepidae      | 7            |
| x                | Ranatra nigra        | Nepidae      | 21           |
| 5                | Notonecta            | Notonectidae | 10           |
| 5                | Notonecta irrorata   | Notonectidae | 88           |
| 5                | Notonecta lunata     | Notonectidae | 24           |
| 5                | Notonecta uhleri     | Notonectidae | 4            |
| 5                | Notonectidae         | Notonectidae | 1            |
| x                | Ochterus banksi      | Ochteridae   | 1            |
| 4                | Neoplea              | Pleidae      | 0            |
| 4                | Neoplea striola      | Pleidae      | 82           |
| 4                | Pleidae              | Pleidae      | 0            |
| x                | Micracanthia         | Saldidae     | 3            |
| x                | Pentacora            | Saldidae     | 3            |
| x                | Salda                | Saldidae     | 1            |
| x                | Saldidae             | Saldidae     | 0            |
| x                | Saldula              | Saldidae     | 3            |
| x                | Microvelia           | Veliidae     | 127          |
| x                | Microvelia americana | Veliidae     | 198          |
| x                | Microvelia austrina  | Veliidae     | 1            |
| x                | Microvelia buenoi    | Veliidae     | 1            |
| x                | Microvelia pulchella | Veliidae     | 7            |
| x                | Rhagovelia           | Veliidae     | 51           |
| x                | Rhagovelia obesa     | Veliidae     | 42           |
| x                | Rhagovelia oriander  | Veliidae     | 57           |
| x                | Rhagovelia rivale    | Veliidae     | 1            |
| x                | Veliidae             | Veliidae     | 14           |

**Lepidoptera**

|   |             |           |   |
|---|-------------|-----------|---|
| x | Lepidoptera |           | 1 |
| x | Crambidae   | Crambidae | 6 |
| x | Bellura     | Noctuidae | 1 |
| x | Noctuidae   | Noctuidae | 1 |
| 4 | Acentria    | Pyralidae | 9 |
| 4 | Crambus     | Pyralidae | 1 |
| 4 | Elophila    | Pyralidae | 1 |
| 4 | Paraponyx   | Pyralidae | 9 |
| 4 | Petrophila  | Pyralidae | 8 |
| 4 | Pyralidae   | Pyralidae | 1 |

| BCG<br>Attribute   | FINAL ID                 | Family         | Num<br>Samps |
|--------------------|--------------------------|----------------|--------------|
| <b>Megaloptera</b> |                          |                |              |
| 4                  | Chauliodes               | Corydalidae    | 1            |
| 4                  | Chauliodes pectinicornis | Corydalidae    | 10           |
| 4                  | Chauliodes rastricornis  | Corydalidae    | 8            |
| 3                  | Corydalidae              | Corydalidae    | 0            |
| 3                  | Corydalus                | Corydalidae    | 0            |
| 3                  | Corydalus cornutus       | Corydalidae    | 63           |
| 2                  | Nigronia                 | Corydalidae    | 0            |
| 2                  | Nigronia fasciatus       | Corydalidae    | 2            |
| 2                  | Nigronia serricornis     | Corydalidae    | 39           |
| 4                  | Sialidae                 | Sialidae       | 1            |
| 4                  | Sialis                   | Sialidae       | 212          |
| <b>Neuroptera</b>  |                          |                |              |
| 3                  | Climacia                 | Sisyridae      | 0            |
| 3                  | Climacia areolaris       | Sisyridae      | 8            |
| 3                  | Sisyra vicaria           | Sisyridae      | 2            |
| 3                  | Sisyridae                | Sisyridae      | 0            |
| <b>Odonata</b>     |                          |                |              |
| x                  | Anisoptera               |                | 42           |
| x                  | Zygoptera                |                | 4            |
| 5                  | Aeshna                   | Aeshnidae      | 5            |
| 5                  | Aeshna umbrosa           | Aeshnidae      | 37           |
| 4                  | Aeshnidae                | Aeshnidae      | 4            |
| 5                  | Anax                     | Aeshnidae      | 4            |
| 5                  | Anax junius              | Aeshnidae      | 20           |
| 5                  | Anax longipes            | Aeshnidae      | 1            |
| 3                  | Basiaeschna              | Aeshnidae      | 0            |
| 3                  | Basiaeschna janata       | Aeshnidae      | 123          |
| 4                  | Boyeria                  | Aeshnidae      | 0            |
| 4                  | Boyeria vinosa           | Aeshnidae      | 237          |
| 4                  | Nasiaeschna              | Aeshnidae      | 0            |
| 4                  | Nasiaeschna pentacantha  | Aeshnidae      | 39           |
| x                  | Rhionaeschna mutata      | Aeshnidae      | 4            |
| 4                  | Calopterygidae           | Calopterygidae | 13           |
| 4                  | Calopteryx               | Calopterygidae | 14           |
| 4                  | Calopteryx maculata      | Calopterygidae | 161          |
| 3                  | Hetaerina                | Calopterygidae | 6            |
| 3                  | Hetaerina americana      | Calopterygidae | 74           |
| 3                  | Hetaerina titia          | Calopterygidae | 10           |

| BCG Attribute | FINAL ID                    | Family           | Num Samps |
|---------------|-----------------------------|------------------|-----------|
| 4             | Argia                       | Coenagrionidae   | 133       |
| 4             | Argia apicalis              | Coenagrionidae   | 80        |
| 4             | Argia fumipennis violacea   | Coenagrionidae   | 65        |
| 3             | Argia moesta                | Coenagrionidae   | 35        |
| 4             | Argia sedula                | Coenagrionidae   | 26        |
| 4             | Argia tibialis              | Coenagrionidae   | 108       |
| 4             | Argia translata             | Coenagrionidae   | 4         |
| 4             | Coenagrionidae              | Coenagrionidae   | 148       |
| 4             | Enallagma                   | Coenagrionidae   | 134       |
| 4             | Enallagma basidens          | Coenagrionidae   | 60        |
| 4             | Enallagma carunculatum      | Coenagrionidae   | 1         |
| 4             | Enallagma civile            | Coenagrionidae   | 1         |
| 4             | Enallagma divagans          | Coenagrionidae   | 198       |
| 4             | Enallagma exsulans          | Coenagrionidae   | 41        |
| 4             | Enallagma signatum          | Coenagrionidae   | 11        |
| 5             | Ischnura                    | Coenagrionidae   | 108       |
| x             | Ischnura hastata            | Coenagrionidae   | 1         |
| 5             | Ischnura posita             | Coenagrionidae   | 124       |
| x             | Ischnura ramburii           | Coenagrionidae   | 1         |
| 5             | Ischnura verticalis         | Coenagrionidae   | 107       |
| 2             | Cordulegaster               | Cordulegastridae | 7         |
| 2             | Cordulegaster maculata      | Cordulegastridae | 2         |
| 2             | Cordulegastridae            | Cordulegastridae | 0         |
| 3             | Cordulia shurtleffii        | Corduliidae      | 1         |
| 4             | Corduliidae                 | Corduliidae      | 1         |
| 3             | Didymops                    | Corduliidae      | 0         |
| 3             | Didymops transversa         | Corduliidae      | 7         |
| 4             | Epitheca                    | Corduliidae      | 7         |
| 4             | Epitheca (tetragoneuria)    | Corduliidae      | 8         |
| 4             | Epitheca princeps           | Corduliidae      | 39        |
| 3             | Macromia                    | Corduliidae      | 103       |
| 3             | Neurocordulia               | Corduliidae      | 1         |
| 3             | Neurocordulia molesta       | Corduliidae      | 2         |
| 3             | Neurocordulia obsoleta      | Corduliidae      | 2         |
| 3             | Neurocordulia yamaskanensis | Corduliidae      | 6         |
| 4             | Somatochlora                | Corduliidae      | 50        |
| 4             | Arigomphus                  | Gomphidae        | 1         |
| 3             | Dromogomphus                | Gomphidae        | 155       |
| 4             | Erpetogomphus               | Gomphidae        | 0         |
| 4             | Erpetogomphus designatus    | Gomphidae        | 15        |



| BCG Attribute     | FINAL ID                 | Family       | Num Samps |
|-------------------|--------------------------|--------------|-----------|
| 3                 | Gomphidae                | Gomphidae    | 20        |
| 3                 | Gomphus                  | Gomphidae    | 60        |
| 2                 | Hagenius                 | Gomphidae    | 0         |
| 2                 | Hagenius brevistylus     | Gomphidae    | 27        |
| 3                 | Ophiogomphus             | Gomphidae    | 5         |
| 4                 | Progomphus               | Gomphidae    | 0         |
| 4                 | Progomphus obscurus      | Gomphidae    | 22        |
| 2                 | Stylogomphus             | Gomphidae    | 6         |
| 2                 | Stylurus                 | Gomphidae    | 39        |
| x                 | Archilestes grandis      | Lestidae     | 1         |
| x                 | Celithemis               | Libellulidae | 3         |
| 5                 | Erythemis                | Libellulidae | 0         |
| 5                 | Erythemis simplicicollis | Libellulidae | 19        |
| 4                 | Libellula                | Libellulidae | 6         |
| 4                 | Libellulidae             | Libellulidae | 2         |
| 4                 | Pachydiplax              | Libellulidae | 0         |
| 4                 | Pachydiplax longipennis  | Libellulidae | 12        |
| 4                 | Pantala hymenaea         | Libellulidae | 4         |
| 4                 | Perithemis               | Libellulidae | 0         |
| 4                 | Perithemis tenera        | Libellulidae | 11        |
| 5                 | Plathemis                | Libellulidae | 0         |
| 5                 | Plathemis lydia          | Libellulidae | 64        |
| 4                 | Sympetrum                | Libellulidae | 10        |
| 4                 | Tramea                   | Libellulidae | 6         |
| x                 | Macromiidae              | Macromiidae  | 1         |
| <b>Orthoptera</b> |                          |              |           |
| NA                | Metaleptea brevicornis   | Acrididae    | 1         |
| <b>Plecoptera</b> |                          |              |           |
| x                 | Plecoptera               |              | 13        |
| 4                 | Allocaenia               | Capniidae    | 1         |
| 2                 | Leuctra                  | Leuctridae   | 7         |
| 2                 | Leuctridae               | Leuctridae   | 0         |
| 2                 | Paraleuctra sara         | Leuctridae   | 1         |
| x                 | Shipsa rotunda           | Nemouridae   | 1         |
| 2                 | Acroneuria               | Perlidae     | 36        |
| 2                 | Agnetina                 | Perlidae     | 14        |
| 2                 | Neoperla                 | Perlidae     | 11        |
| 3                 | Perlesta                 | Perlidae     | 9         |
| 3                 | Perlidae                 | Perlidae     | 8         |
| 3                 | Perlinella               | Perlidae     | 4         |

| BCG Attribute | FINAL ID         | Family           | Num Samps |
|---------------|------------------|------------------|-----------|
| 3             | Perlinella drymo | Perlidae         | 9         |
| 3             | Isoperla         | Perlodidae       | 4         |
| 3             | Perlodidae       | Perlodidae       | 1         |
| 2             | Pteronarcyidae   | Pteronarcyidae   | 0         |
| 2             | Pteronarcys      | Pteronarcyidae   | 6         |
| 4             | Taeniopterygidae | Taeniopterygidae | 0         |
| 4             | Taeniopteryx     | Taeniopterygidae | 6         |

### Trichoptera

|   |                           |                 |     |
|---|---------------------------|-----------------|-----|
| 3 | Brachycentridae           | Brachycentridae | 1   |
| 3 | Brachycentrus             | Brachycentridae | 0   |
| 3 | Brachycentrus numerosus   | Brachycentridae | 25  |
| 3 | Glossosoma                | Glossosomatidae | 1   |
| 3 | Protoptila                | Glossosomatidae | 3   |
| 3 | Helicopsyche              | Helicopsychidae | 0   |
| 3 | Helicopsyche borealis     | Helicopsychidae | 46  |
| 3 | Helicopsychidae           | Helicopsychidae | 0   |
| 3 | Ceratopsyche              | Hydropsychidae  | 78  |
| 3 | Ceratopsyche alhedra      | Hydropsychidae  | 5   |
| 3 | Ceratopsyche checkerboard | Hydropsychidae  | 122 |
| 3 | Ceratopsyche slossonae    | Hydropsychidae  | 16  |
| 4 | Ceratopsyche sparna       | Hydropsychidae  | 18  |
| 4 | Cheumatopsyche            | Hydropsychidae  | 417 |
| 3 | Diplectrona               | Hydropsychidae  | 5   |
| 3 | Hydropsyche               | Hydropsychidae  | 40  |
| 3 | Hydropsyche aerata        | Hydropsychidae  | 8   |
| 4 | Hydropsyche betteni group | Hydropsychidae  | 139 |
| 3 | Hydropsyche bidens        | Hydropsychidae  | 27  |
| 3 | Hydropsyche cuanis        | Hydropsychidae  | 7   |
| 3 | Hydropsyche demora        | Hydropsychidae  | 10  |
| 3 | Hydropsyche dicantha      | Hydropsychidae  | 31  |
| 3 | Hydropsyche frisoni       | Hydropsychidae  | 15  |
| 3 | Hydropsyche hageni        | Hydropsychidae  | 3   |
| 3 | Hydropsyche orris         | Hydropsychidae  | 12  |
| 3 | Hydropsyche phalerata     | Hydropsychidae  | 4   |
| 3 | Hydropsyche simulans      | Hydropsychidae  | 74  |
| 3 | Hydropsyche venularis     | Hydropsychidae  | 13  |
| 4 | Hydropsychidae            | Hydropsychidae  | 112 |
| 3 | Macrostemum carolina      | Hydropsychidae  | 1   |
| 3 | Macrostemum zebratum      | Hydropsychidae  | 1   |
| 2 | Parapsyche apicalis       | Hydropsychidae  | 1   |

| BCG<br>Attribute | FINAL ID                      | Family            | Num<br>Samps |
|------------------|-------------------------------|-------------------|--------------|
| 3                | Potamyia                      | Hydropsychidae    | 21           |
| x                | Agraylea                      | Hydroptilidae     | 1            |
| 4                | Hydroptila                    | Hydroptilidae     | 92           |
| 4                | Hydroptilidae                 | Hydroptilidae     | 14           |
| x                | Mayatrichia                   | Hydroptilidae     | 2            |
| 4                | Neotrichia                    | Hydroptilidae     | 4            |
| 3                | Ochrotrichia                  | Hydroptilidae     | 5            |
| 4                | Orthotrichia                  | Hydroptilidae     | 4            |
| 4                | Oxyethira                     | Hydroptilidae     | 8            |
| 3                | Ceraclea                      | Leptoceridae      | 9            |
| 4                | Leptoceridae                  | Leptoceridae      | 22           |
| 3                | Mystacides                    | Leptoceridae      | 8            |
| 3                | Nectopsyche                   | Leptoceridae      | 24           |
| 3                | Nectopsyche candida/exquisita | Leptoceridae      | 50           |
| 3                | Nectopsyche diarina           | Leptoceridae      | 28           |
| 3                | Nectopsyche pavidata          | Leptoceridae      | 1            |
| 4                | Oecetis                       | Leptoceridae      | 56           |
| 4                | Oecetis avara                 | Leptoceridae      | 5            |
| 4                | Oecetis cinerascens           | Leptoceridae      | 1            |
| 4                | Oecetis immobilis             | Leptoceridae      | 1            |
| 4                | Oecetis nocturna              | Leptoceridae      | 6            |
| 3                | Oecetis persimilis            | Leptoceridae      | 4            |
| 4                | Oecetis sp. A                 | Leptoceridae      | 3            |
| 3                | Triaenodes                    | Leptoceridae      | 4            |
| 3                | Triaenodes ignitus            | Leptoceridae      | 1            |
| 4                | Triaenodes marginatus         | Leptoceridae      | 4            |
| 3                | Triaenodes melacus            | Leptoceridae      | 1            |
| 3                | Triaenodes perna              | Leptoceridae      | 3            |
| 3                | Limnephilidae                 | Limnephilidae     | 4            |
| 3                | Pycnopsyche                   | Limnephilidae     | 42           |
| 3                | Molanna tryphena              | Molannidae        | 2            |
| 3                | Chimarra                      | Philopotamidae    | 6            |
| 3                | Chimarra aterrima             | Philopotamidae    | 32           |
| 3                | Chimarra obscura              | Philopotamidae    | 91           |
| 3                | Philopotamidae                | Philopotamidae    | 11           |
| 4                | Phryganeidae                  | Phryganeidae      | 0            |
| 4                | Ptilostomis                   | Phryganeidae      | 6            |
| 3                | Cernotina/Polycentropus       | Polycentropodidae | 85           |
| 4                | Cyrnellus                     | Polycentropodidae | 1            |
| 4                | Cyrnellus fraternus           | Polycentropodidae | 2            |

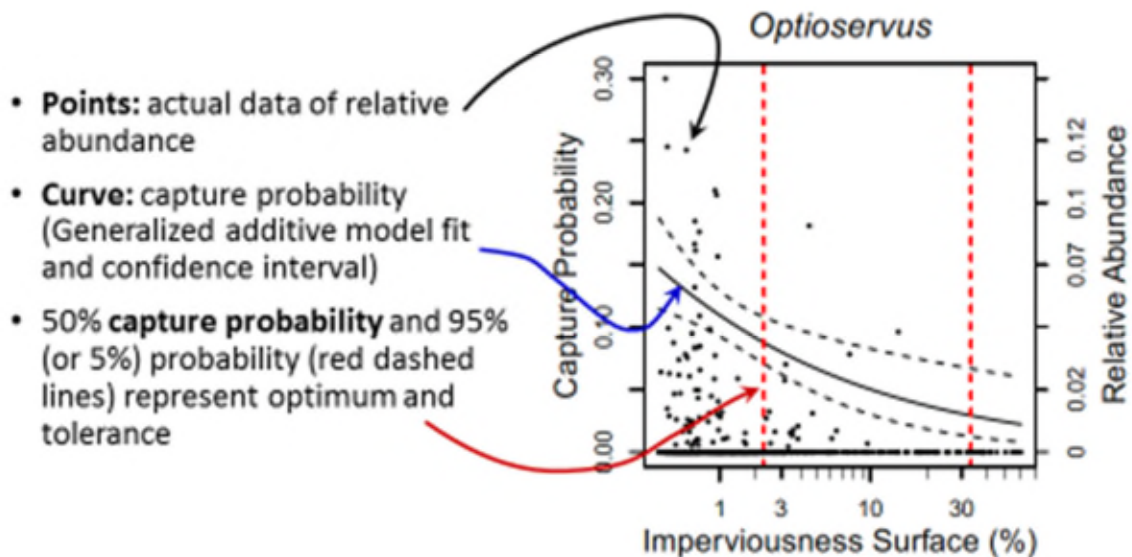
| <b>BCG<br/>Attribute</b> | <b>FINAL ID</b>      | <b>Family</b>     | <b>Num<br/>Samps</b> |
|--------------------------|----------------------|-------------------|----------------------|
| 4                        | Neureclipsis         | Polycentropodidae | 42                   |
| 3                        | Nyctiophylax         | Polycentropodidae | 4                    |
| 4                        | Polycentropodidae    | Polycentropodidae | 9                    |
| 3                        | Lype                 | Psychomyiidae     | 0                    |
| 3                        | Lype diversa         | Psychomyiidae     | 6                    |
| 3                        | Psychomyia flavida   | Psychomyiidae     | 3                    |
| 3                        | Psychomyiidae        | Psychomyiidae     | 0                    |
| 4                        | Rhyacophila lobifera | Rhyacophilidae    | 1                    |
| x                        | Trichoptera          | Trichoptera       | 29                   |
| 3                        | Neophylax            | Uenoidae          | 6                    |
| 3                        | Uenoidae             | Uenoidae          | 0                    |

## Appendix C

### Macroinvertebrate Capture Probability Modeled against Stress Gradients

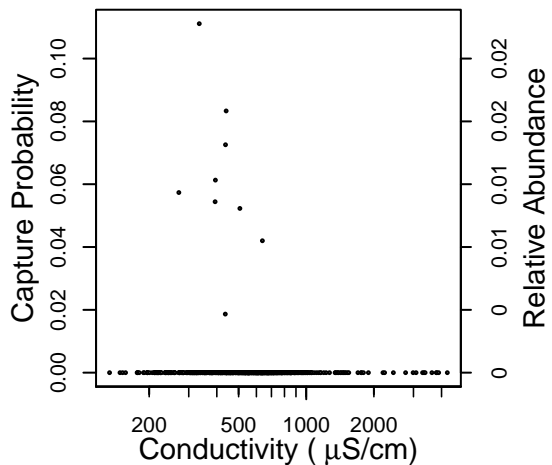
The following plots compare taxa (species, genera, and families) against stressors (conductivity, total phosphorus, ammonia, habitat quality [QHEI], and % impervious surface).

#### Taxon-response curve and tolerance (Indiana statewide data)

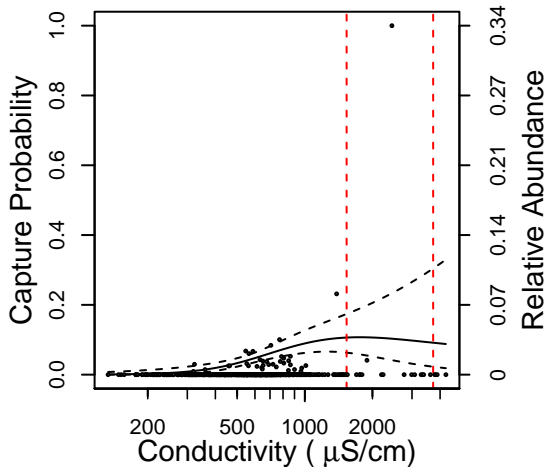


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

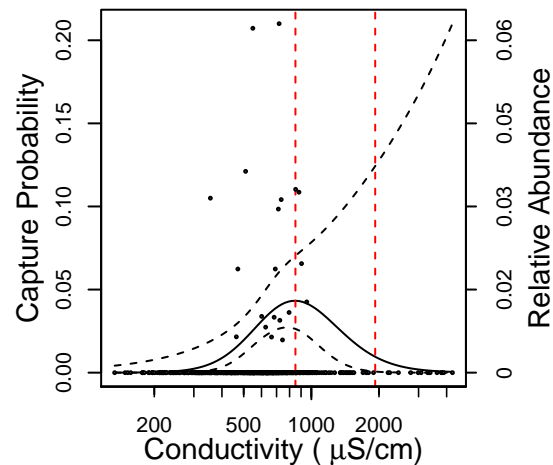
*Acerpenna pygmaea*



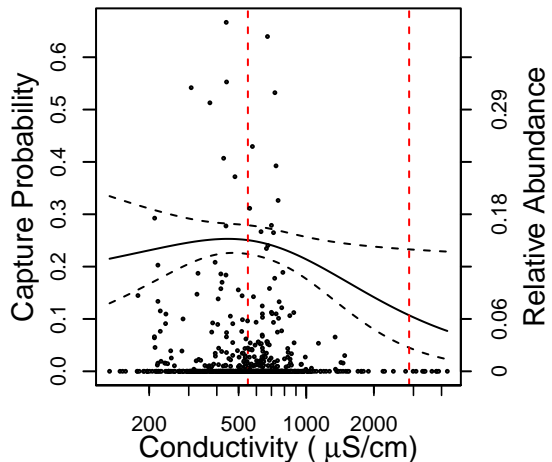
*Aeshna umbrosa*



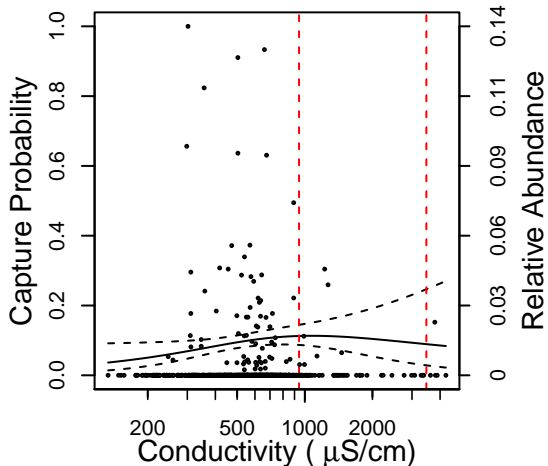
*Anax junius*



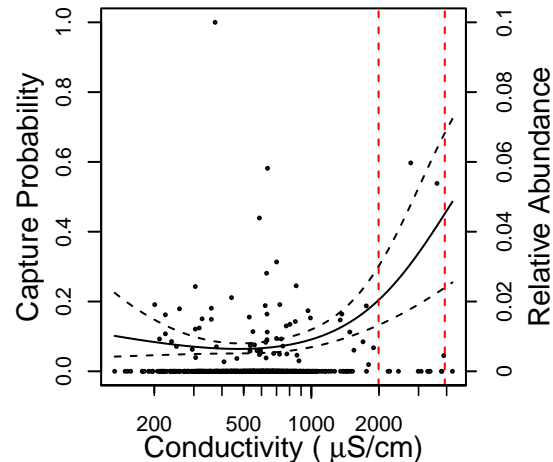
*Ancyronyx variegatus*



*Argia apicalis*

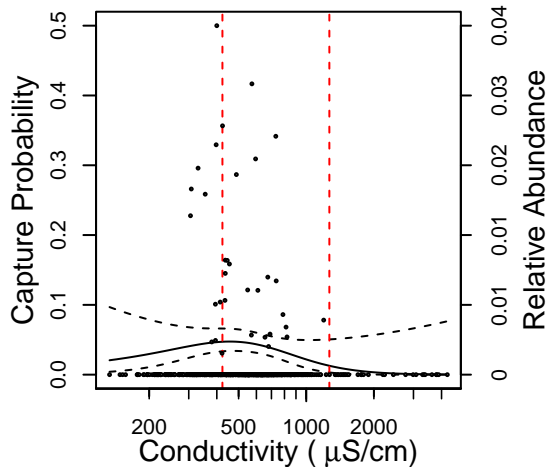


*Argia fumipennis violacea*

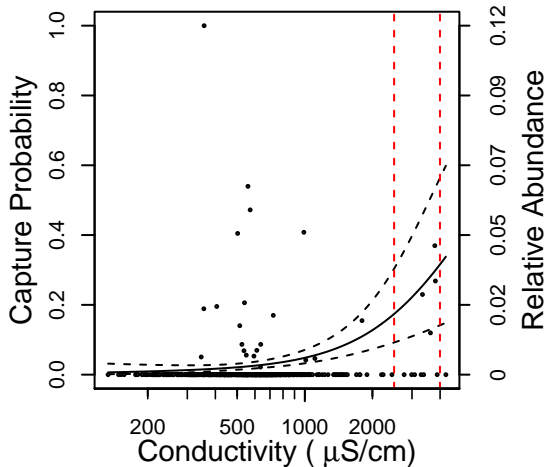


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

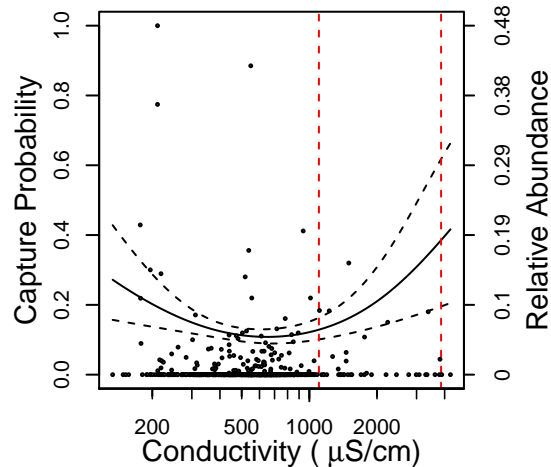
*Argia moesta*



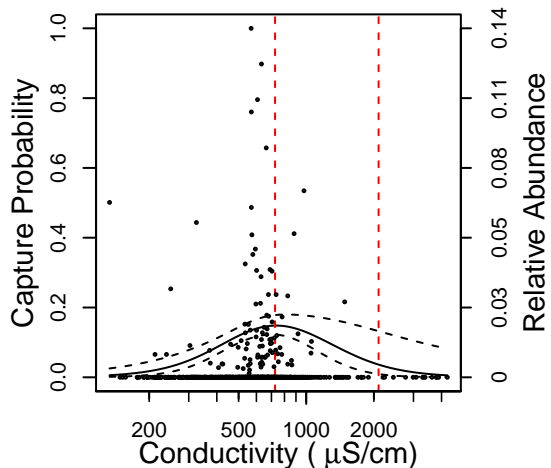
*Argia sedula*



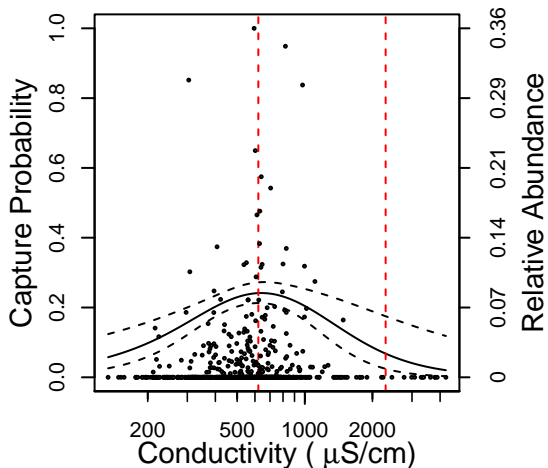
*Argia tibialis*



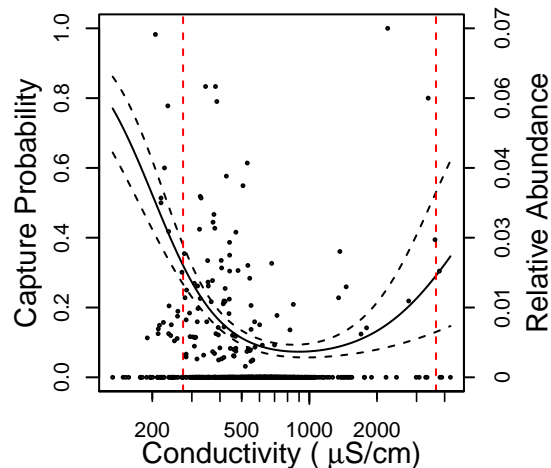
*Baetis flavistriga*



*Baetis intercalaris*

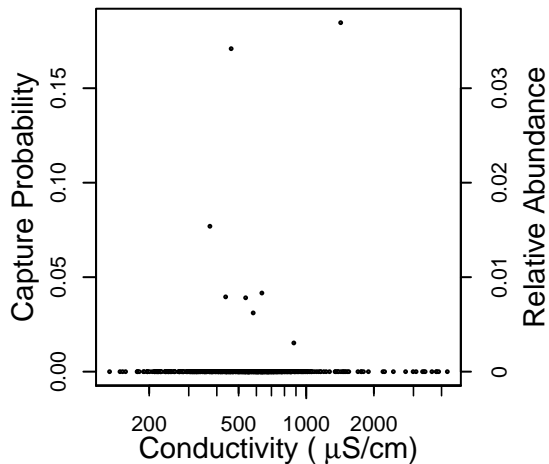


*Basiaeschna janata*

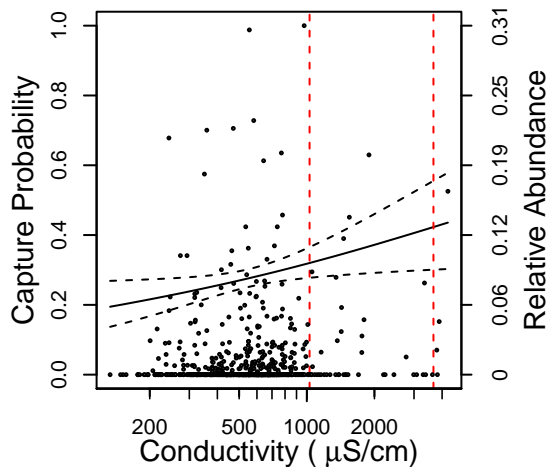


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

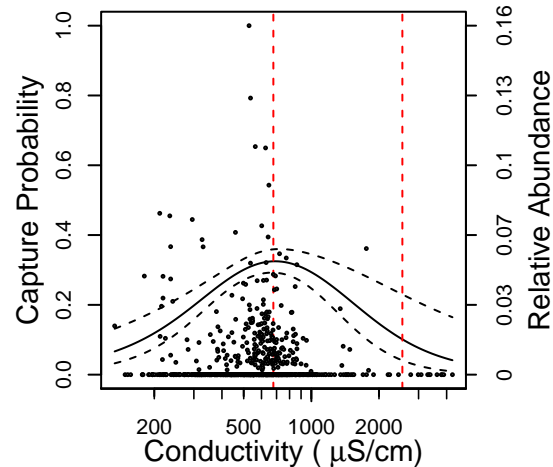
*Berosus infuscatus*



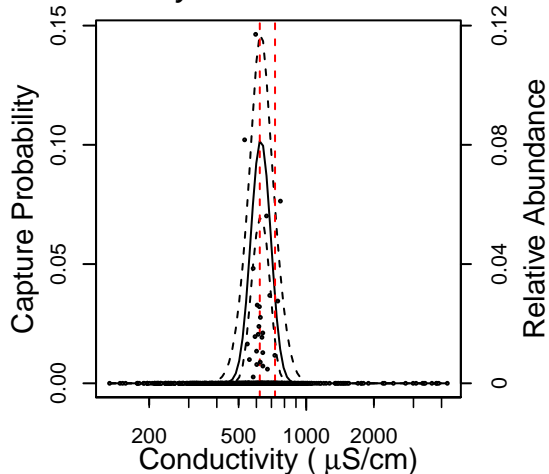
*Berosus peregrinus*



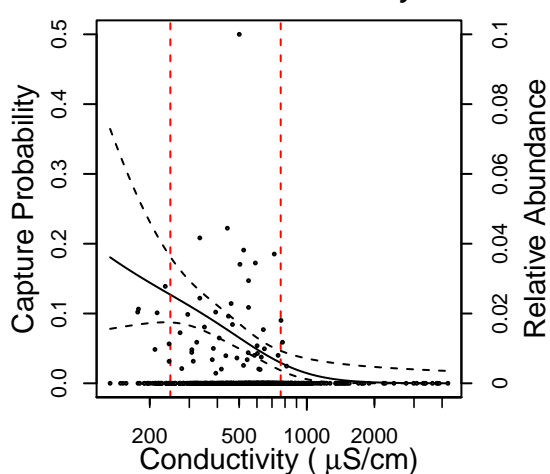
*Boyeria vinosa*



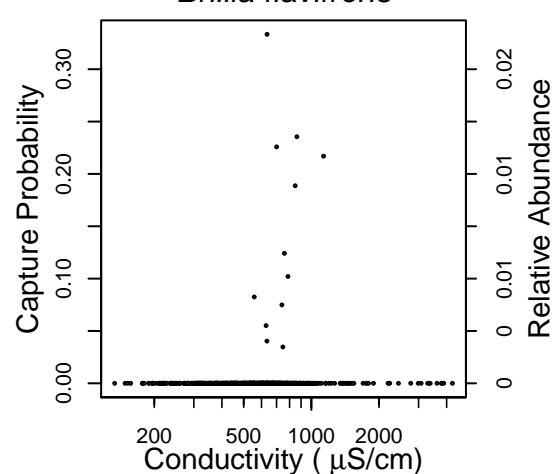
*Brachycentrus numerosus*



*Branchiura sowerbyi*



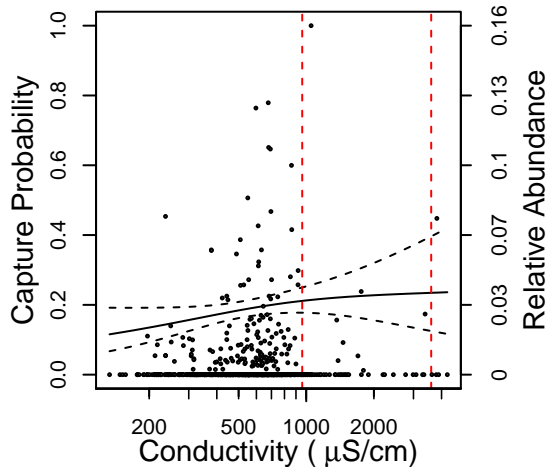
*Brillia flavifrons*



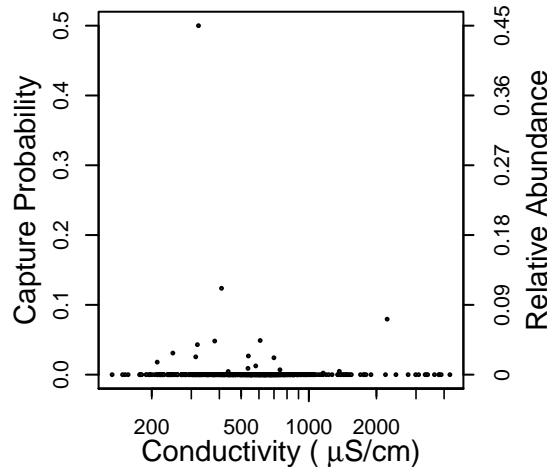


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

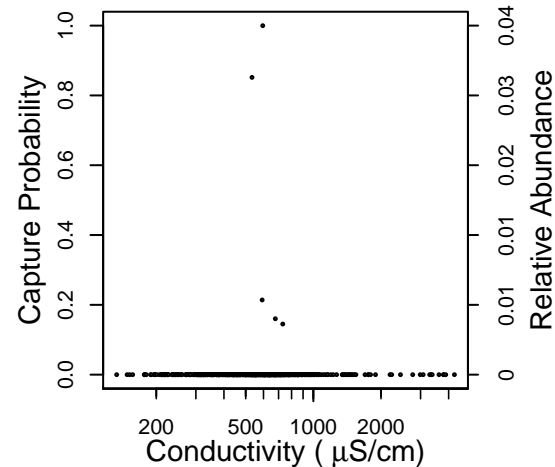
*Calopteryx maculata*



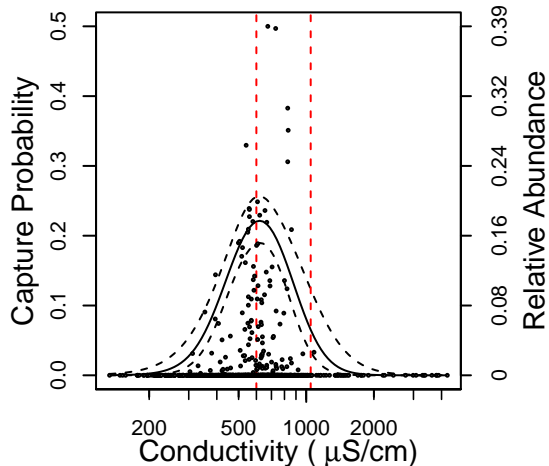
*Cambarus nebrascensis*



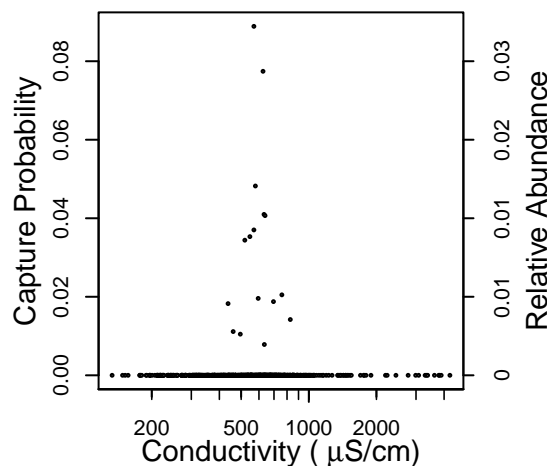
*Ceratopsyche alhedra*



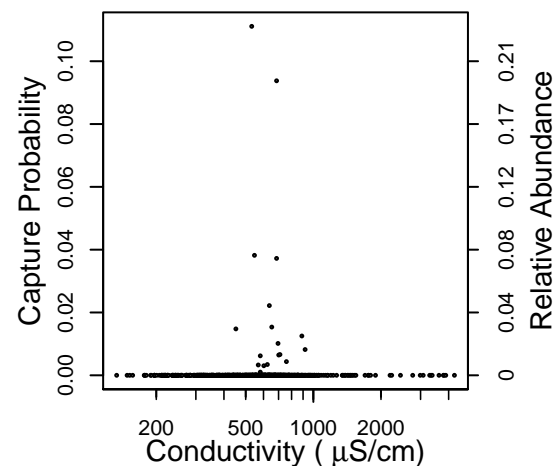
*Ceratopsyche checkerboard*



*Ceratopsyche slossonae*

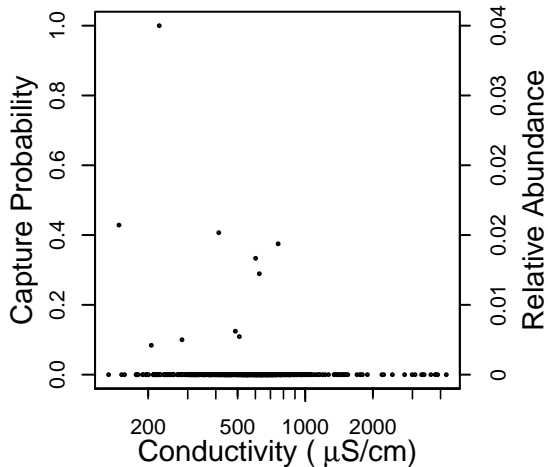


*Ceratopsyche sparna*

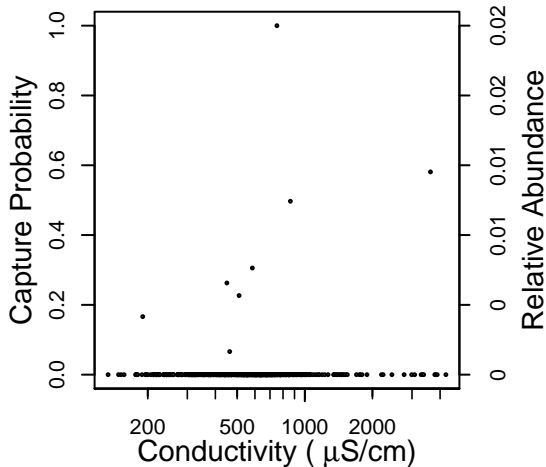


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

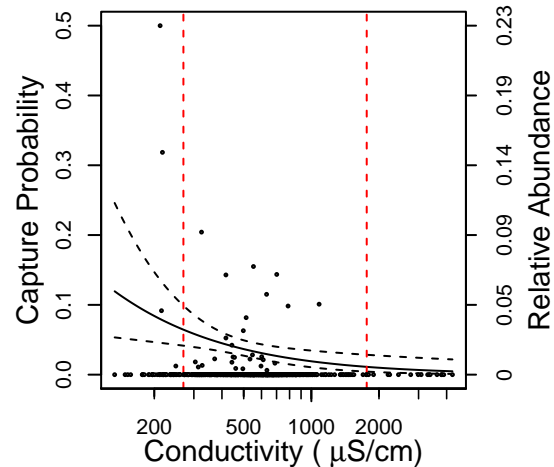
*Chauliodes pectinicornis*



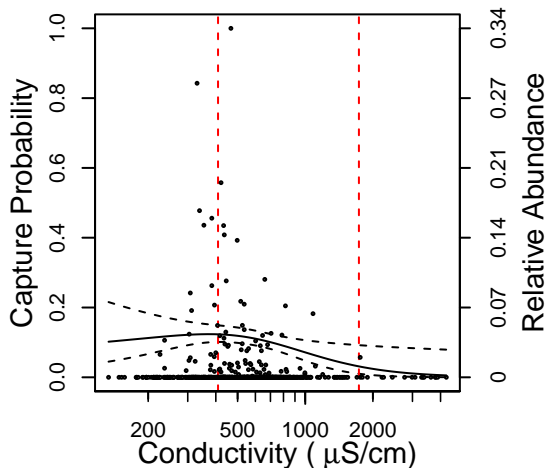
*Chauliodes rastricornis*



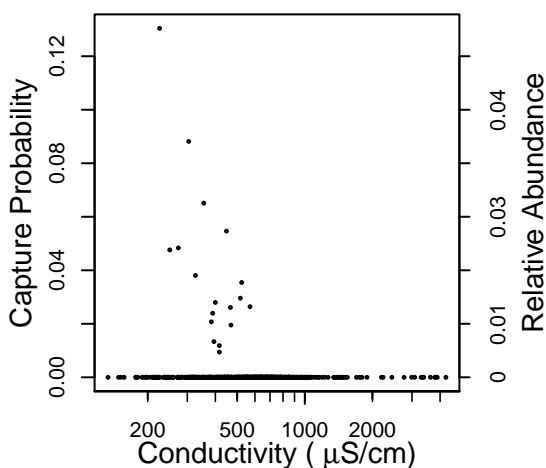
*Chimarra aterrma*



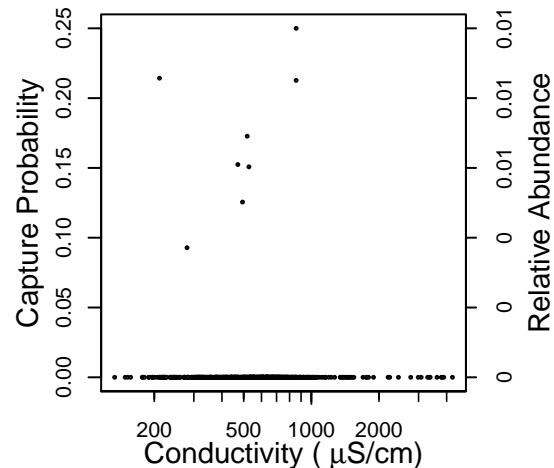
*Chimarra obscura*



*Choroterpes basalis*

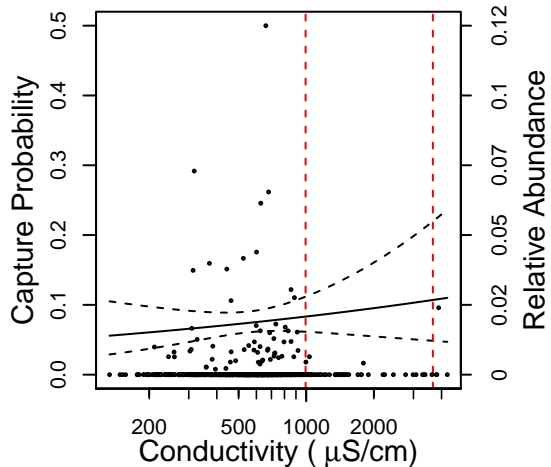


*Climacia areolaris*

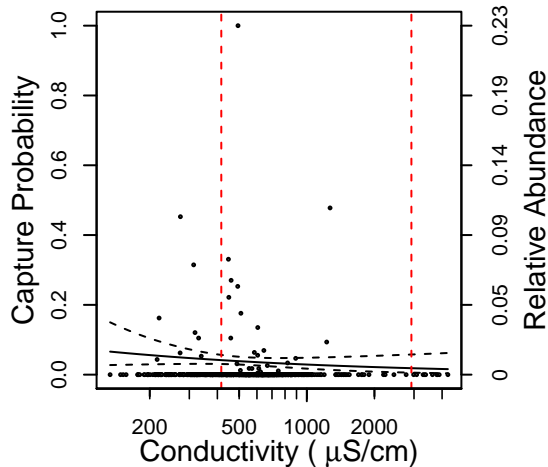


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

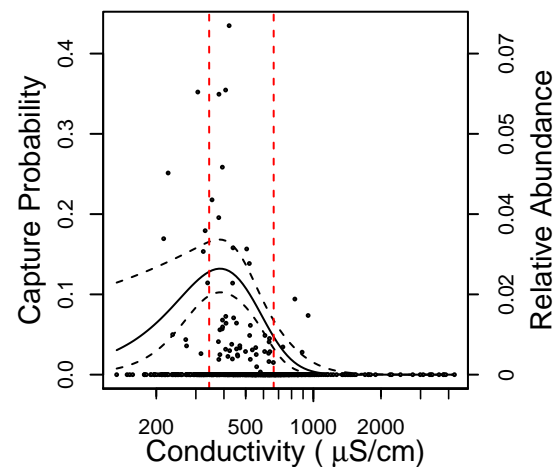
*Clinotanypus pinguis*



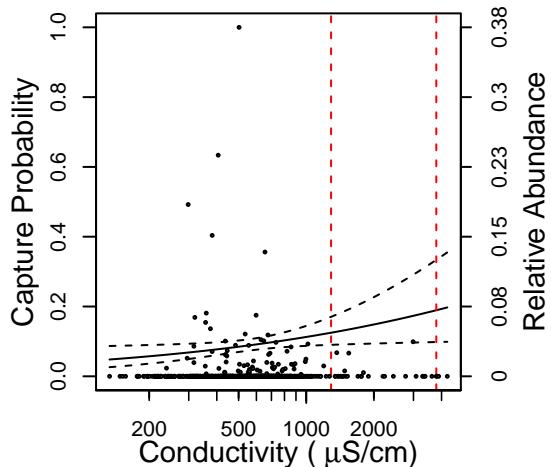
*Coptotomus loticus*



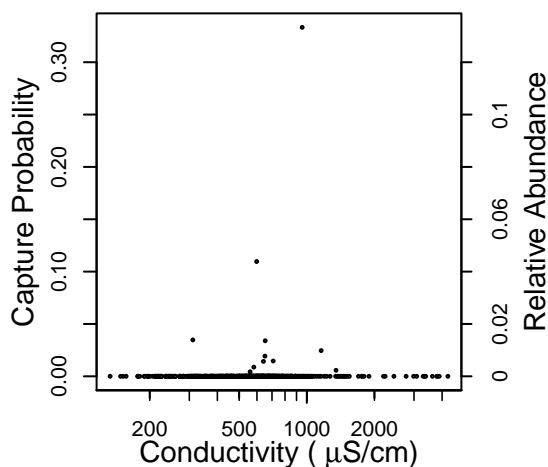
*Corydalus cornutus*



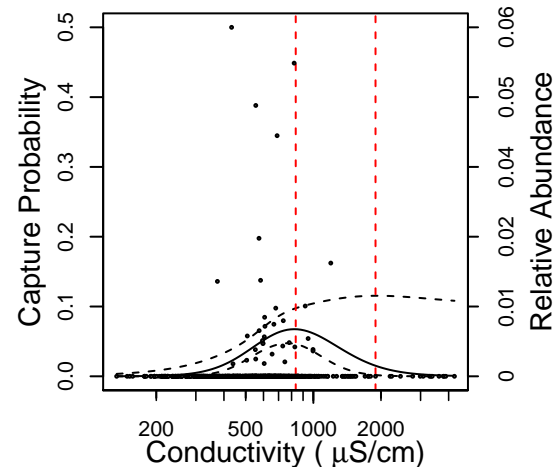
*Cricotopus (cricotopus)*



*Cricotopus sylvestris* group

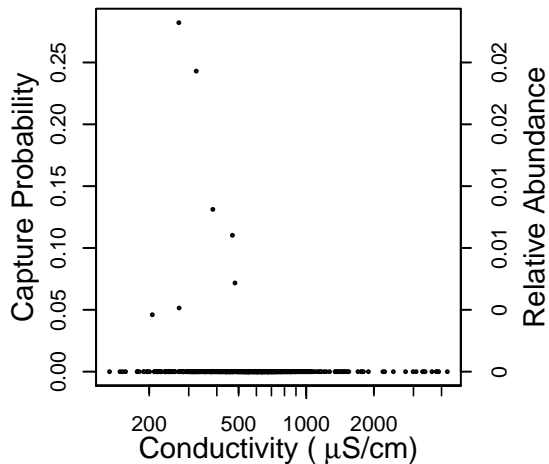


*Cricotopus trifascia*

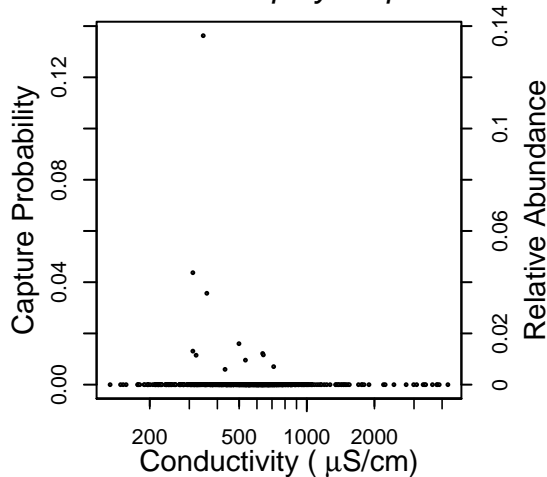


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

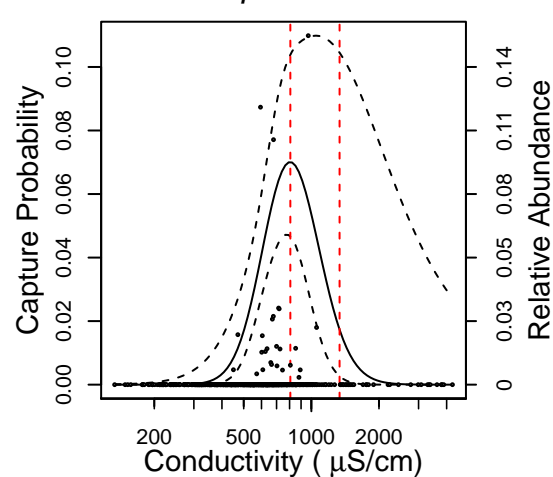
*Didymops transversa*



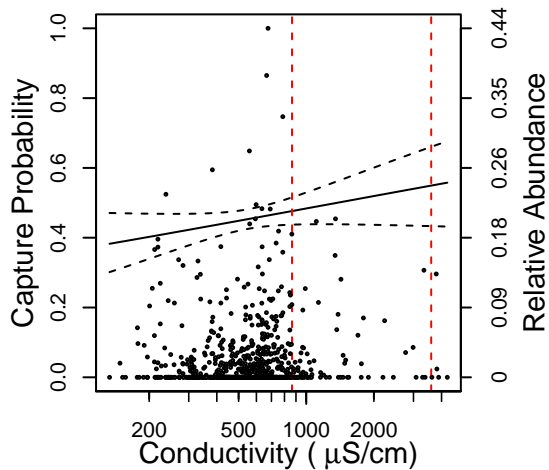
*Dreissena polymorpha*



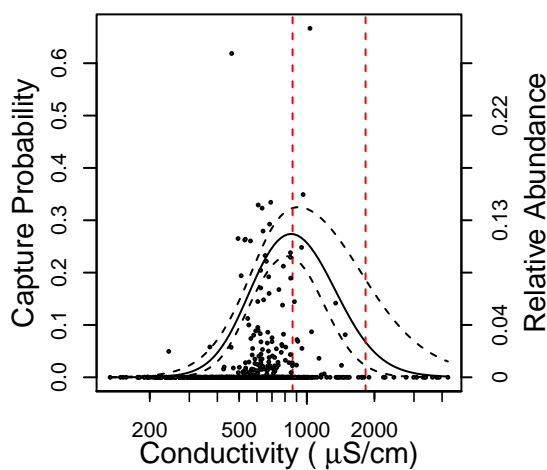
*Dubiraphia bivittata*



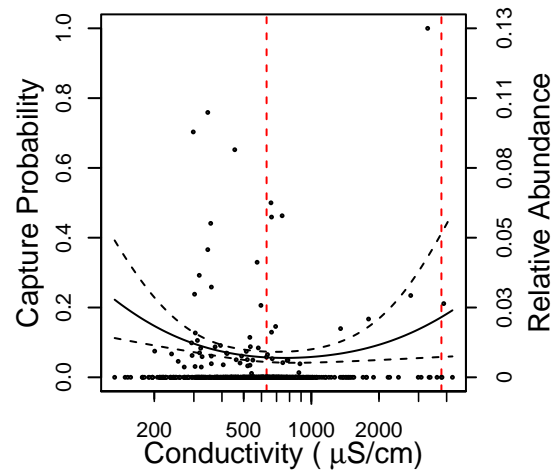
*Dubiraphia minima* group



*Dubiraphia quadrinotata*

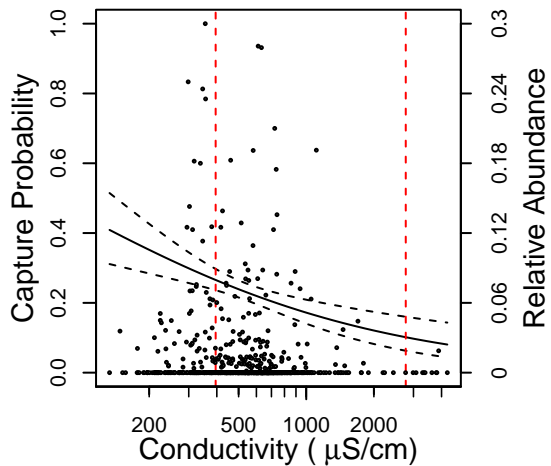


*Enallagma basidens*

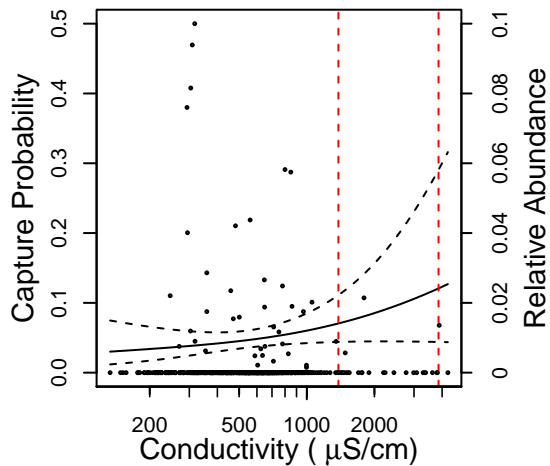


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

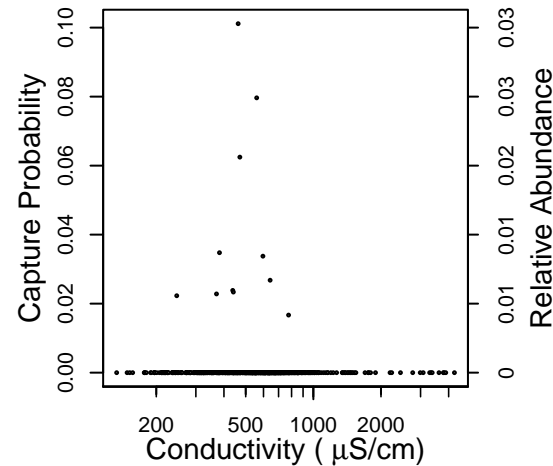
*Enallagma divagans*



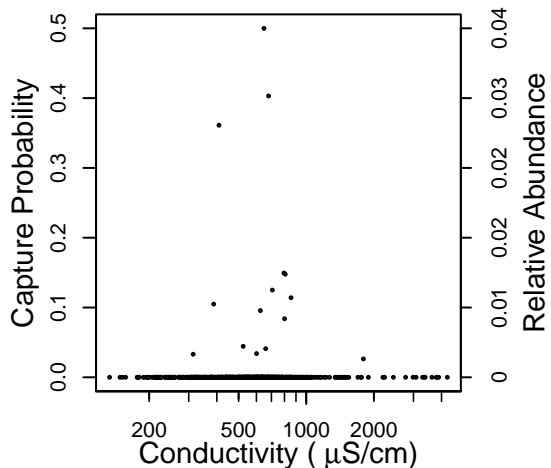
*Enallagma exsulans*



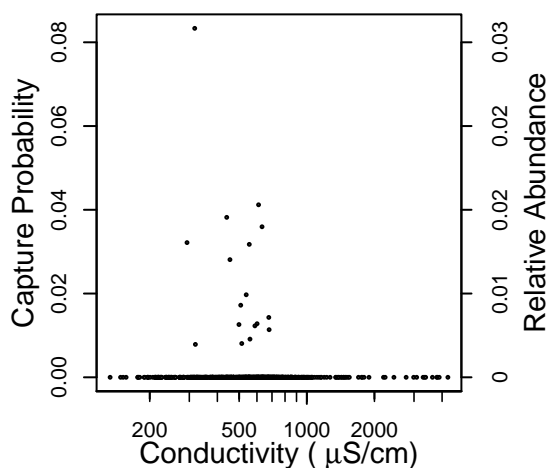
*Enallagma signatum*



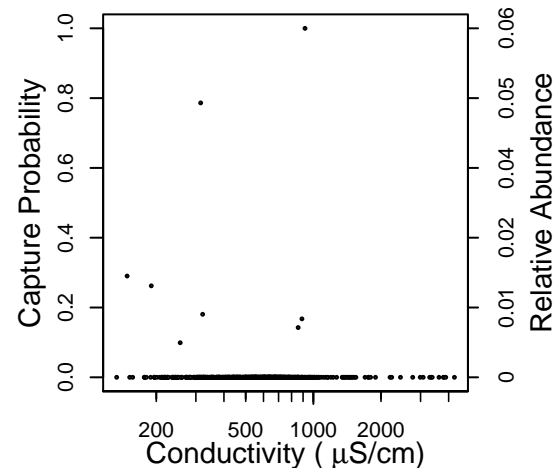
*Enochrus ochraceus*



*Enochrus pygmaeus*

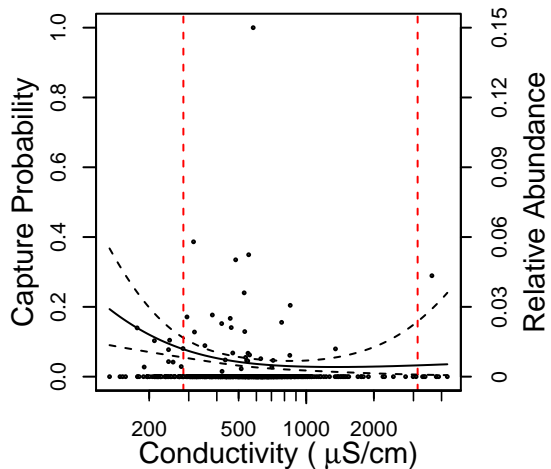


*Epitheca (tetragoneuria)*

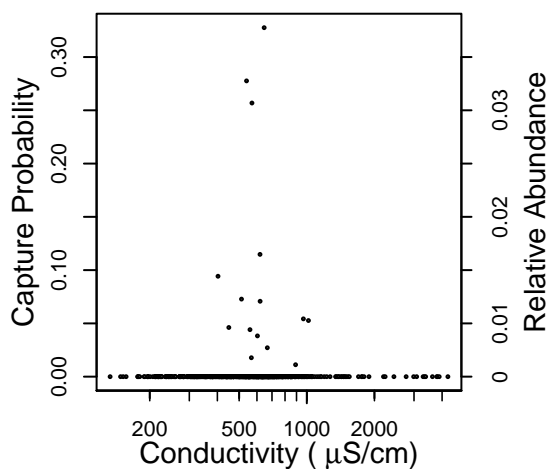


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

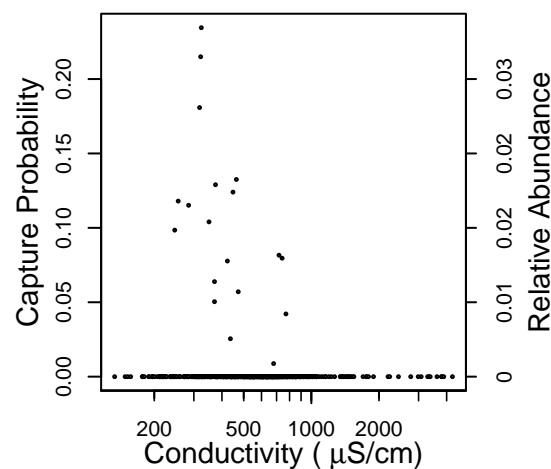
*Epitheca princeps*



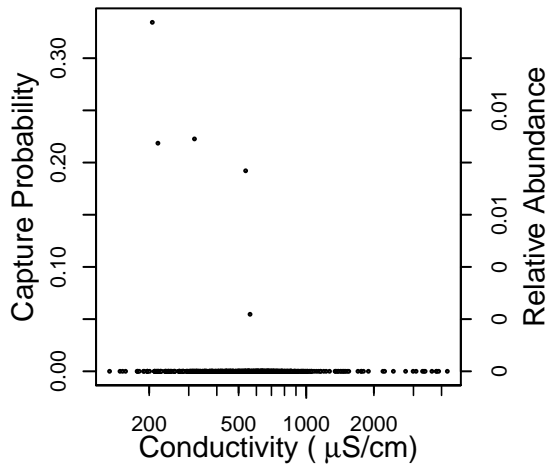
*Erpetogomphus designatus*



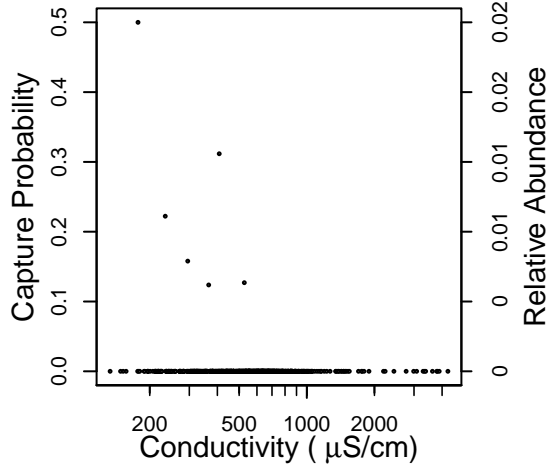
*Erythemis simplicicollis*



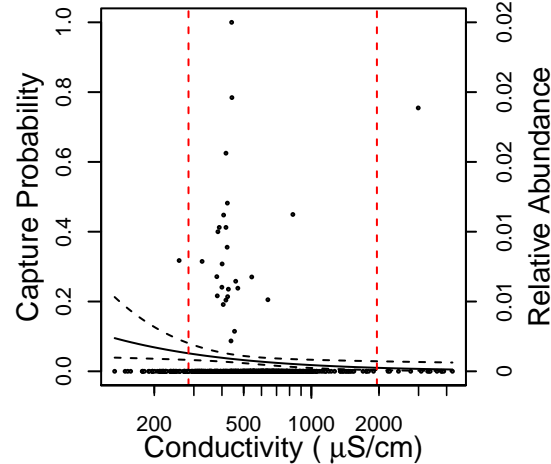
*Gelastocoris oculatus*



*Gyretes sinuatus*

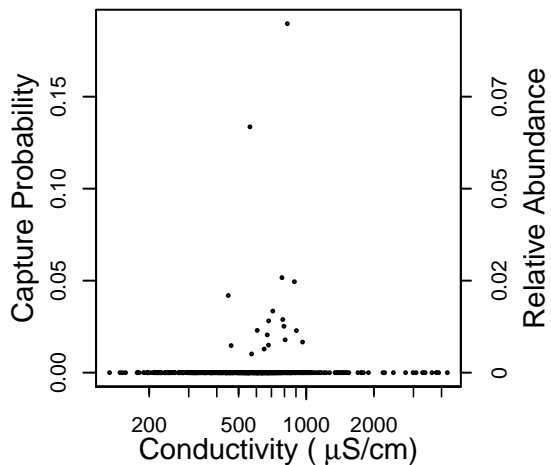


*Hagenius brevistylus*

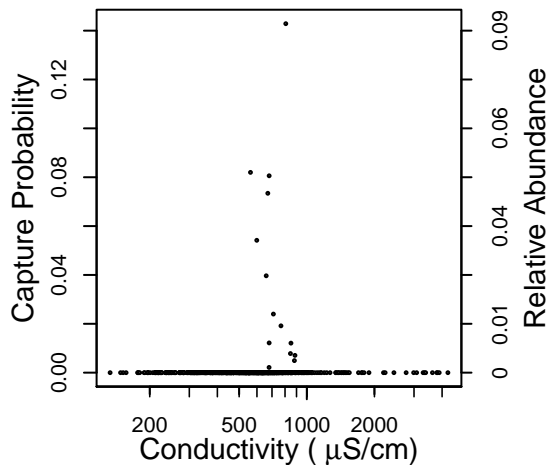


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

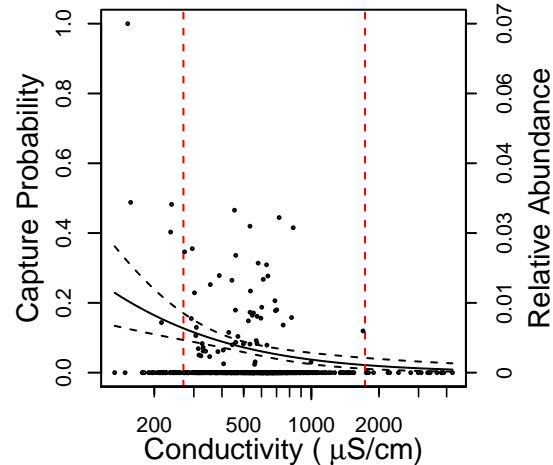
*Haliplus borealis*



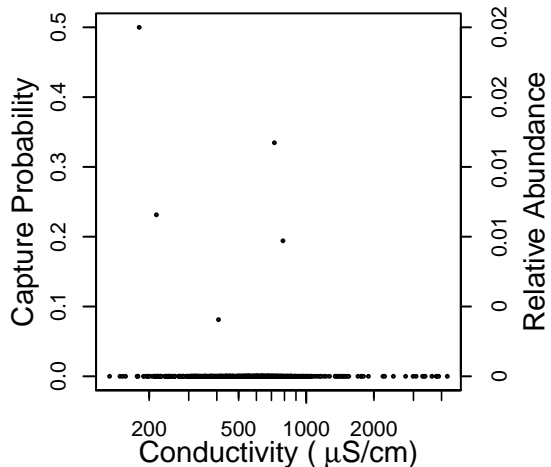
*Haliplus immaculicollis*



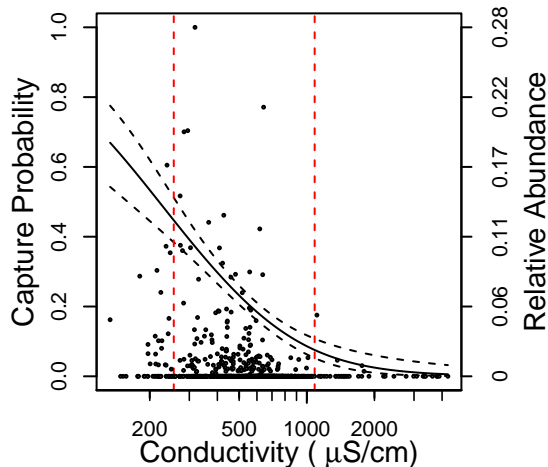
*Helichus basalis*



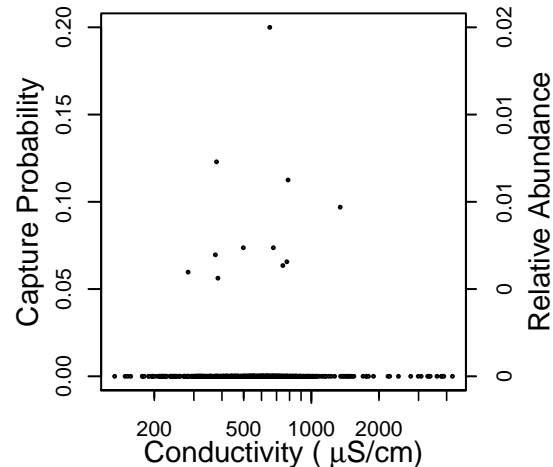
*Helichus fastigiatus*



*Helichus lithophilus*

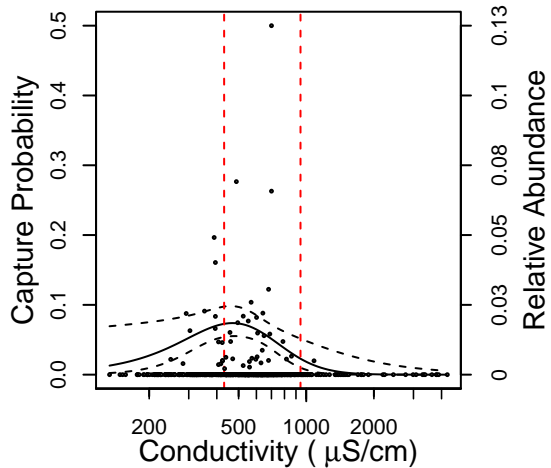


*Helichus striatus*

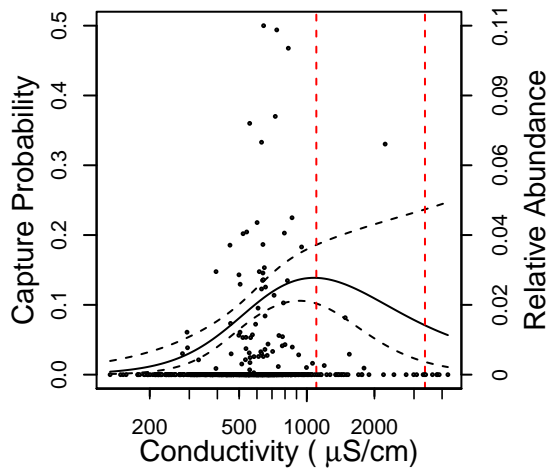


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

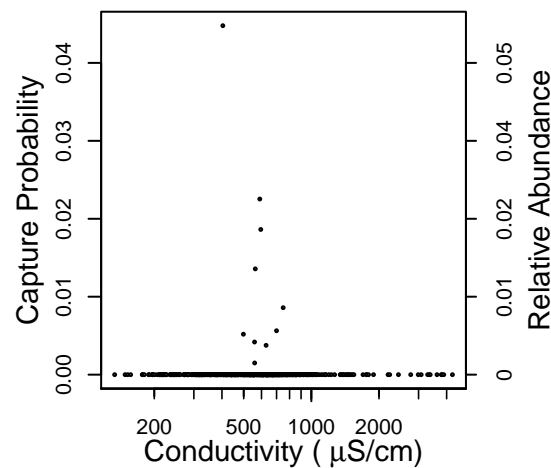
*Helicopsyche borealis*



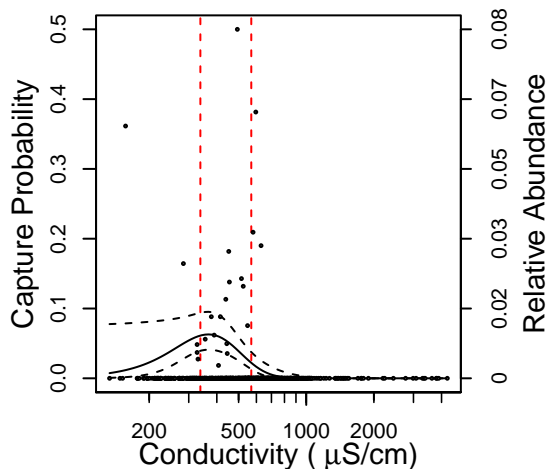
*Hetaerina americana*



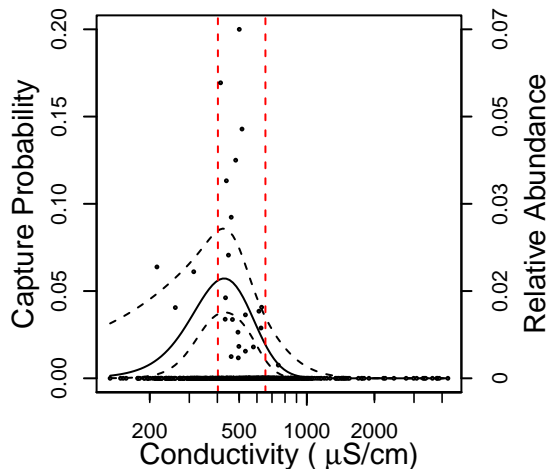
*Hetaerina titia*



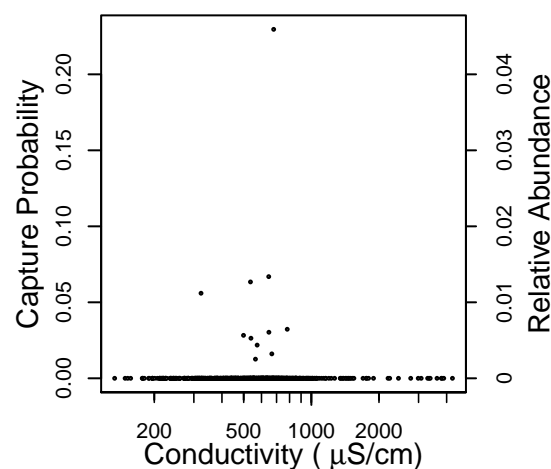
*Heterosternuta ohionis*



*Heterosternuta pulcher*



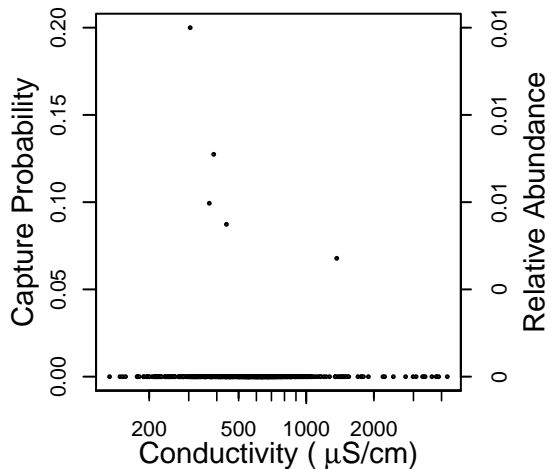
*Heterosternuta wickhami*



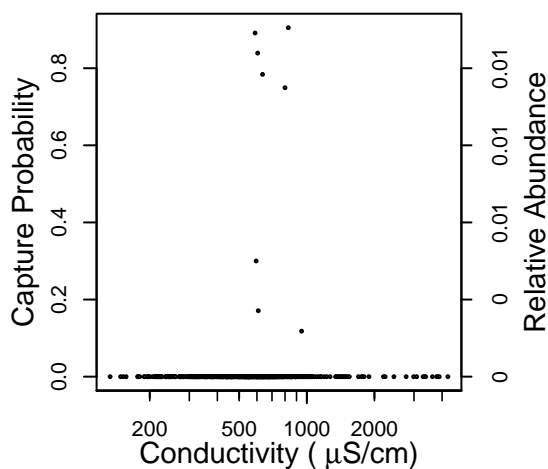


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

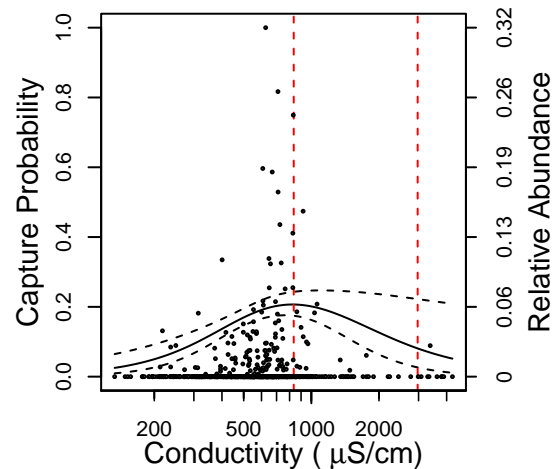
*Hydrometra martini*



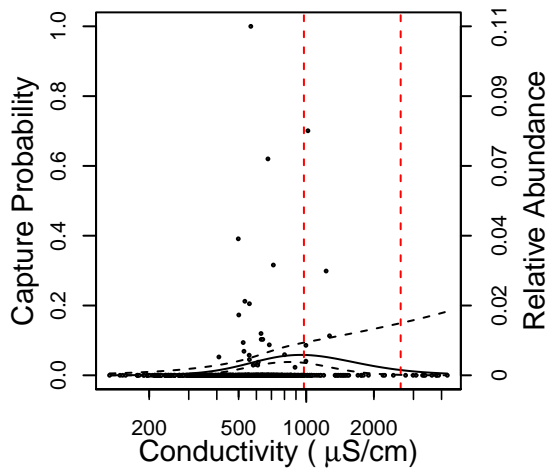
*Hydropsyche aerata*



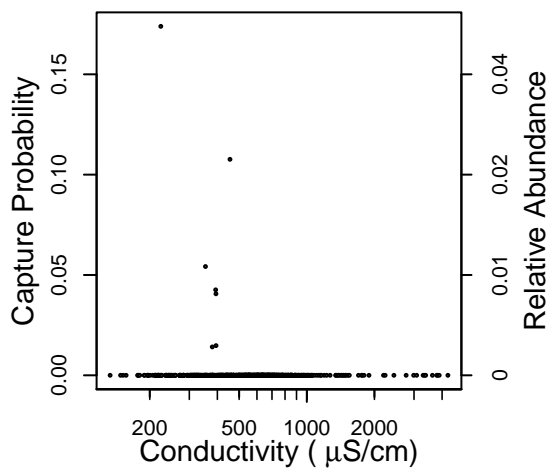
*Hydropsyche betteni group*



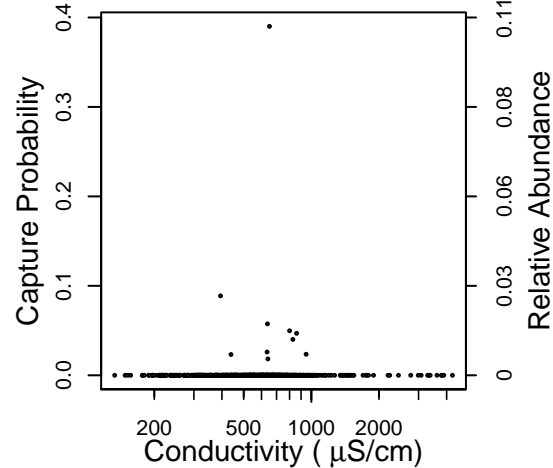
*Hydropsyche bidens*



*Hydropsyche cuanis*

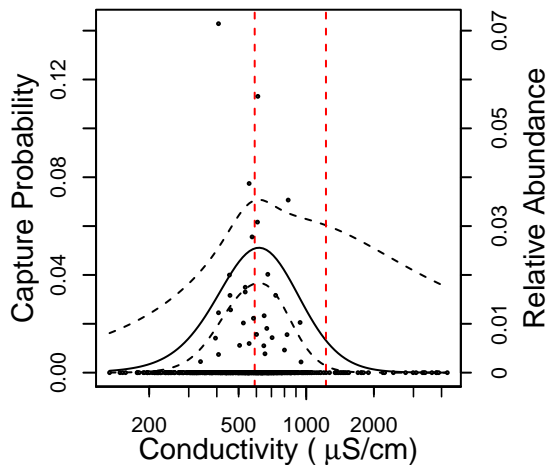


*Hydropsyche demora*

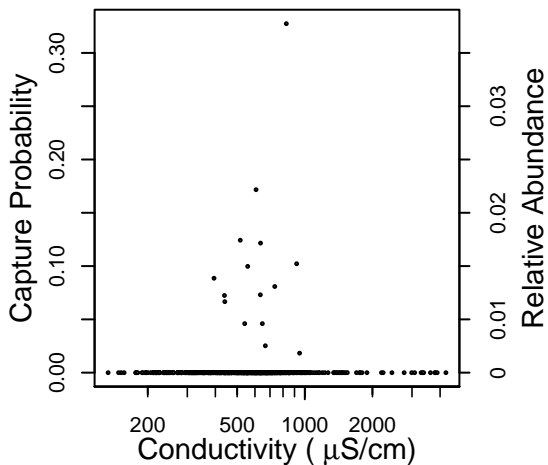


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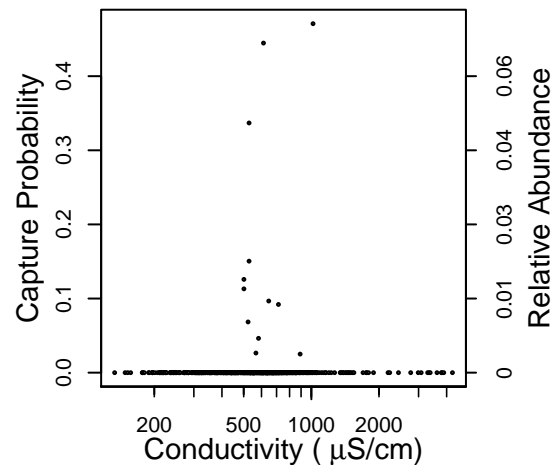
*Hydropsyche dicantha*



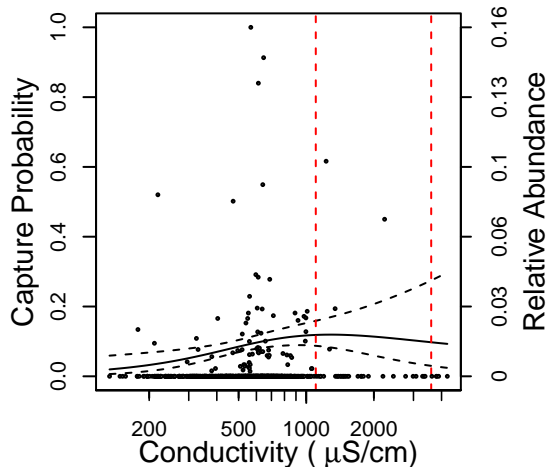
*Hydropsyche frisoni*



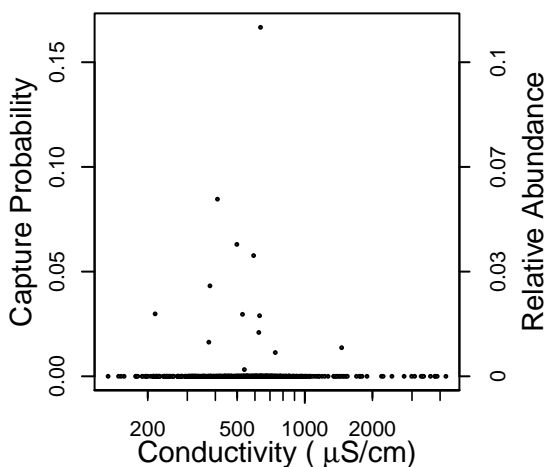
*Hydropsyche orris*



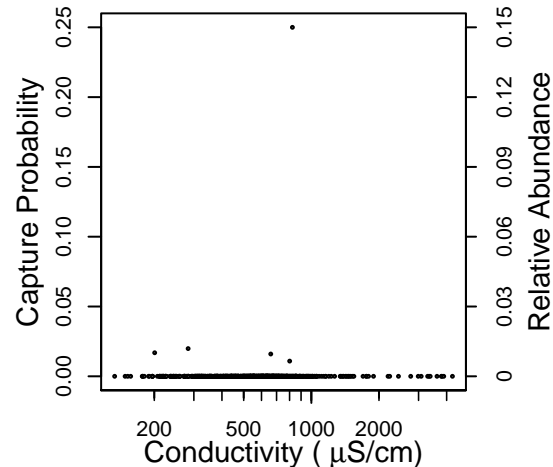
*Hydropsyche simulans*



*Hydropsyche venularis*

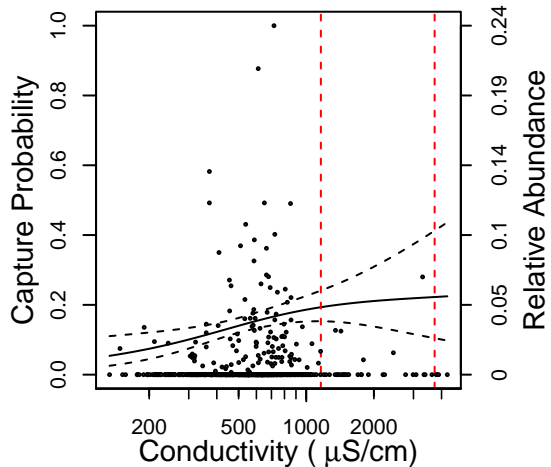


*Hydrovatus pustulatus*

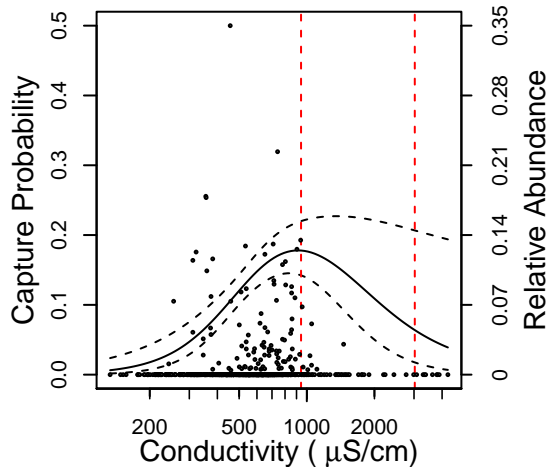


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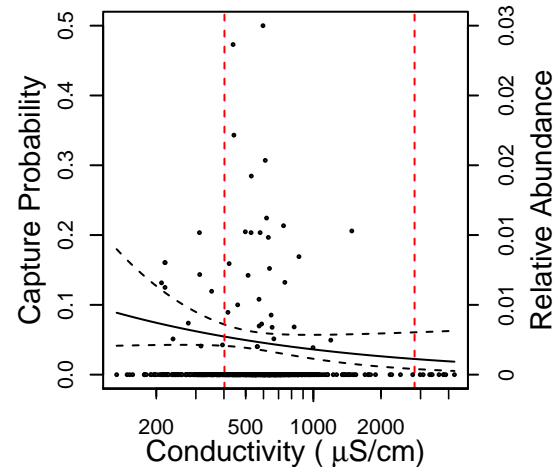
*Ischnura posita*



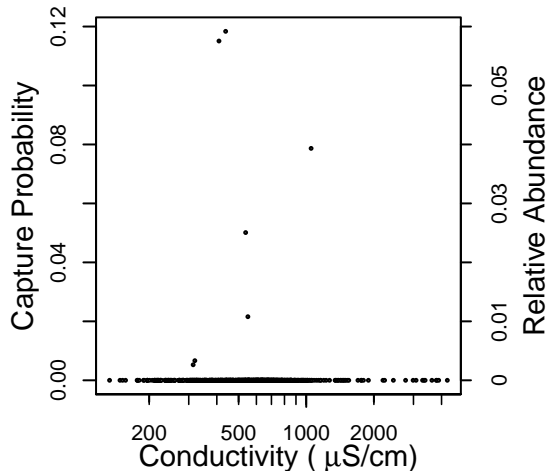
*Ischnura verticalis*



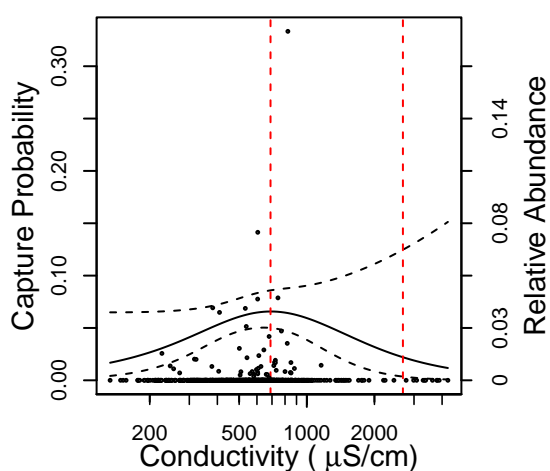
*Labrundinia pilosella*



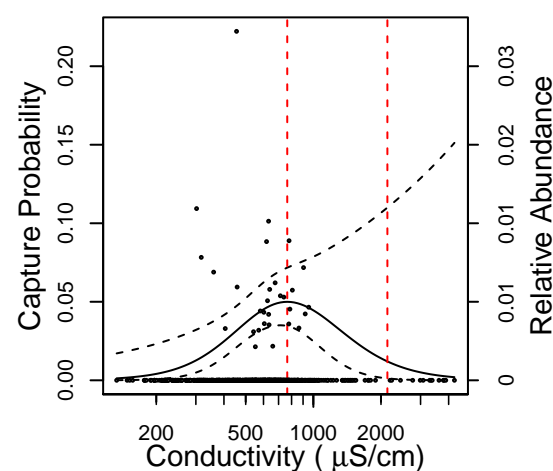
*Laccophilus fasciatus*



*Laccophilus maculosus*

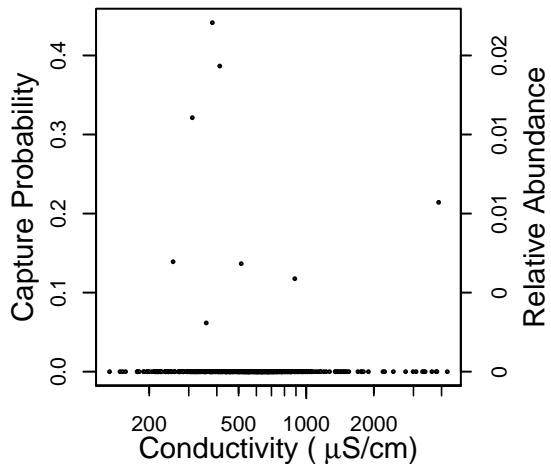


*Liodessus affinis complex*

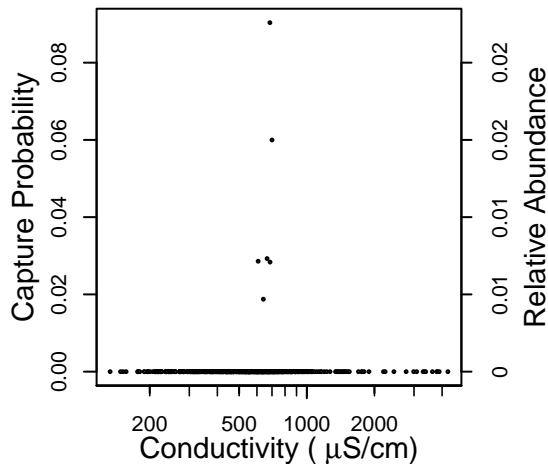


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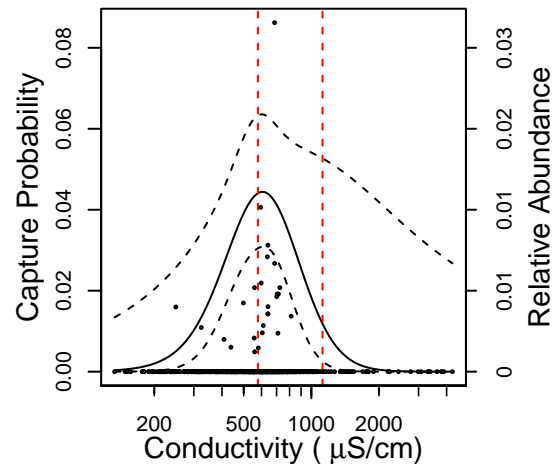
*Liodessus flavicollis*



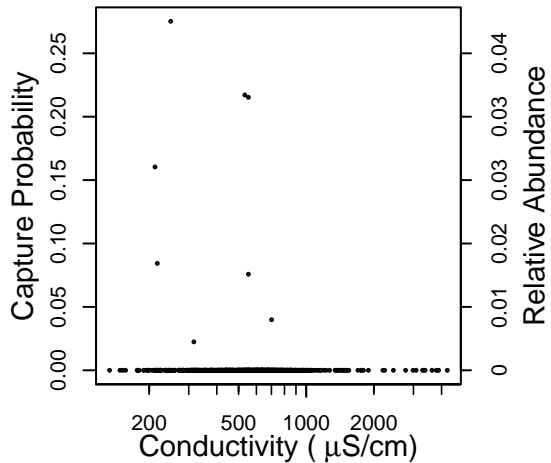
*Lype diversa*



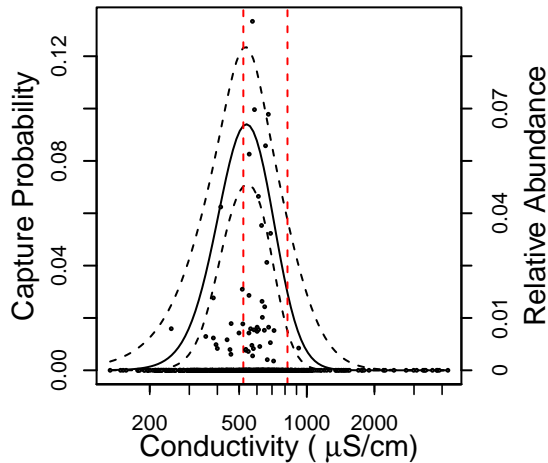
*Maccaffertium exiguum*



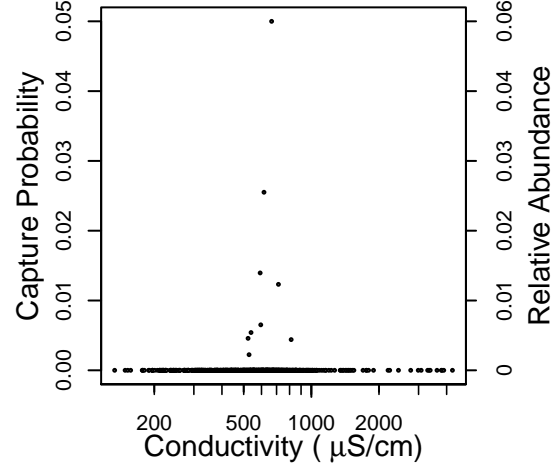
*Maccaffertium luteum*



*Maccaffertium mediopunctatum*

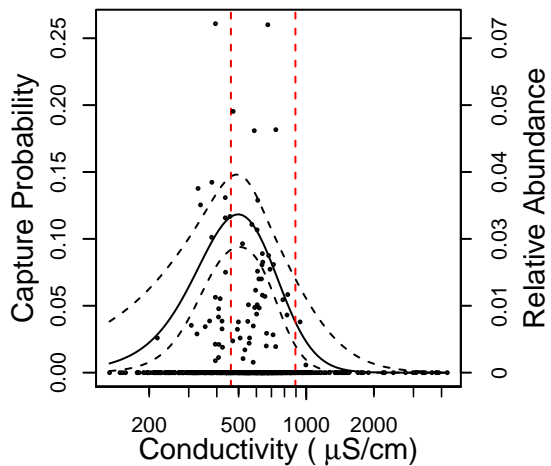


*Maccaffertium mexicanum integrum*

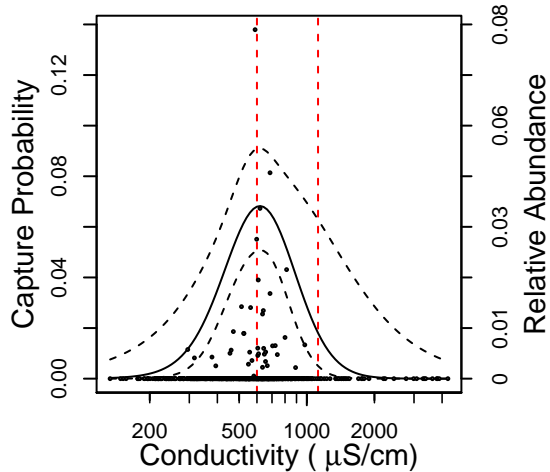


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

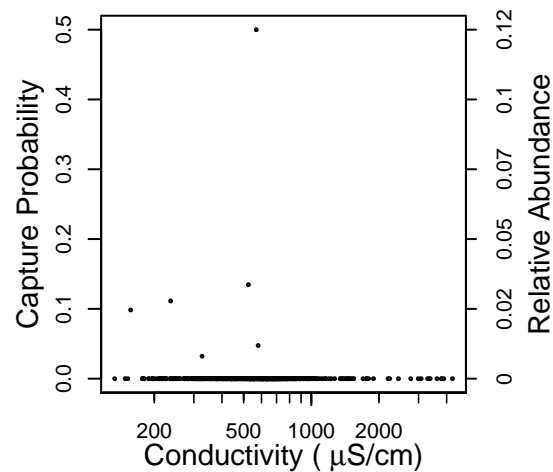
*Maccaffertium pulchellum*



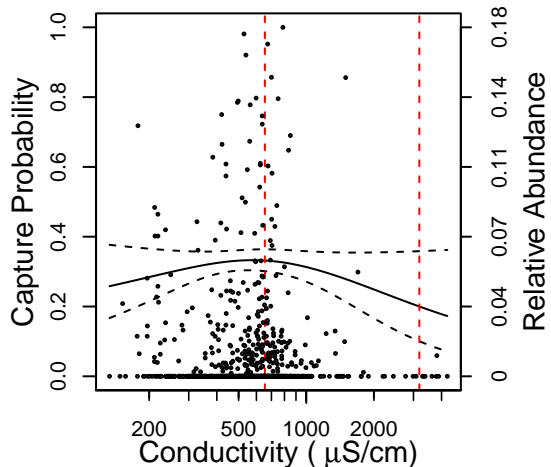
*Maccaffertium terminatum*



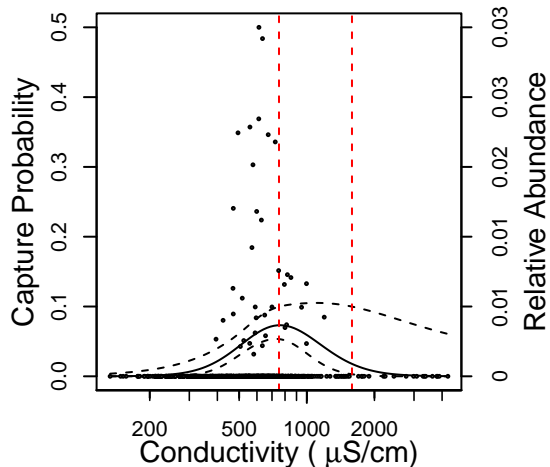
*Maccaffertium vicarium*



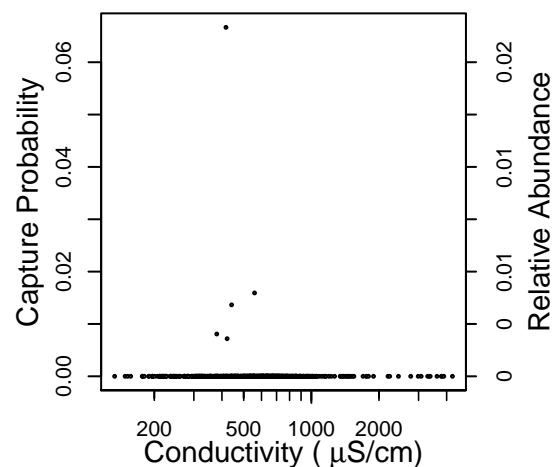
*Macronychus glabratus*



*Metrobates hesperius*

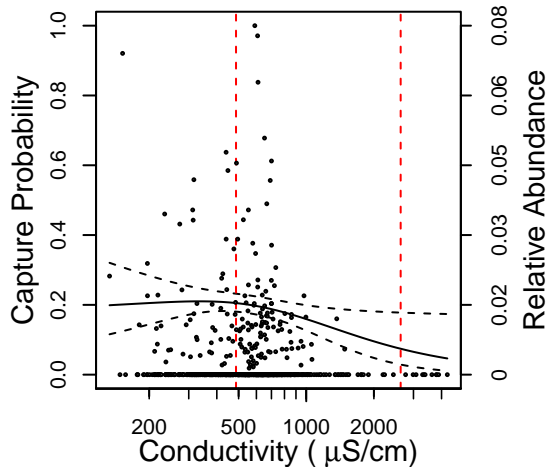


*Microcylloepus pusillus*

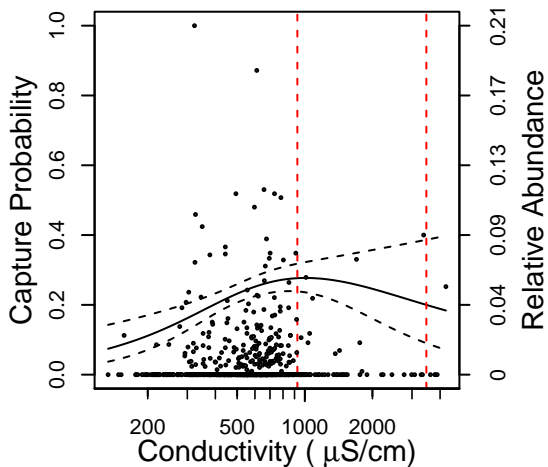


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

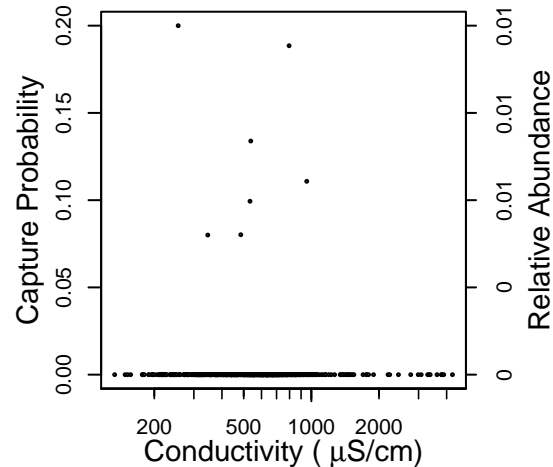
*Microtendipes pedellus* group



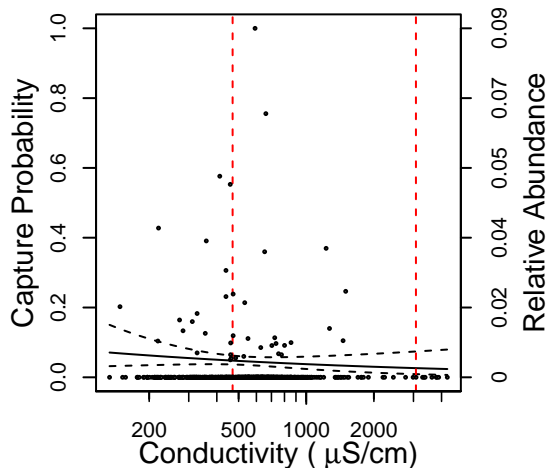
*Microvelia americana*



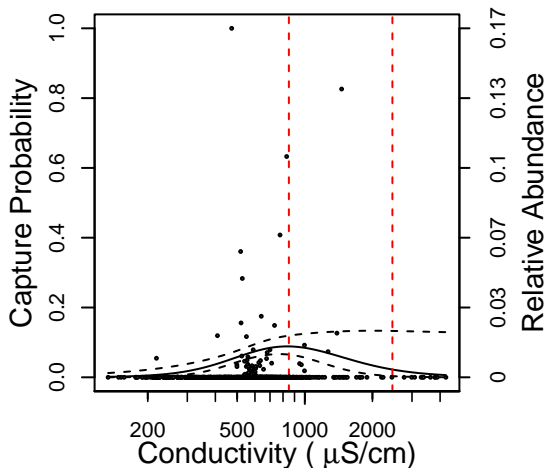
*Microvelia pulchella*



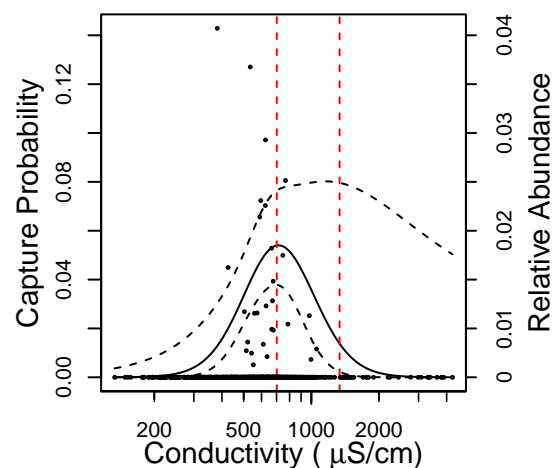
*Nasiaeschna pentacantha*



*Nectopsyche candida/exquisita*

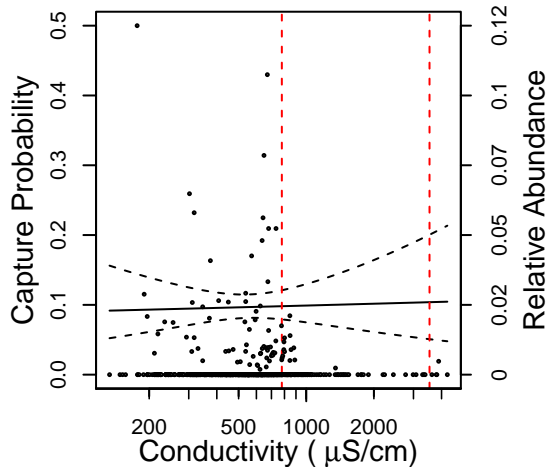


*Nectopsyche diarina*

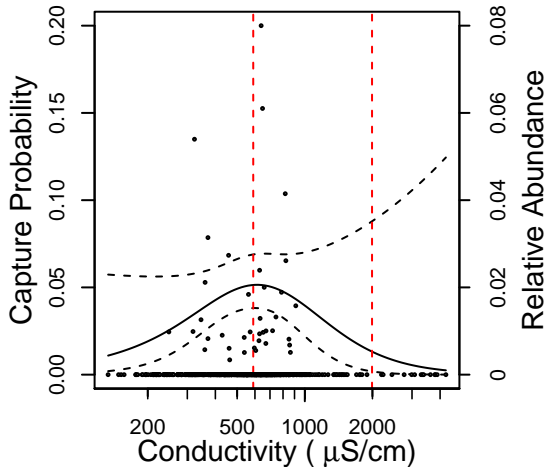


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

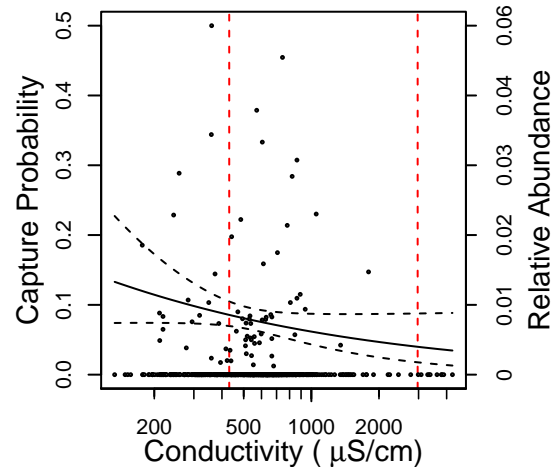
*Neoplea striola*



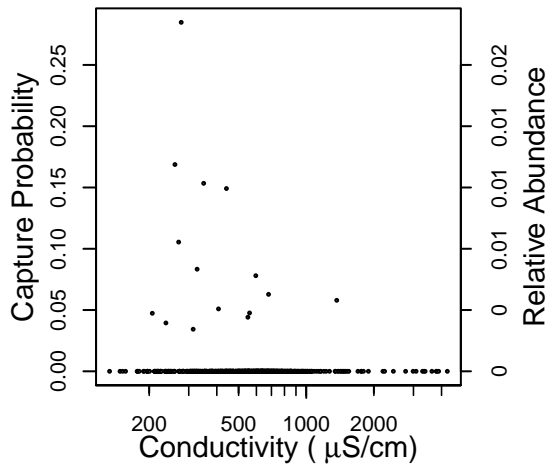
*Neoporus clypealis*



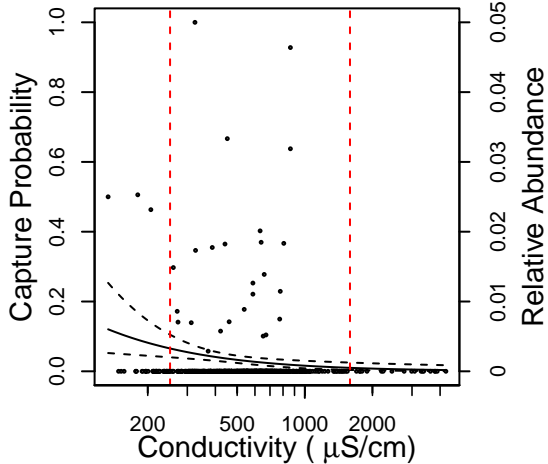
*Neoporus dimidiatus*



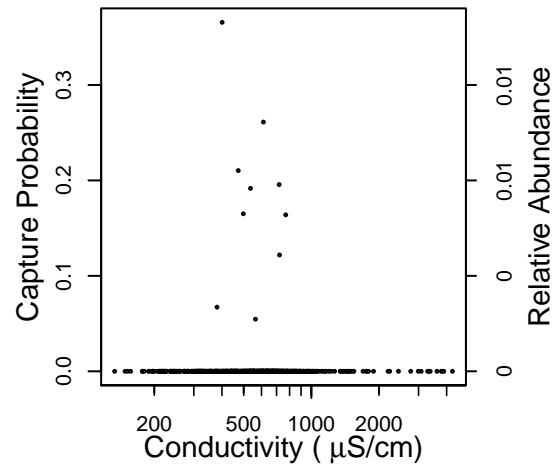
*Neoporus striatopunctatus*



*Neoporus tennetum*

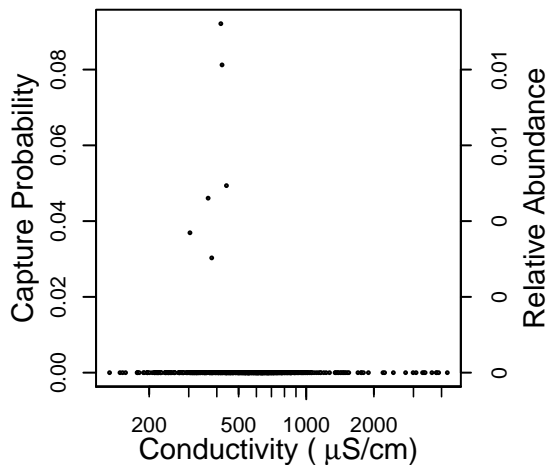


*Nepa apiculata*

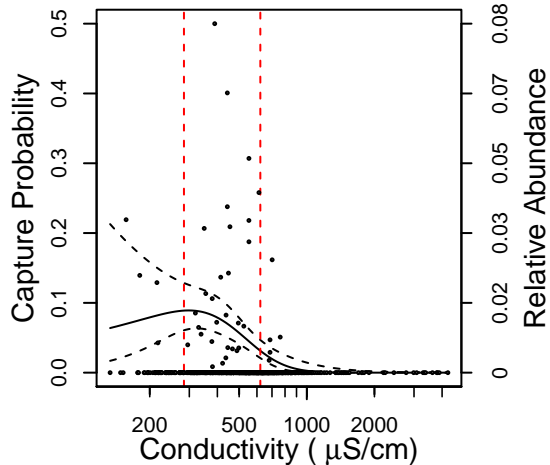


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

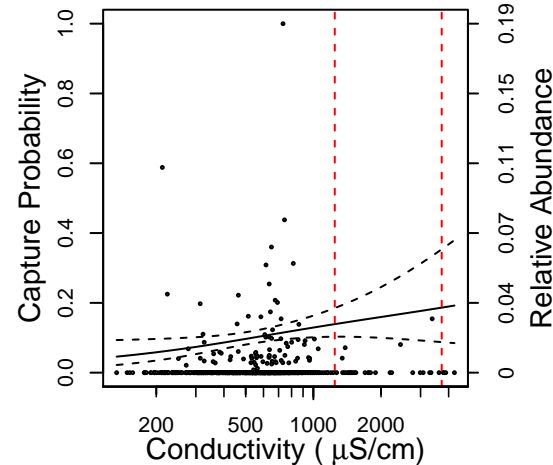
*Neurocordulia yamaskanensis*



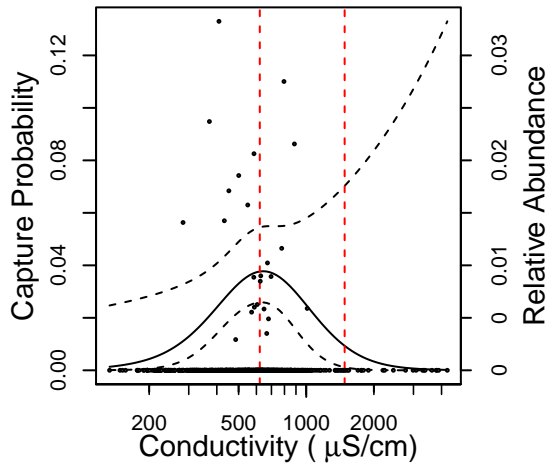
*Nigronia serricornis*



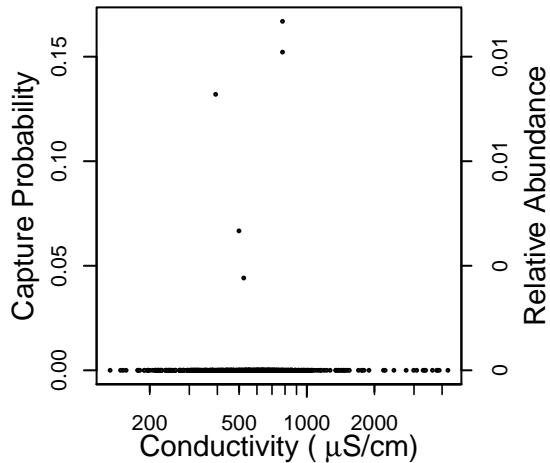
*Notonecta irrorata*



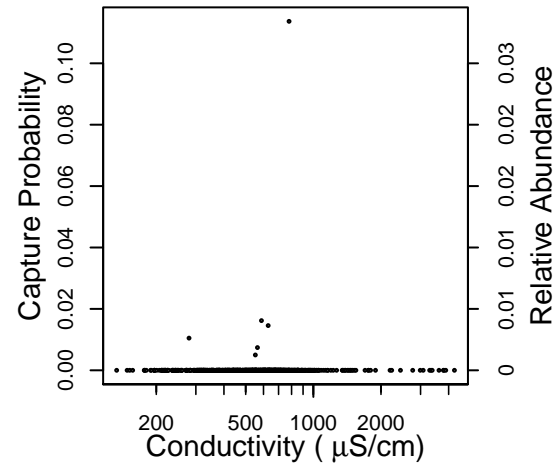
*Notonecta lunata*



*Oecetis avara*



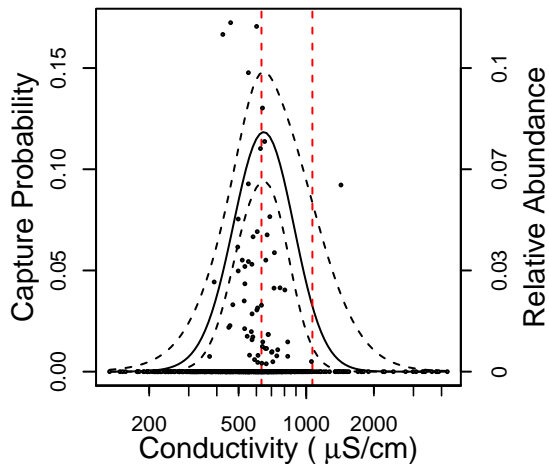
*Oecetis nocturna*



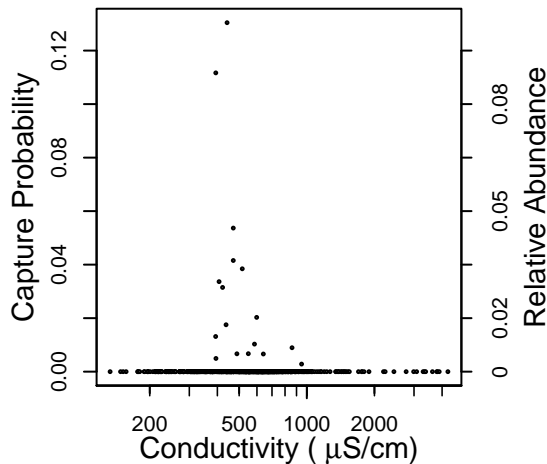


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

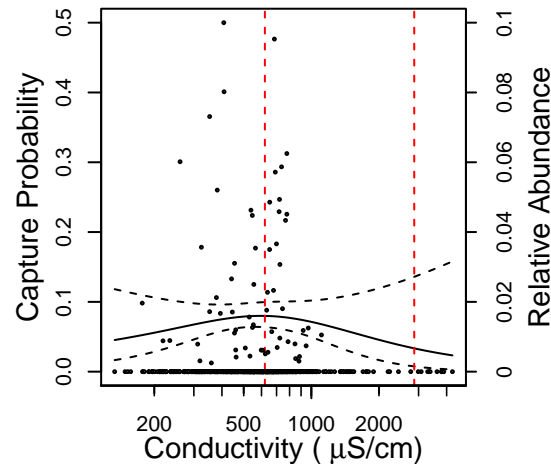
*Optioservus fastiditus*



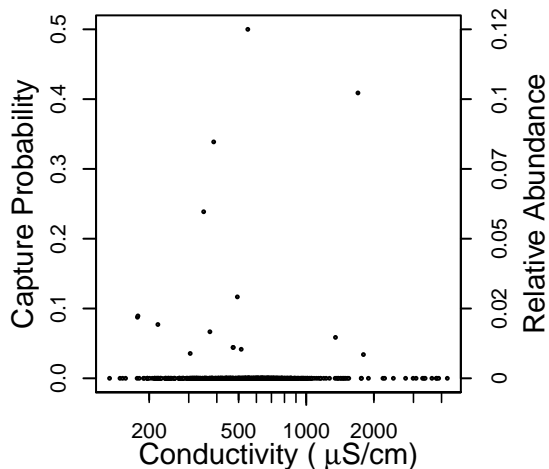
*Optioservus trivittatus*



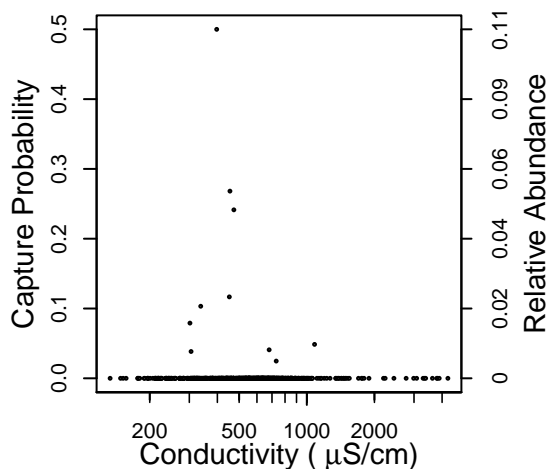
*Orconectes immunis*



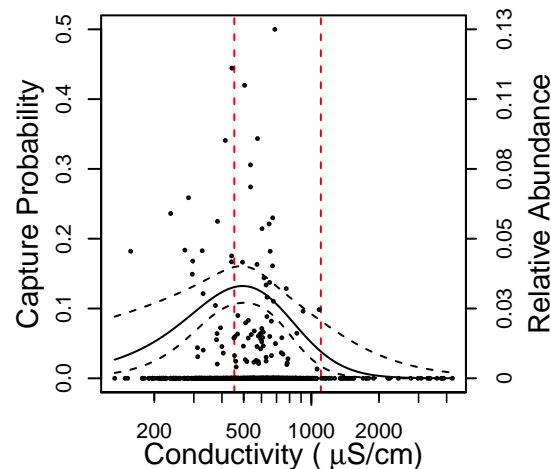
*Orconectes indianensis*



*Orconectes juvenilis*

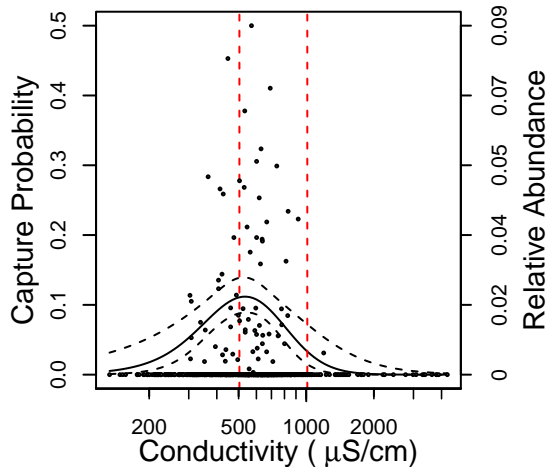


*Orconectes propinquus*

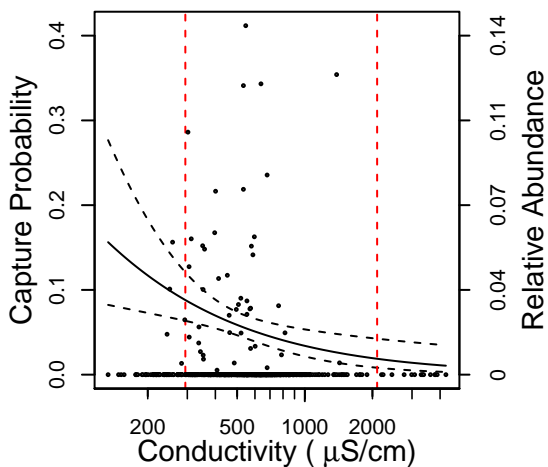


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

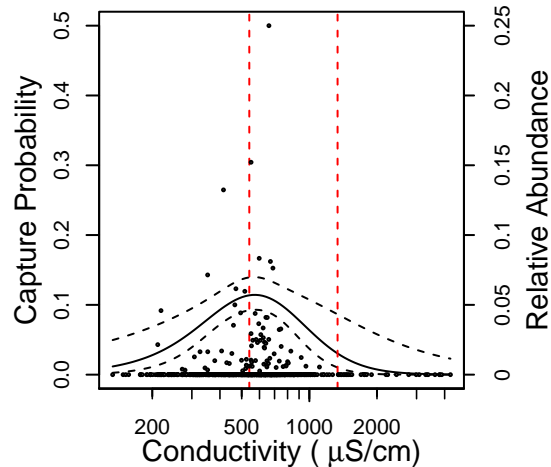
*Orconectes rusticus*



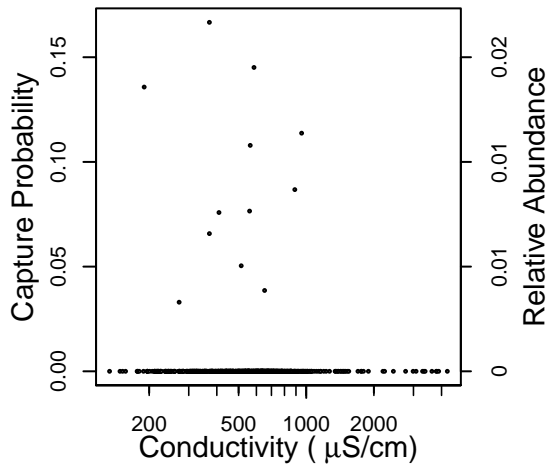
*Orconectes sloanii*



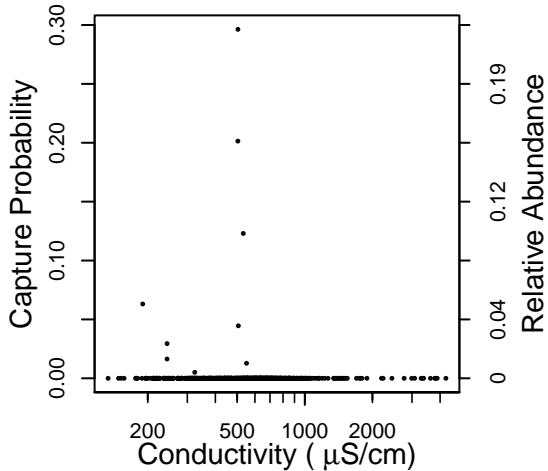
*Orconectes virilis*



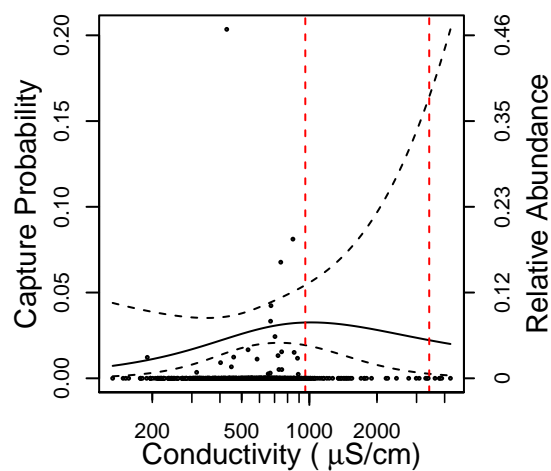
*Pachydiplax longipennis*



*Palaemonetes kadiakensis*

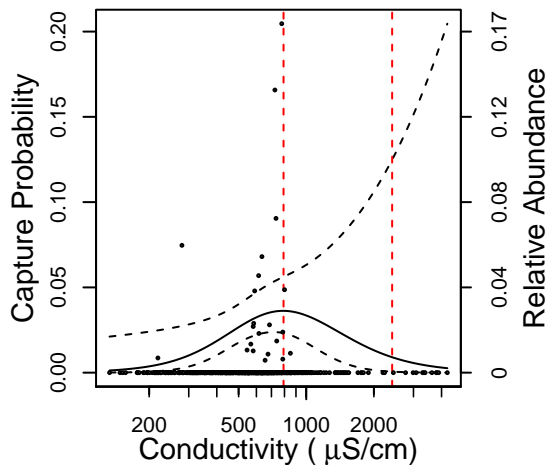


*Palmarcorixa buenoi*

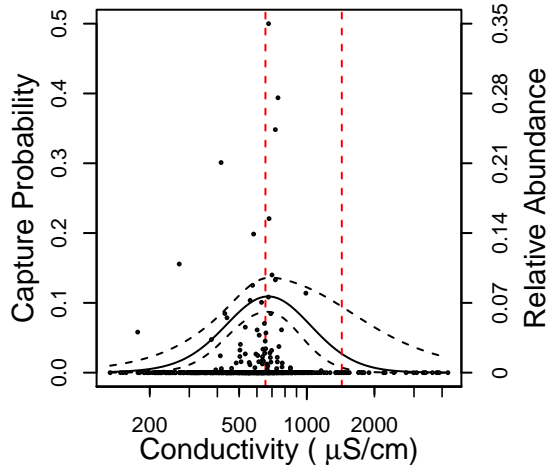


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

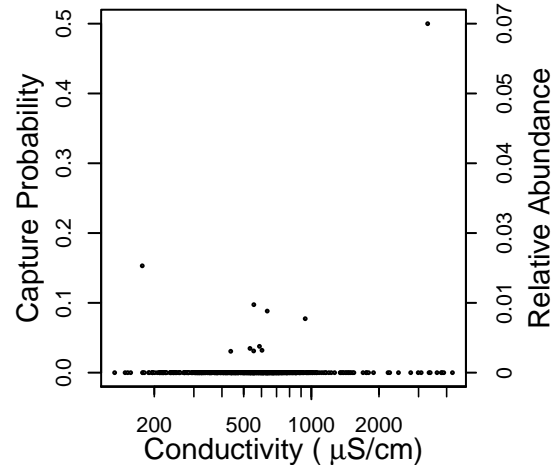
*Palmacorixa gillettei*



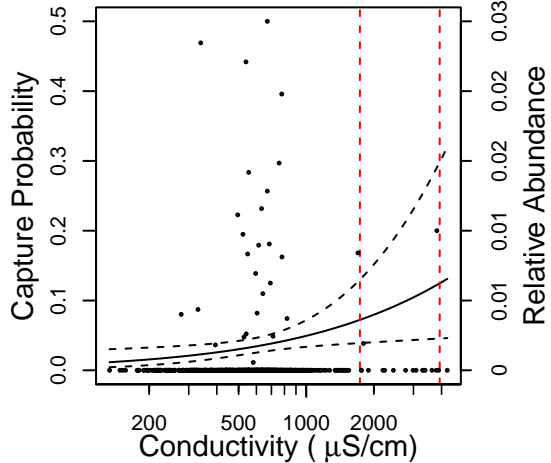
*Palmacorixa nana*



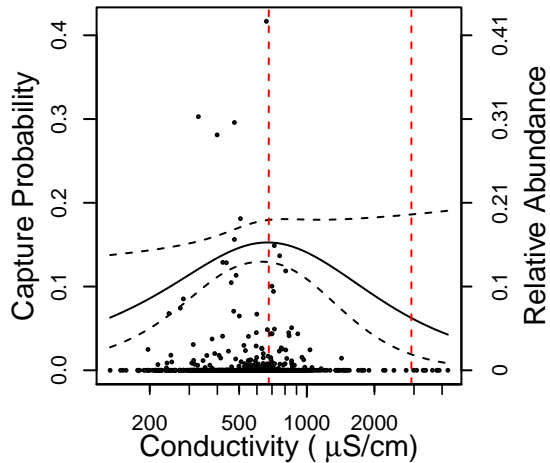
*Paragordius varius*



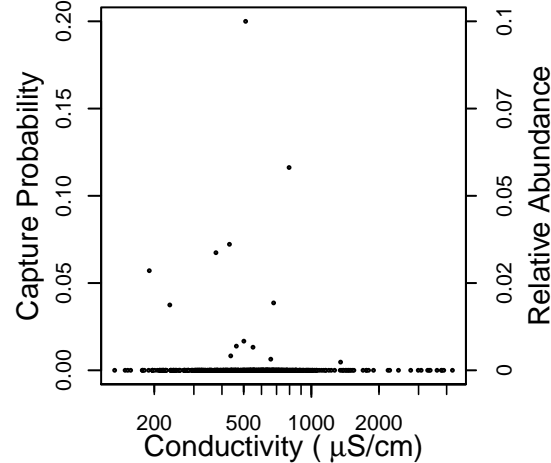
*Paralauterborniella nigrohalterale*



*Paratendipes albimanus*

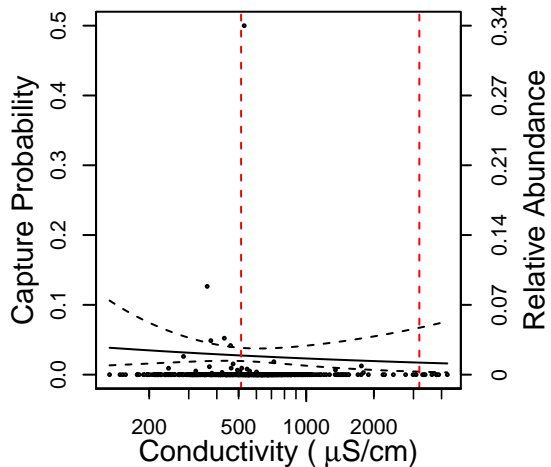


*Pelocoris femoratus*

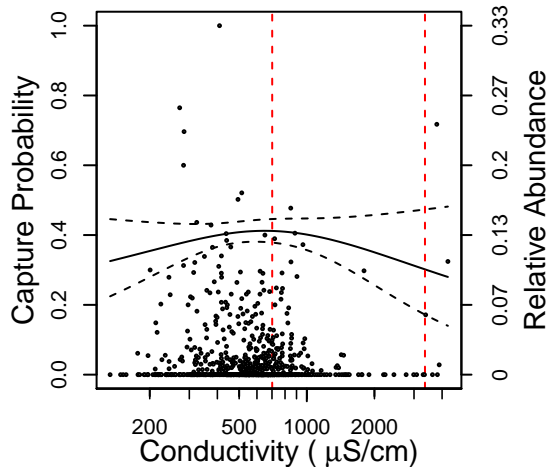


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

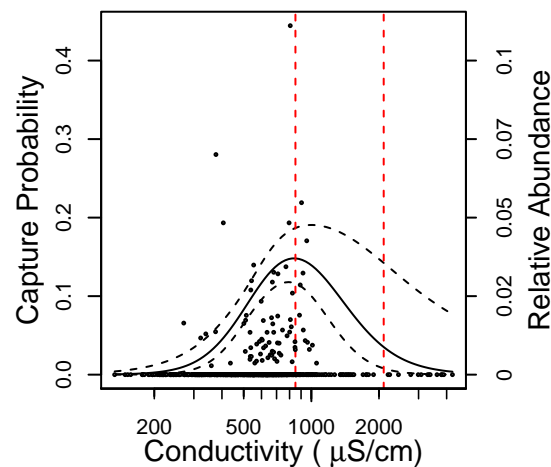
*Peltodytes dunavani*



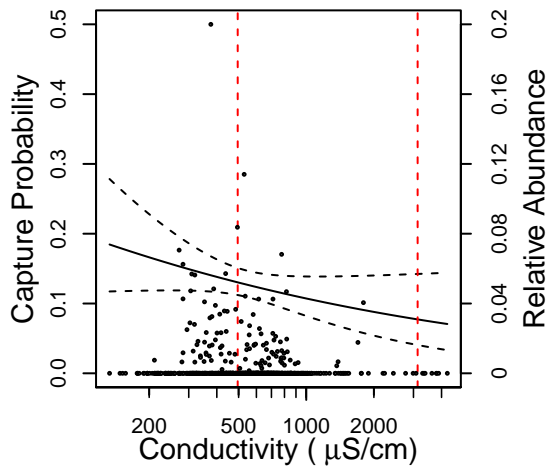
*Peltodytes duodecimpunctatus*



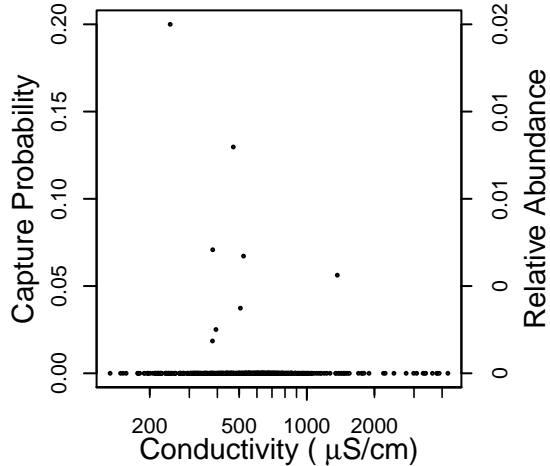
*Peltodytes edentulus*



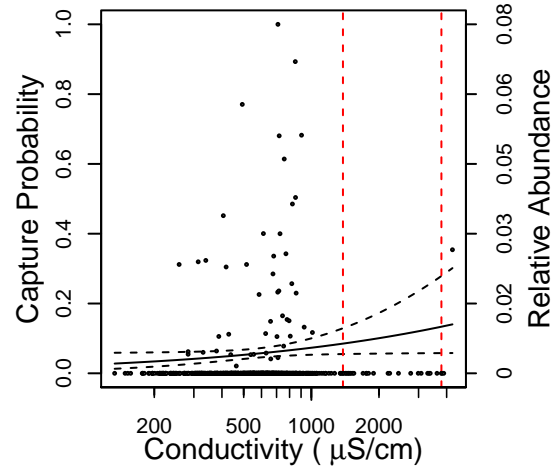
*Peltodytes lengi*



*Peltodytes litoralis*

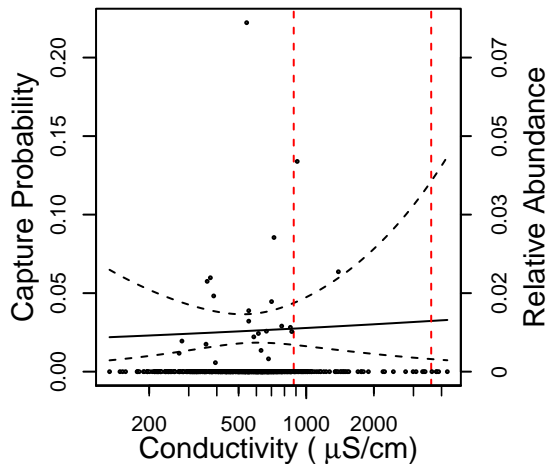


*Peltodytes muticus*

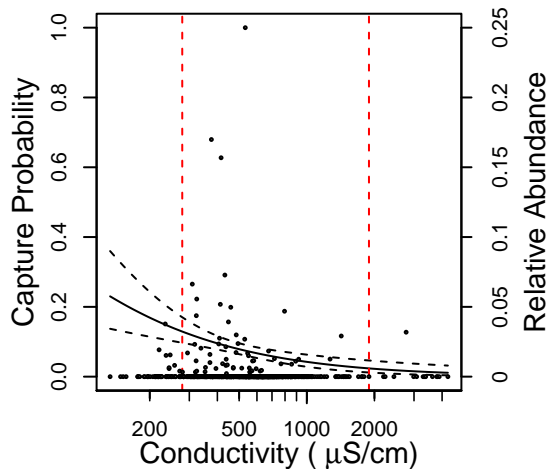


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

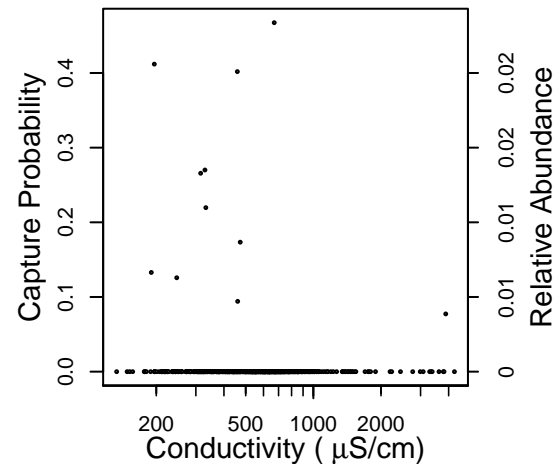
*Peltodytes pedunculatus*



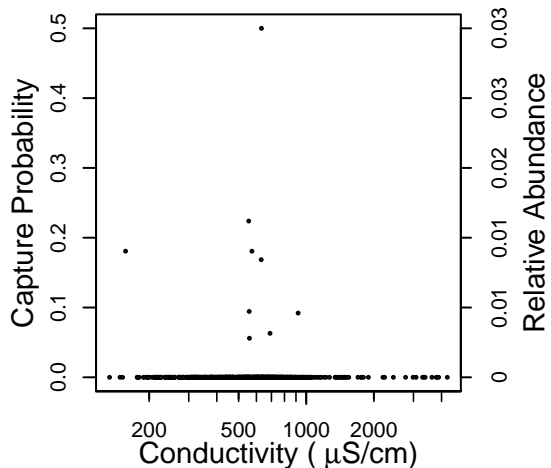
*Peltodytes sexmaculatus*



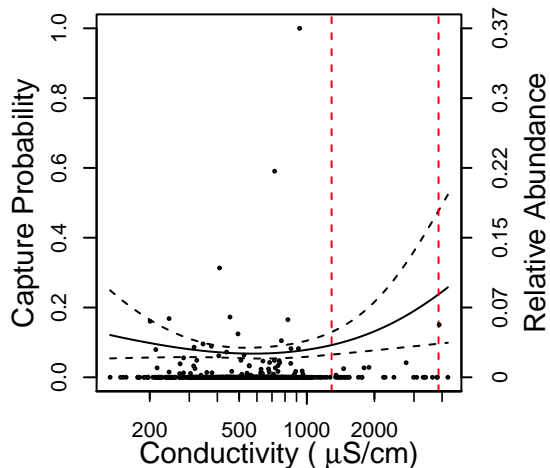
*Perithemis tenera*



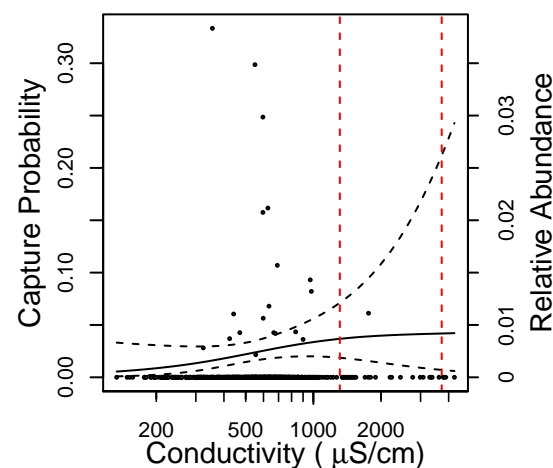
*Perlinella drymo*



*Plathemis lydia*

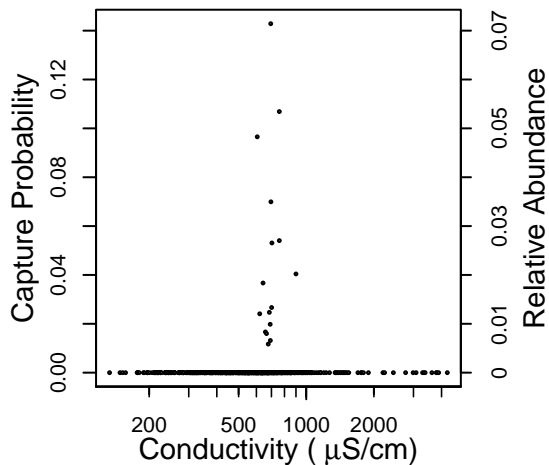


*Polypedilum (tripodura)*

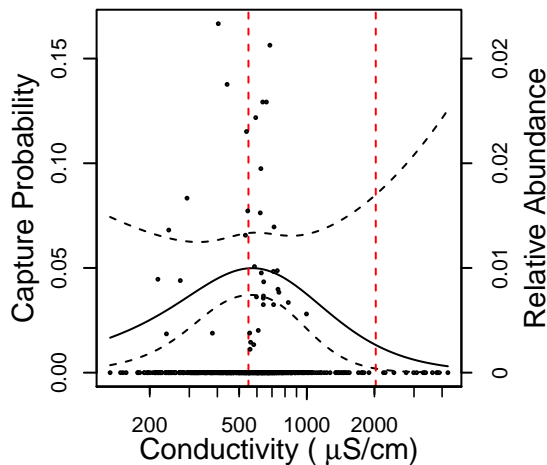


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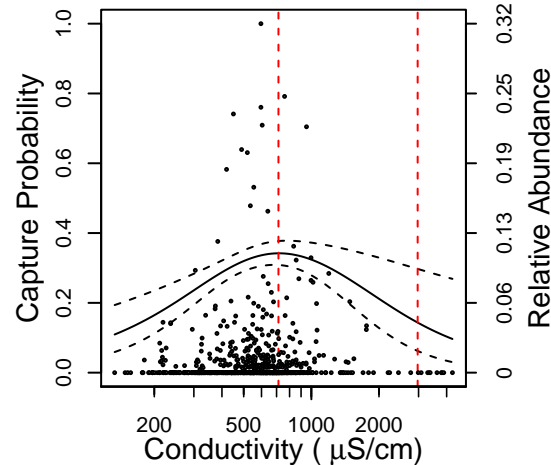
*Polypedilum aviceps*



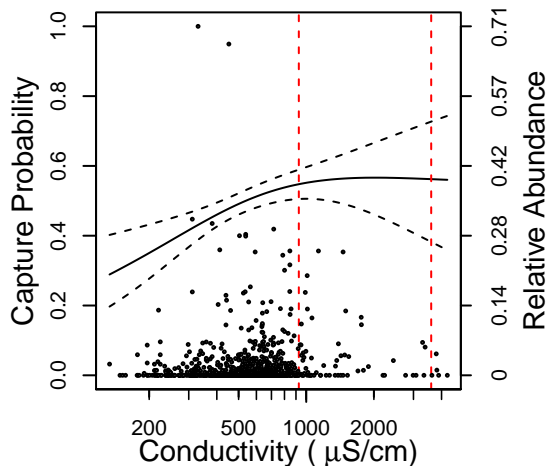
*Polypedilum fallax* group



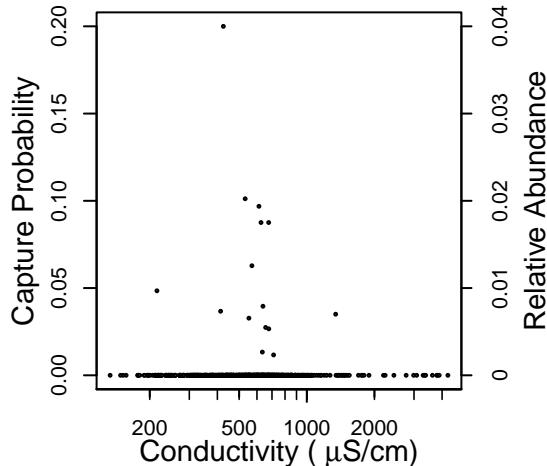
*Polypedilum flavum*



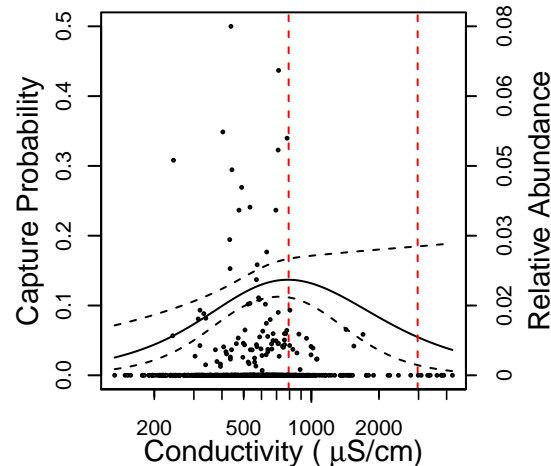
*Polypedilum illinoense* group



*Polypedilum laetum* group

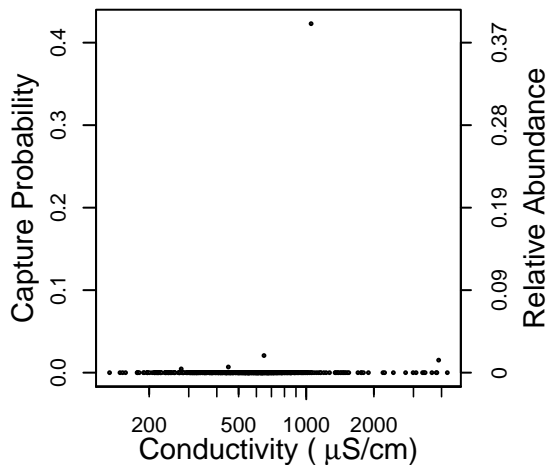


*Polypedilum scalaenum* group

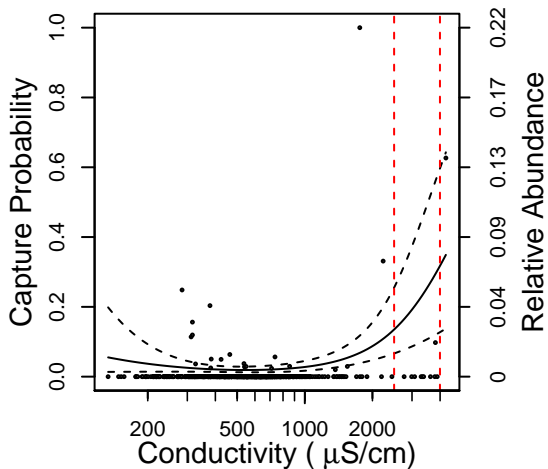


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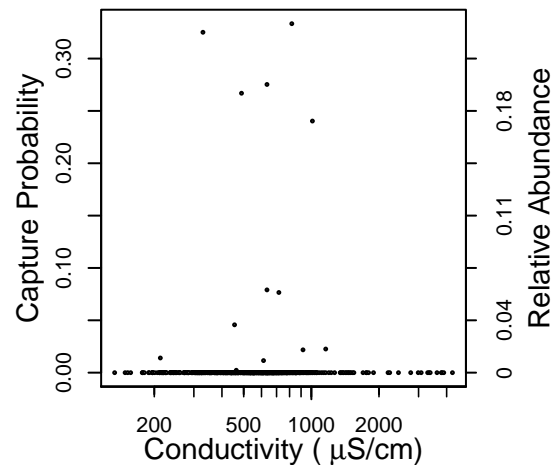
*Polypedilum tritum*



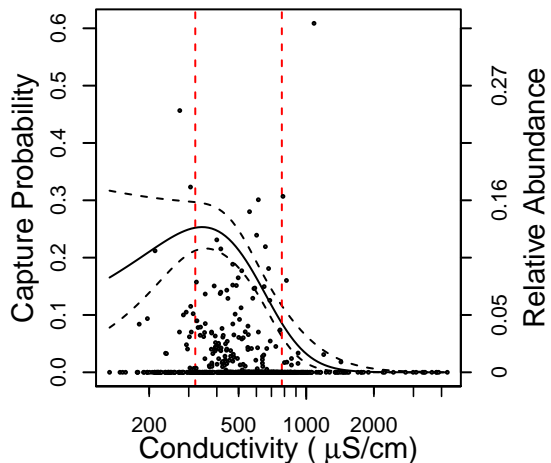
*Progomphus obscurus*



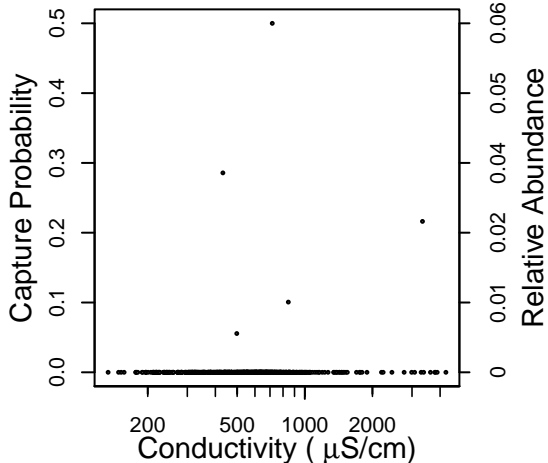
*Psectrotanypus dyari*



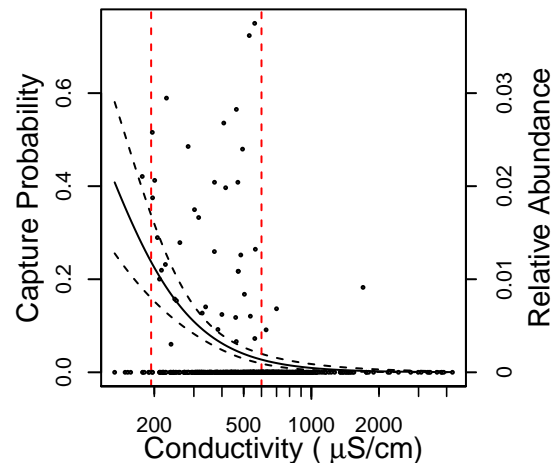
*Psephenus herricki*



*Ranatra australis*

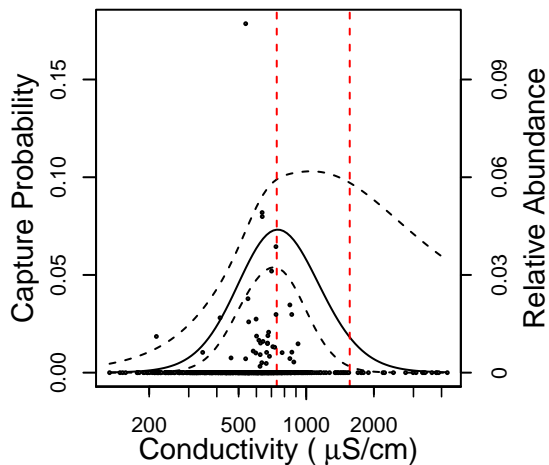


*Ranatra buenoi*

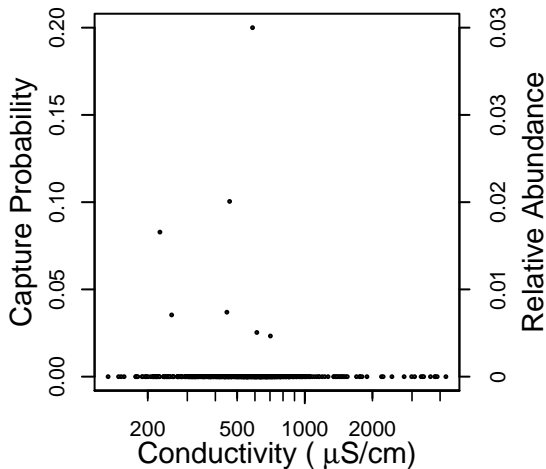


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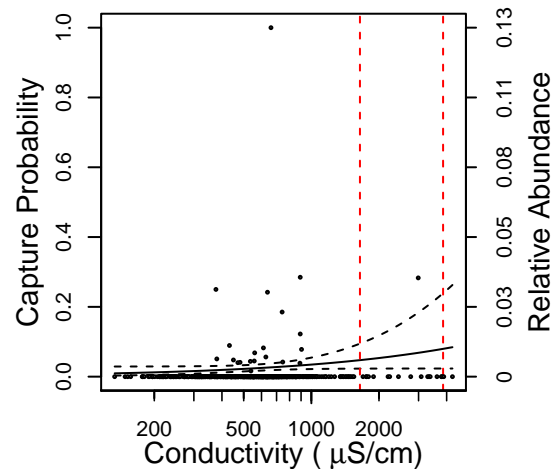
*Ranatra fusca*



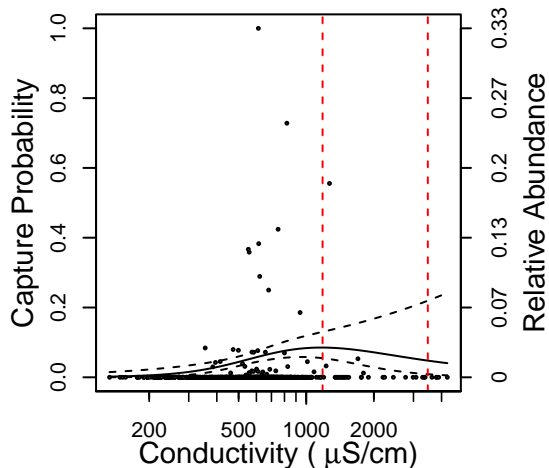
*Ranatra kirkaldyi*



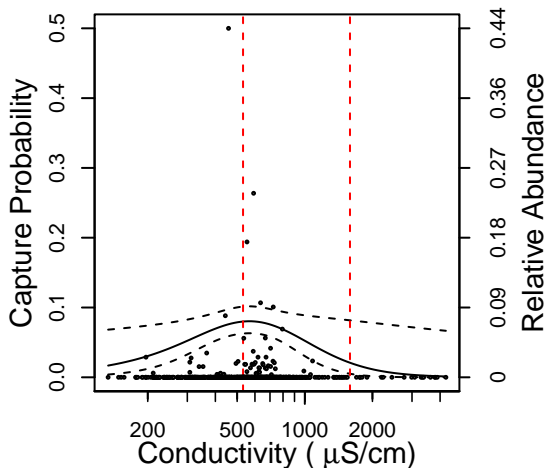
*Ranatra nigra*



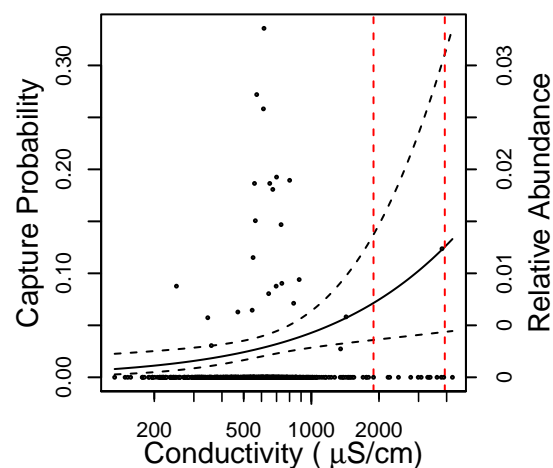
*Rhagovelia obesa*



*Rhagovelia oriander*



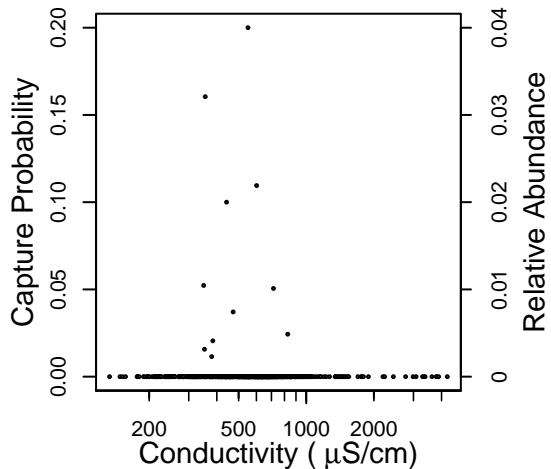
*Rheumatobates palosi*



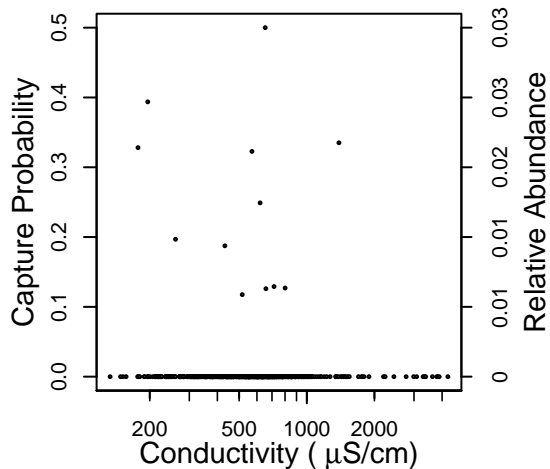


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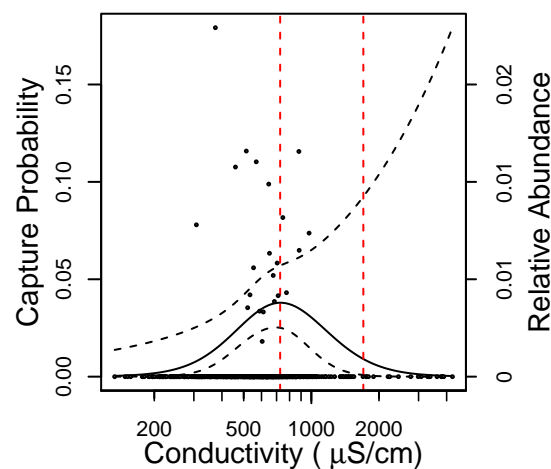
*Rheumatobates rileyi*



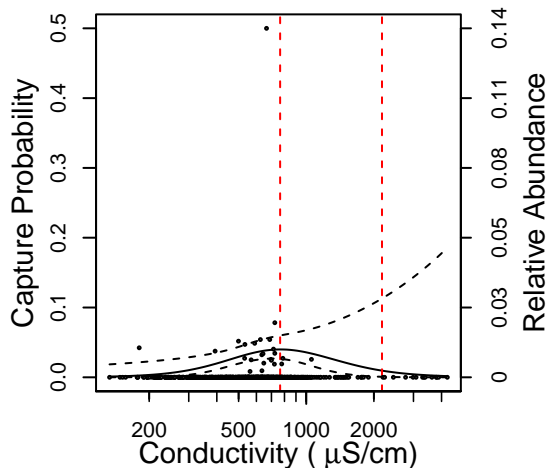
*Rheumatobates tenuipes*



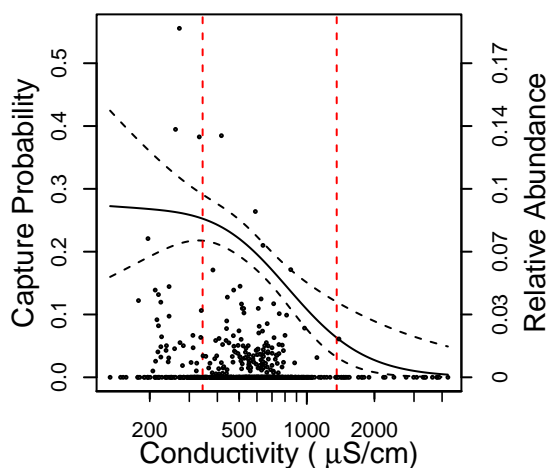
*Saetheria tylus*



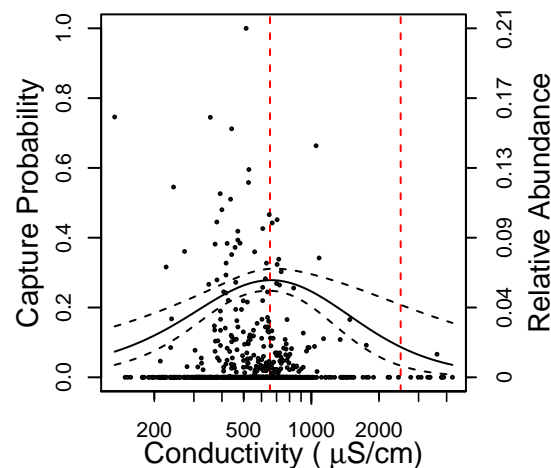
*Sperchopsis tessellata*



*Stenacron interpunctatum*

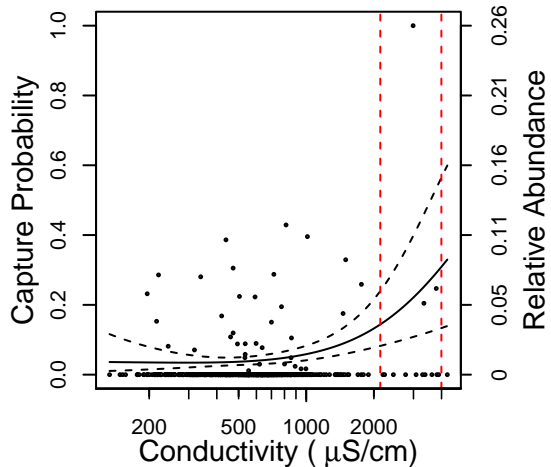


*Stenelmis crenata*

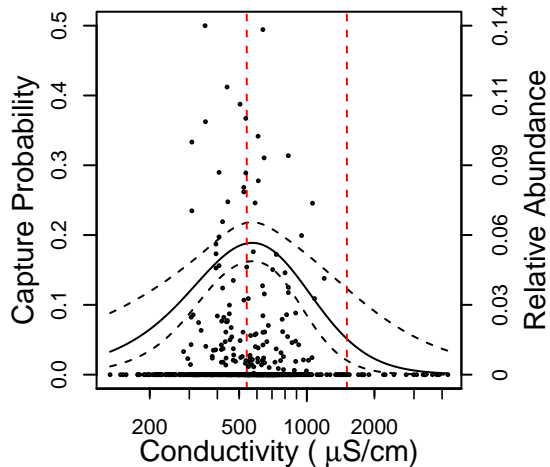


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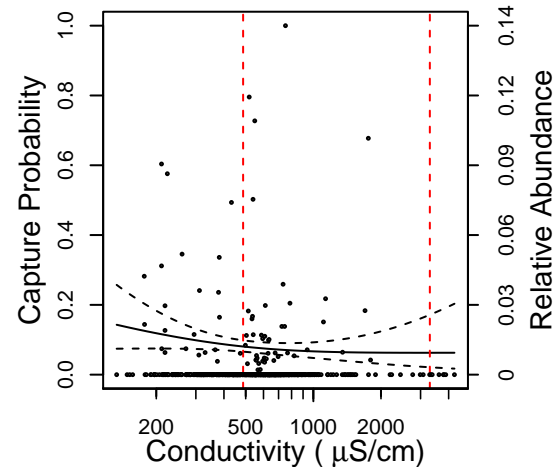
*Stenelmis grossa*



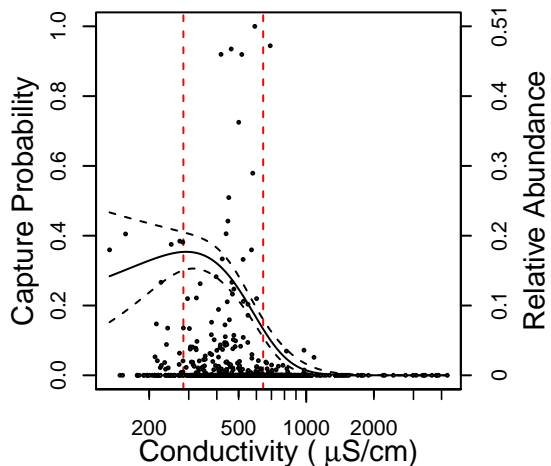
*Stenelmis sexlineata*



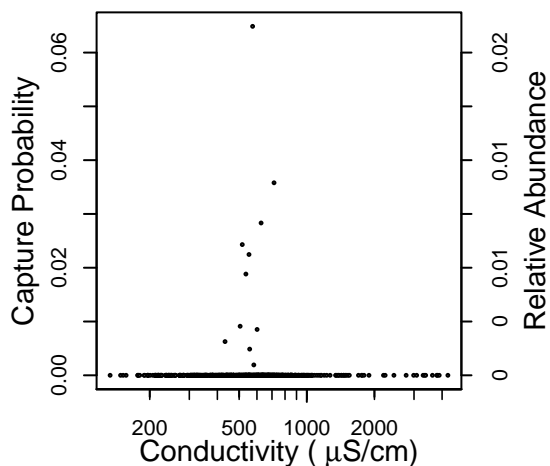
*Stenelmis vittipennis*



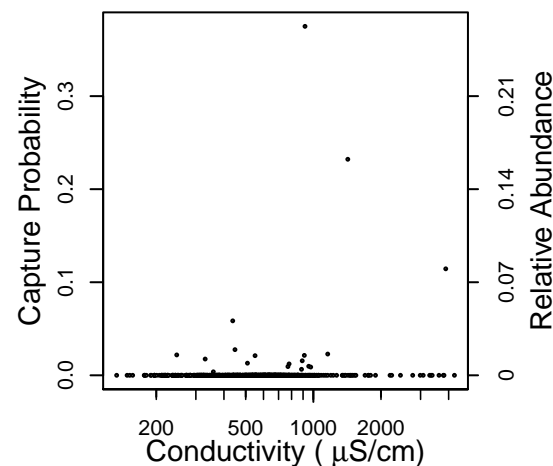
*Stenonema femoratum*



*Sublettea coffmani*

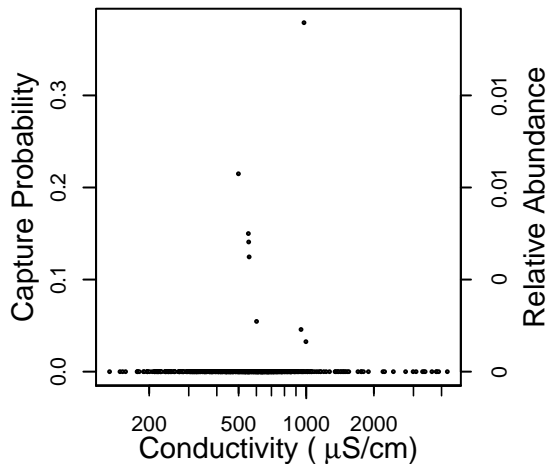


*Tanytus neopunctipennis*

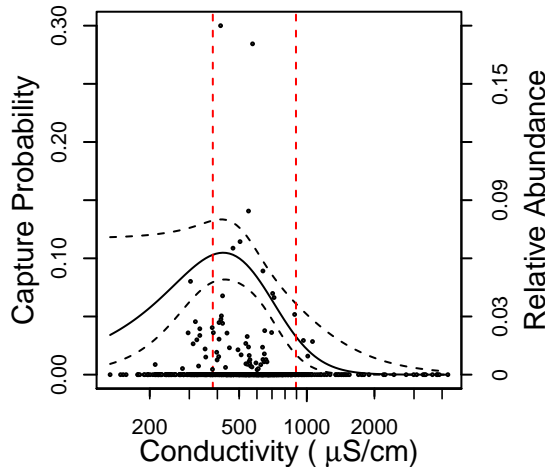


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

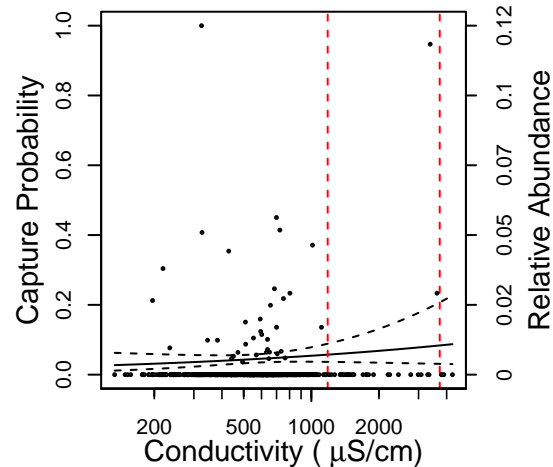
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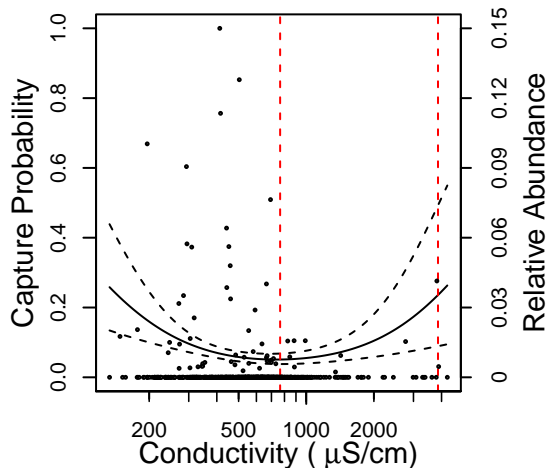
*Trepobates inermis/knighti*



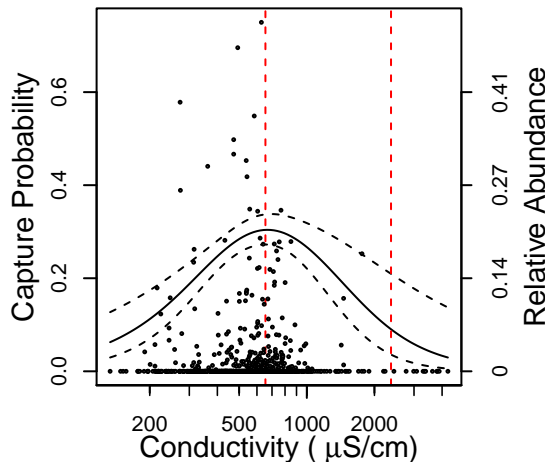
*Trepobates pictus*



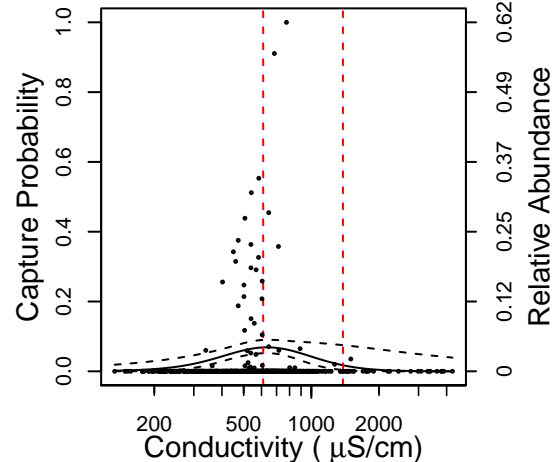
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*Trichocorixa calva*

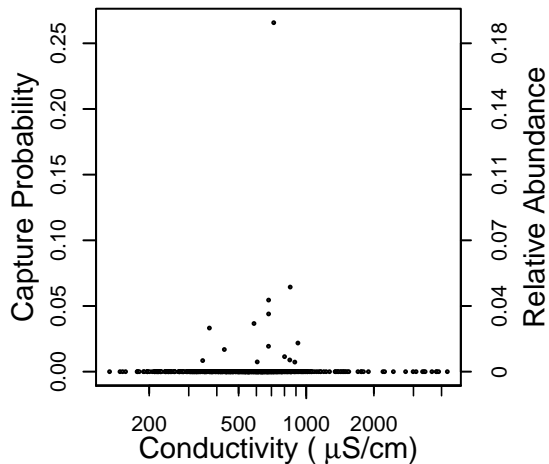


*Trichocorixa kanza*

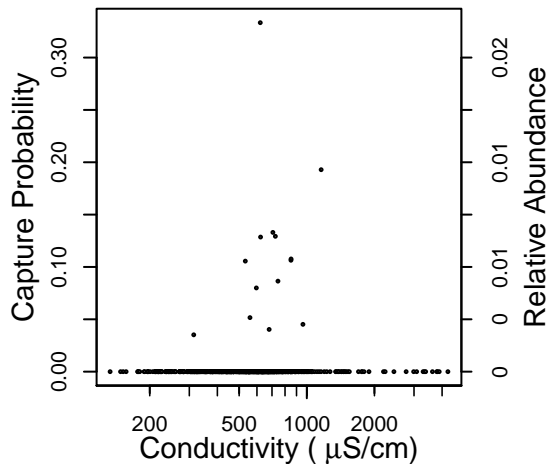


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

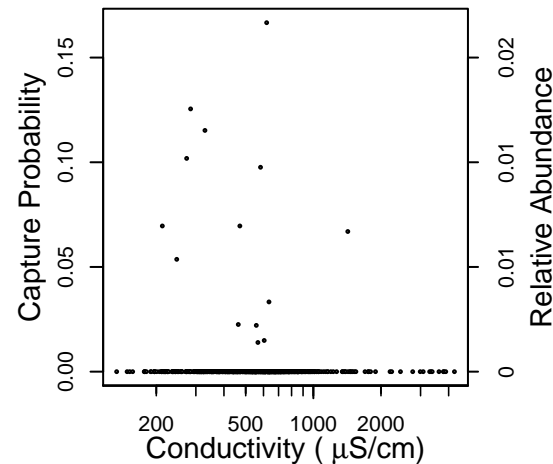
*Trichocorixa sexcincta*



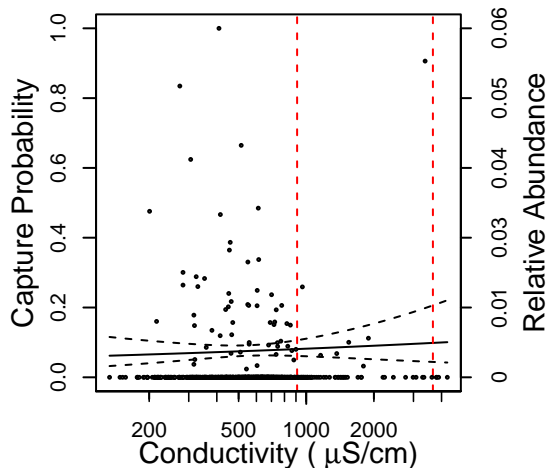
*Tropisternus affinis*



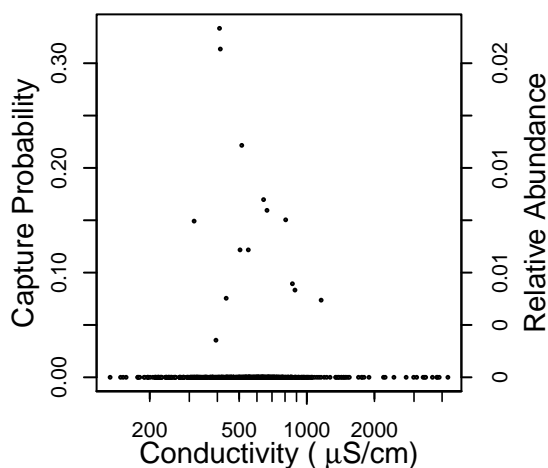
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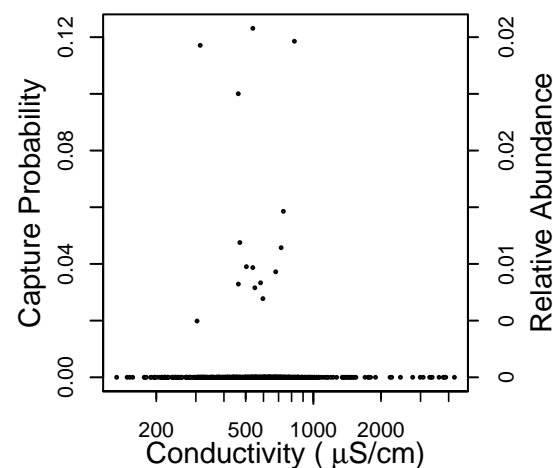
*Tropisternus glaber*



*Tropisternus lateralis*

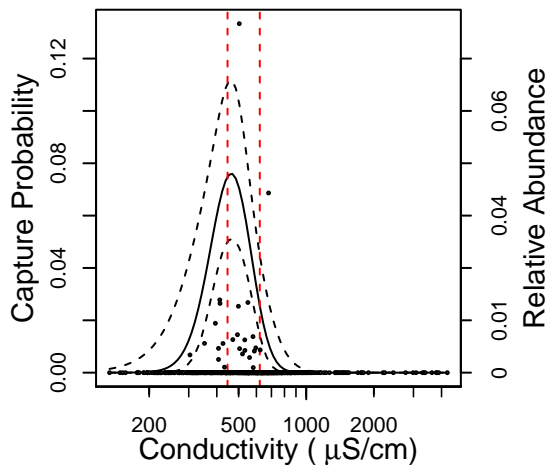


*Tropisternus mixtus*

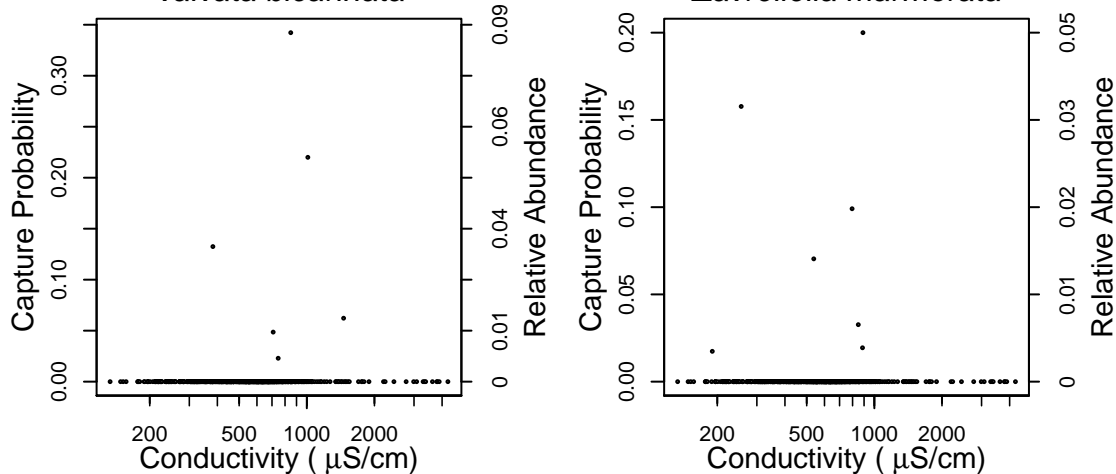


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

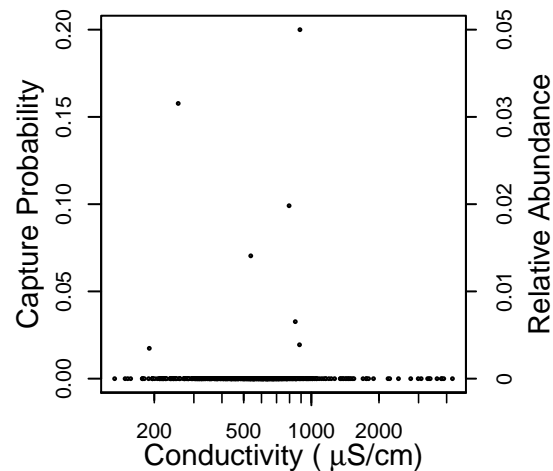
*Tropisternus natator*



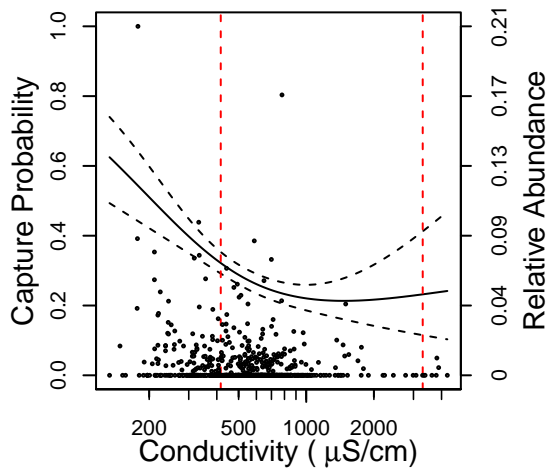
*Valvata bicarinata*



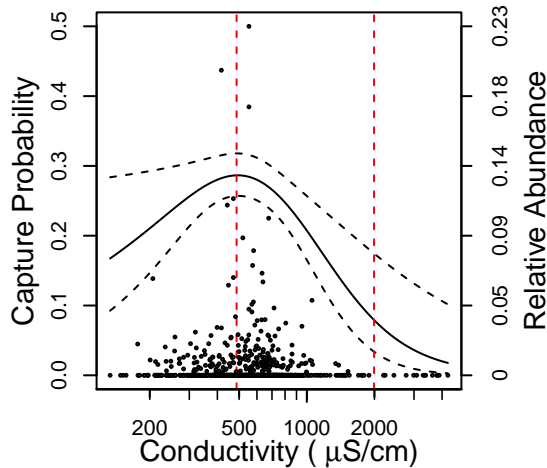
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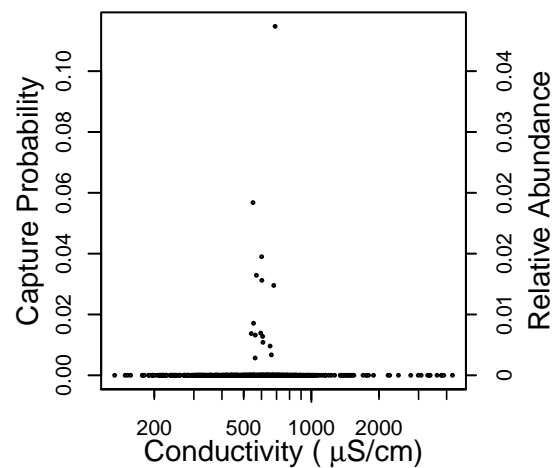
*Ablabesmyia*



*Acari*

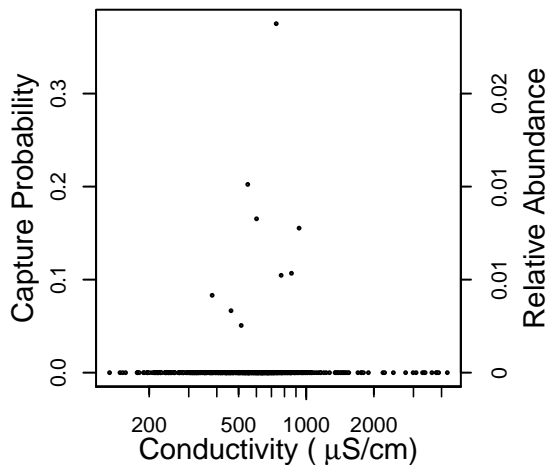


*Acentrella*

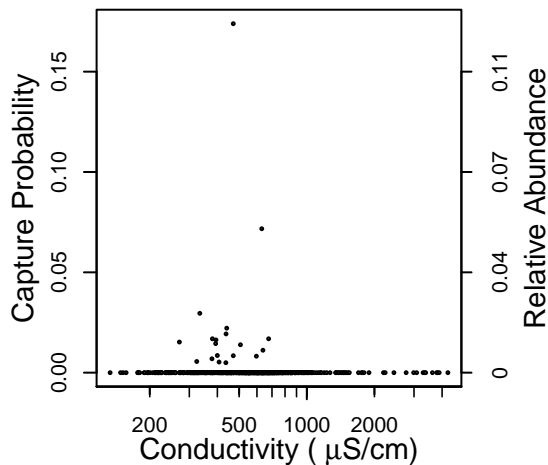


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

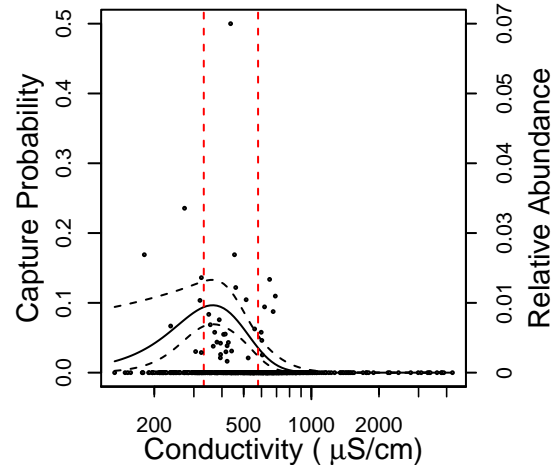
*Acentria*



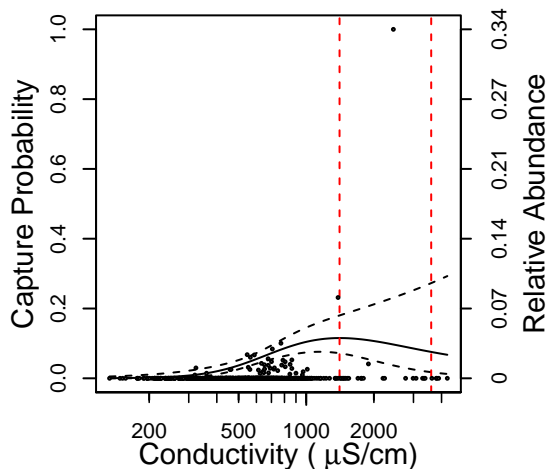
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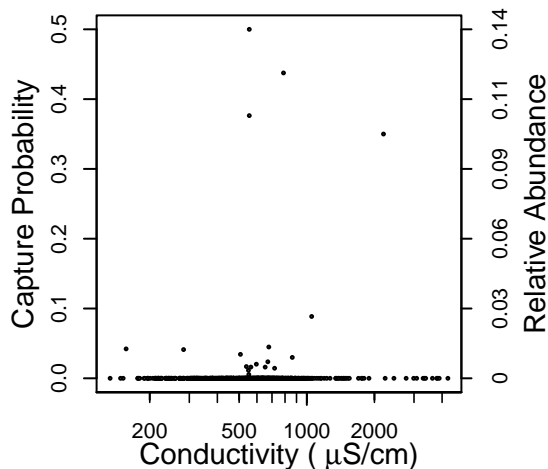
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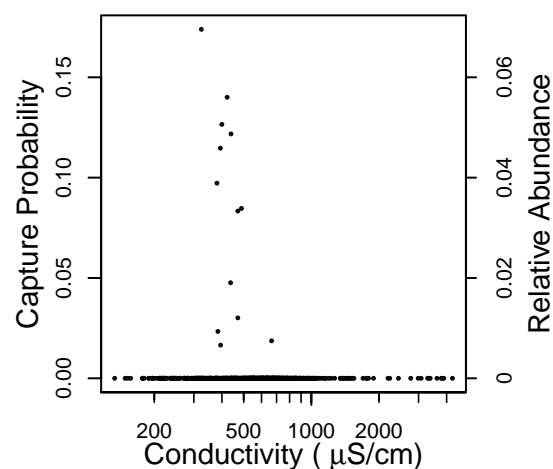
*Aeshna*



*Agabus*

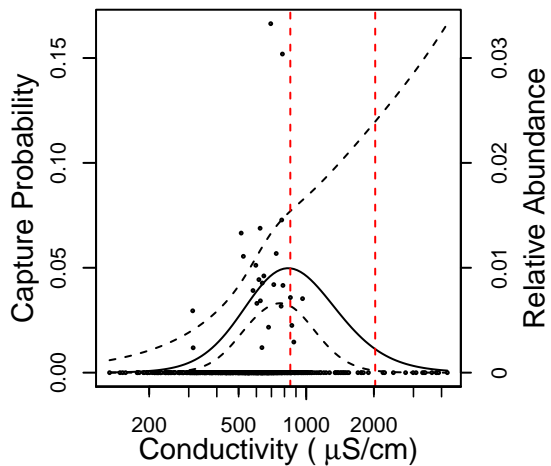


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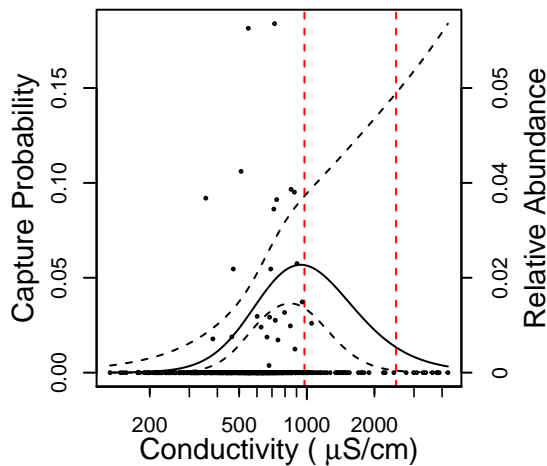


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

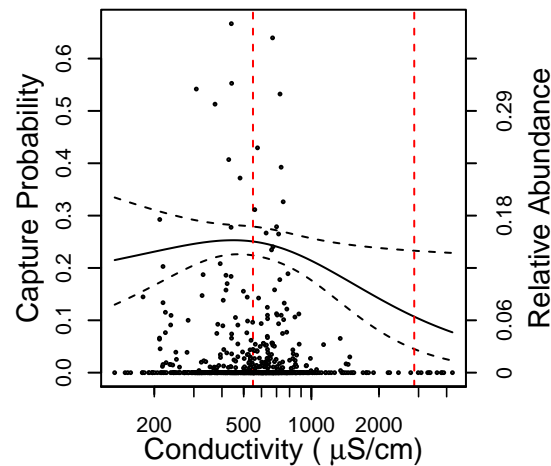
*ANACAENA*



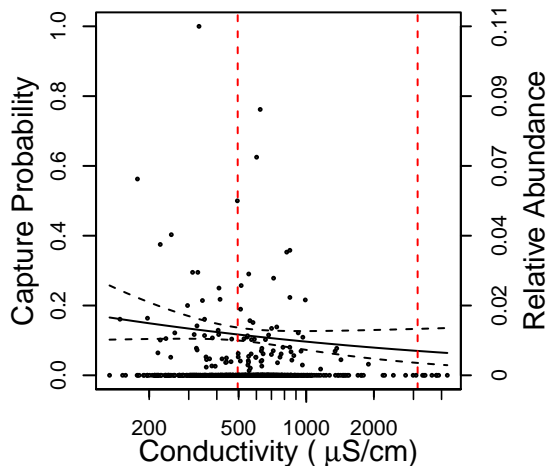
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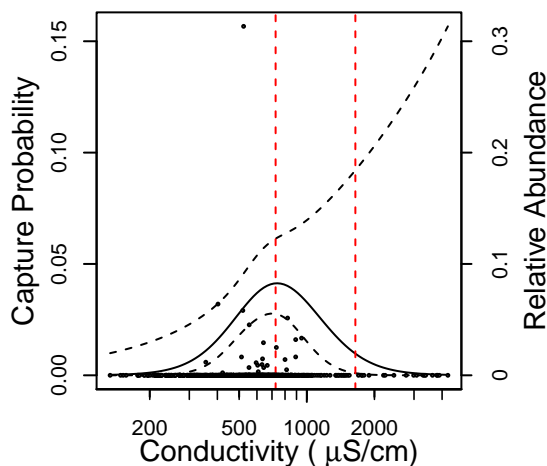
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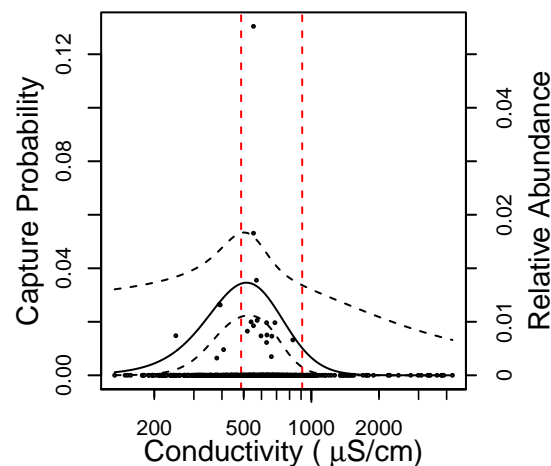
*Anopheles*



*Anthopotamus*

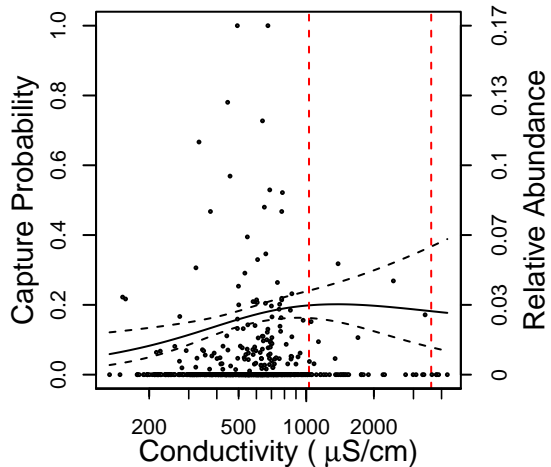


*Antocha*

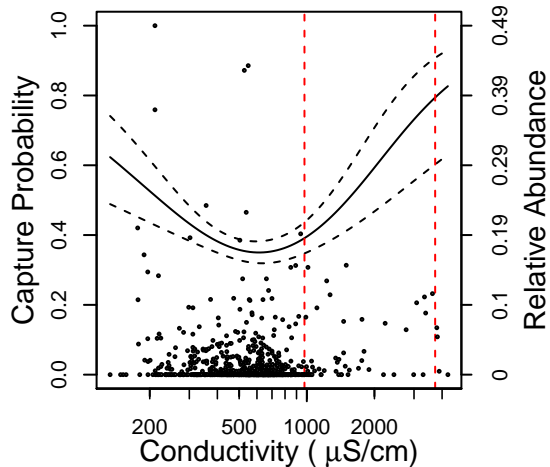


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

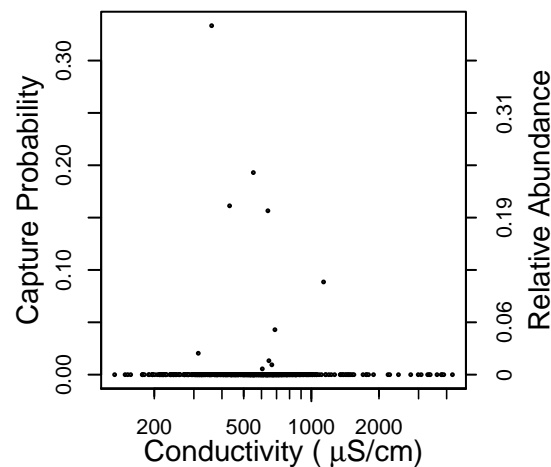
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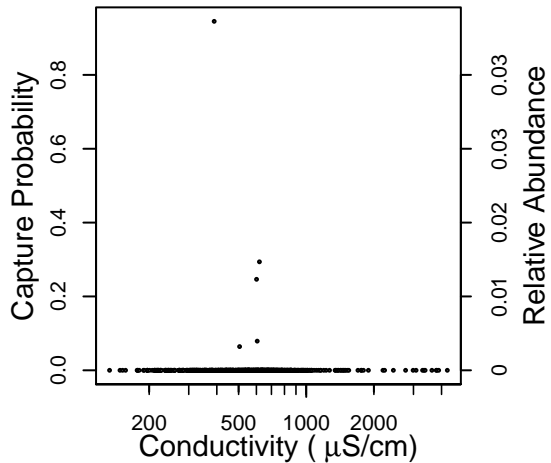
*Argia*



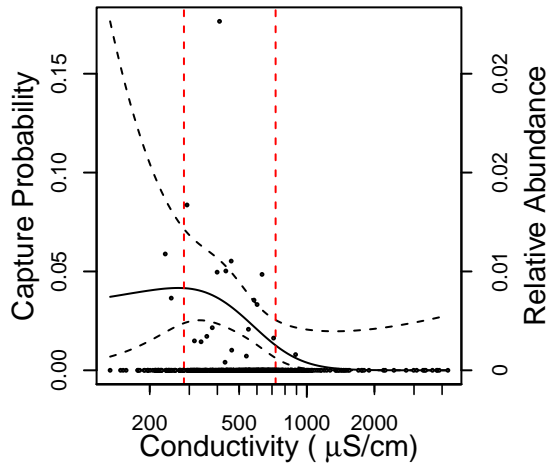
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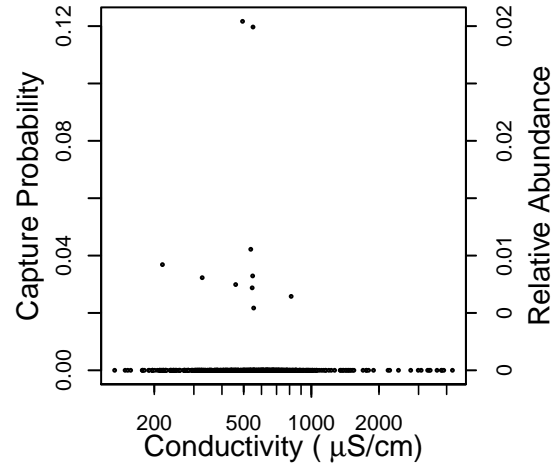
*Atherix*



*Atrichopogon*



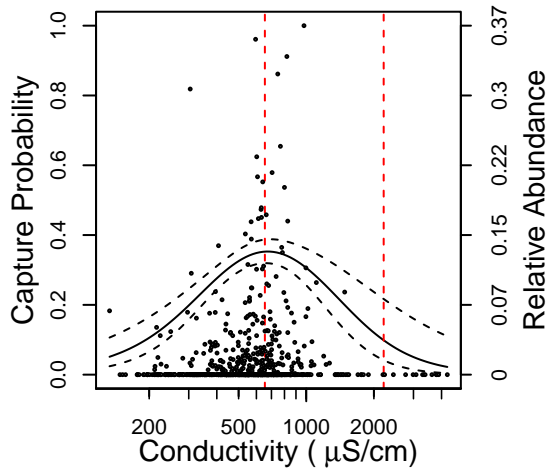
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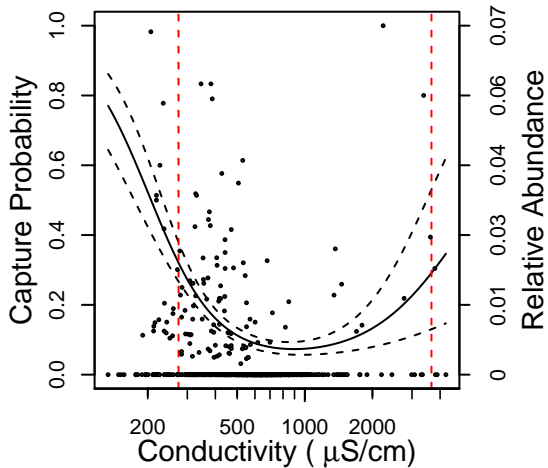


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

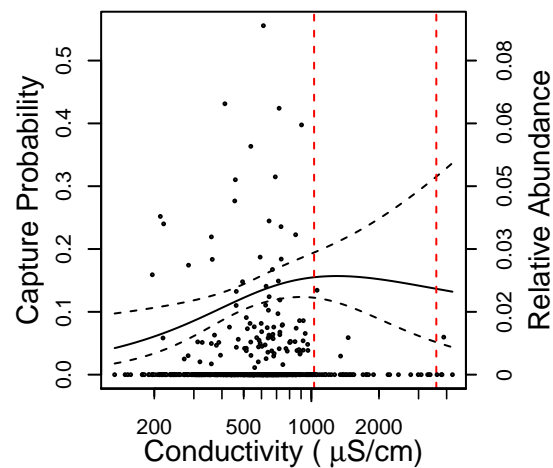
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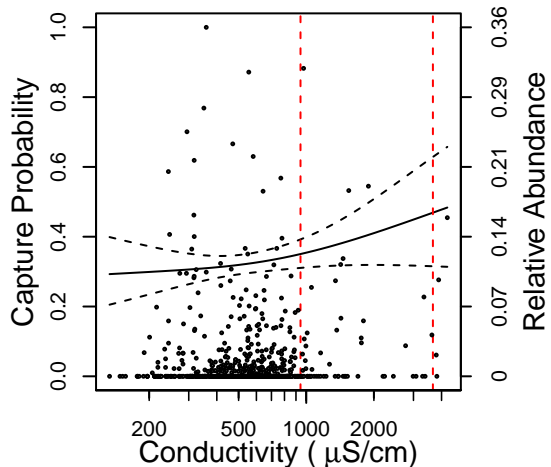
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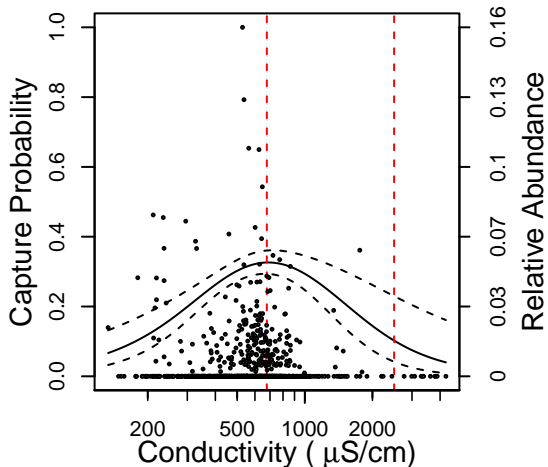
*Belostoma*



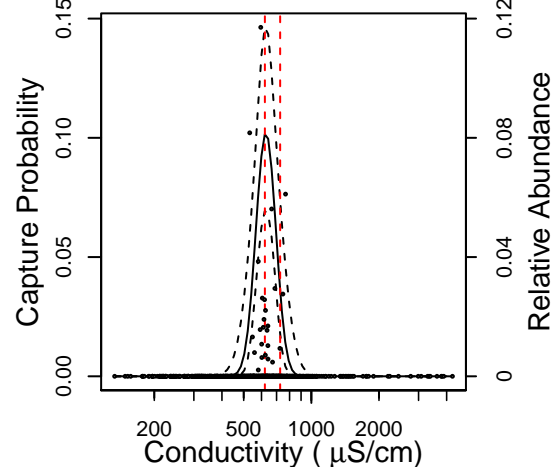
*Berosus*



*Boyeria*

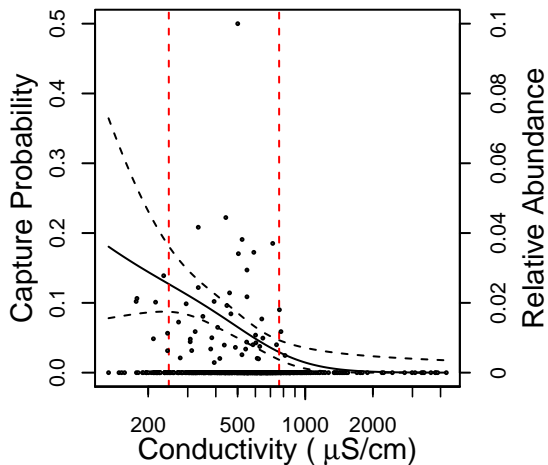


*Brachycentrus*

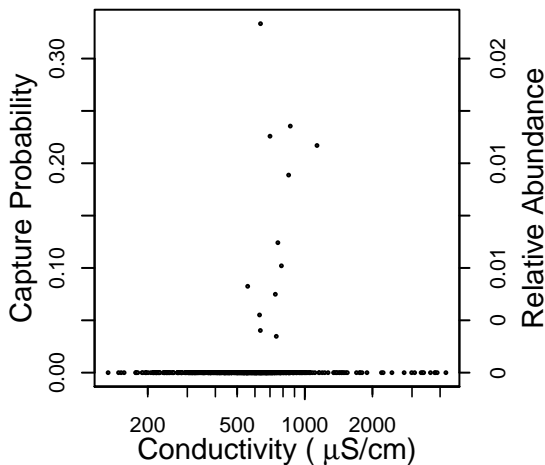


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

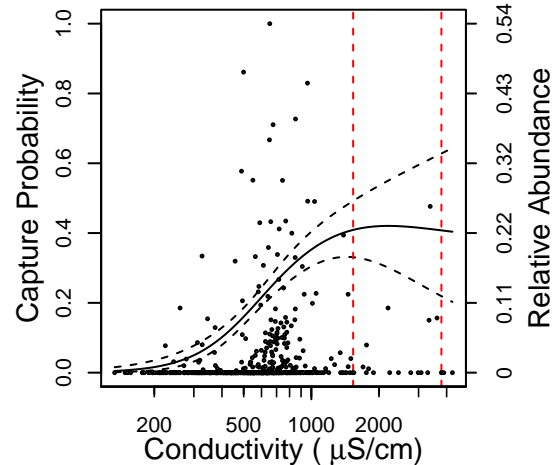
*Branchiura*



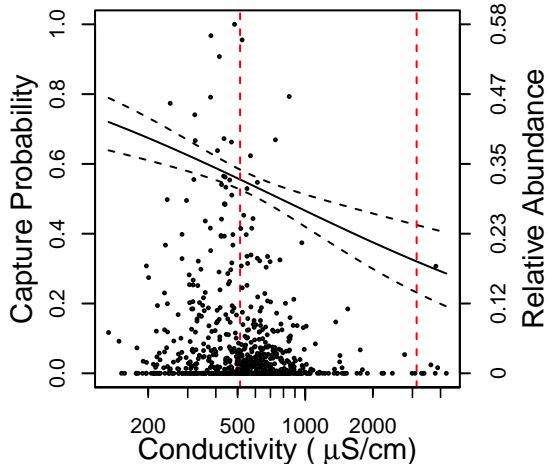
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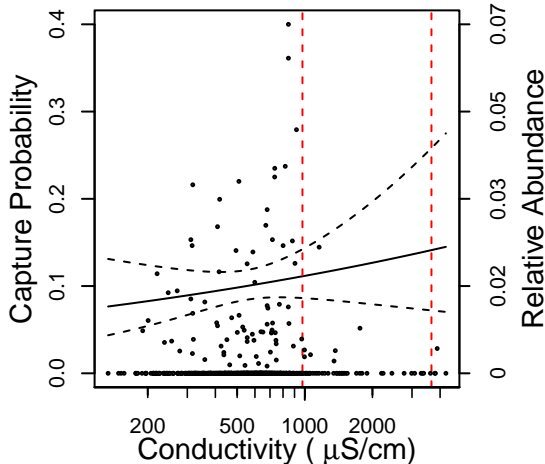
*Caecidotea*



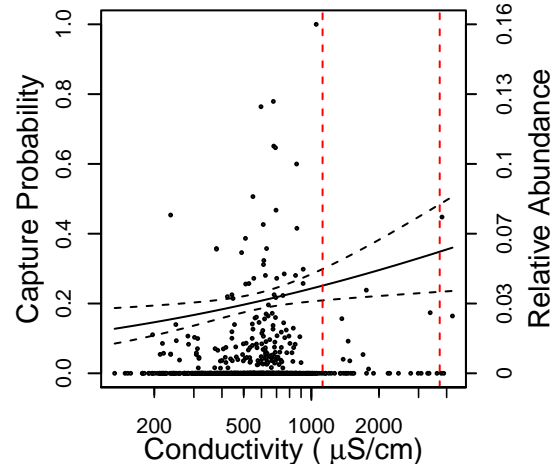
*Caenis*



*Callibaetis*

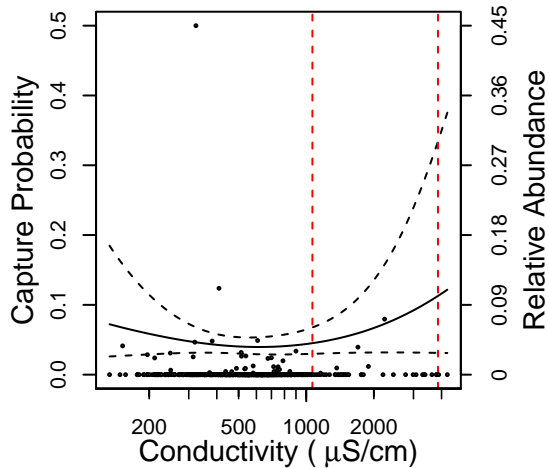


*Calopteryx*

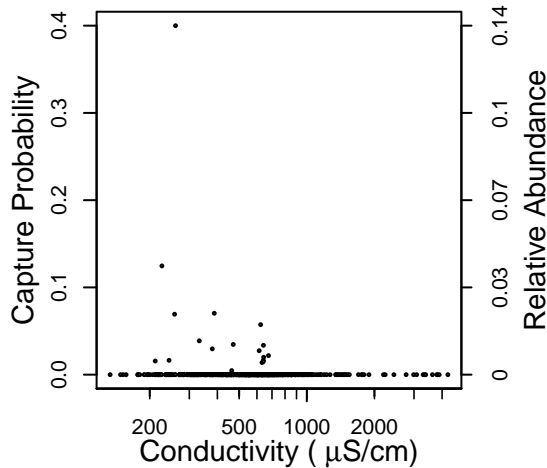


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

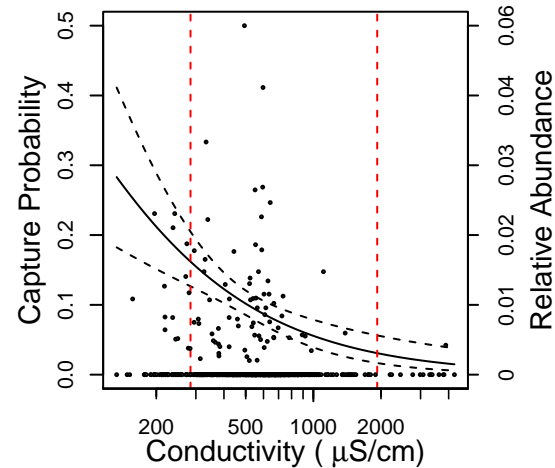
*Cambarus*



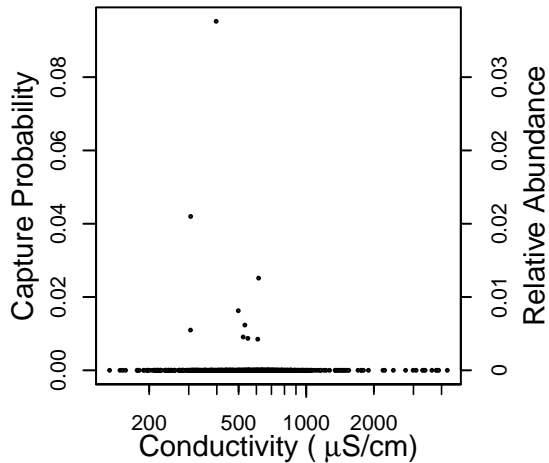
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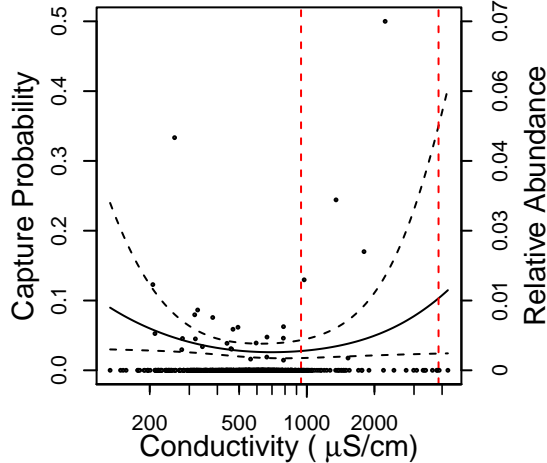
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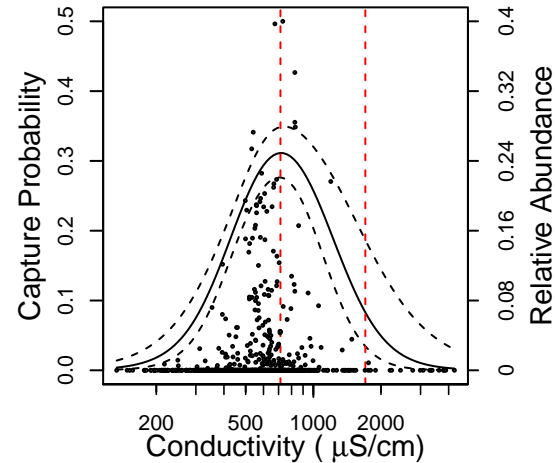
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*Ceratopogon*

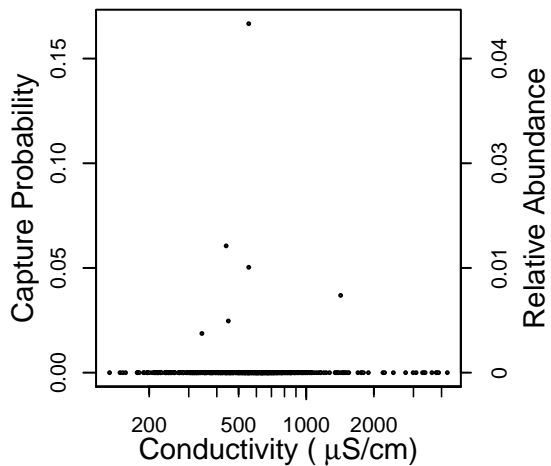


*Ceratopsyche*

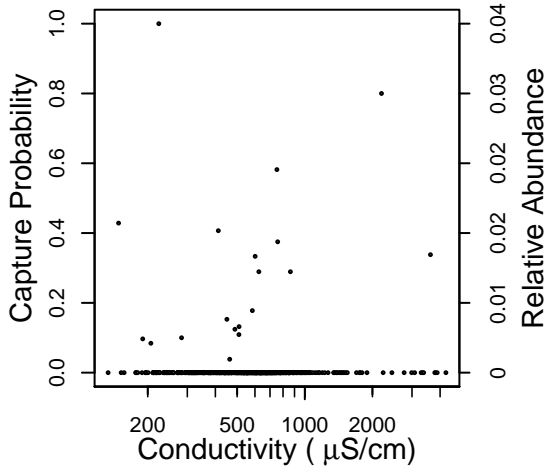


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

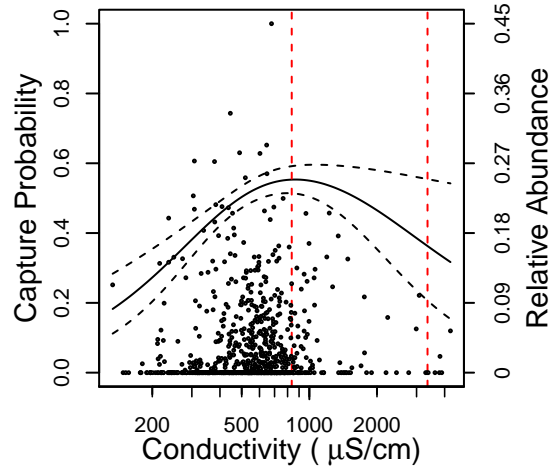
*Chaoborus*



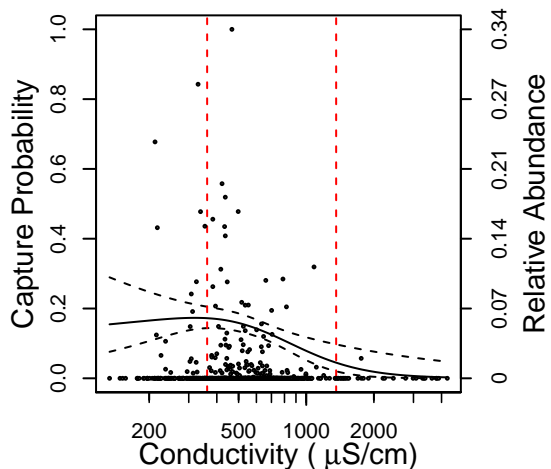
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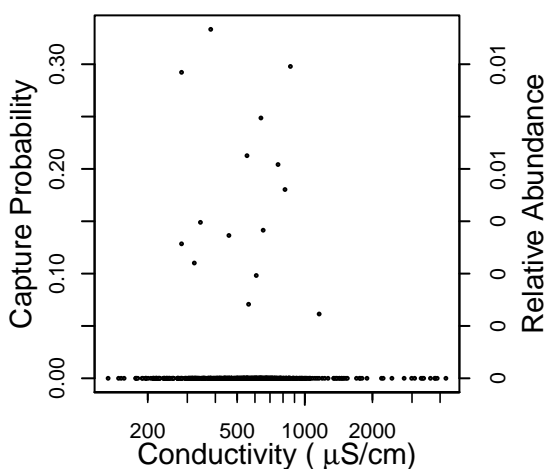
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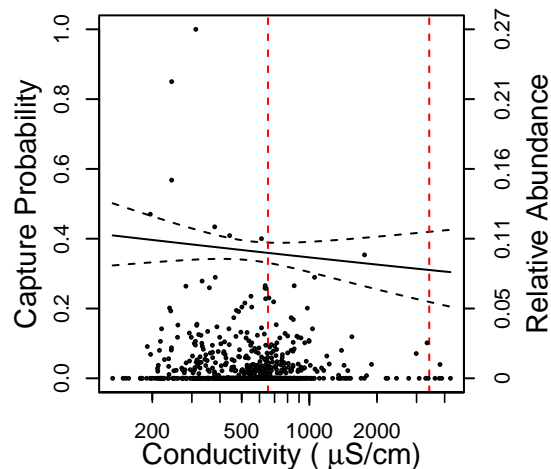
*Chimarra*



*Chironominae*

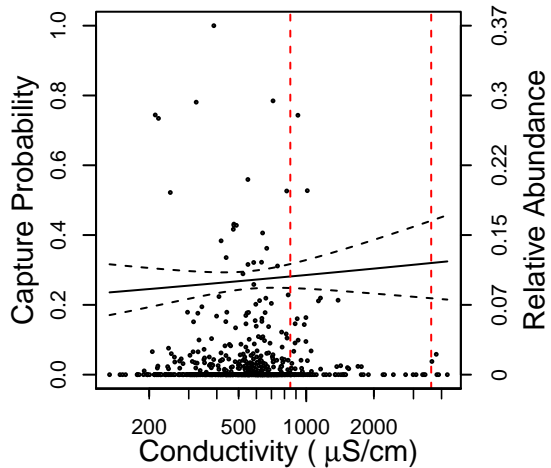


*Chironomini*

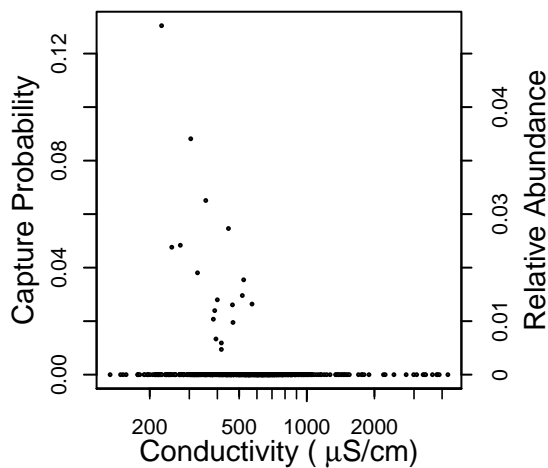


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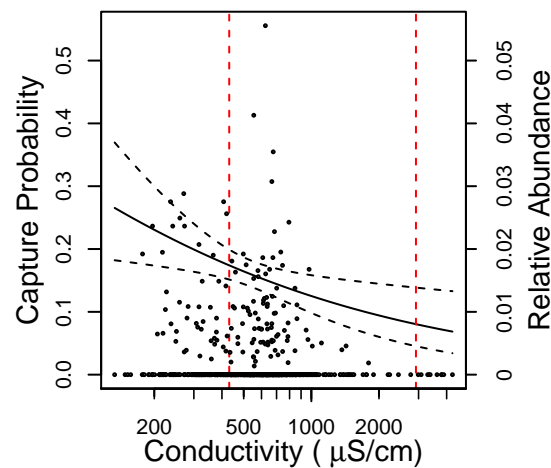
*Chironomus*



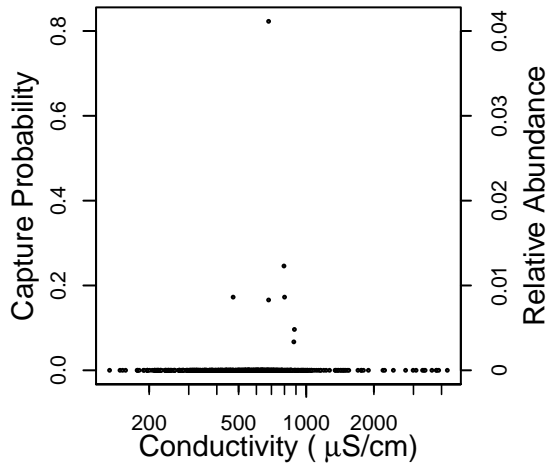
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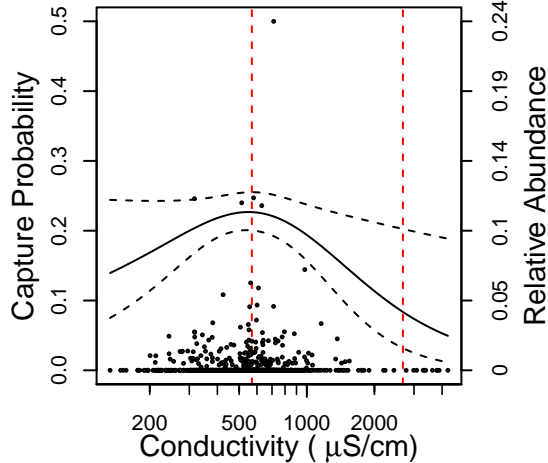
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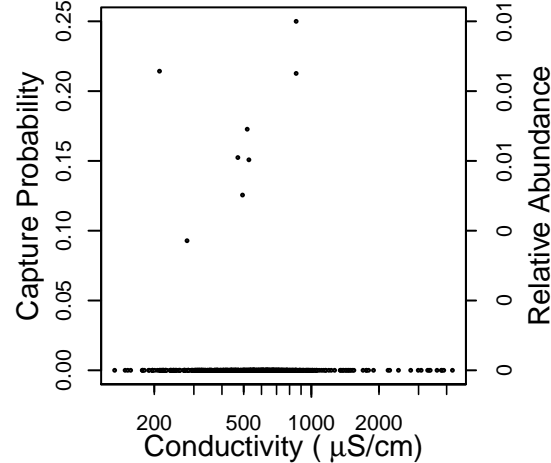
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*Cladotanytarsus*

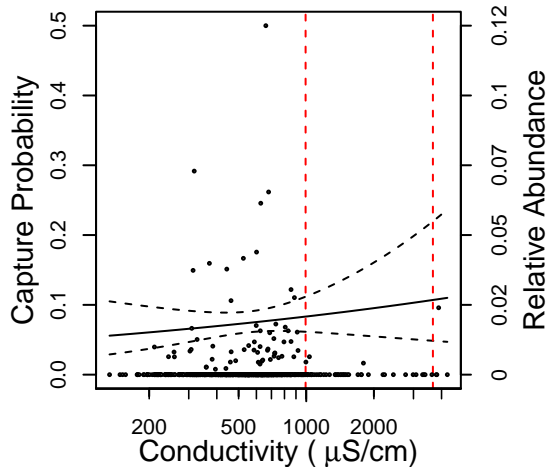


*Climacia*

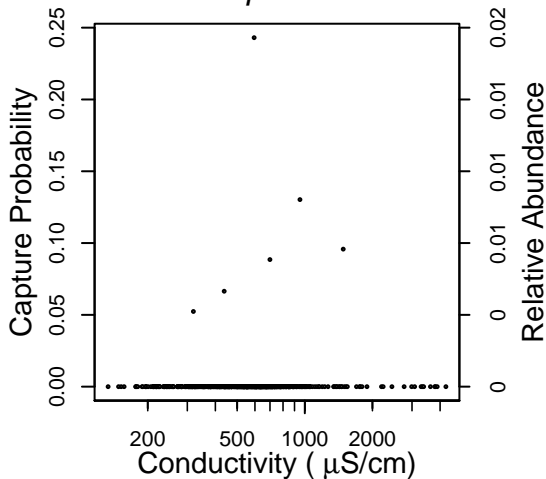


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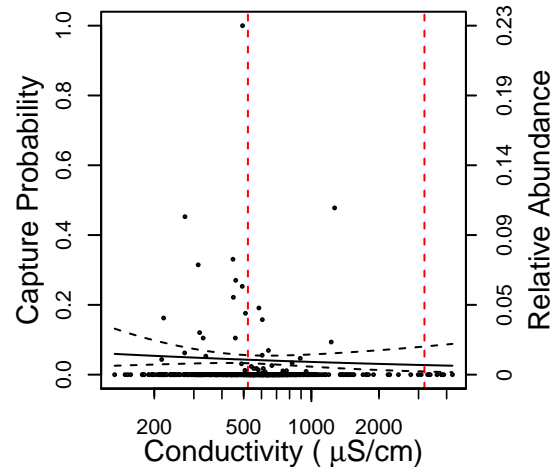
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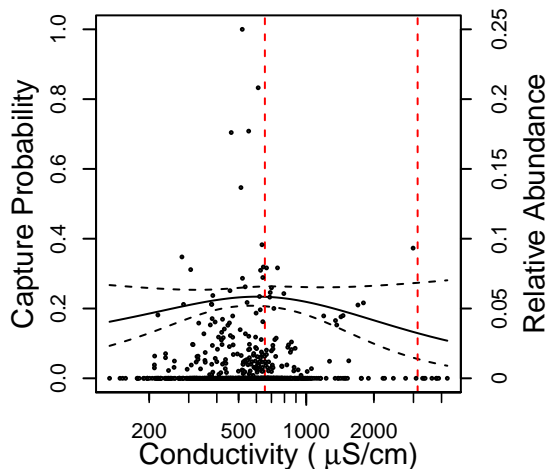
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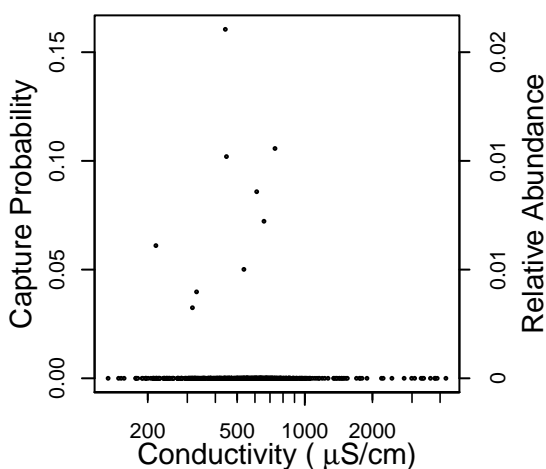
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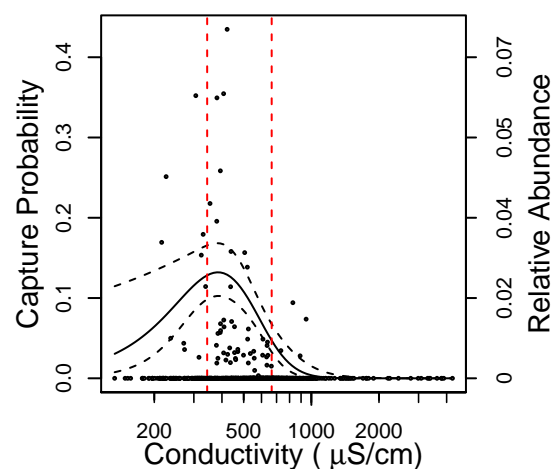
*Corbicula*



*Cordulegaster*

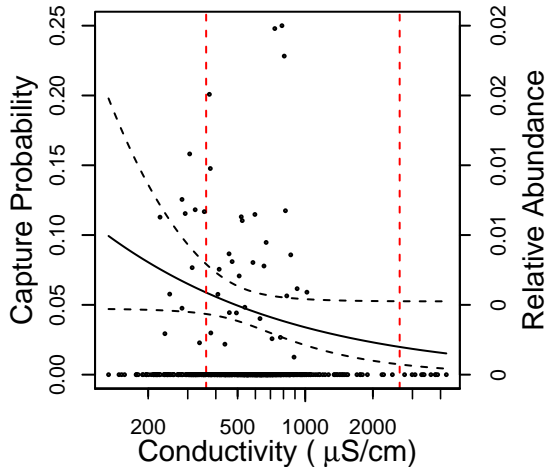


*Corydalus*

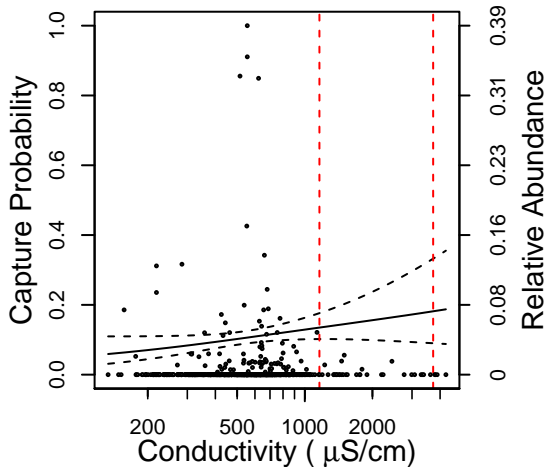


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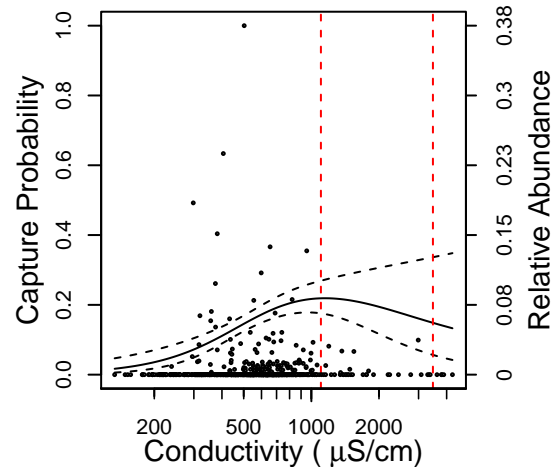
*Corynoneura*



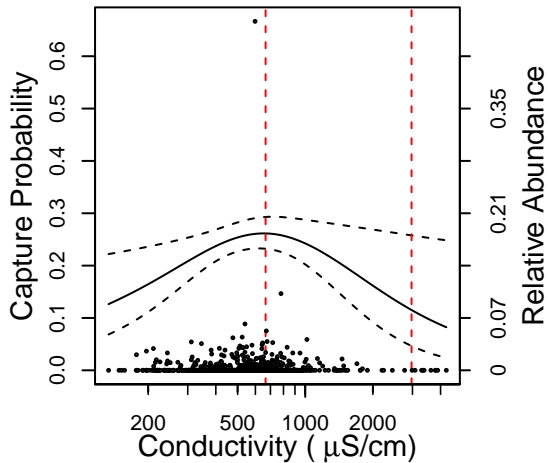
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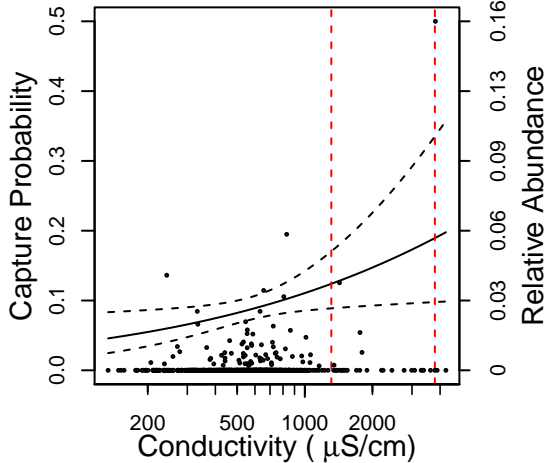
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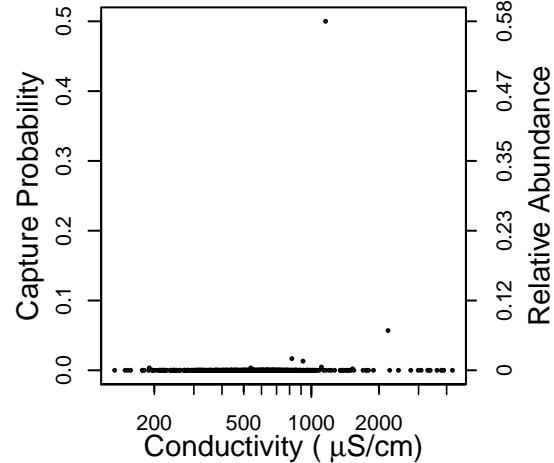
*Cryptochironomus*



*Cryptotendipes*

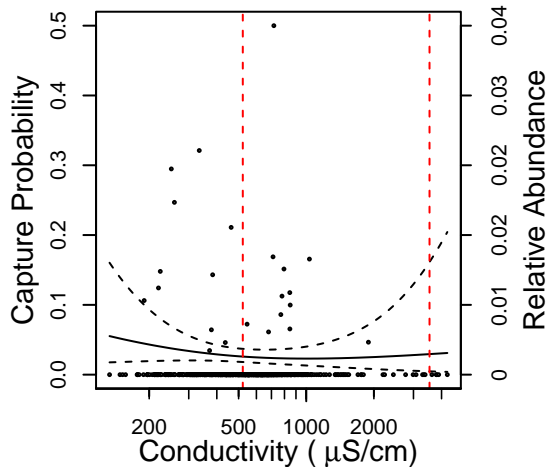


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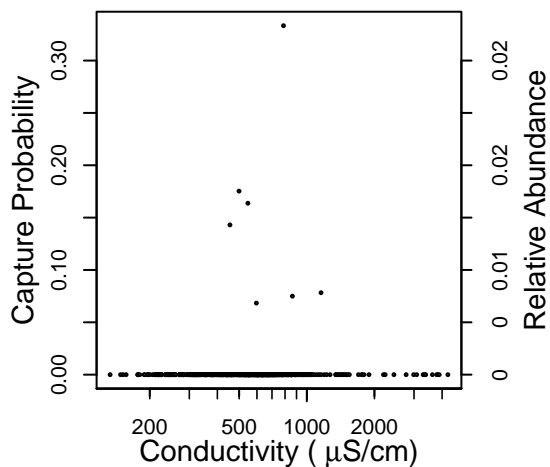


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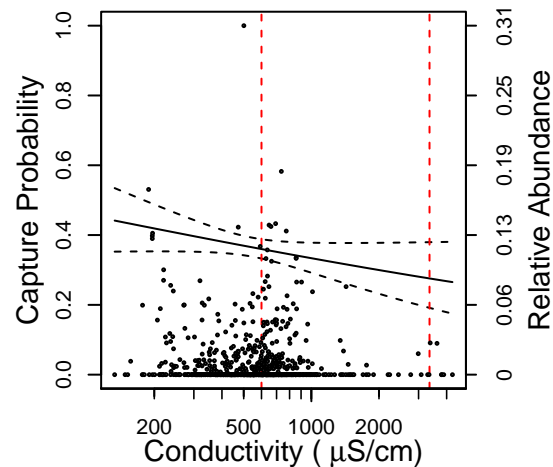
*Culicoides*



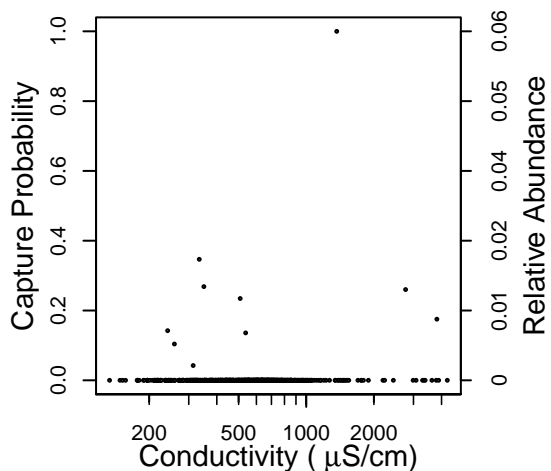
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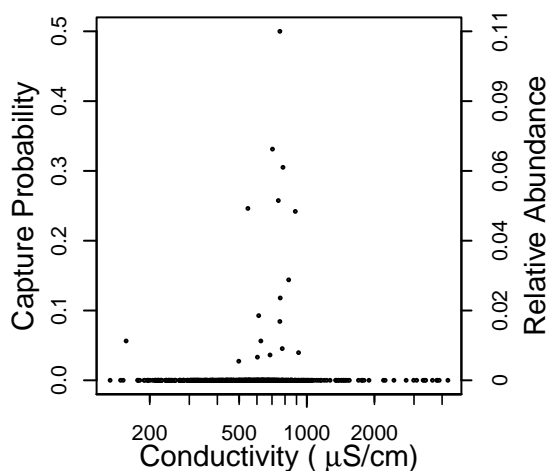
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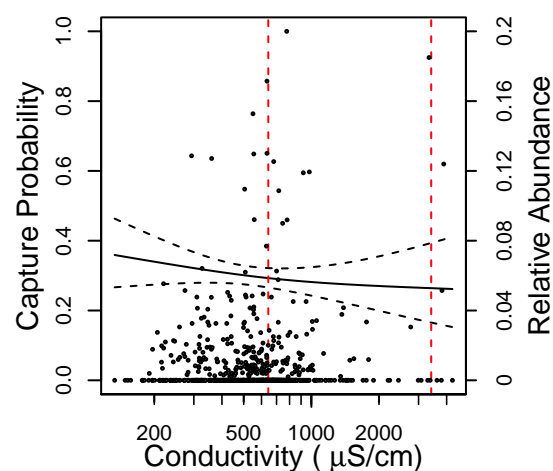
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*Dicranota*



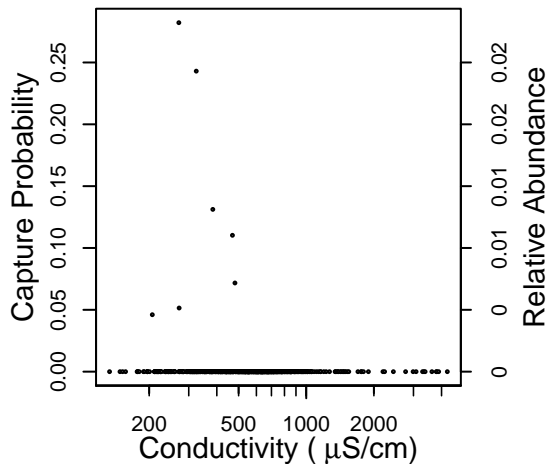
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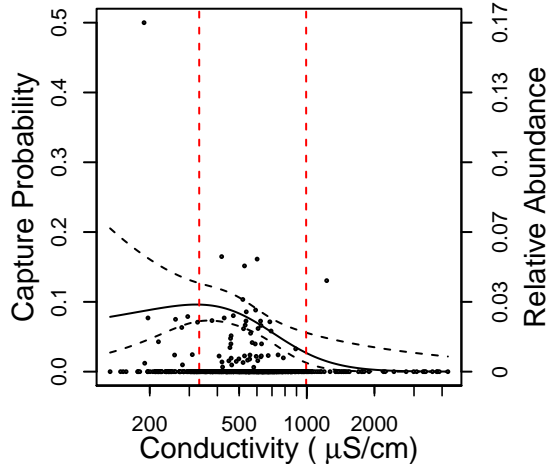


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

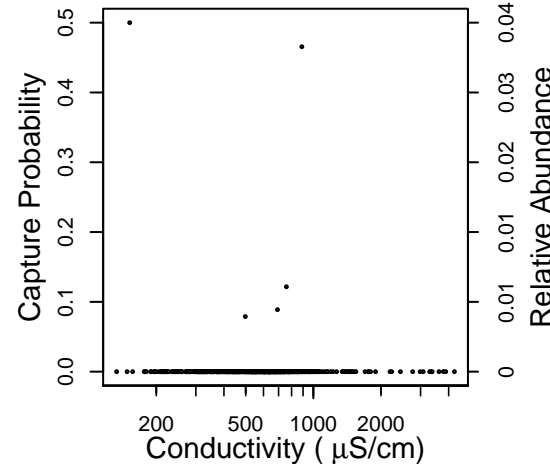
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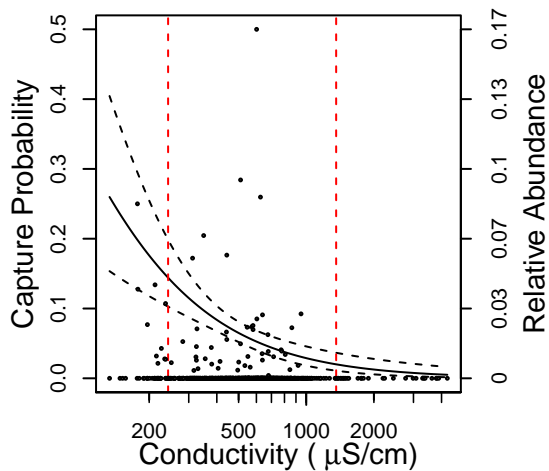
*Dineutus*



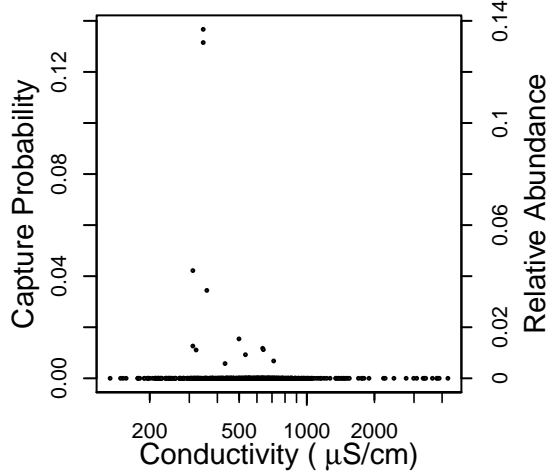
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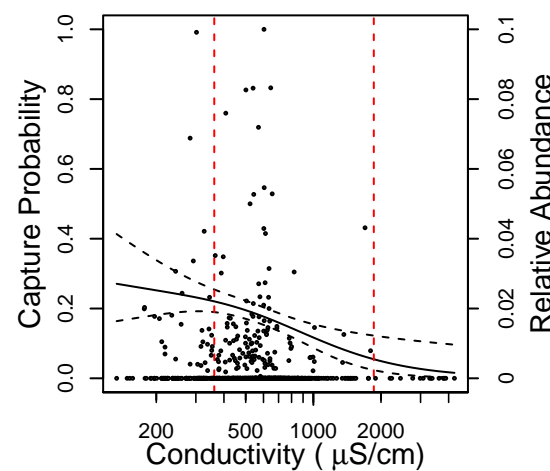
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*Dreissena*

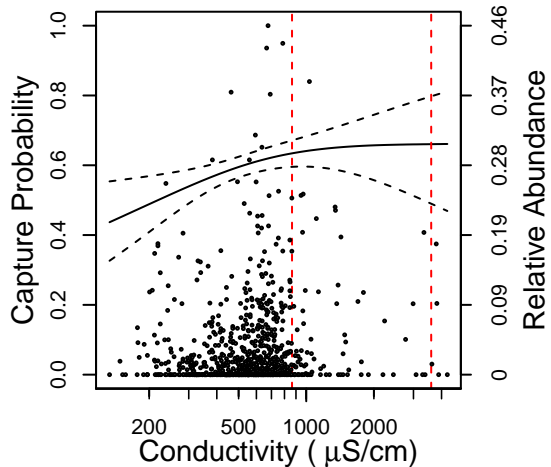


*Dromogomphus*

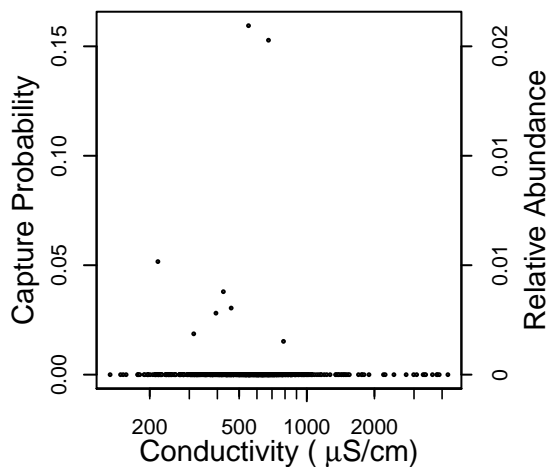


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

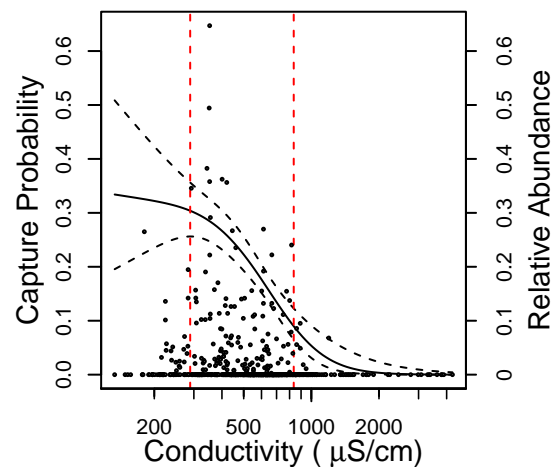
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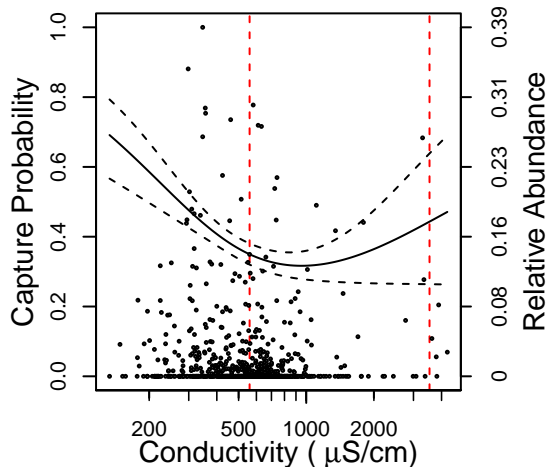
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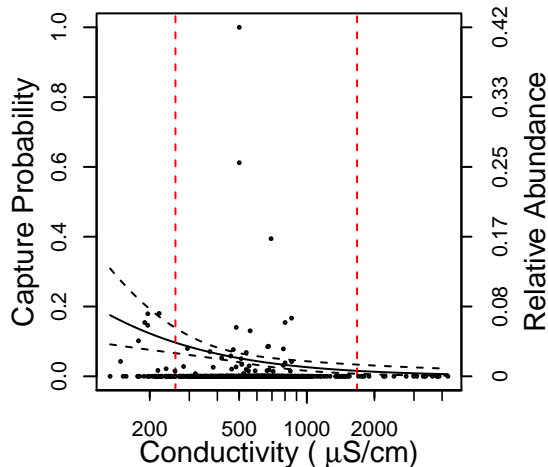
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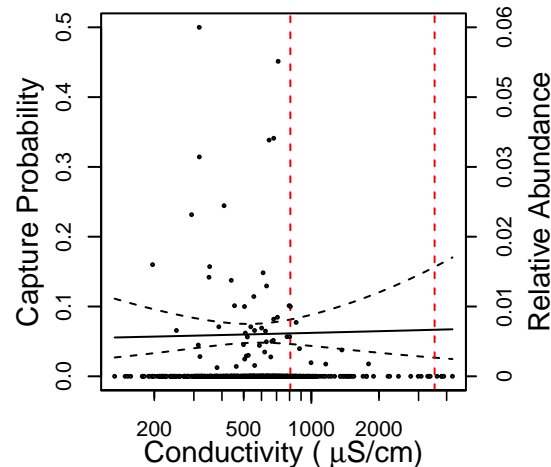
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*Endochironomus*

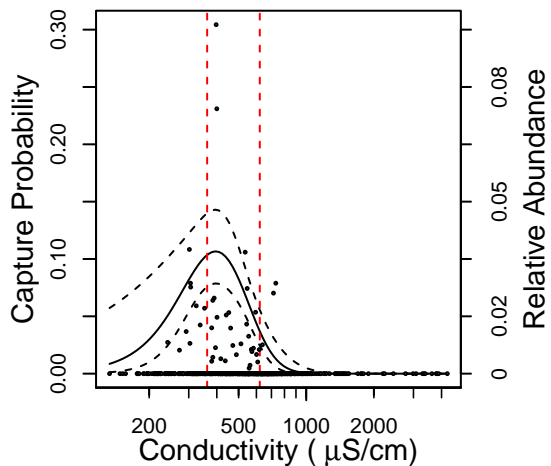


*Enochrus*

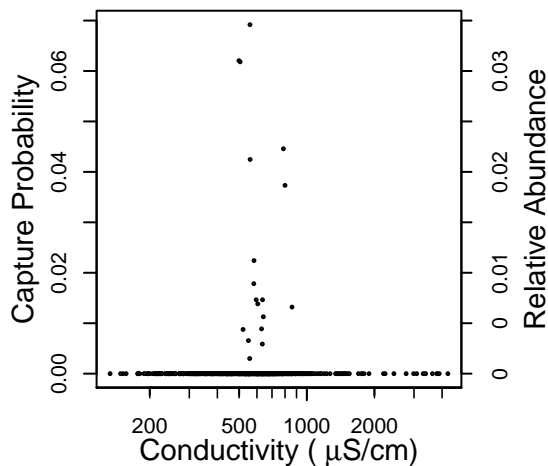


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

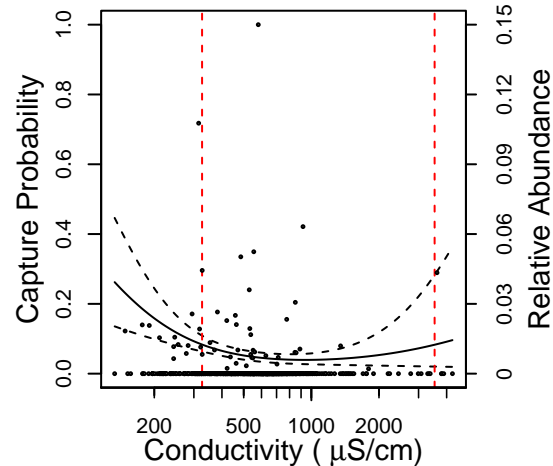
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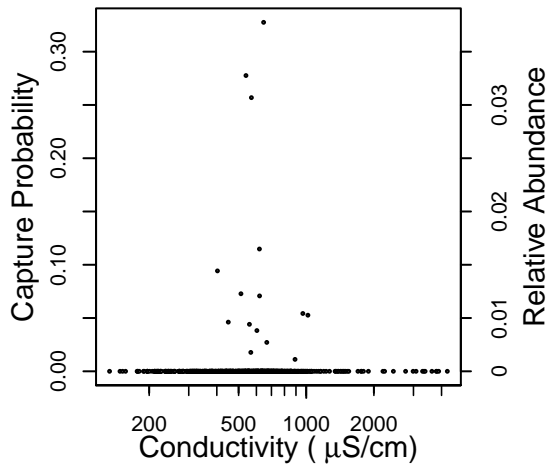
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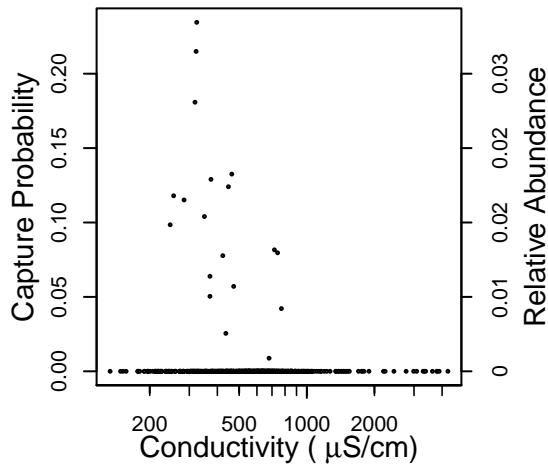
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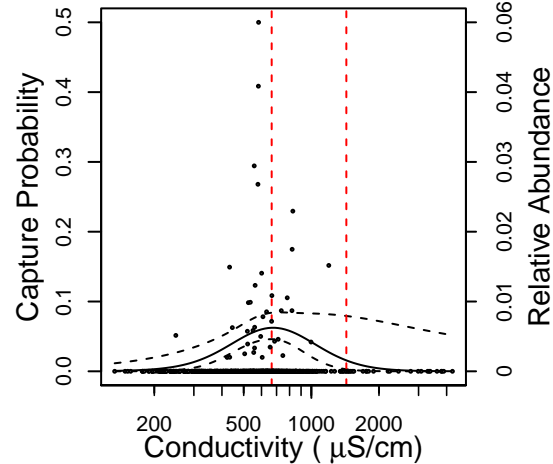
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*Erythemis*

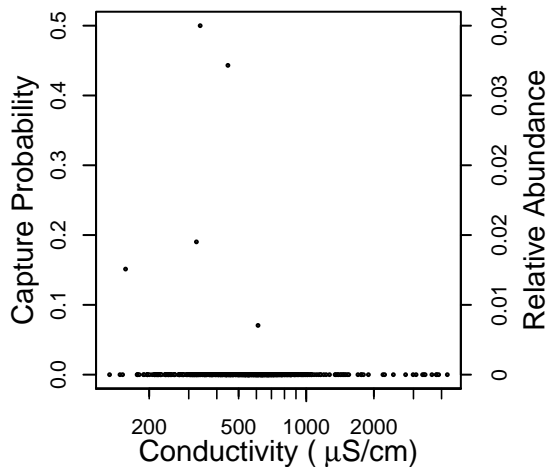


*Eukiefferiella*

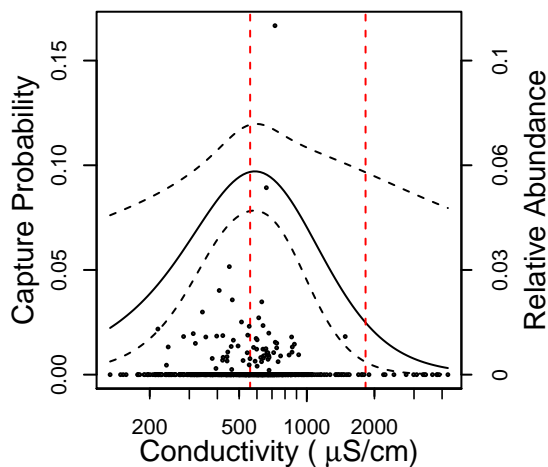


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

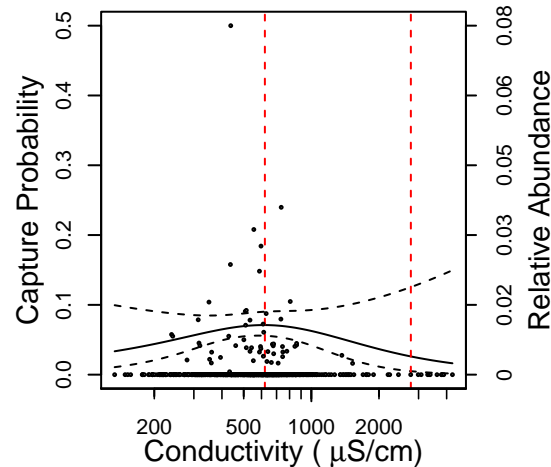
*Eurylophella*



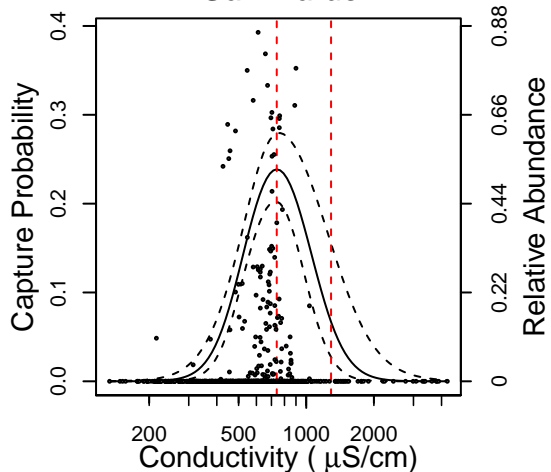
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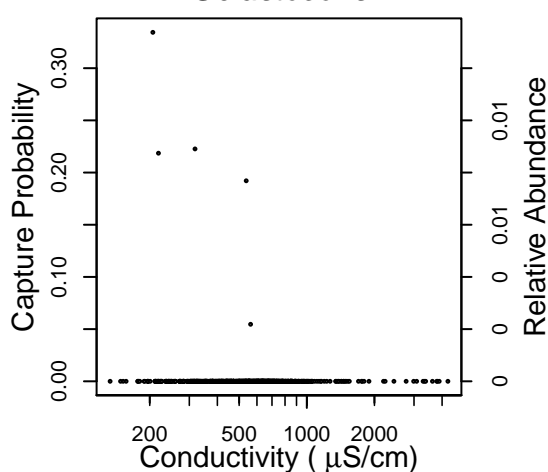
*Fossaria*



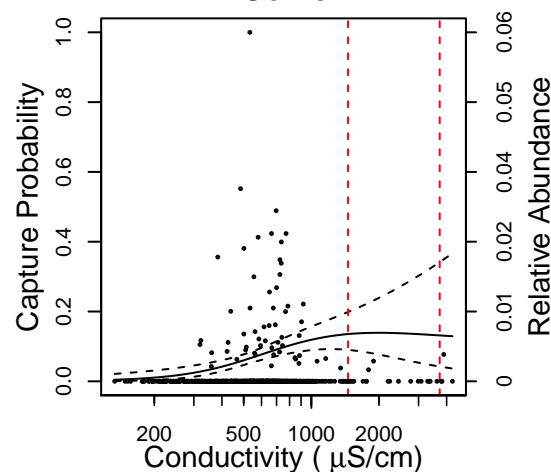
*Gammarus*



*Gelastocoris*

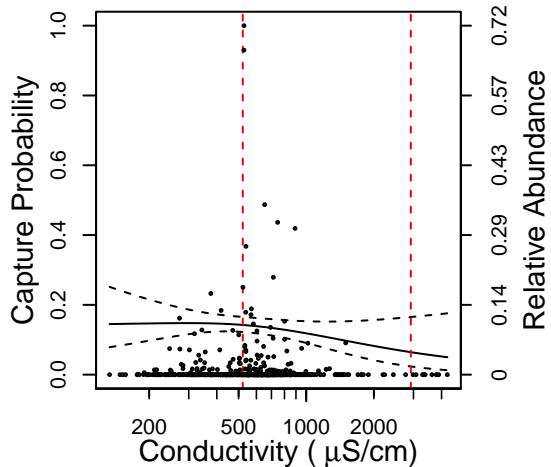


*Gerris*

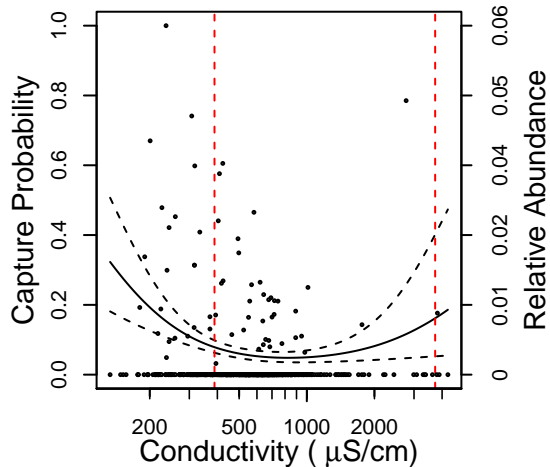


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

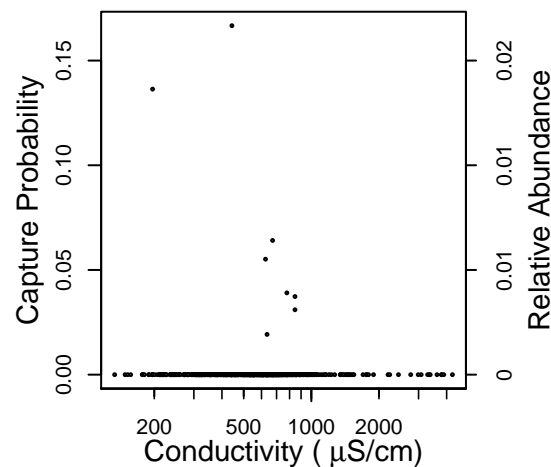
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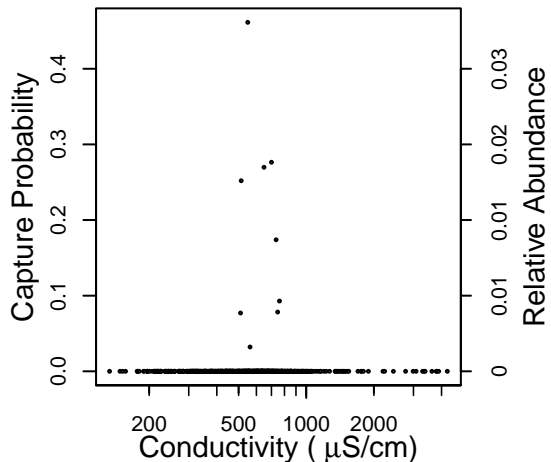
*Gomphus*



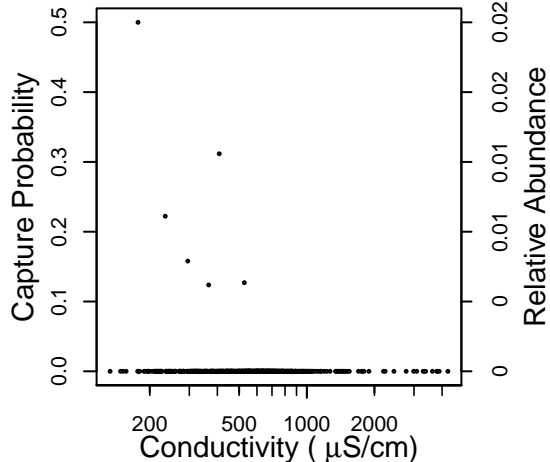
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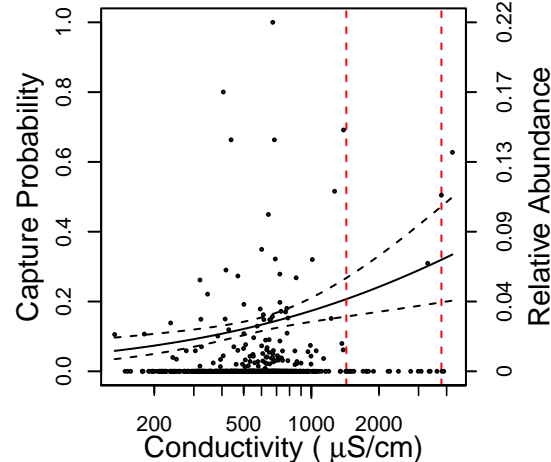
*Gyraulus*



*Gyretes*

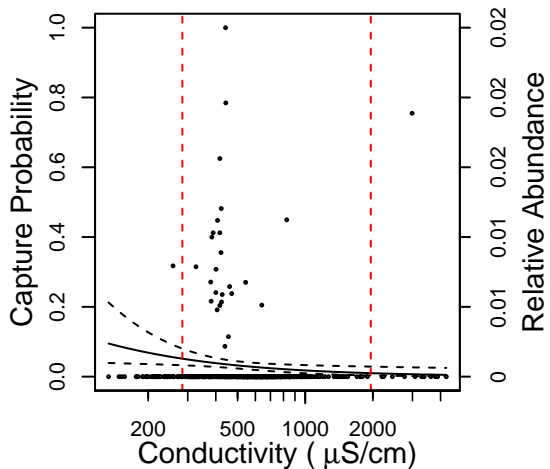


*Gyrinus*

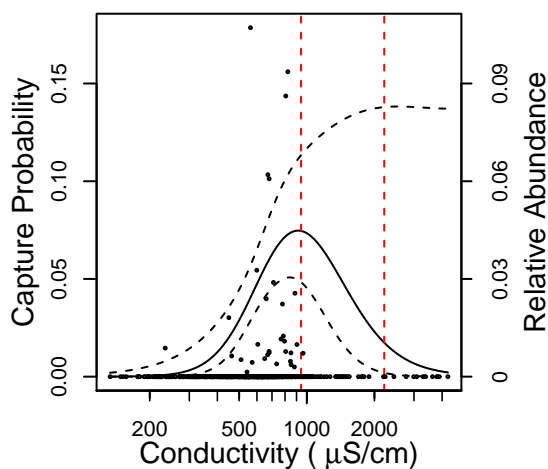


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

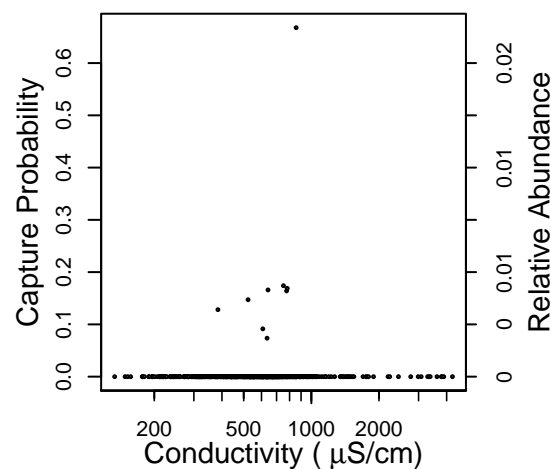
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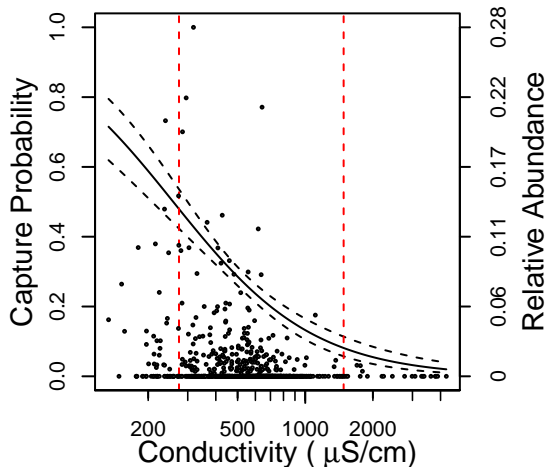
*Haliphus*



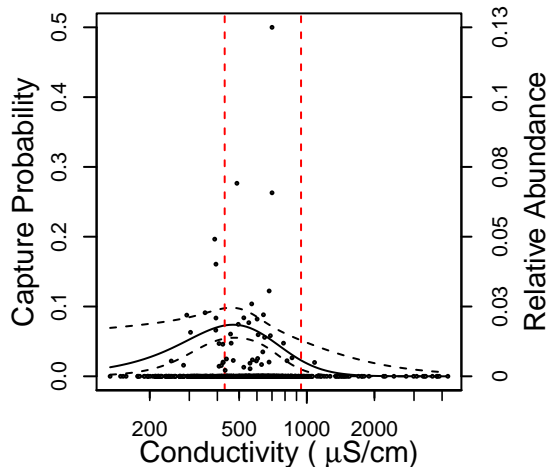
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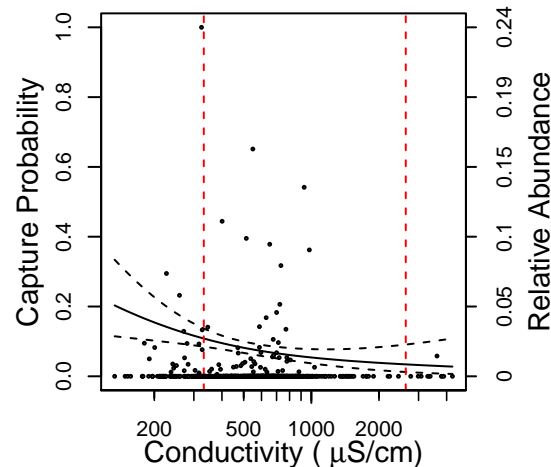
*Helichus*



*Helicopsyche*

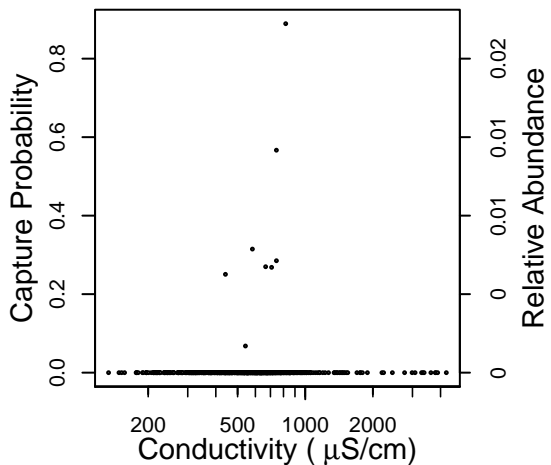


*Helisoma*

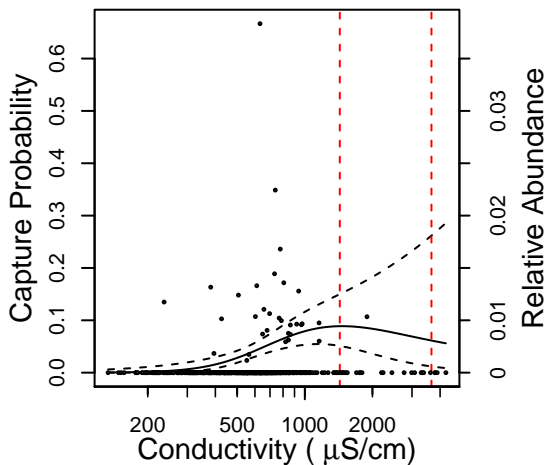


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

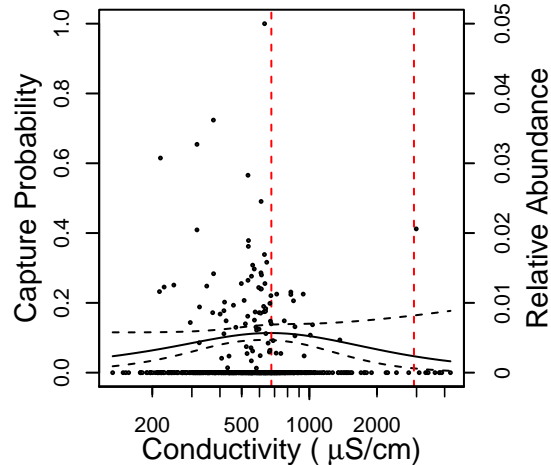
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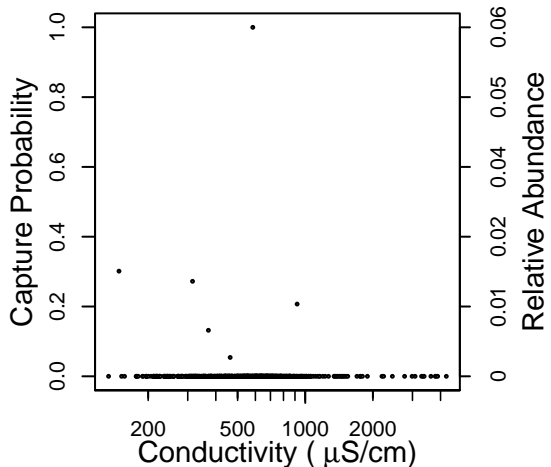
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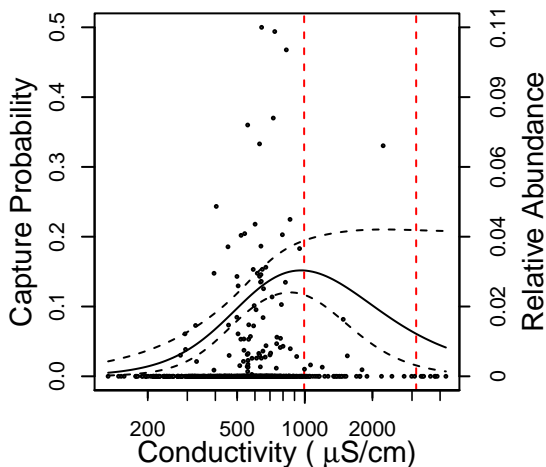
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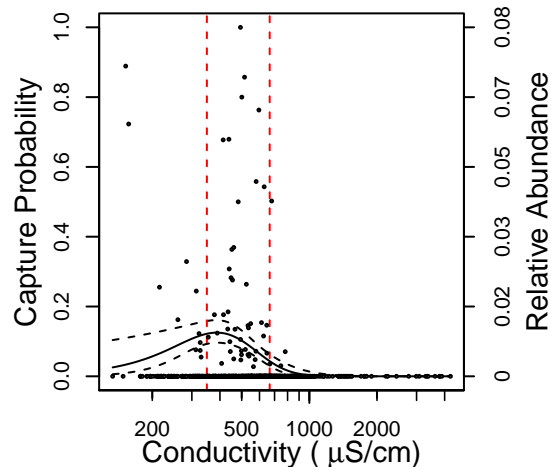
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*Hetaerina*

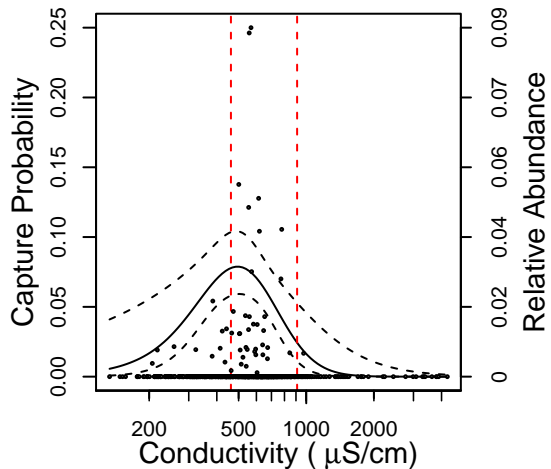


*Heterosternuta*

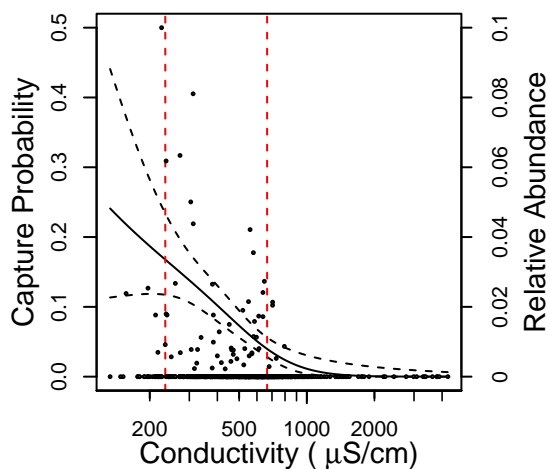


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

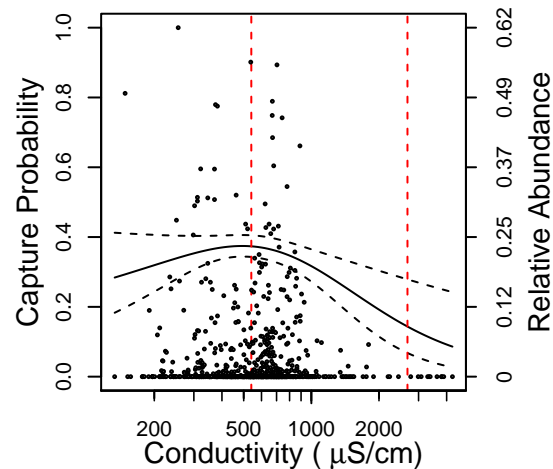
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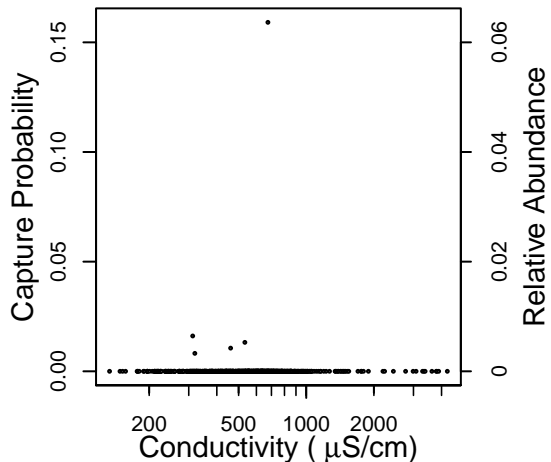
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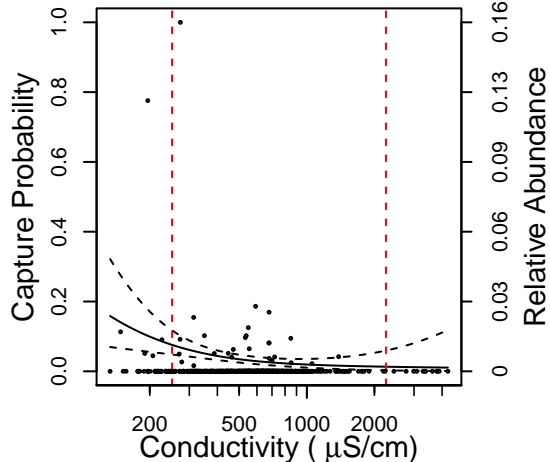
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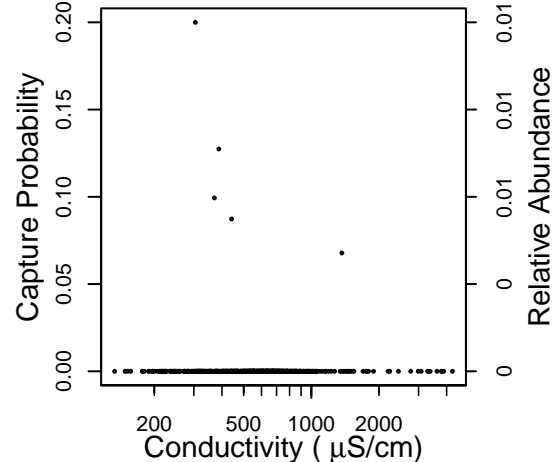
*Hydrobius*



*Hydrochus*



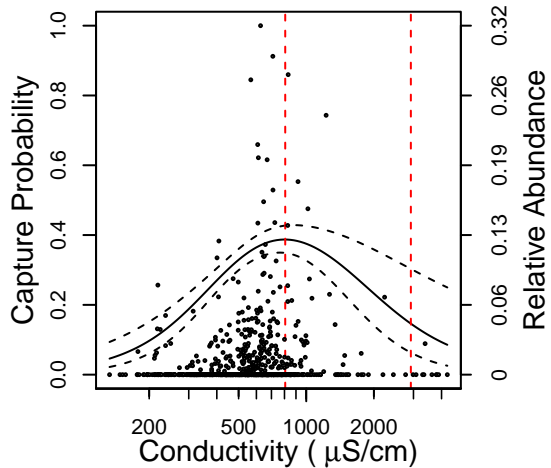
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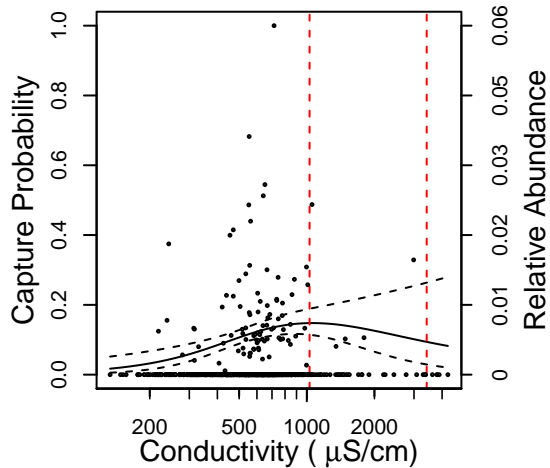


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

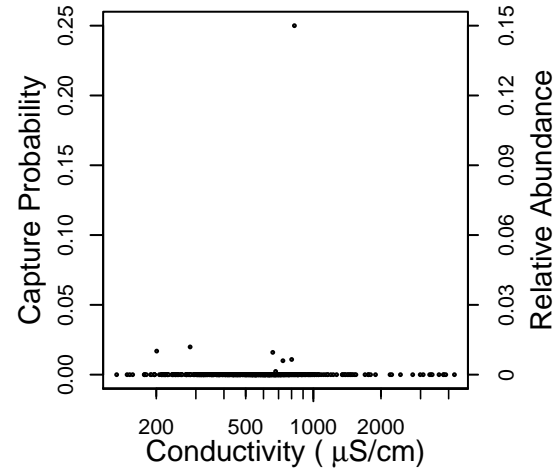
*Hydropsyche*



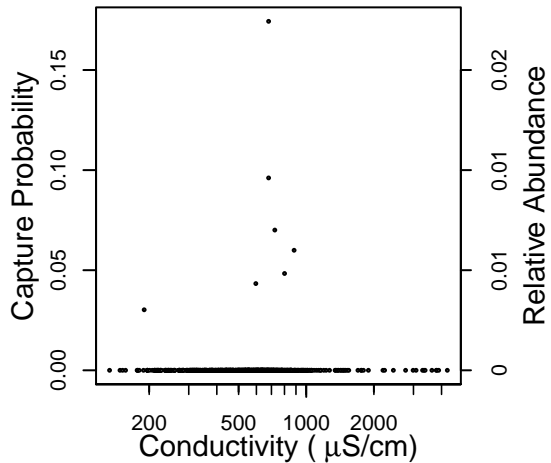
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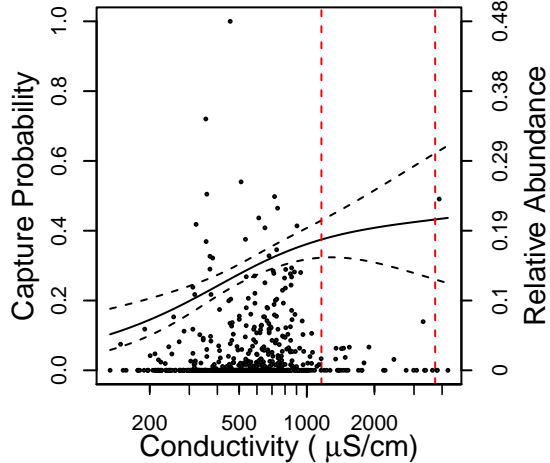
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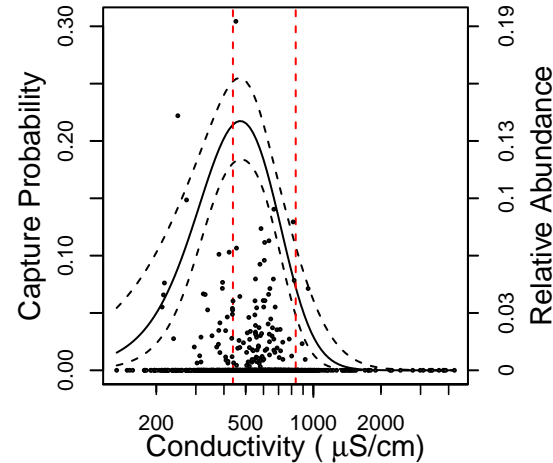
*Hygrotus*



*Ischnura*

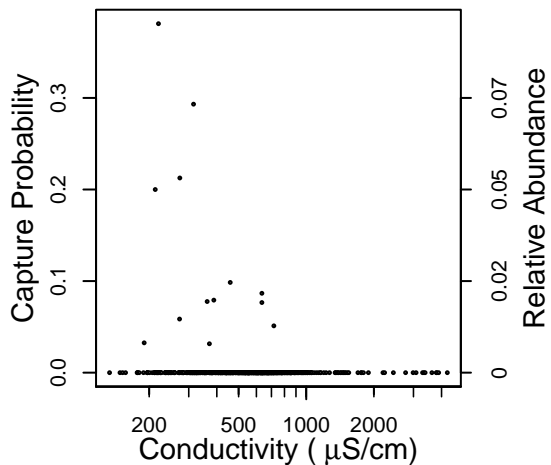


*Isonychia*

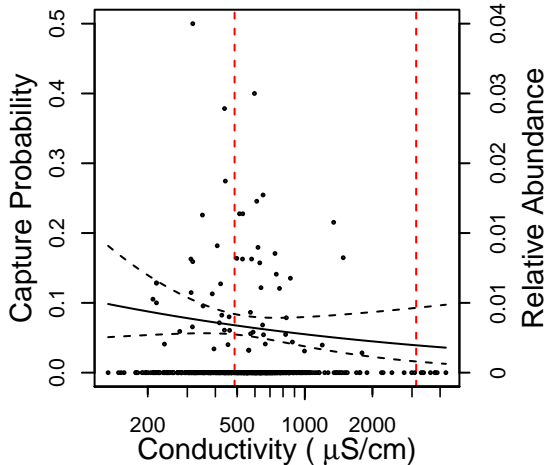


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

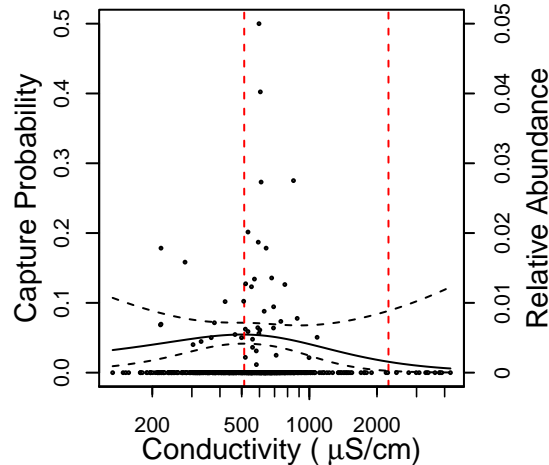
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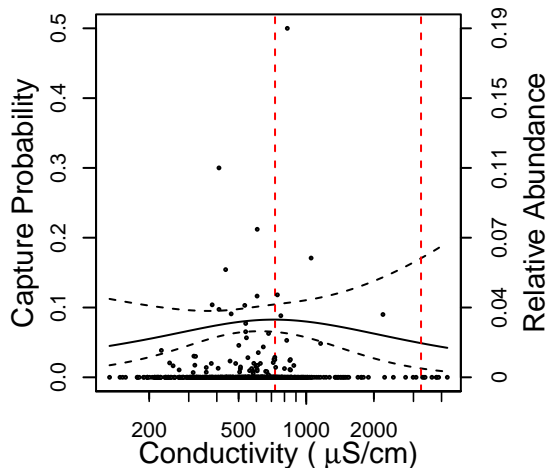
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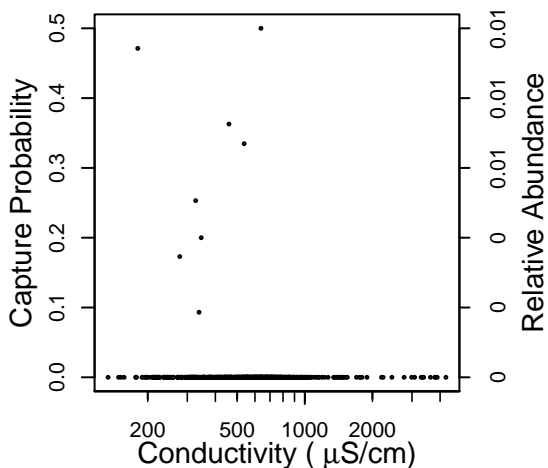
*Laccobius*



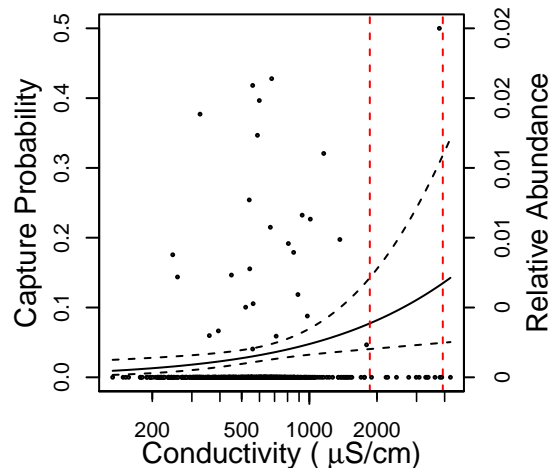
*Laccophilus*



*Laevapex*

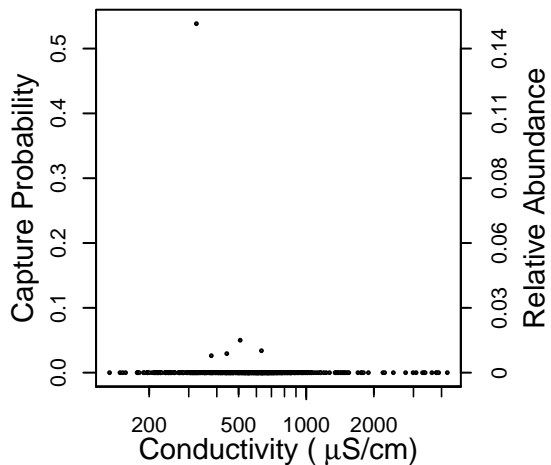


*Larsia*

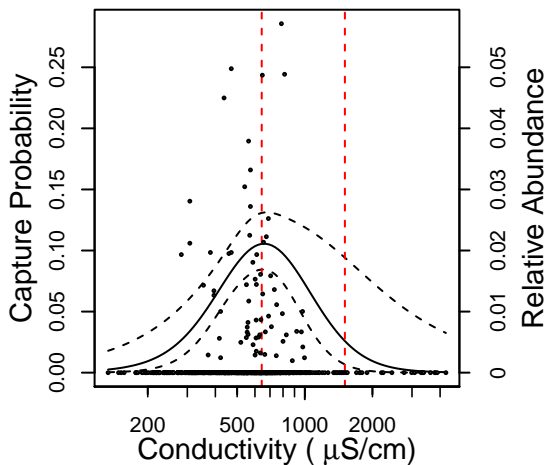


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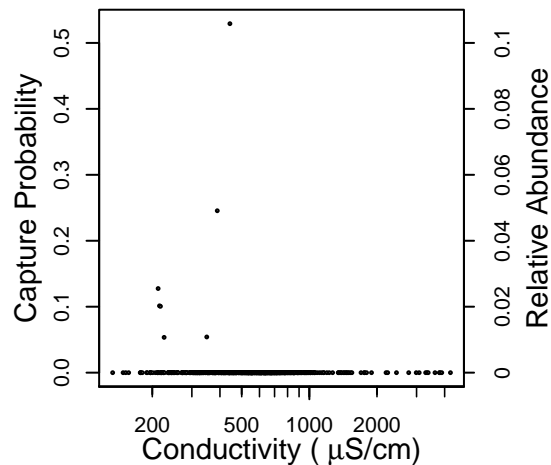
*Leptophlebia*



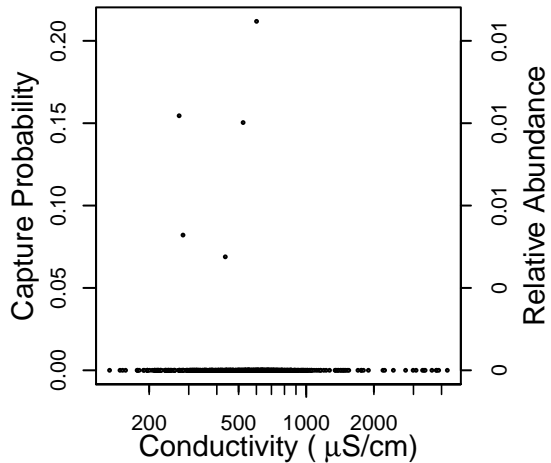
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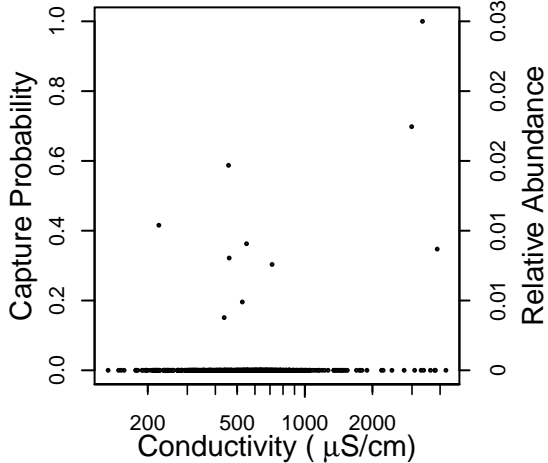
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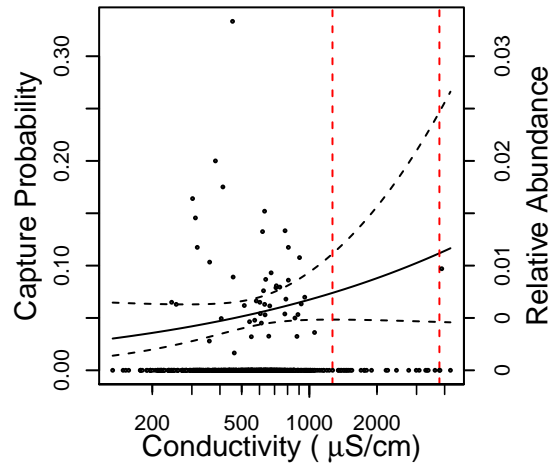
*Libellula*



*Limnoporus*

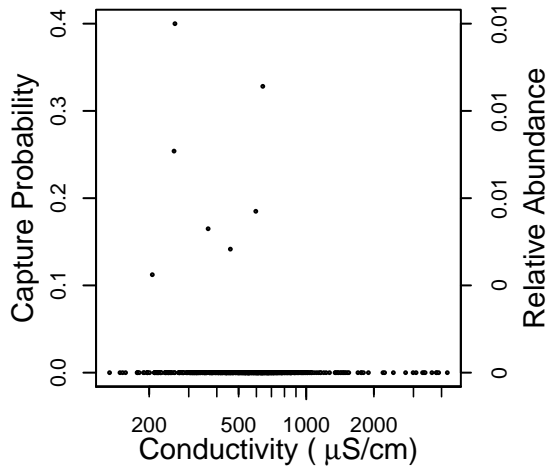


*Liodessus*

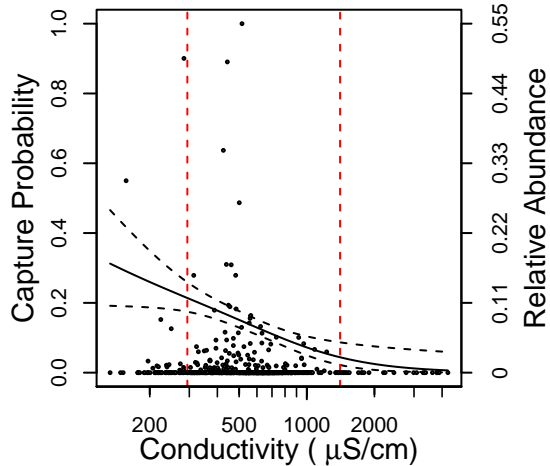


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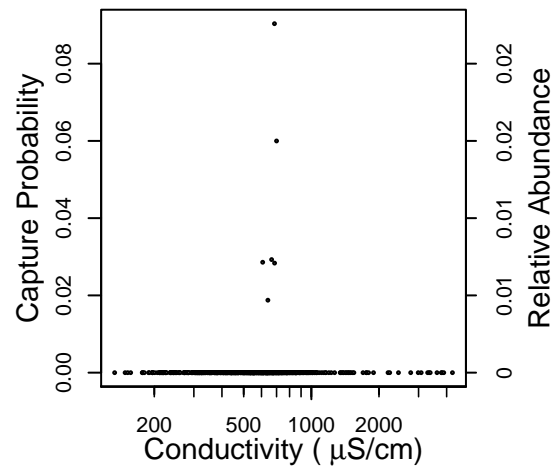
*Lioporeus*



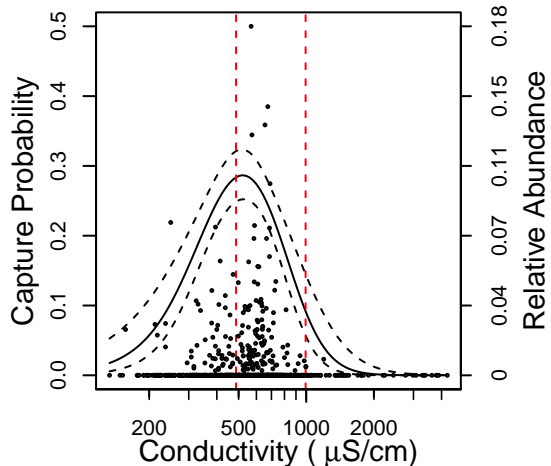
*Lirceus*



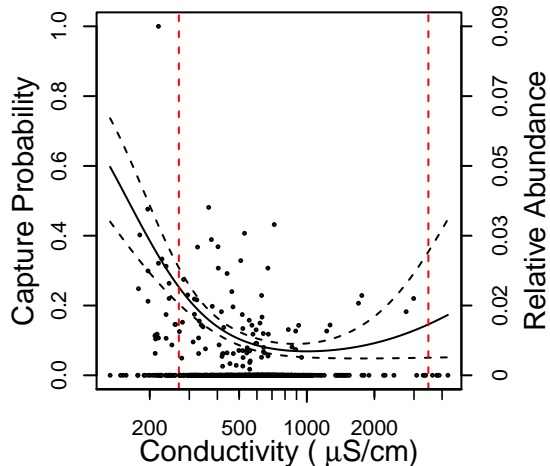
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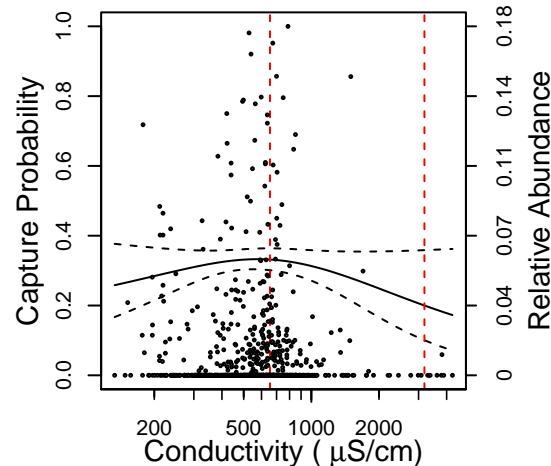
*Maccaffertium*



*Macromia*

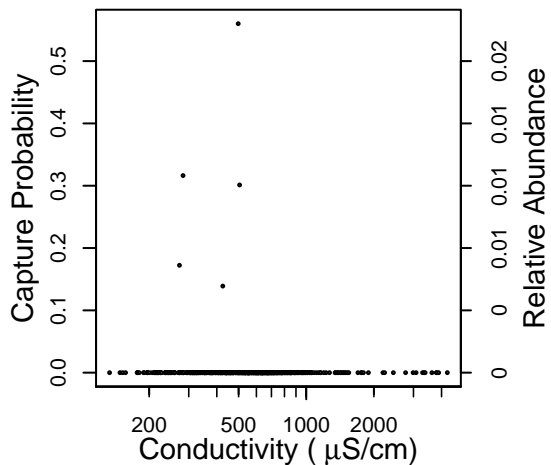


*Macronychus*

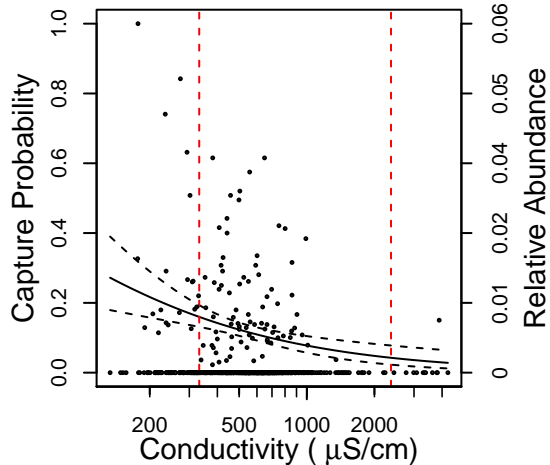


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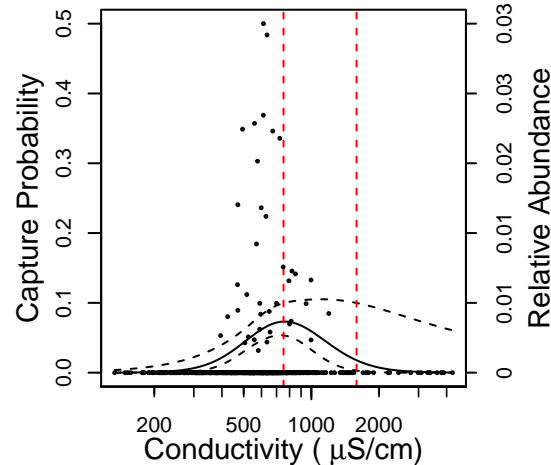
*Mallochohelea*



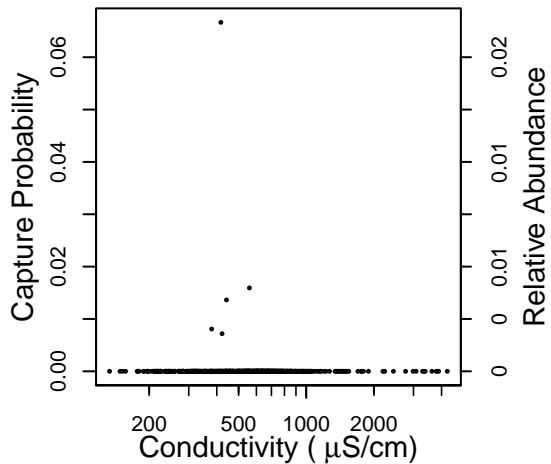
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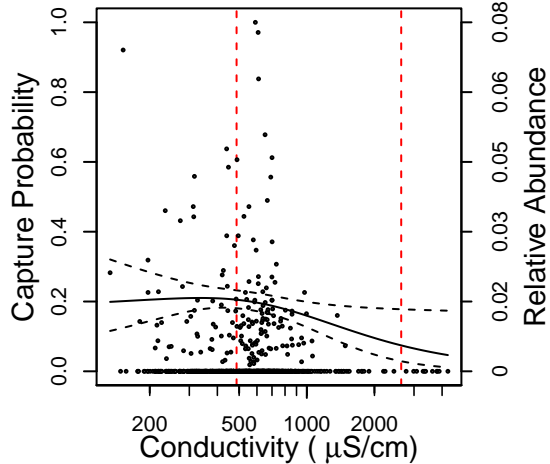
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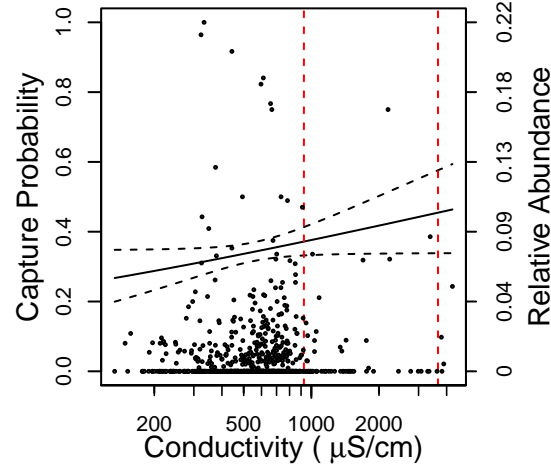
*Microcyloopus*



*Microtendipes*

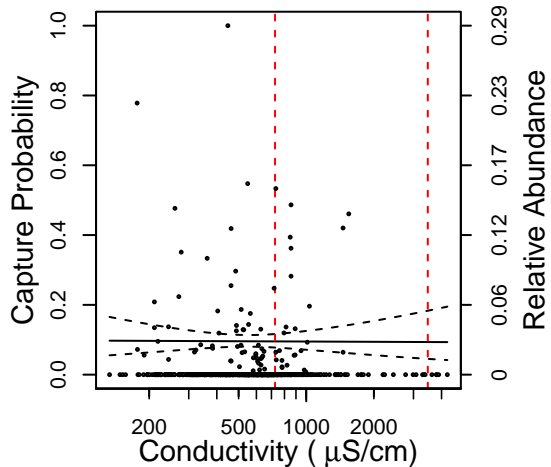


*Microvelia*

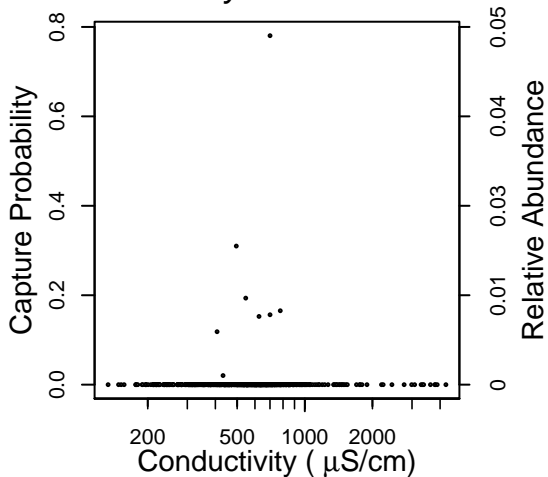


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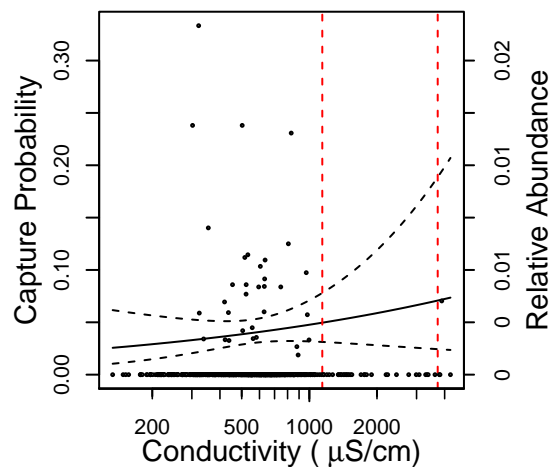
*Musculium*



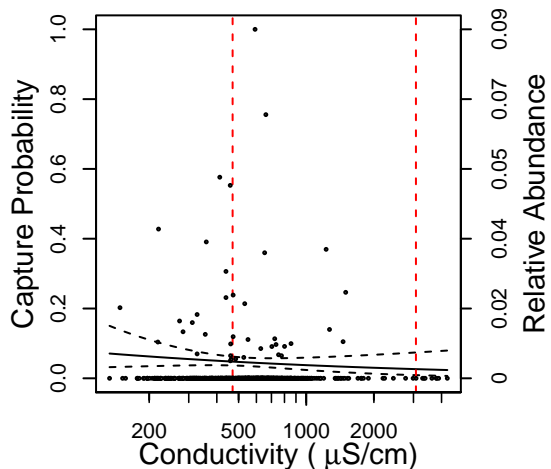
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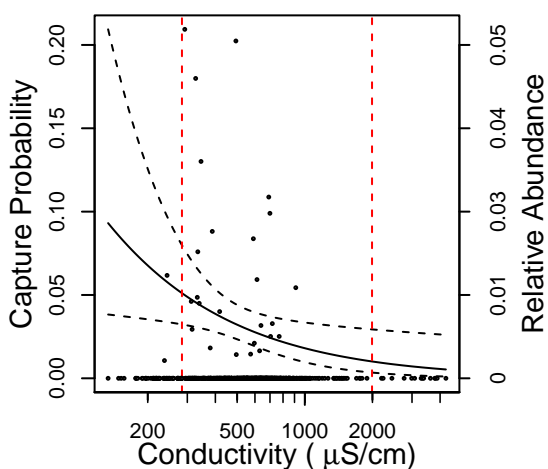
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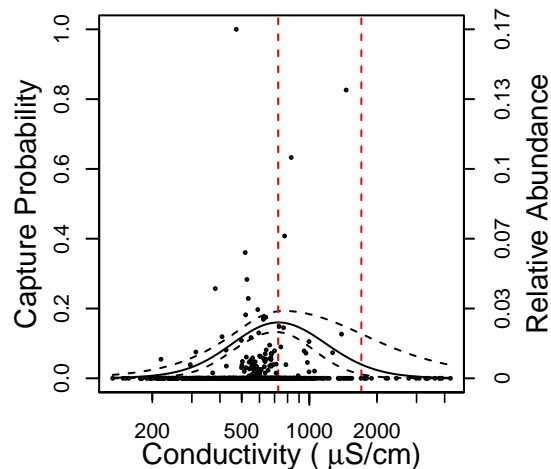
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*Natarsia*

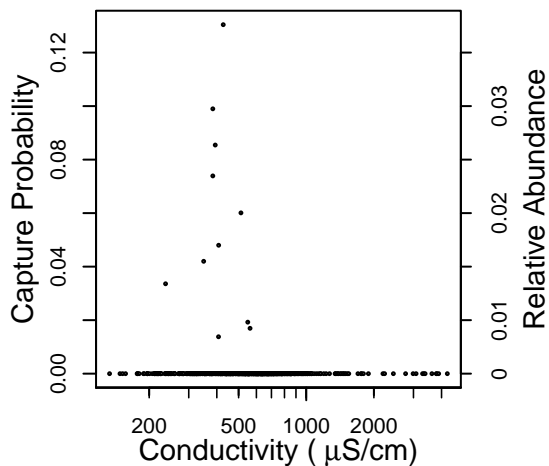


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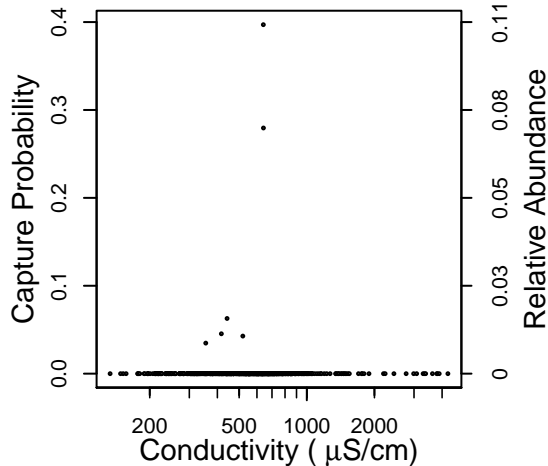


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

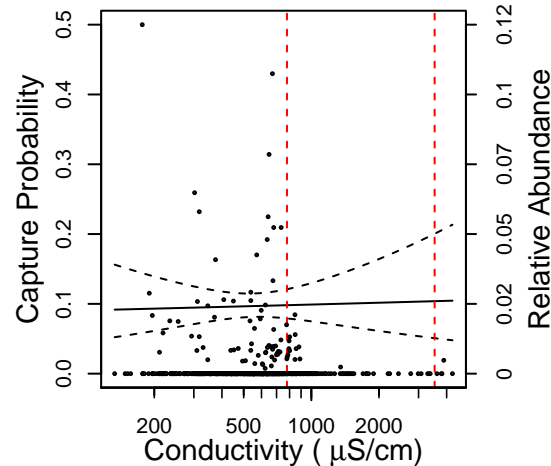
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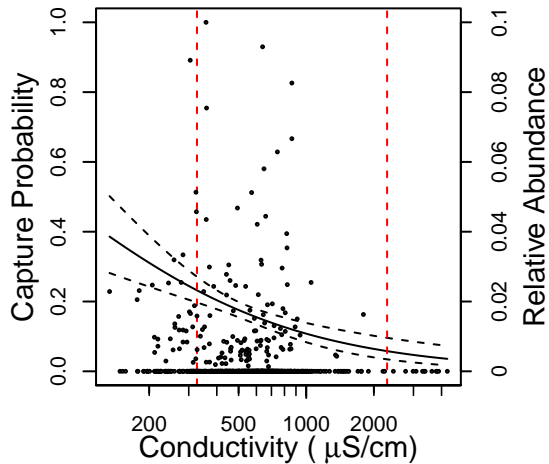
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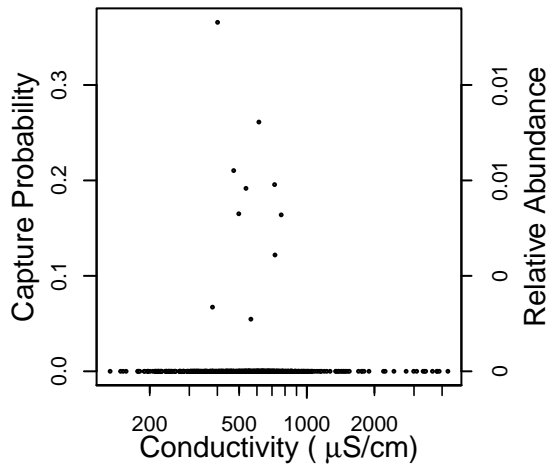
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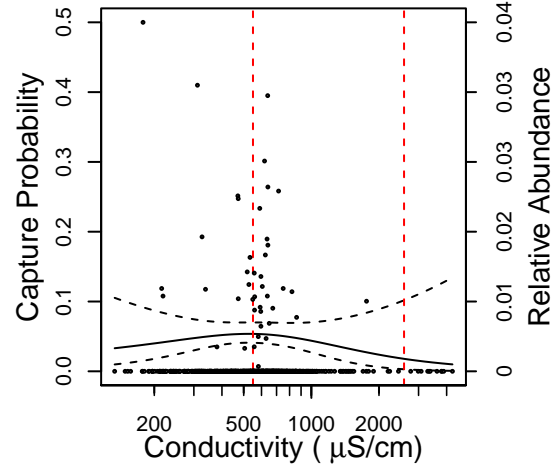
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*Nepa*

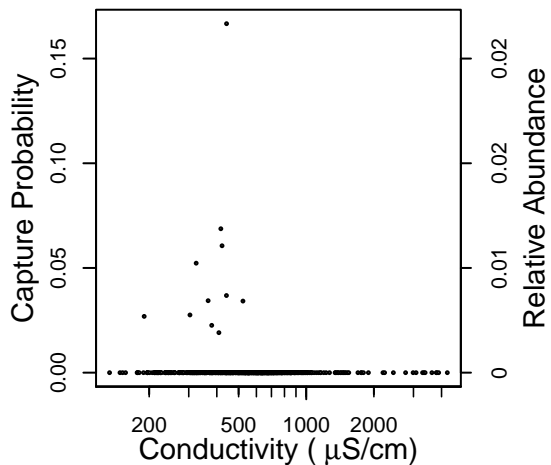


*Neureclipsis*

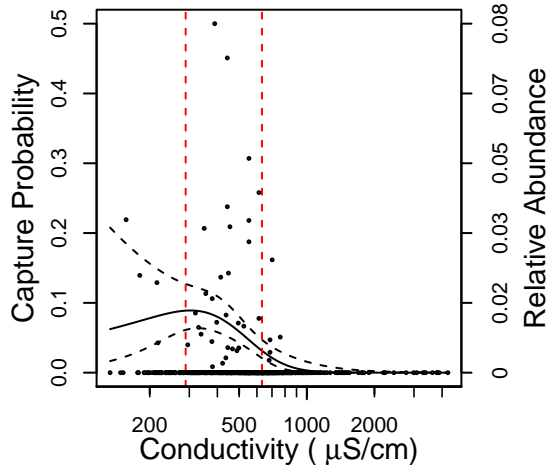


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

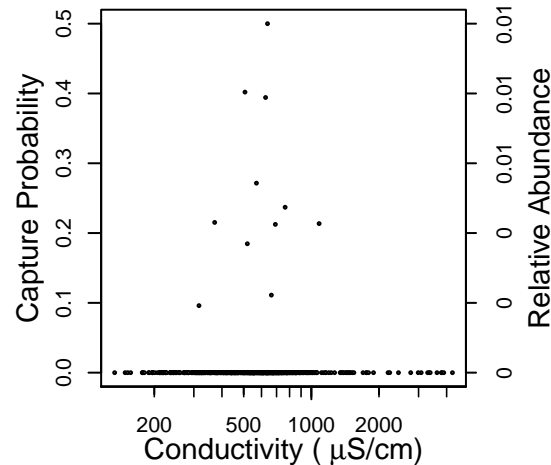
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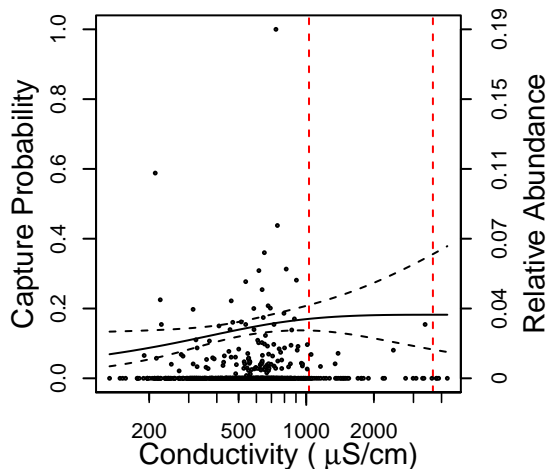
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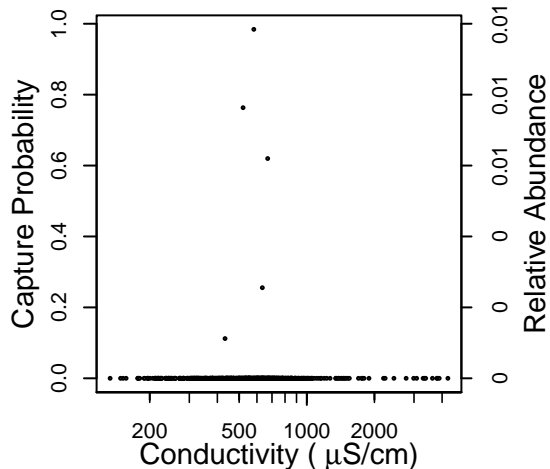
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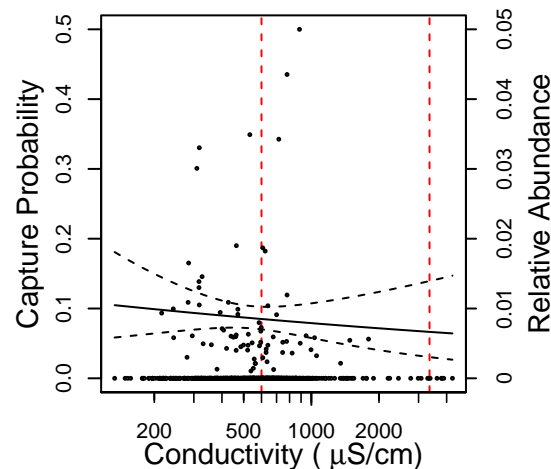
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*Ochrotrichia*



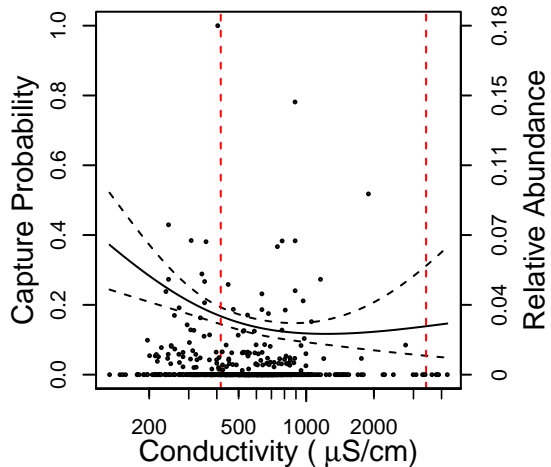
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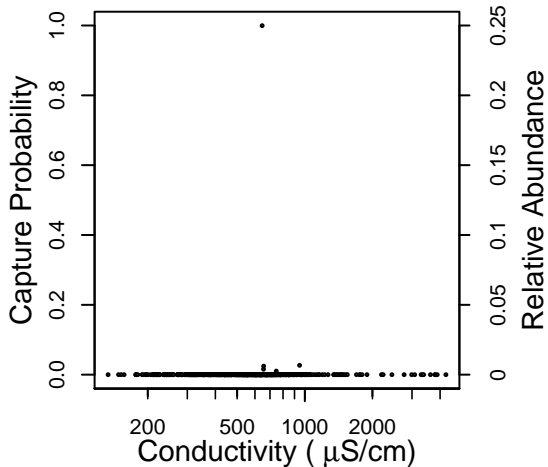


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

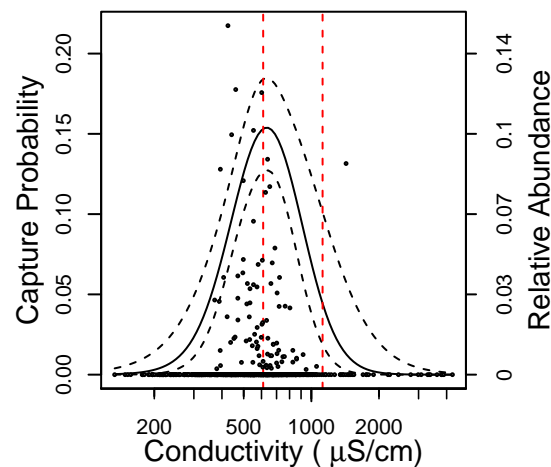
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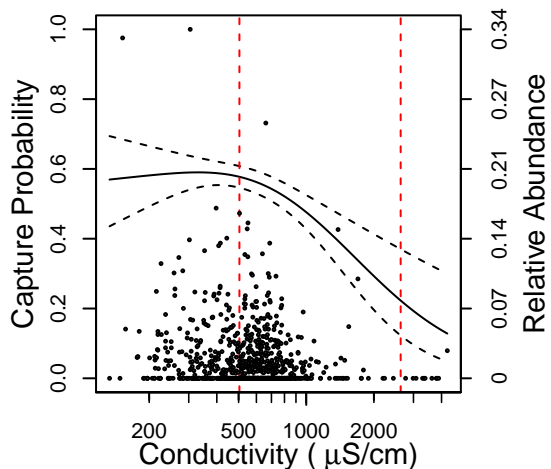
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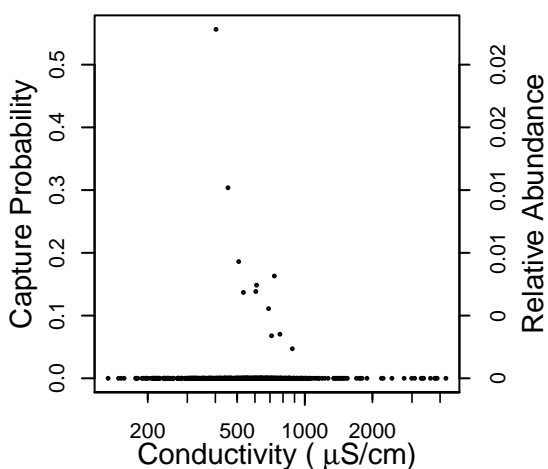
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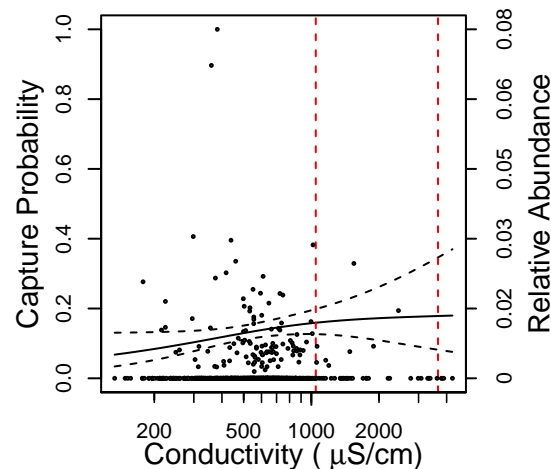
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*Ormosia*

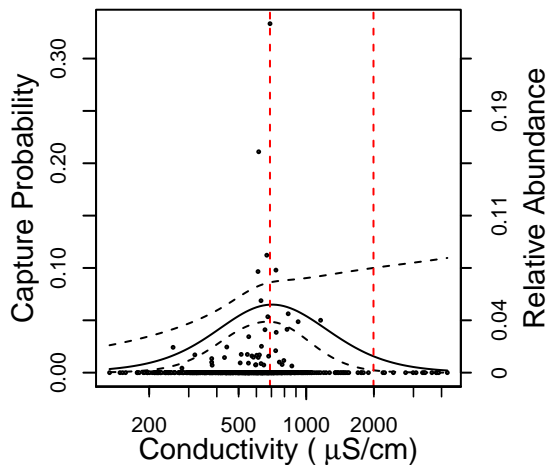


*Orthocladiinae*

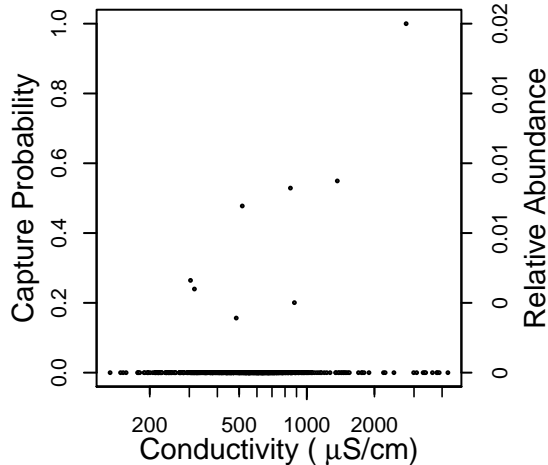


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

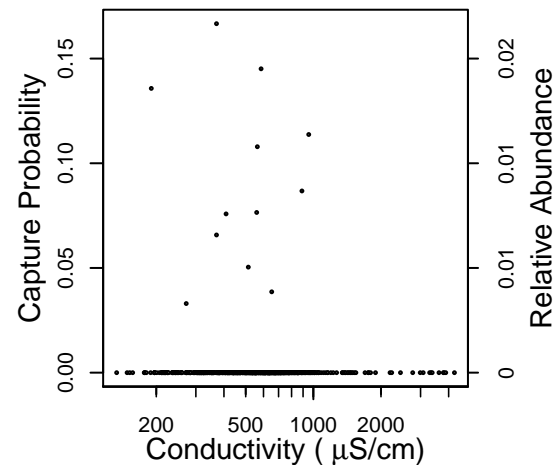
*Orthocladius*



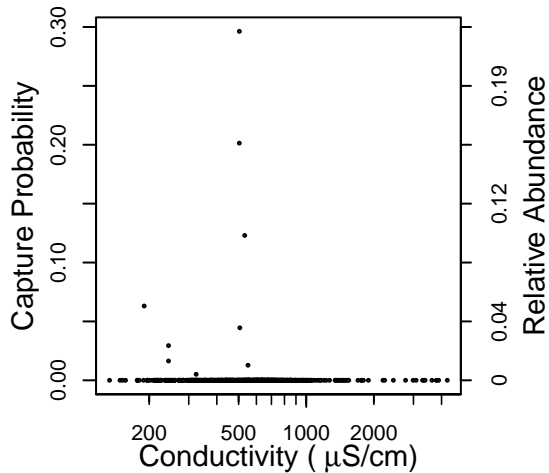
*Oxyethira*



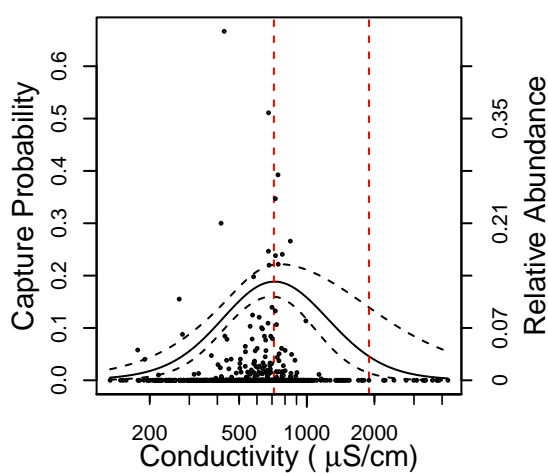
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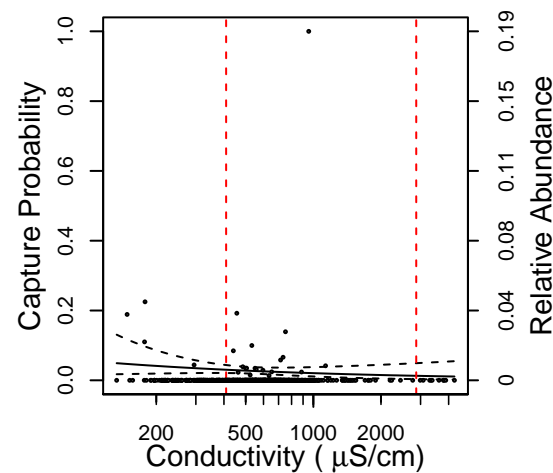
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*Palmarcorixa*

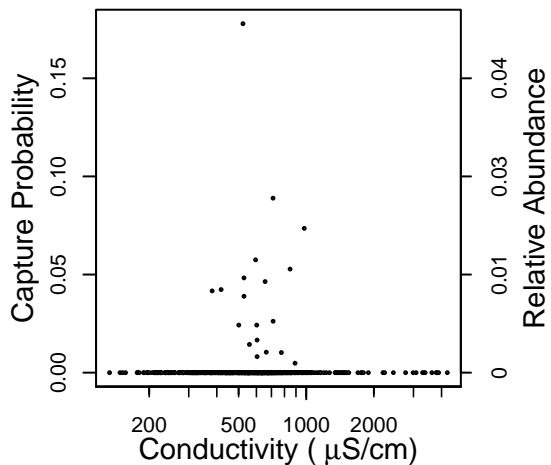


*Parachironomus*

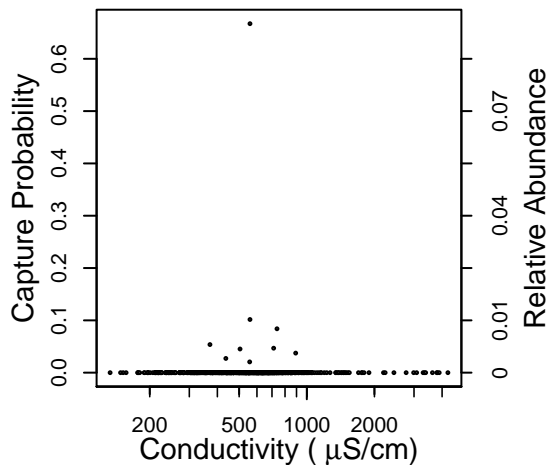


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

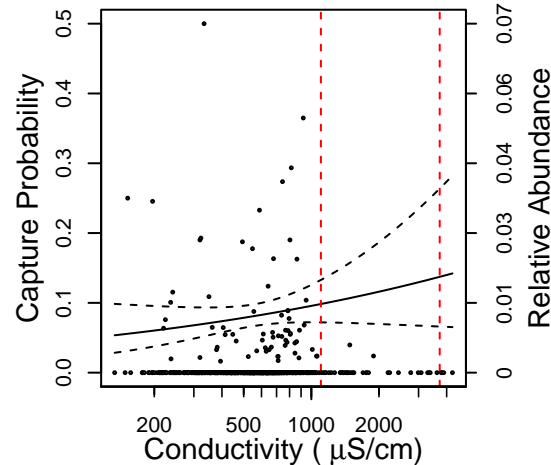
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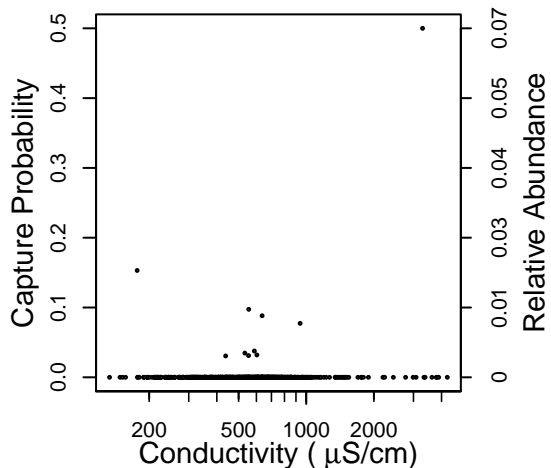
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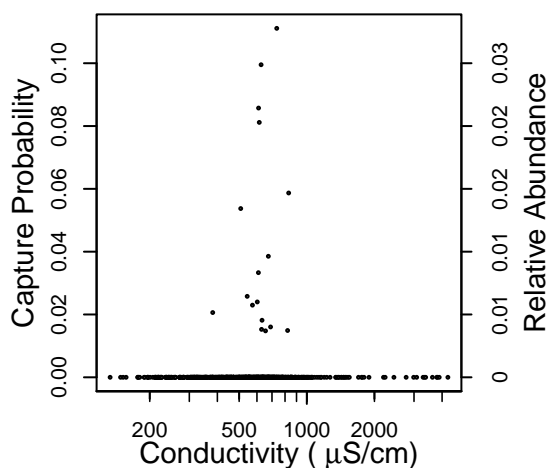
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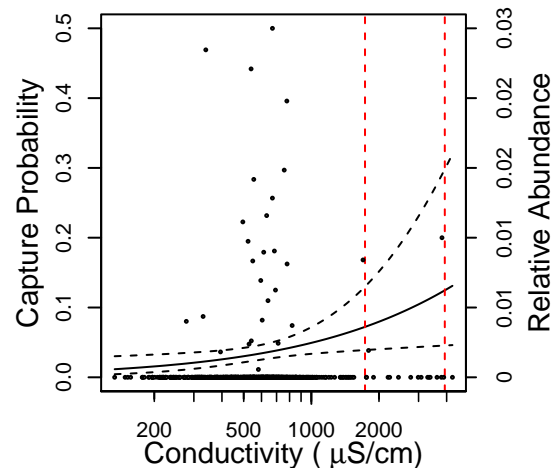
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*Parakiefferiella*

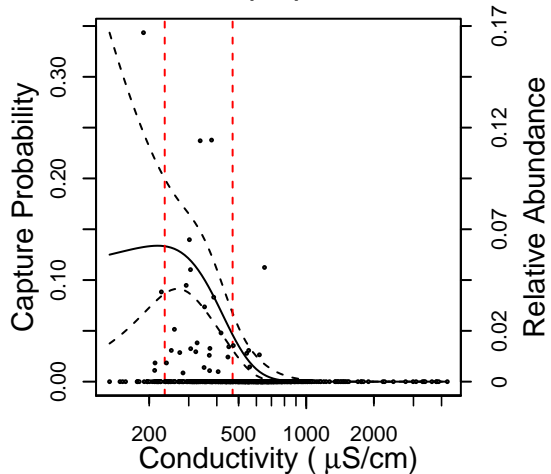


*Paralauterborniella*

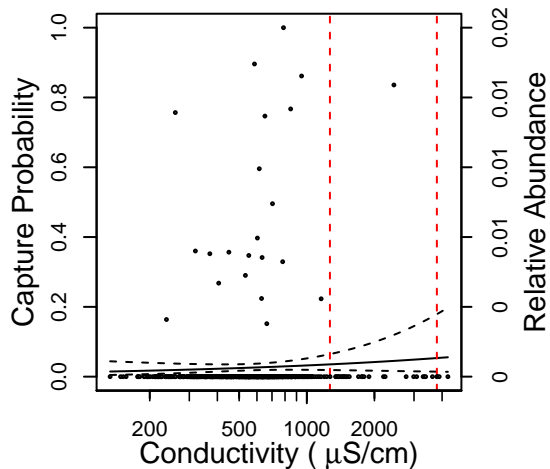


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

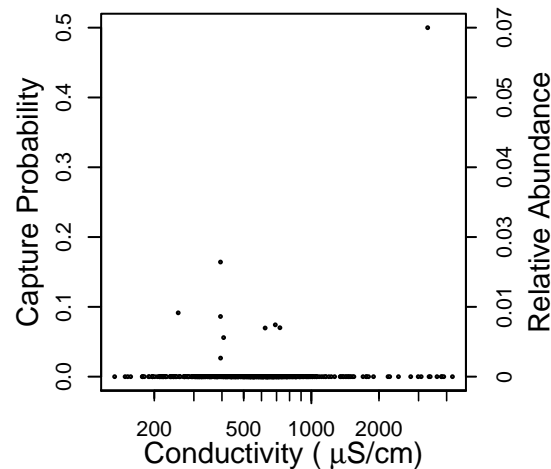
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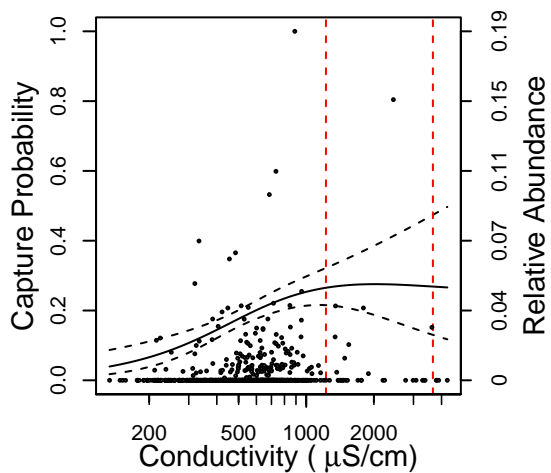
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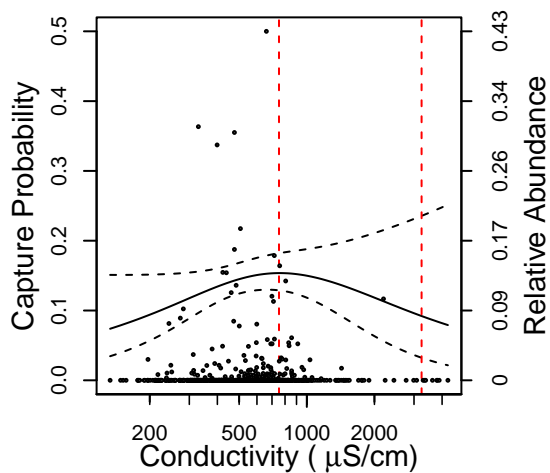
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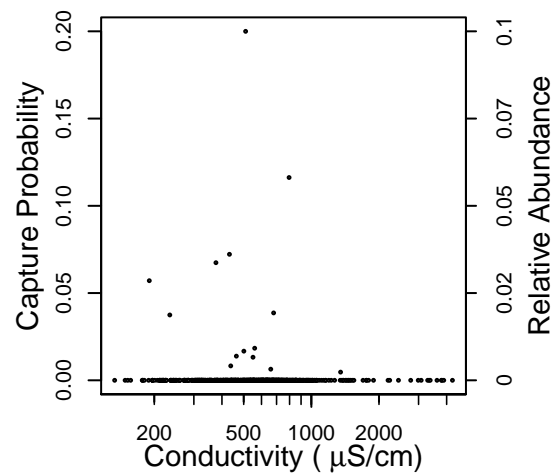
*Paratanytarsus*



*Paratendipes*

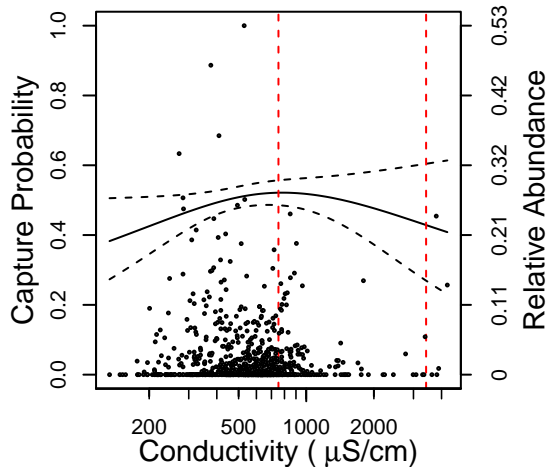


*Pelocoris*

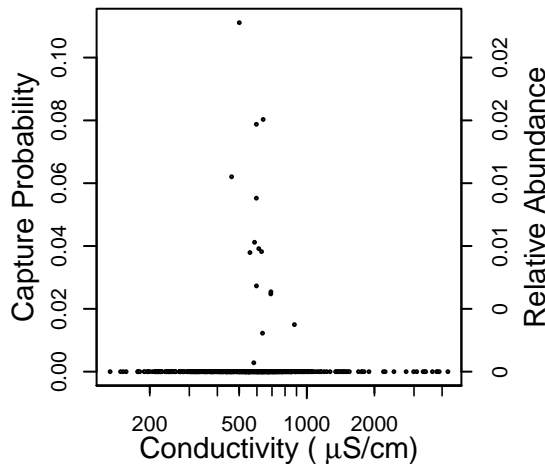


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

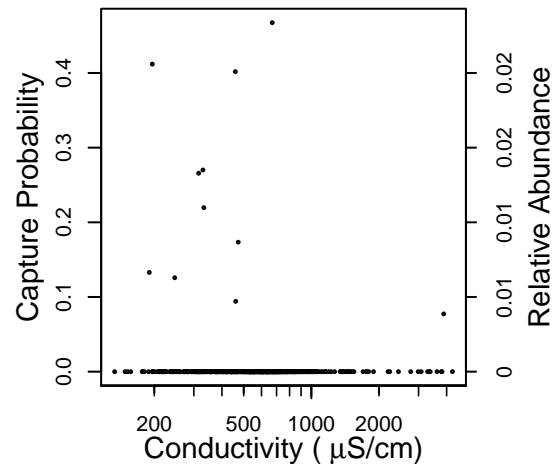
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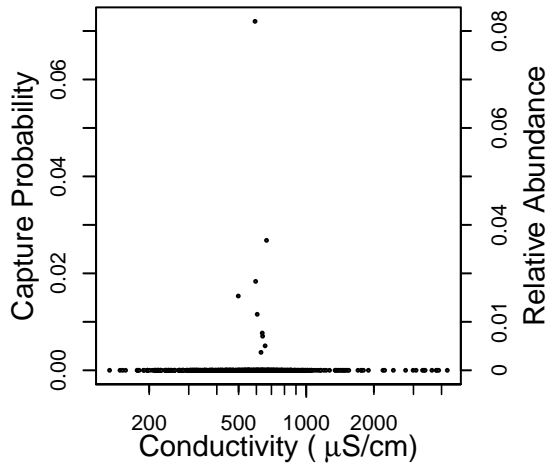
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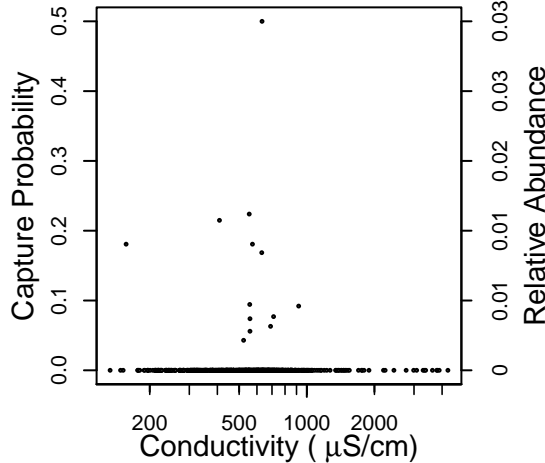
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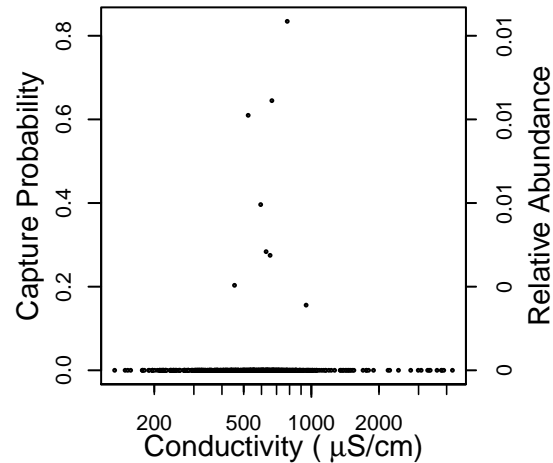
*Perlesta*



*Perlinella*

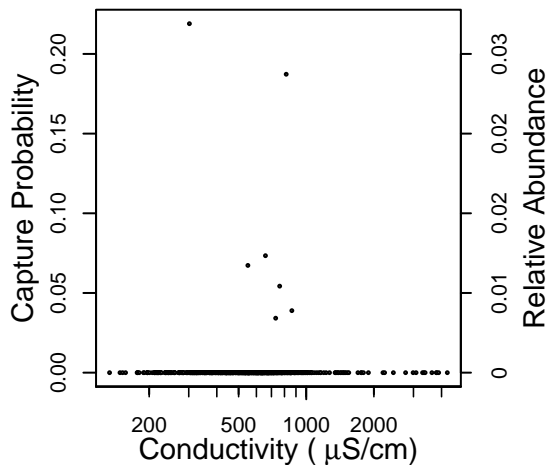


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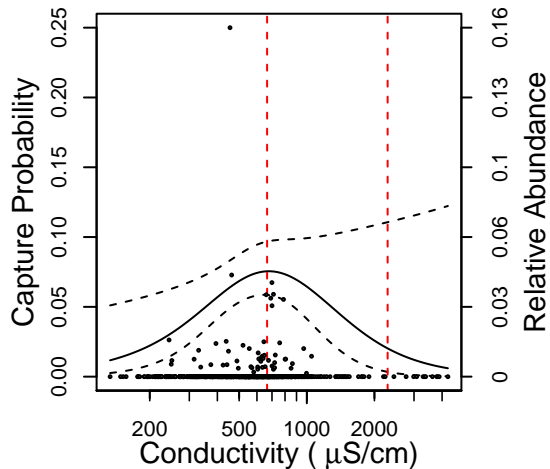


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

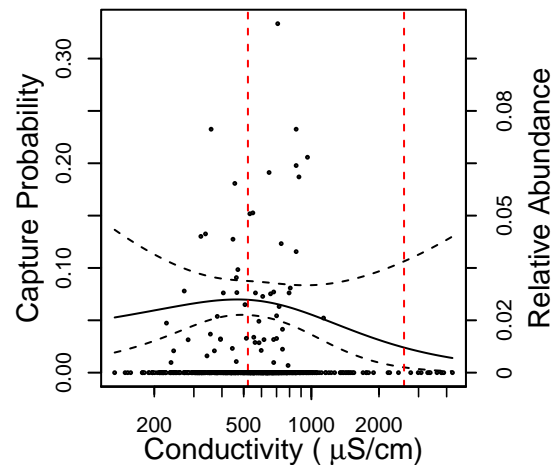
*Pilaria*



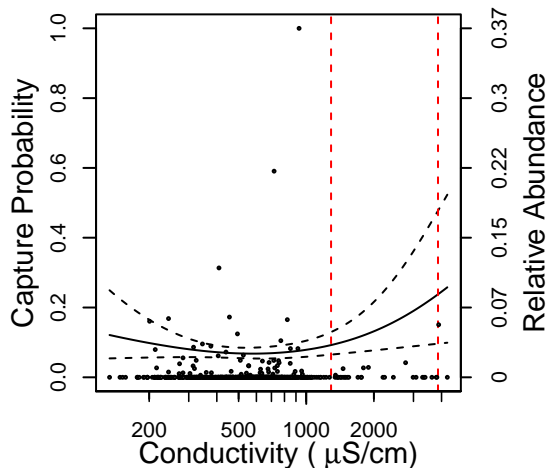
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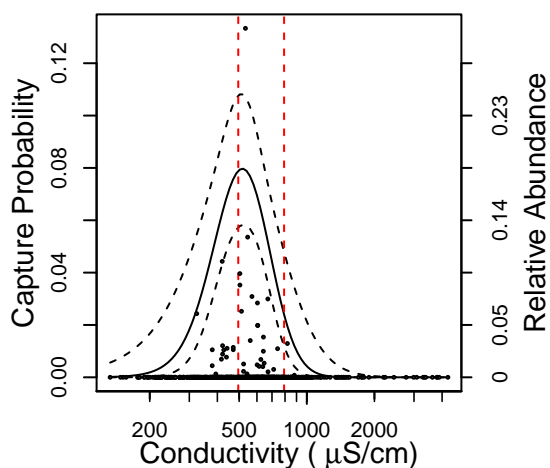
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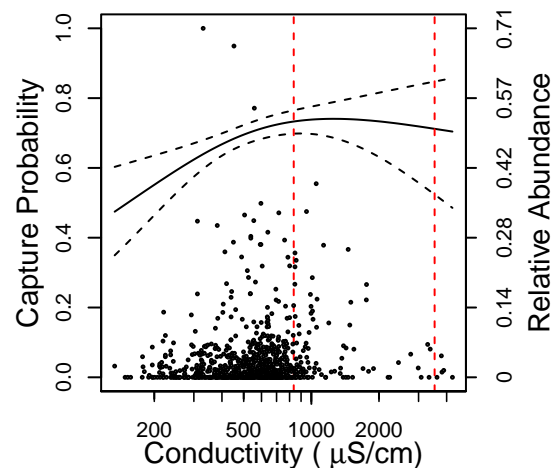
*Plathemis*



*Pleurocera*

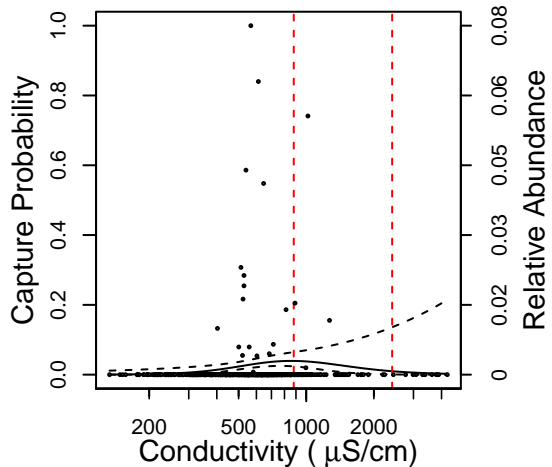


*Polypedilum*

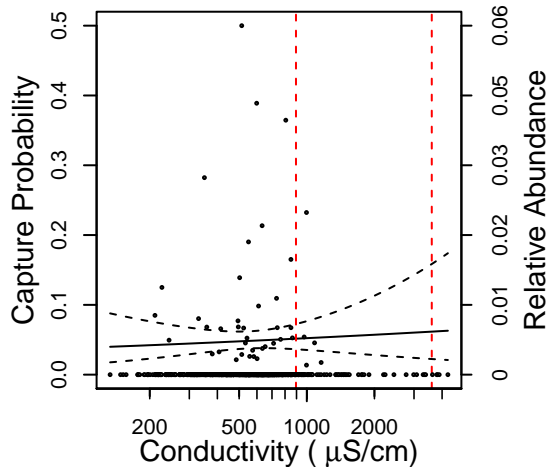


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

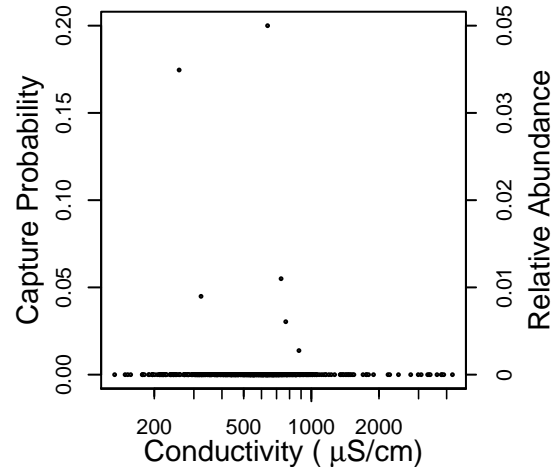
*Potamyia*



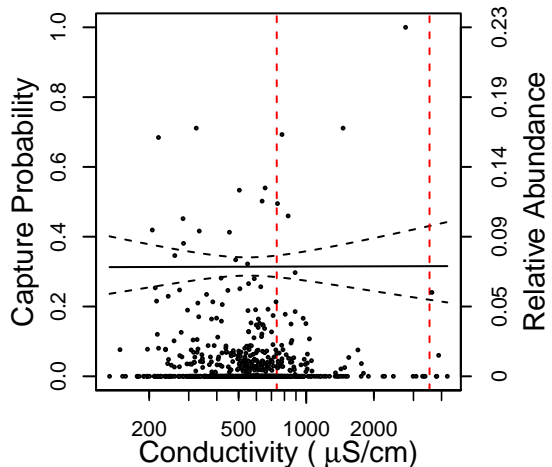
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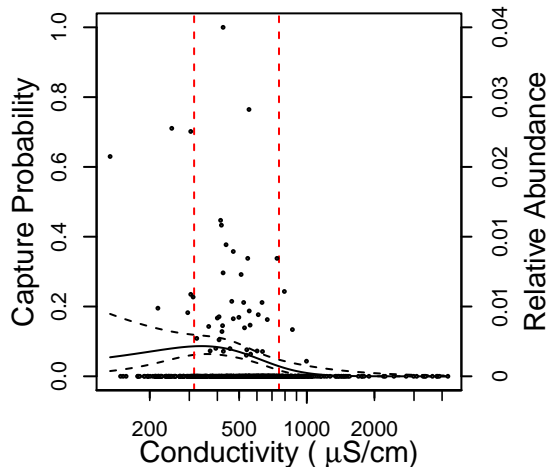
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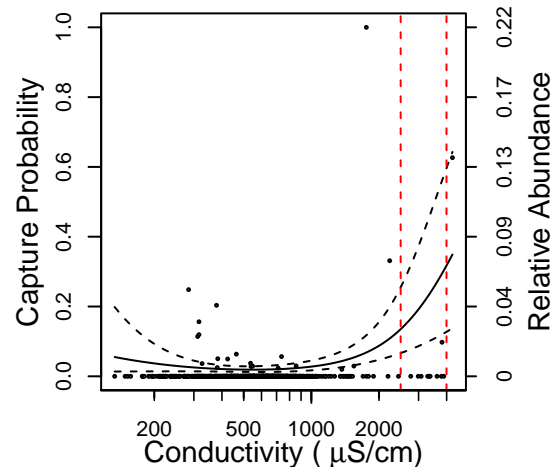
*Procladius*



*Proclleon*

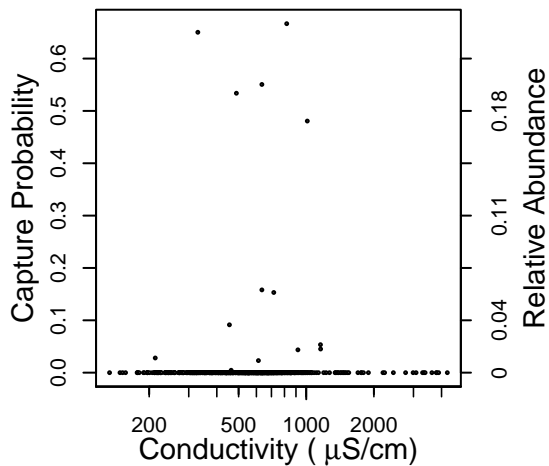


*Progomphus*

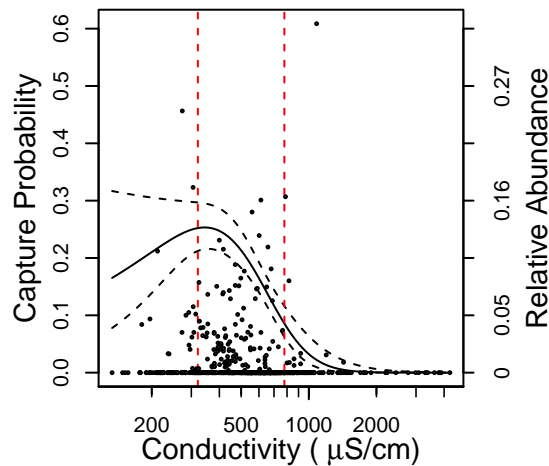


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

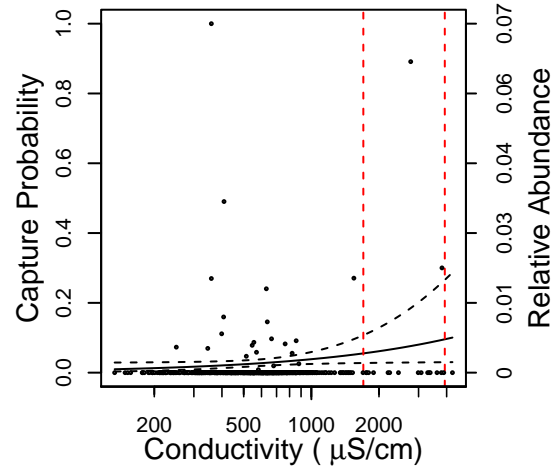
*Psectrotanypus*



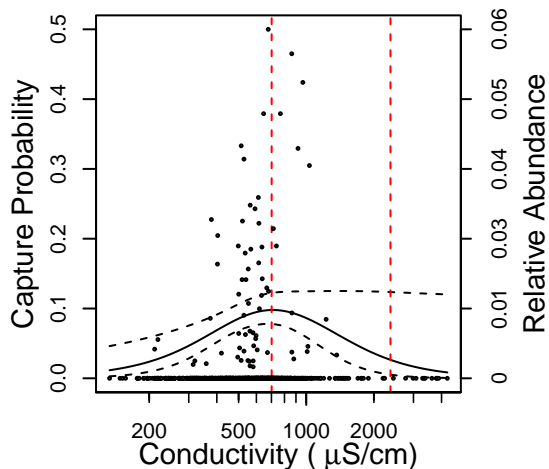
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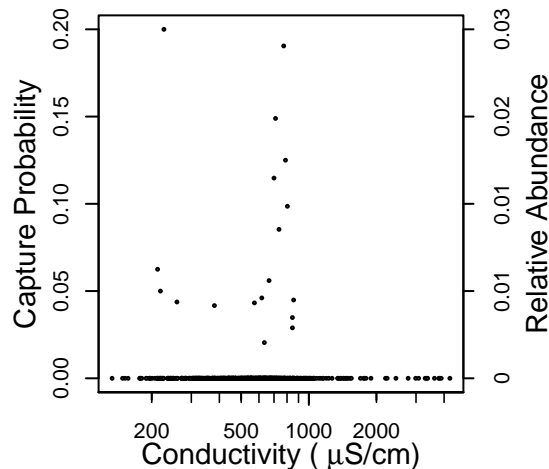
*Pseudochironomus*



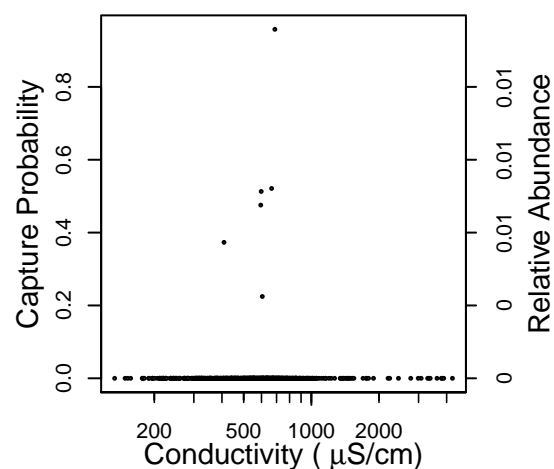
*Pseudocloeon*



*Pseudosuccinea*



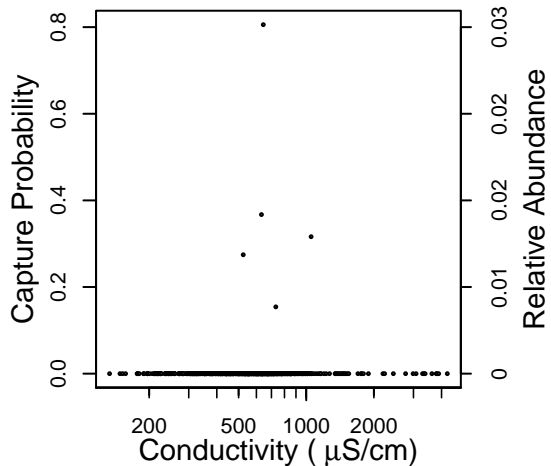
*Pteronarcys*



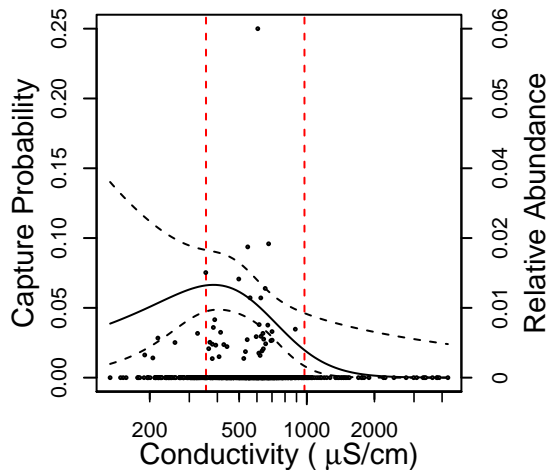


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

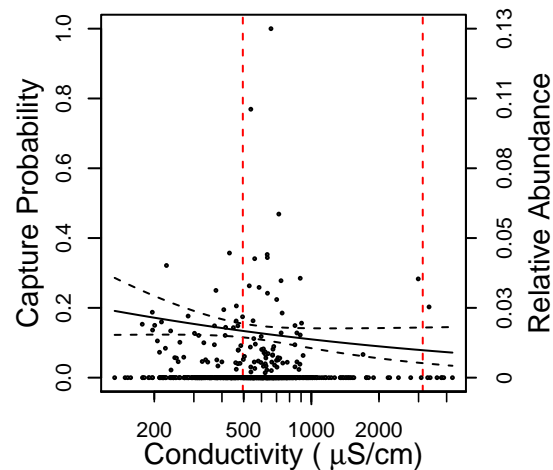
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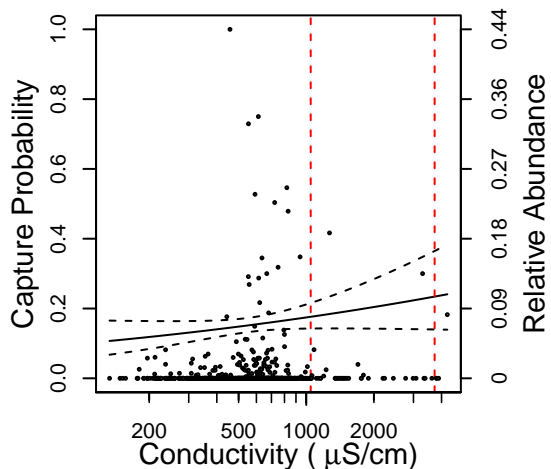
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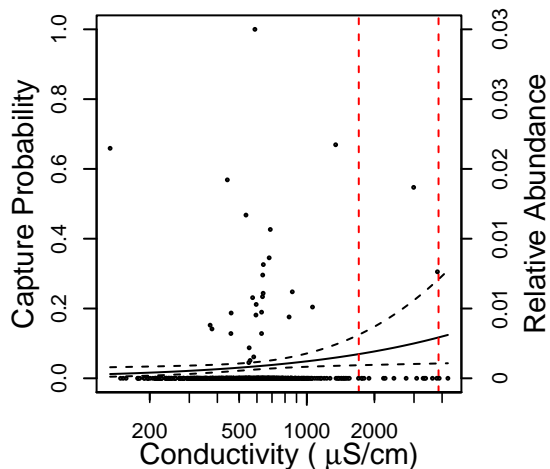
*Ranatra*



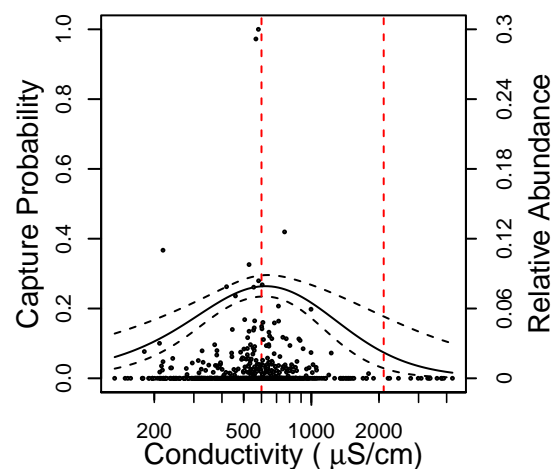
*Rhagovelia*



*Rheocricotopus*

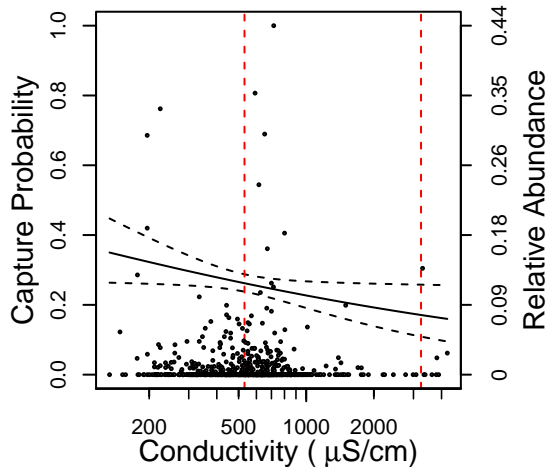


*Rheotanytarsus*

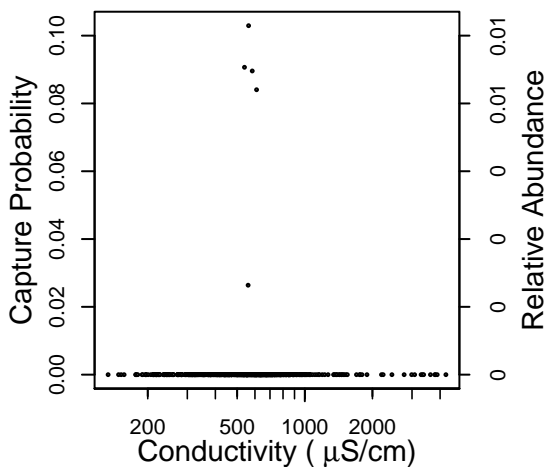


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

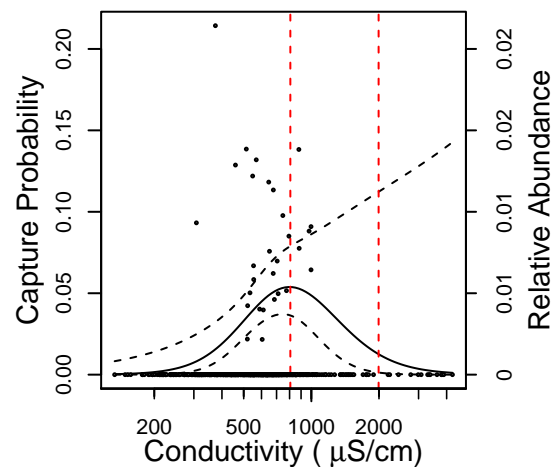
*Rheumatobates*



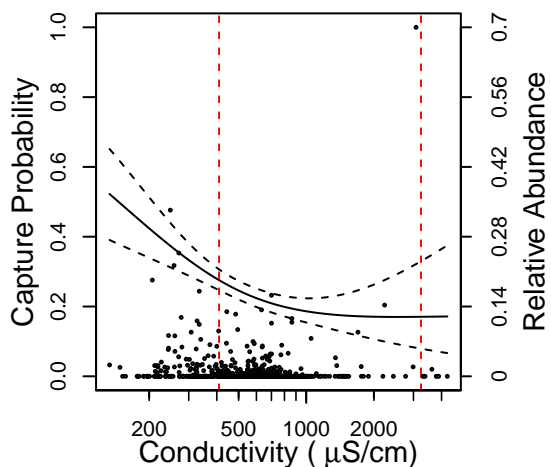
*Robackia*



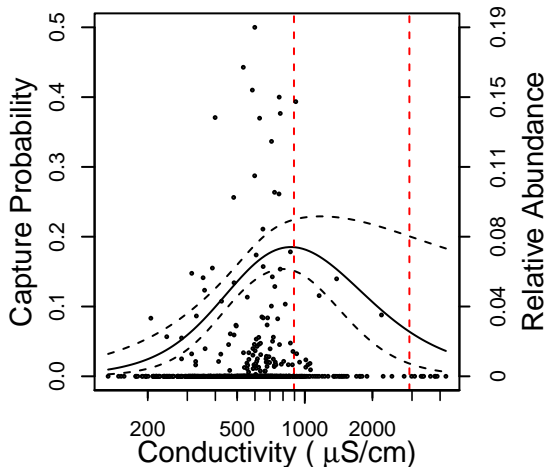
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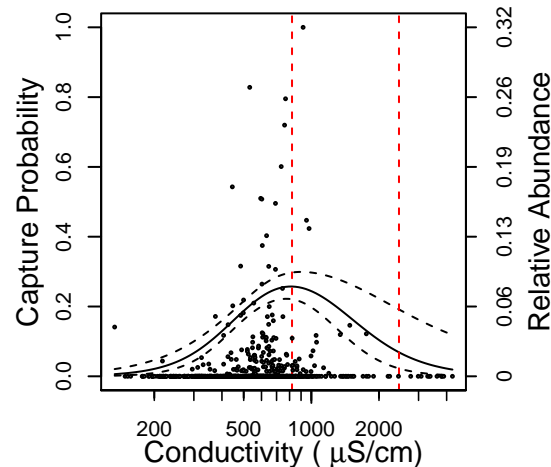
*Sialis*



*Sigara*

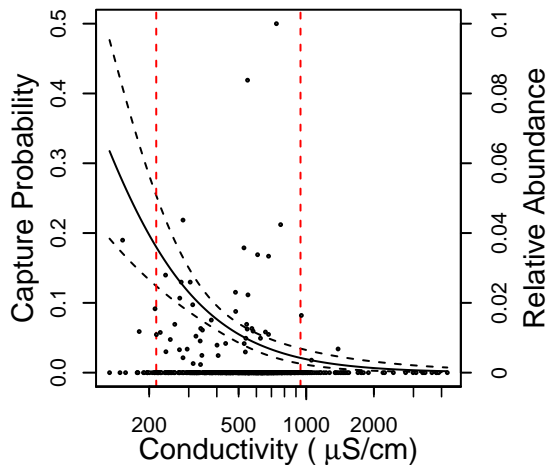


*Simulium*

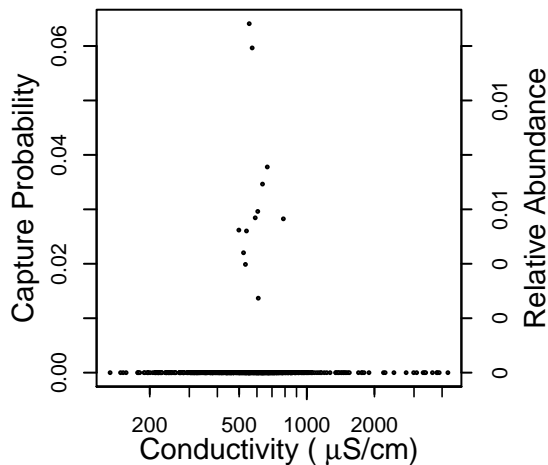


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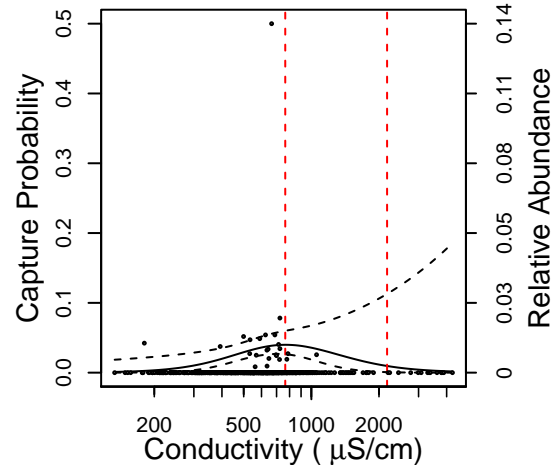
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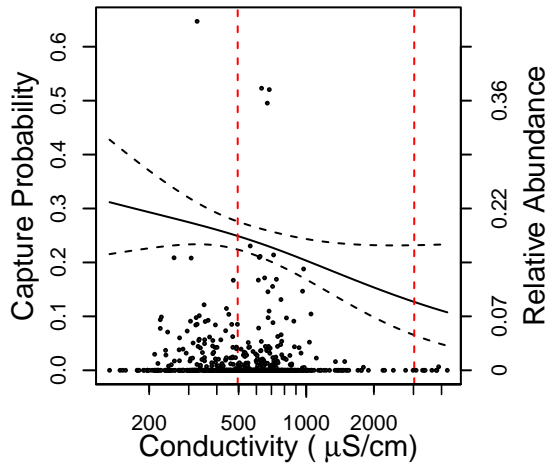
*Sparbarus*



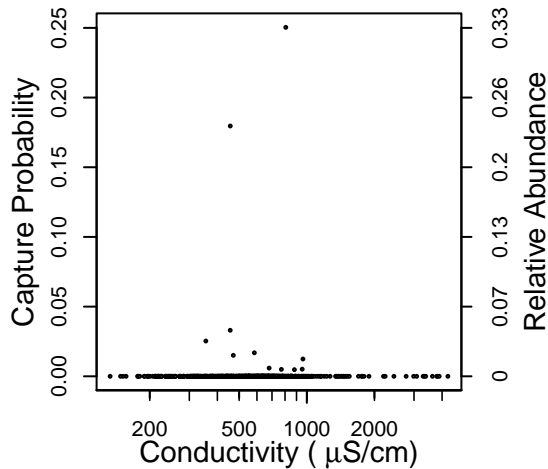
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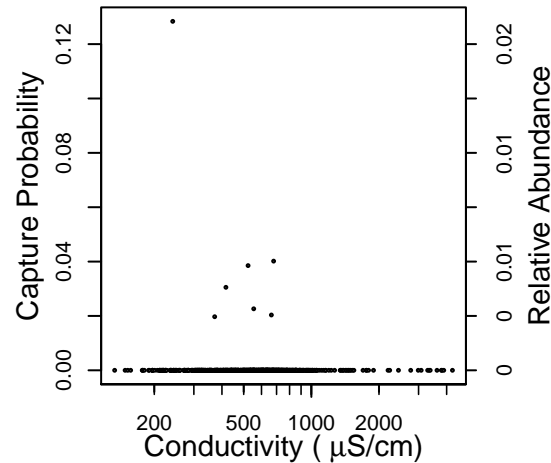
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*Stagnicola*

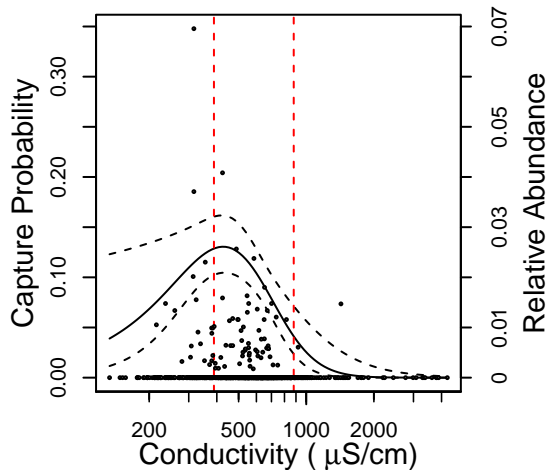


*Stempellina*

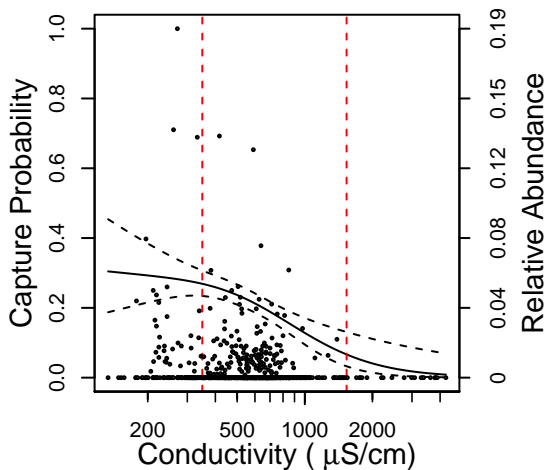


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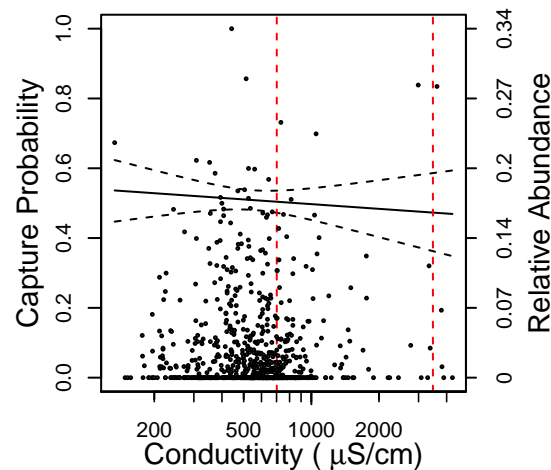
*Stempellinella*



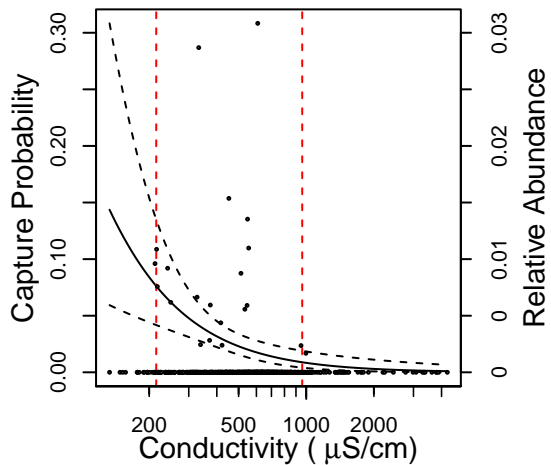
*Stenacron*



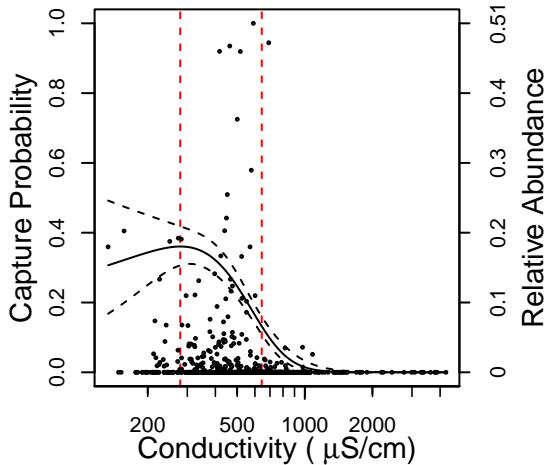
*Stenelmis*



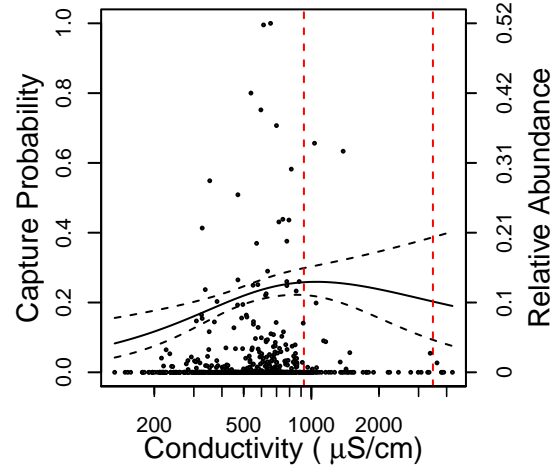
*Stenochironomus*



*Stenonema*

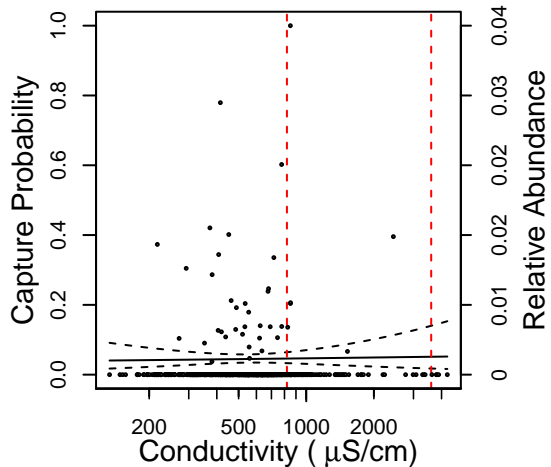


*Stictochironomus*

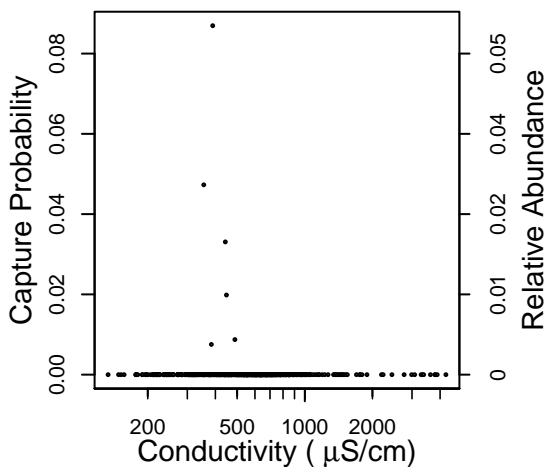


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

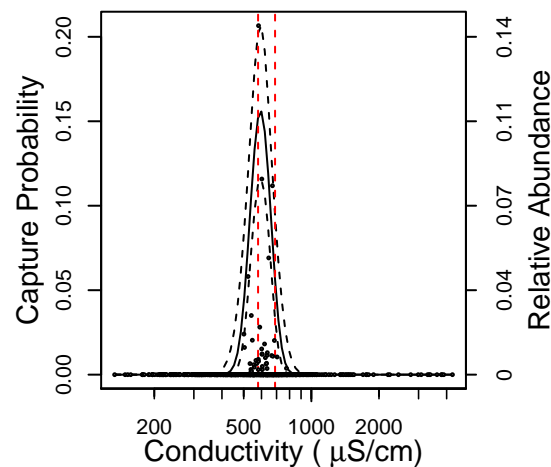
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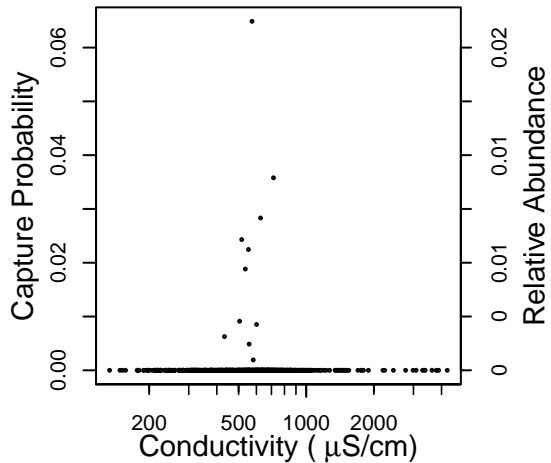
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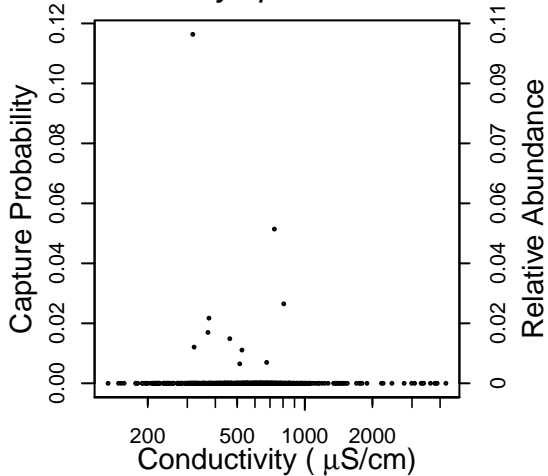
*Stylurus*



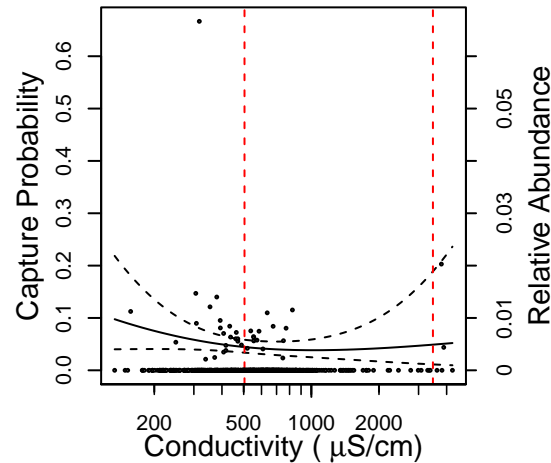
*Sublettea*



*Sympetrum*

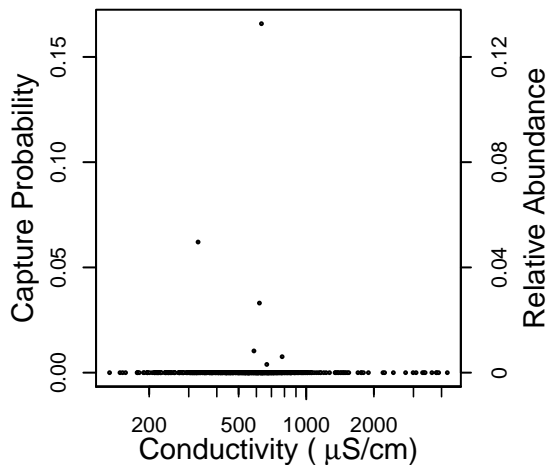


*Tabanus*

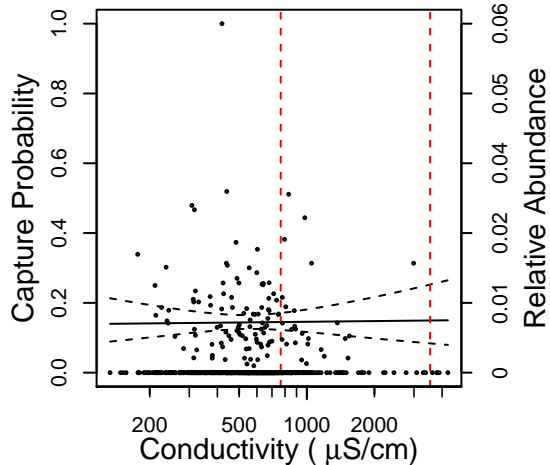


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

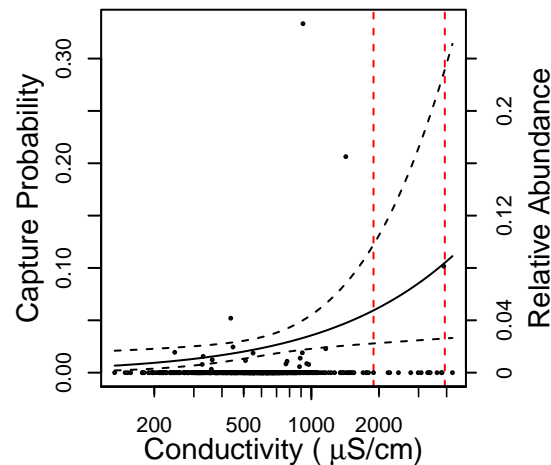
*Taeniopteryx*



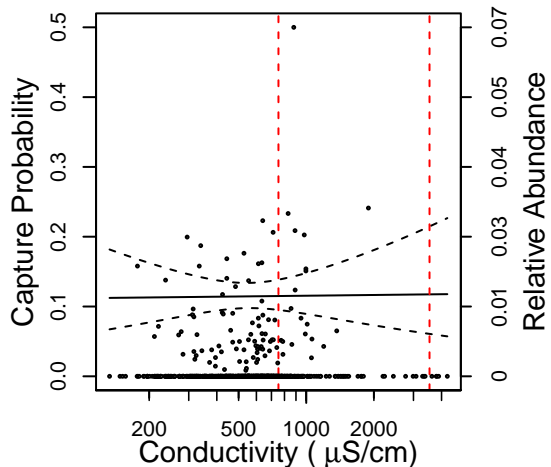
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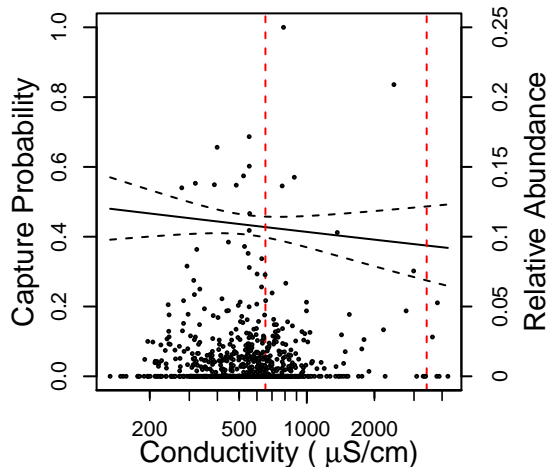
*Tanypus*



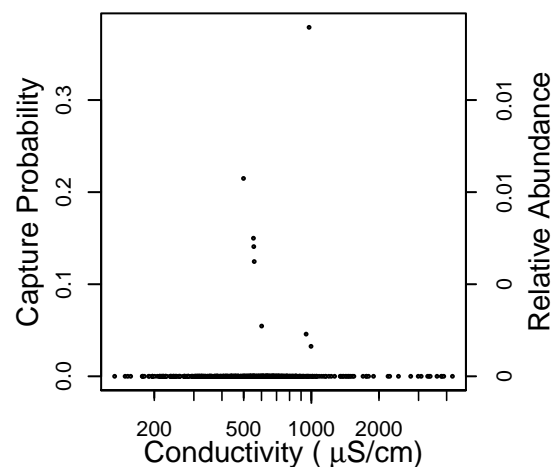
*Tanytarsini*



*Tanytarsus*

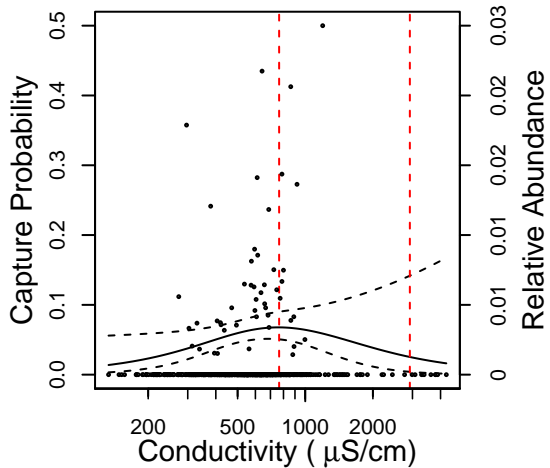


*Telopelopia*

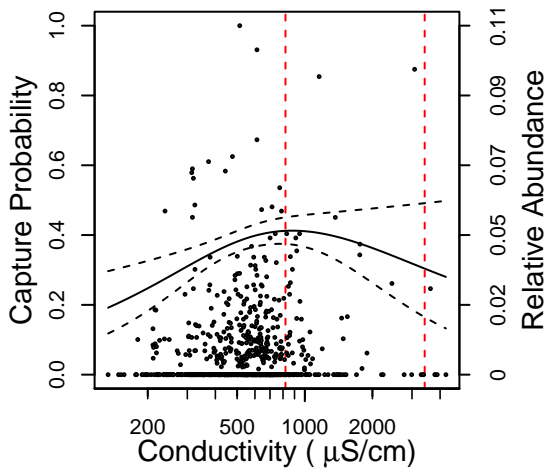


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

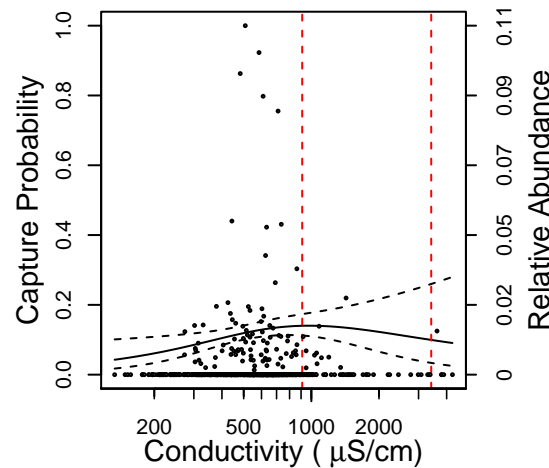
*Thienemanniella*



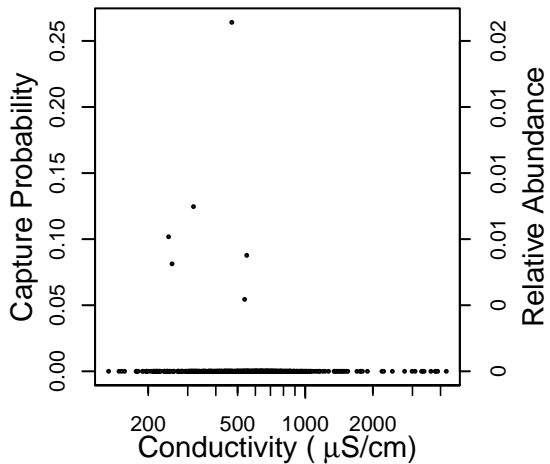
*Thienemannimyia*



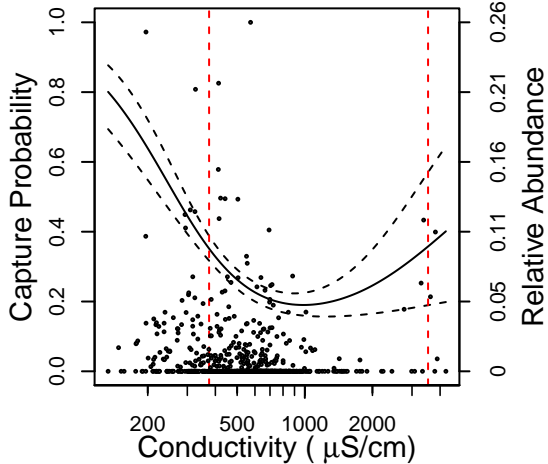
*Tipula*



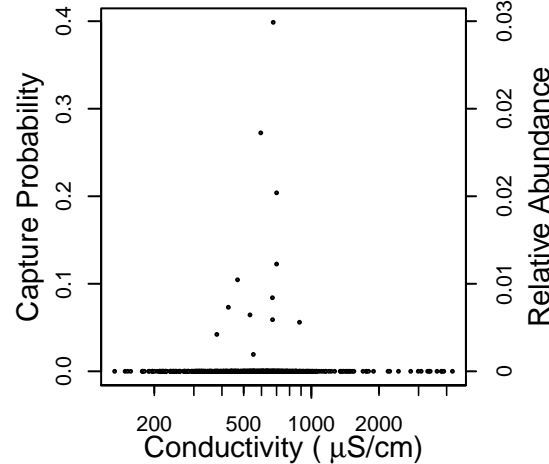
*Tramea*



*Trepobates*

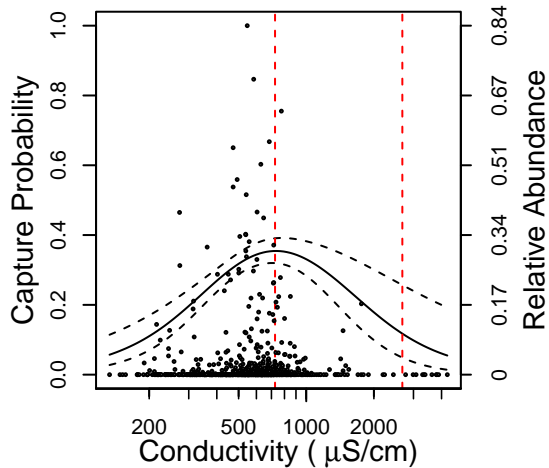


*Triaenodes*

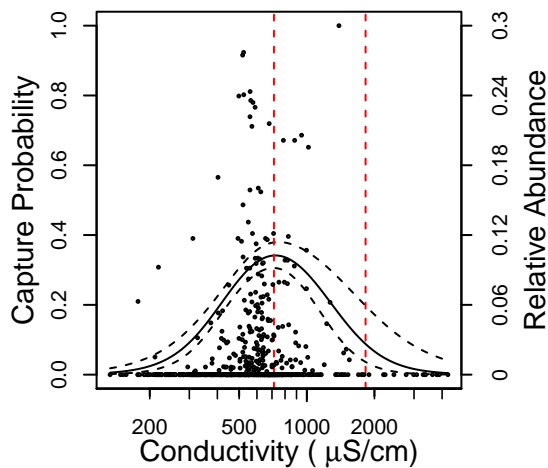


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

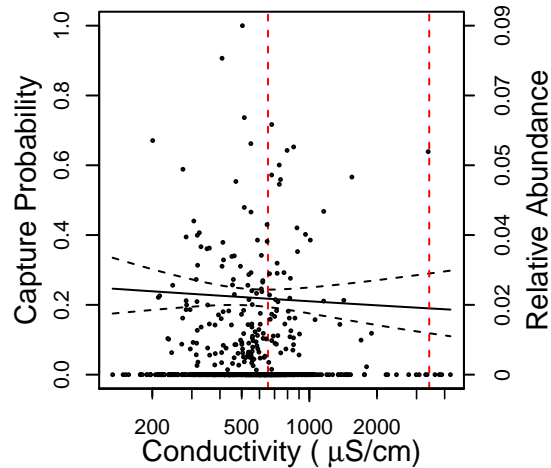
*Trichocorixa*



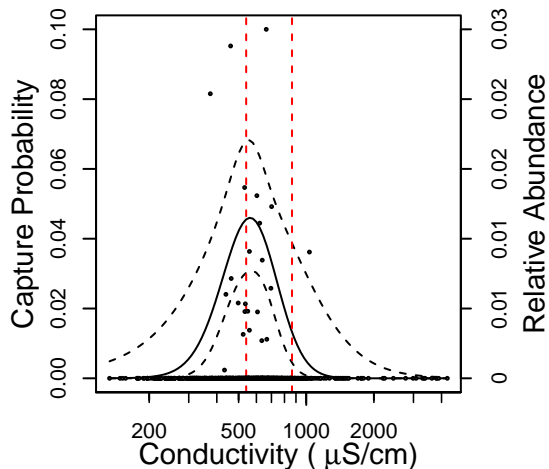
*Tricorythodes*



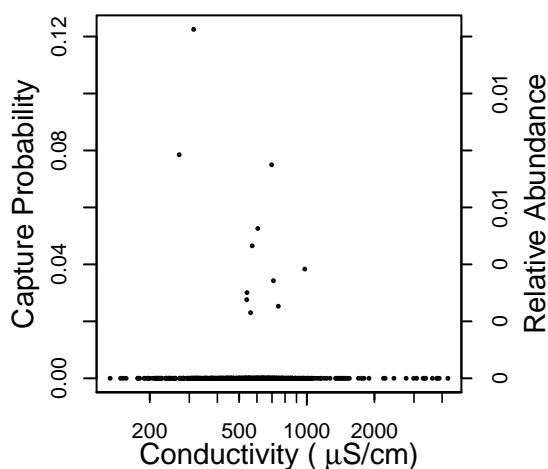
*Tropisternus*



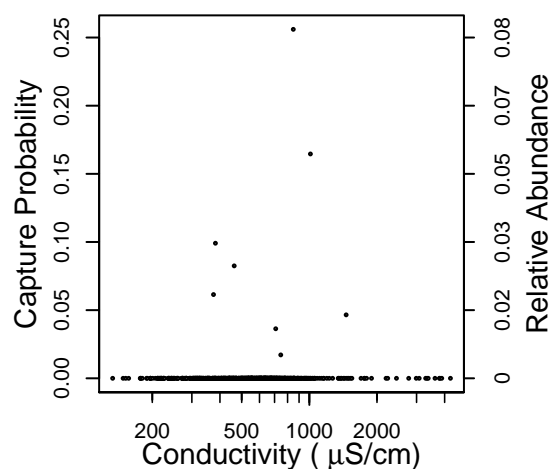
*Tvetenia*



*Uvarus*



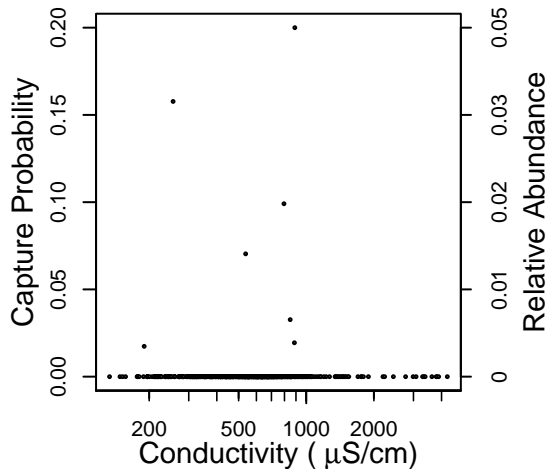
*Valvata*



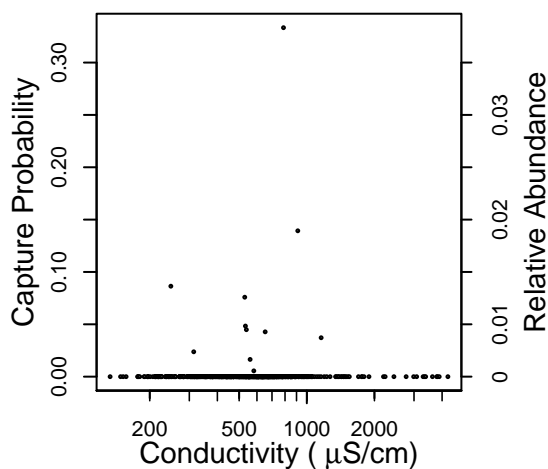


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

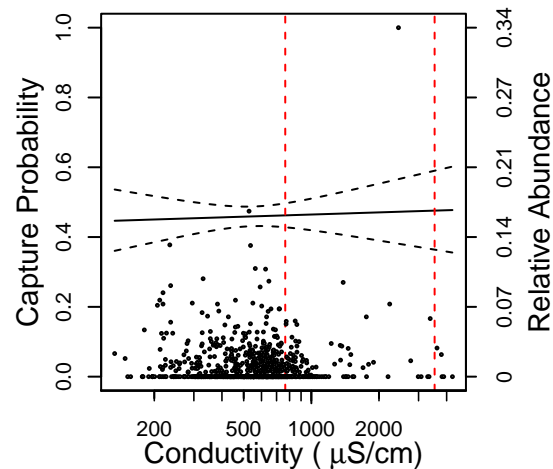
*Zavreliella*



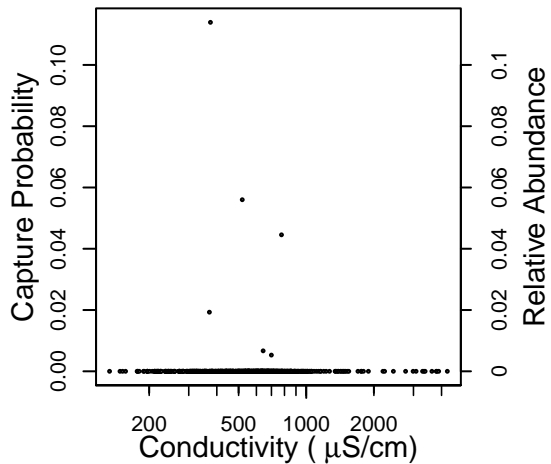
*Zavreliomyia*



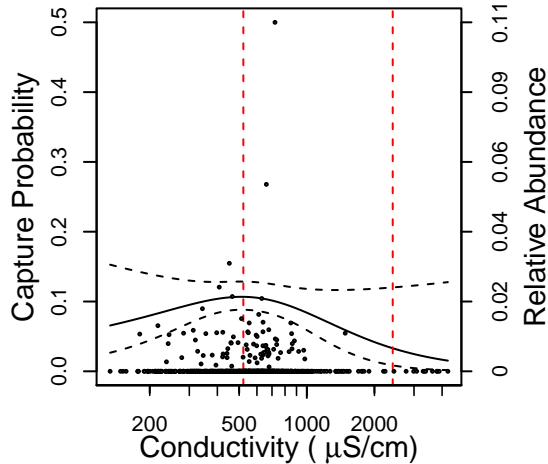
*Aeshnidae*



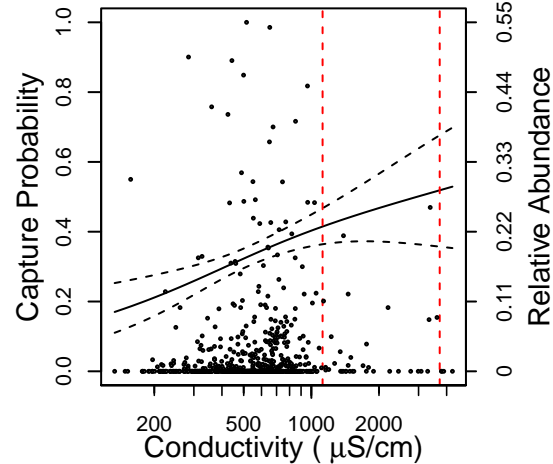
*Amphipoda*



*Ancyliidae*

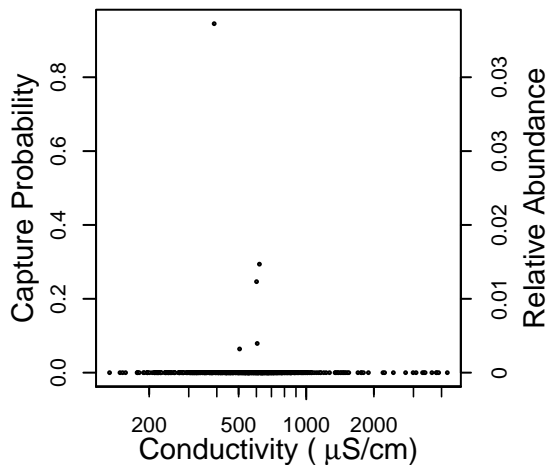


*Asellidae*

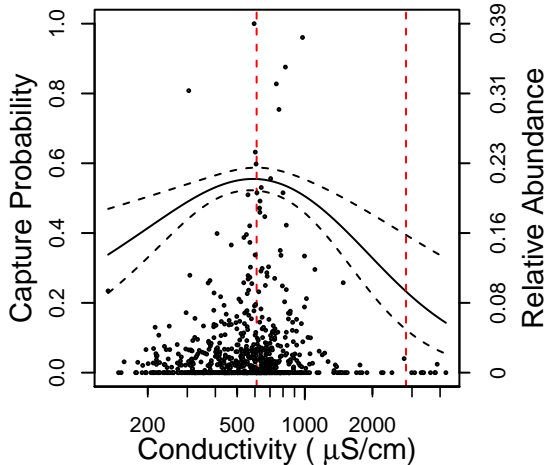


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

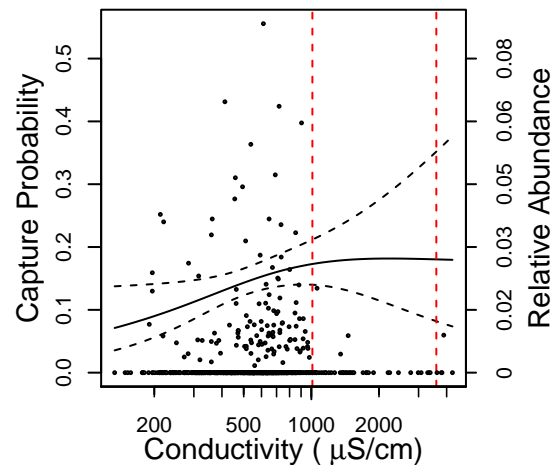
*Athericidae*



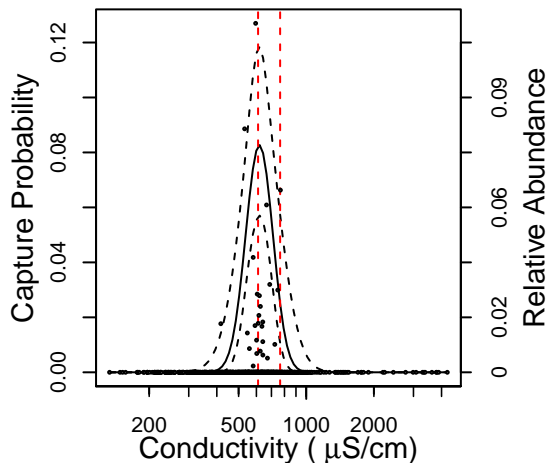
*Baetidae*



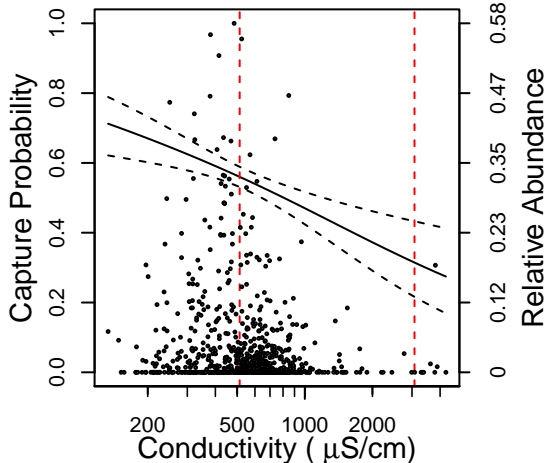
*Belostomatidae*



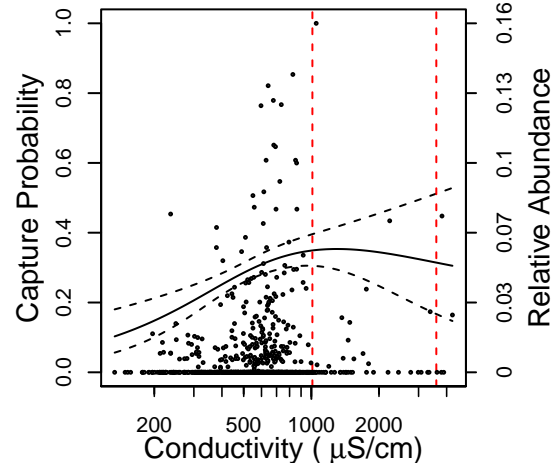
*Brachycentridae*



*Caenidae*

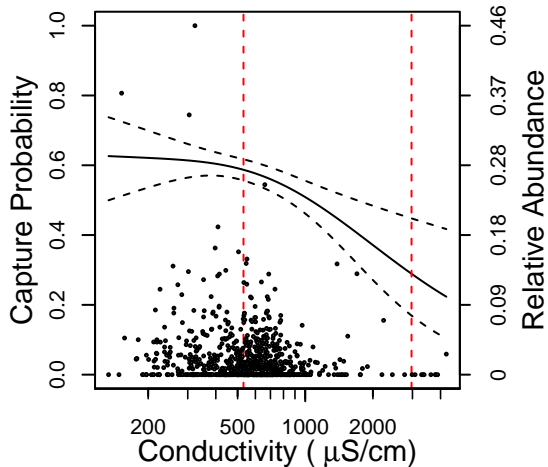


*Calopterygidae*

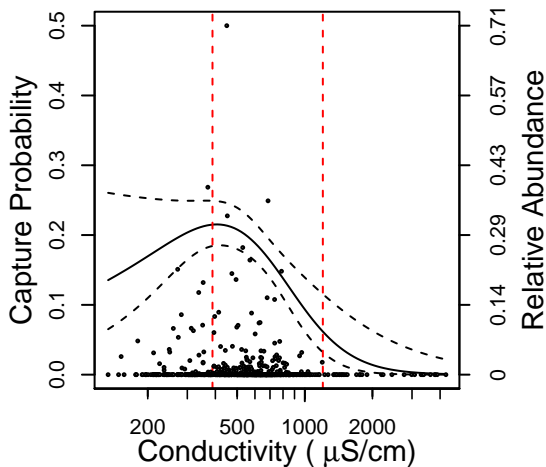


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

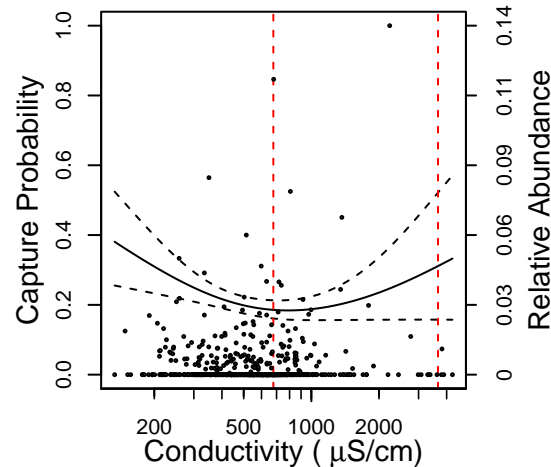
*Cambaridae*



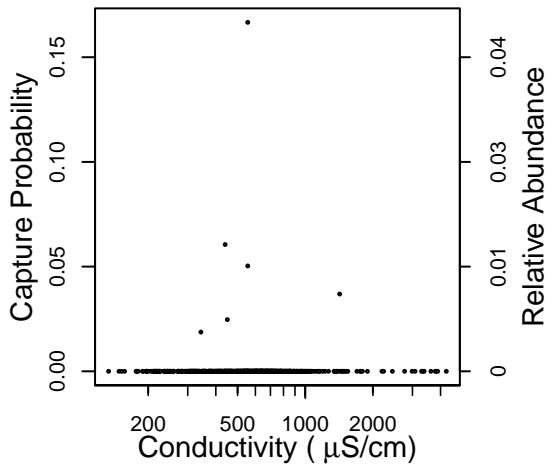
*Cambarincolidae*



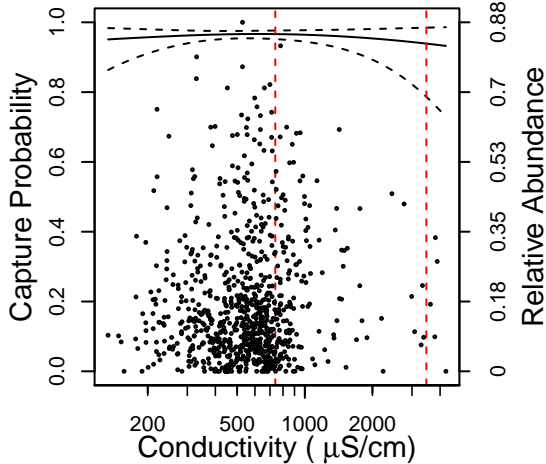
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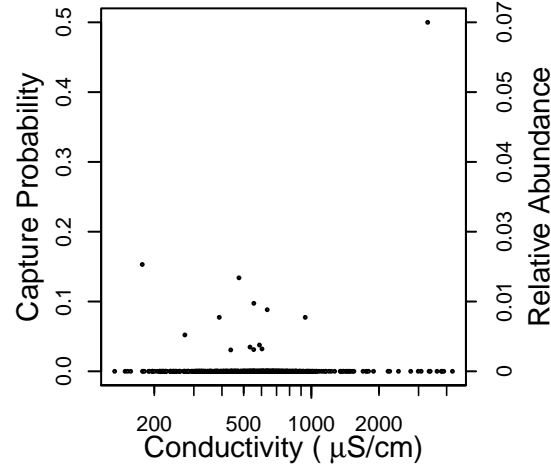
*Chaoboridae*



*Chironomidae*

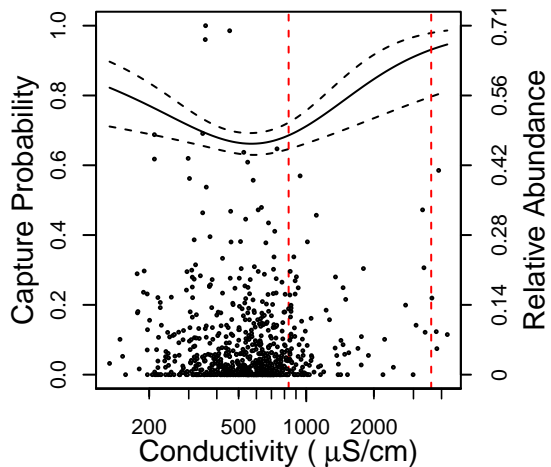


*Chordodidae*

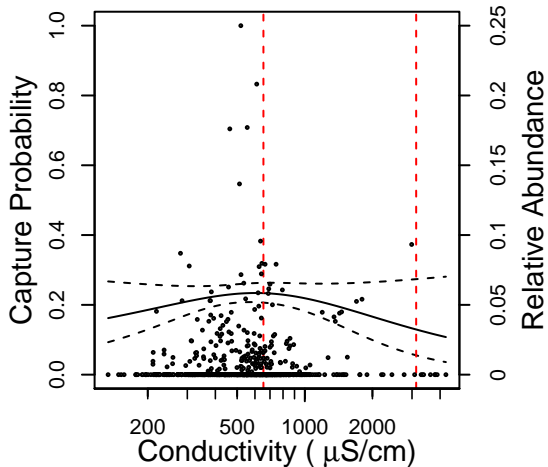


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

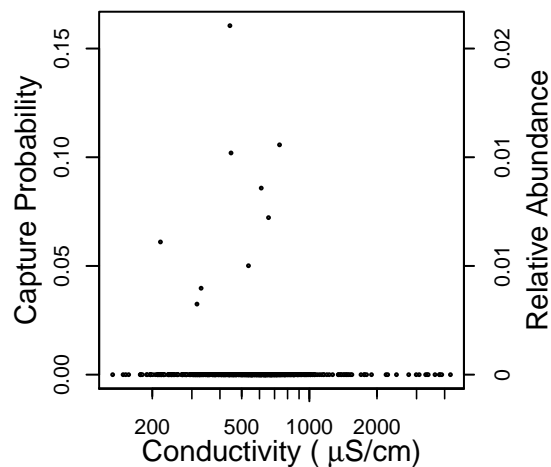
*Coenagrionidae*



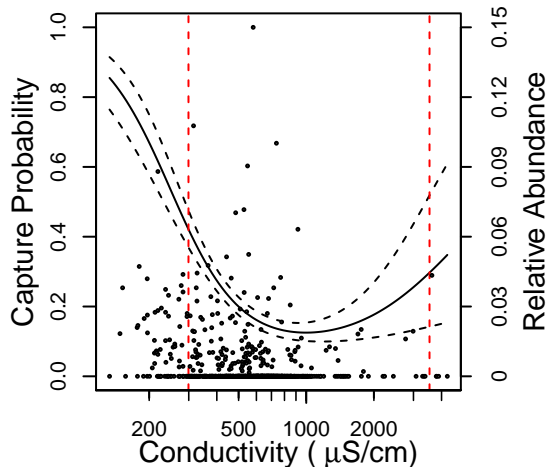
*Corbiculidae*



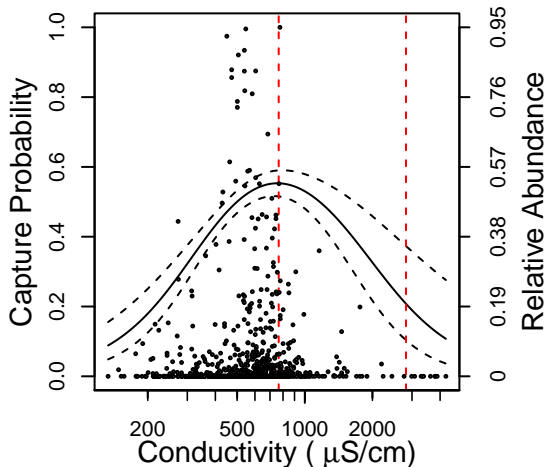
*Cordulegastridae*



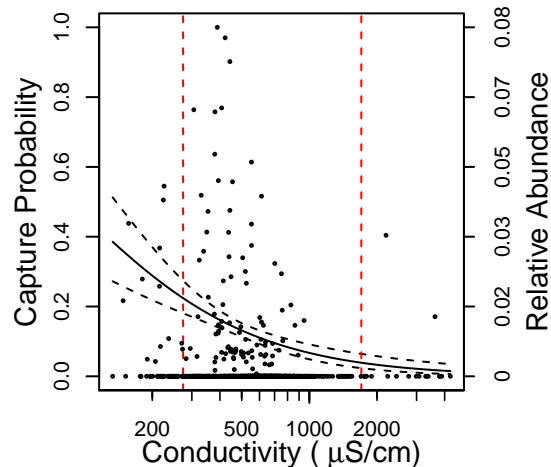
*Corduliidae*



*Corixidae*

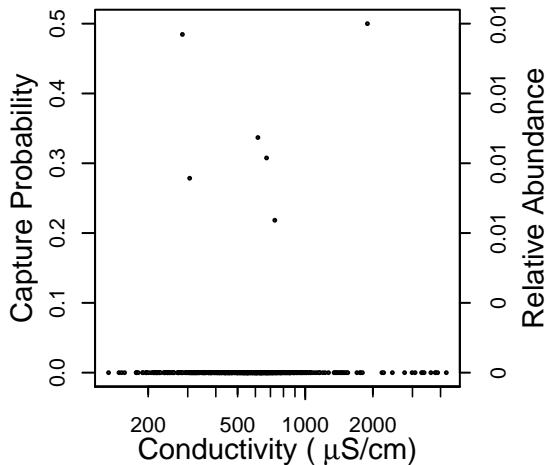


*Corydalidae*

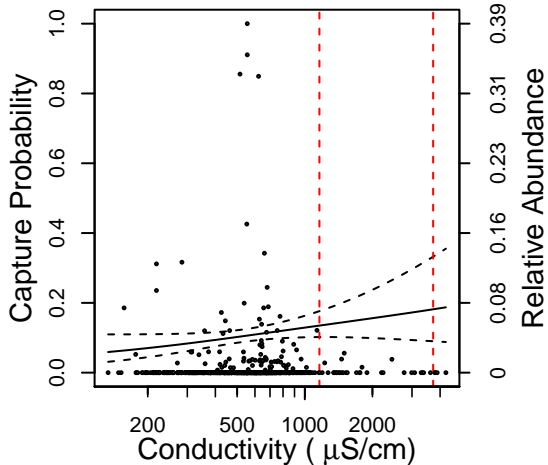


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

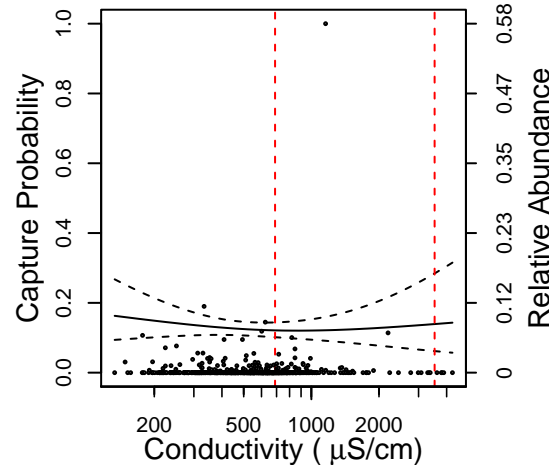
*Crambidae*



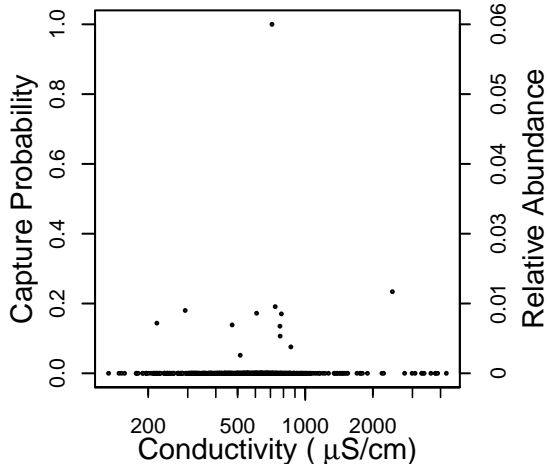
*Crangonyctidae*



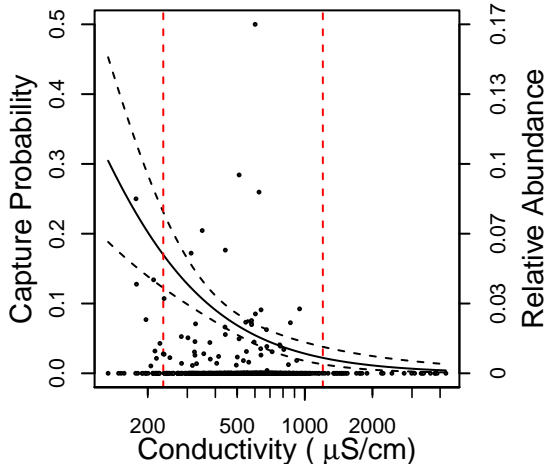
*Culicidae*



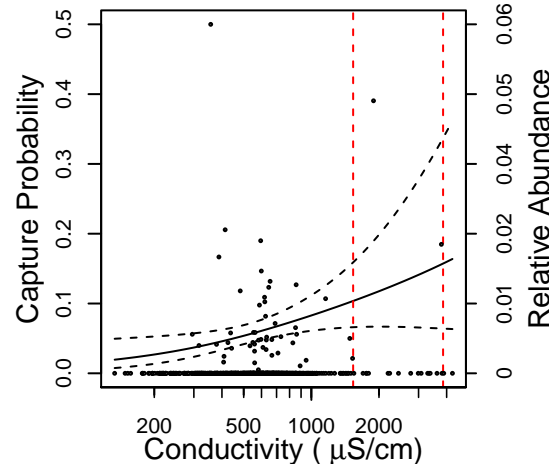
*Curculionidae*



*Dixidae*

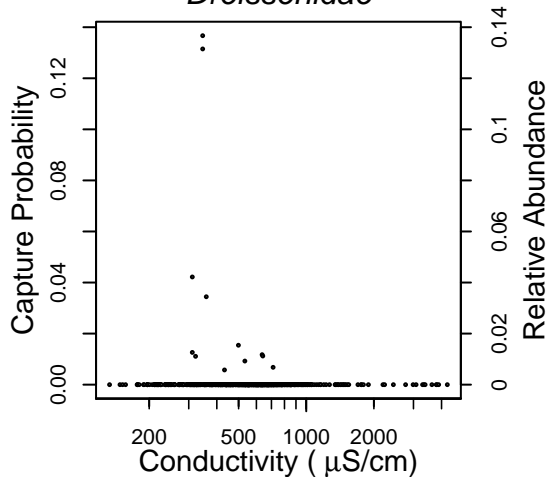


*Dorylaimidae*

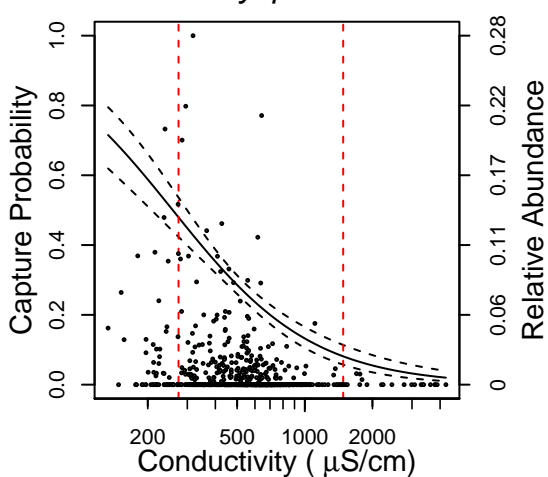


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

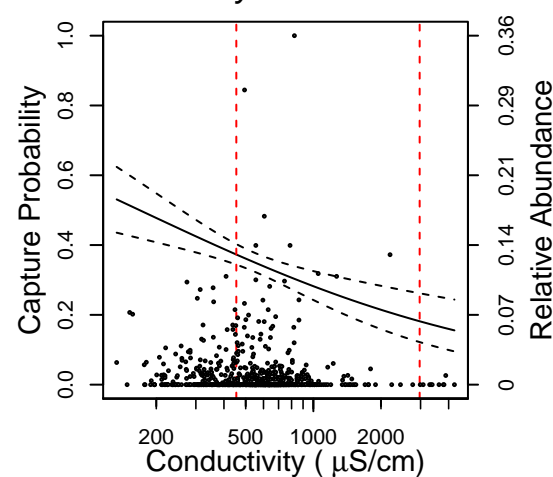
*Dreissenidae*



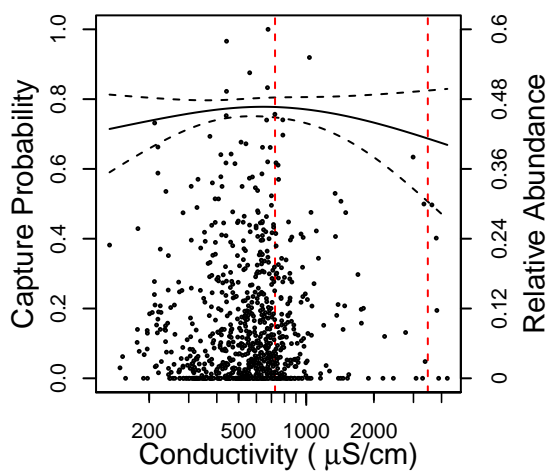
*Dryopidae*



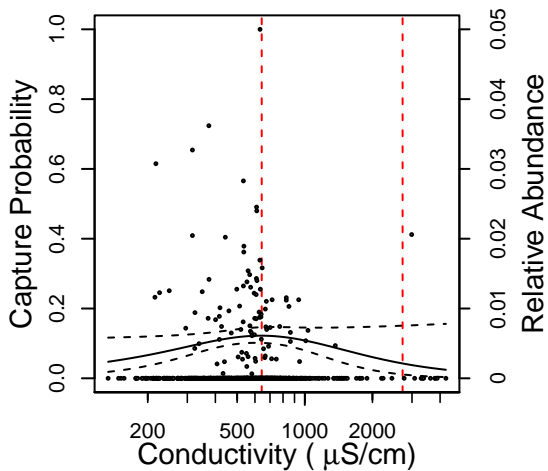
*Dytiscidae*



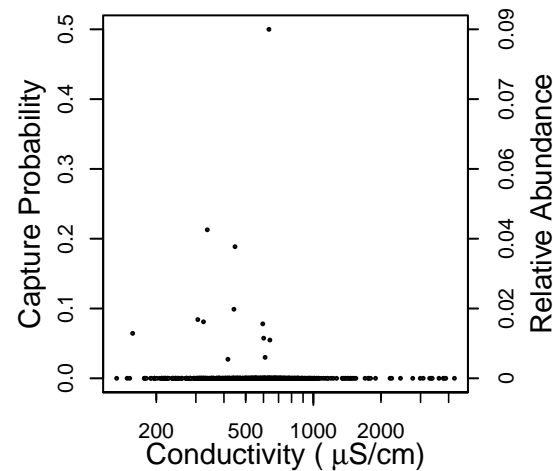
*Elmidae*



*Empididae*

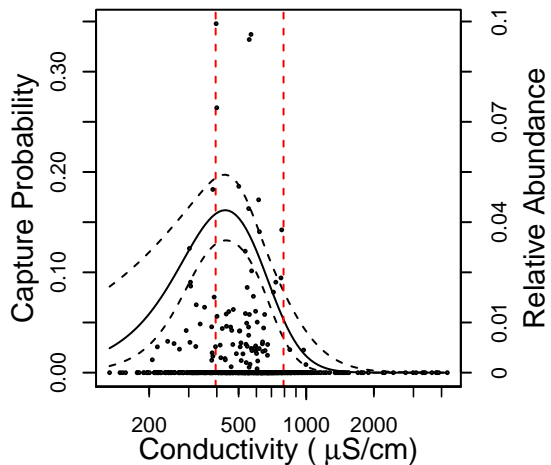


*Ephemerellidae*

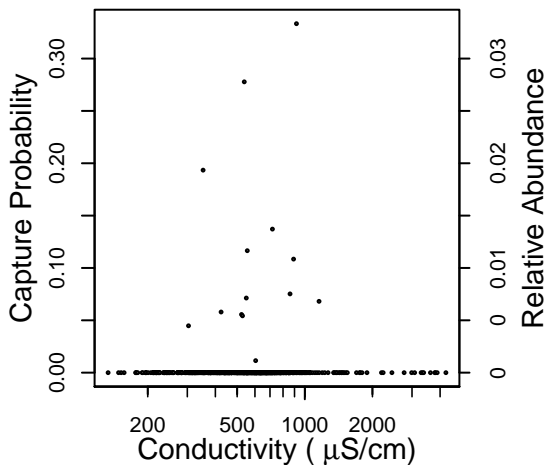


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

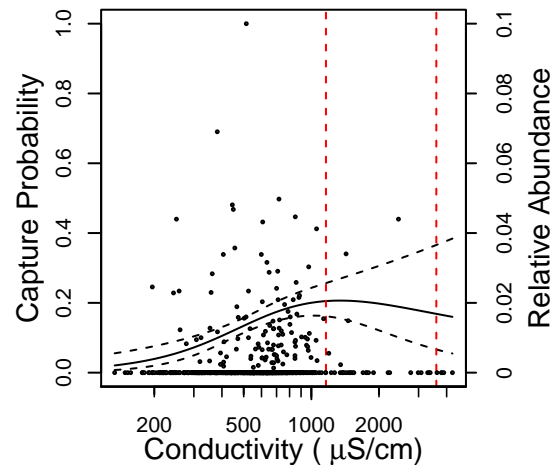
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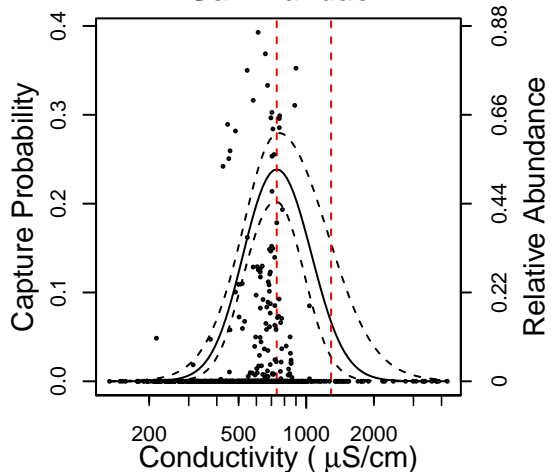
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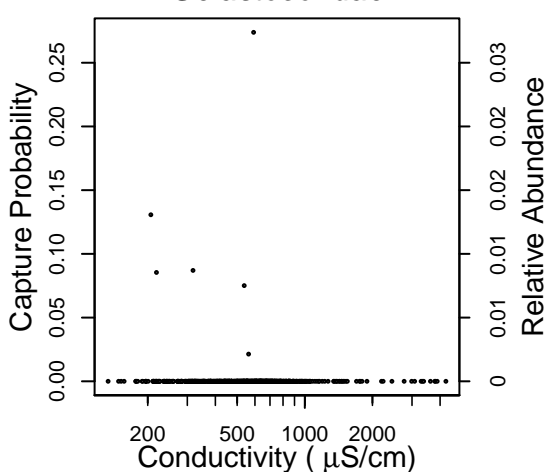
*Erpobdellidae*



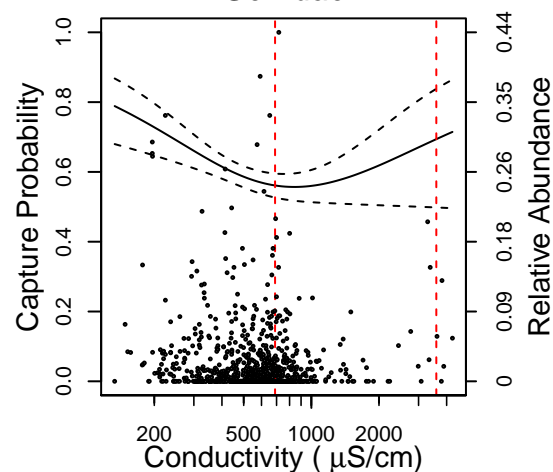
*Gammaridae*



*Gelastocoridae*

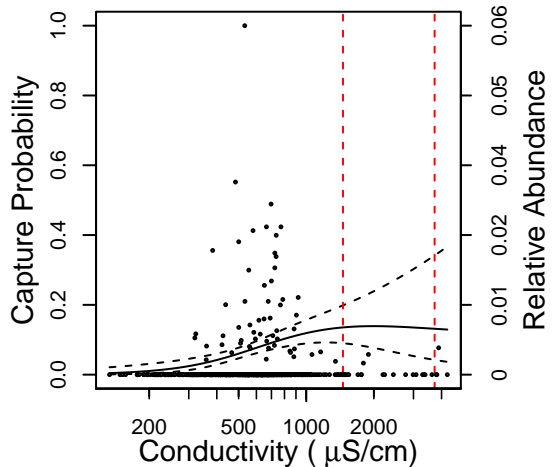


*Gerridae*

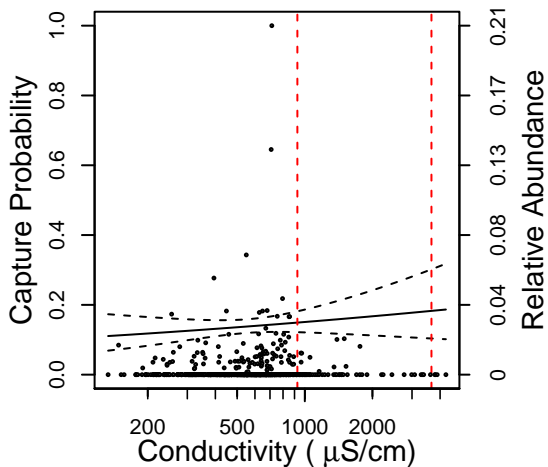


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

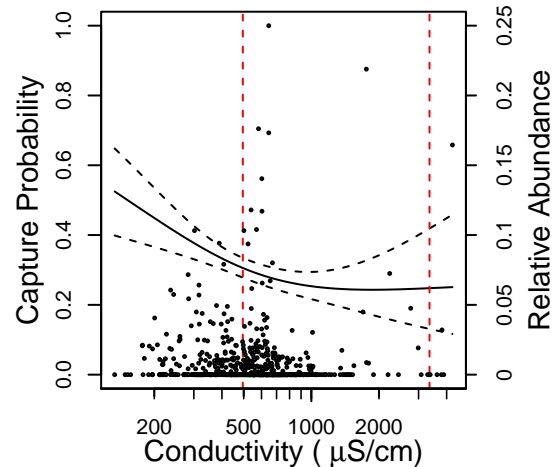
*GERRIDAE*



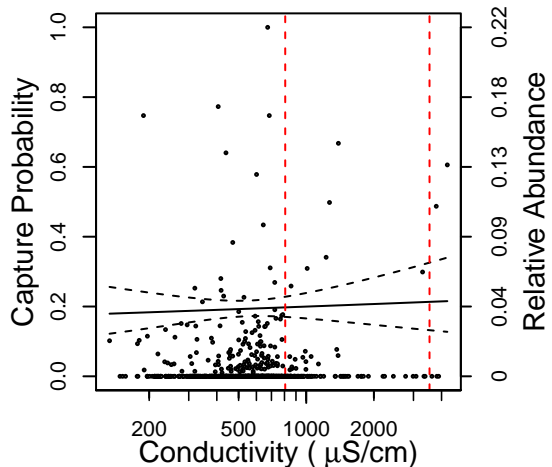
*Glossiphoniidae*



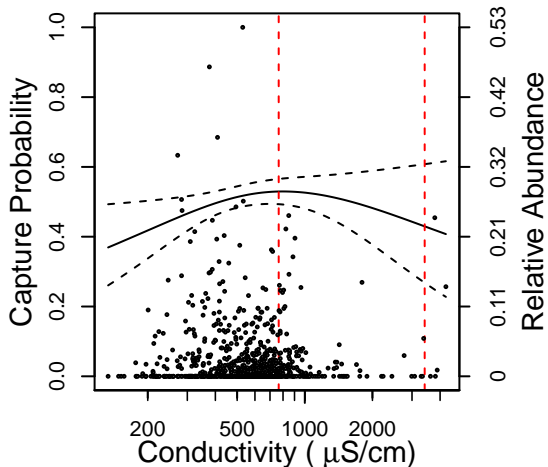
*Gomphidae*



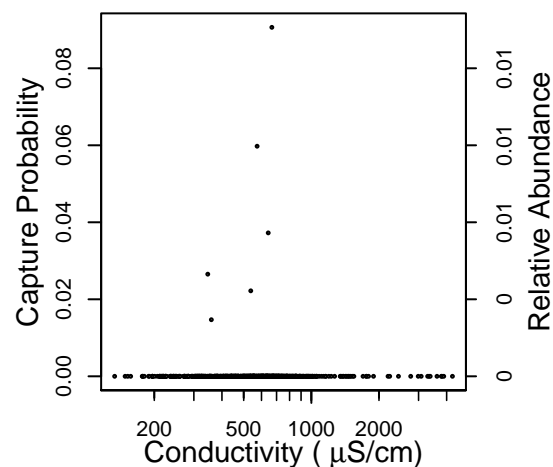
*Gyrinidae*



*Haliplidae*



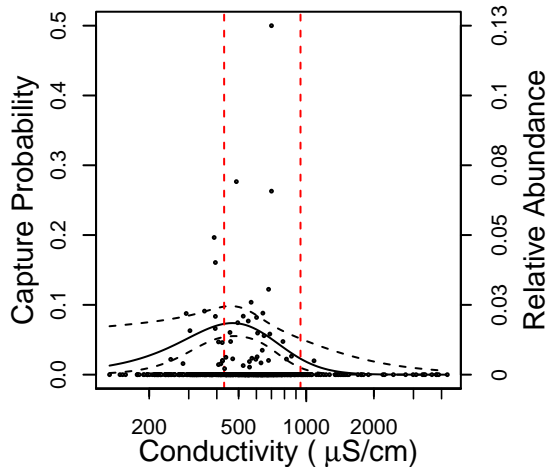
*Hebridae*



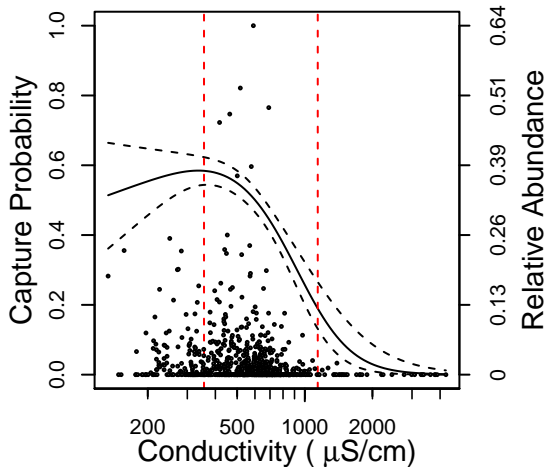


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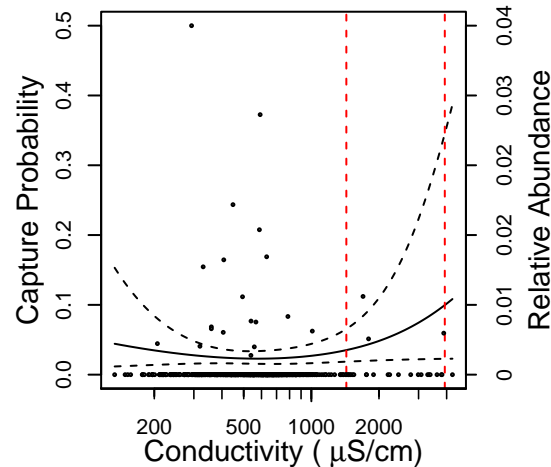
*Helicopsychidae*



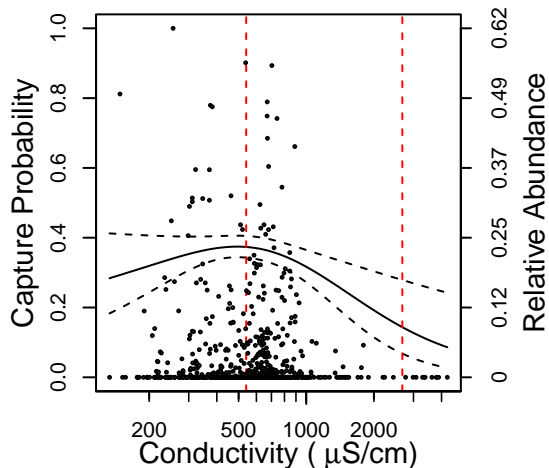
*Heptageniidae*



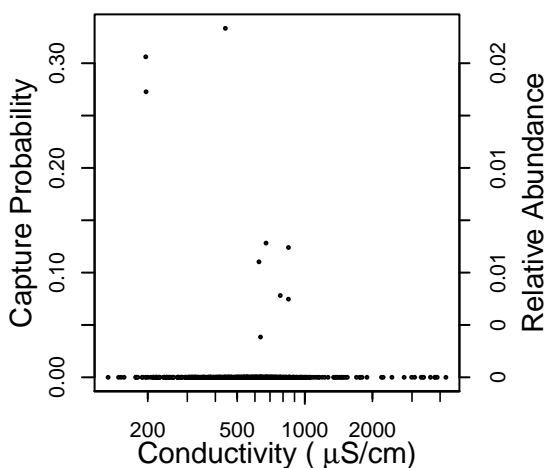
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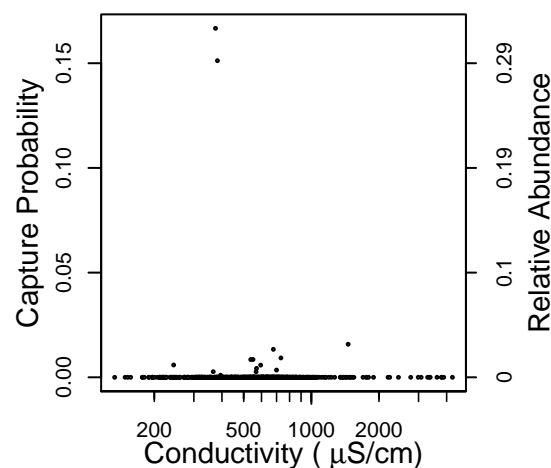
*Hyalellidae*



*Hydraenidae*

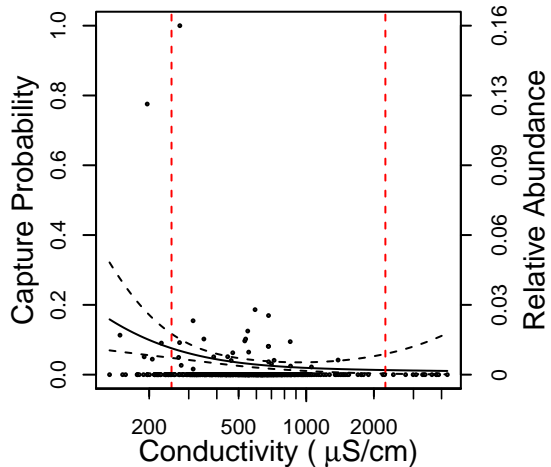


*Hydrobiidae*

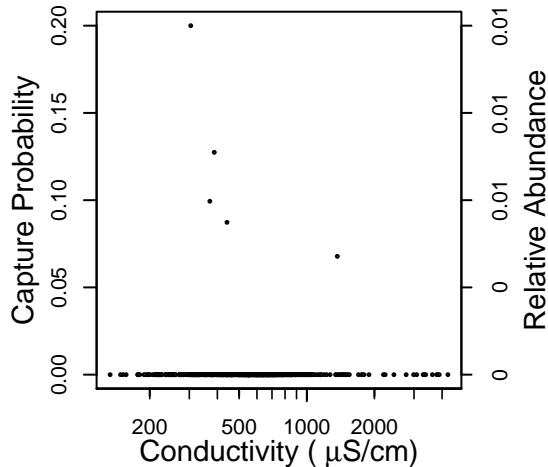


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

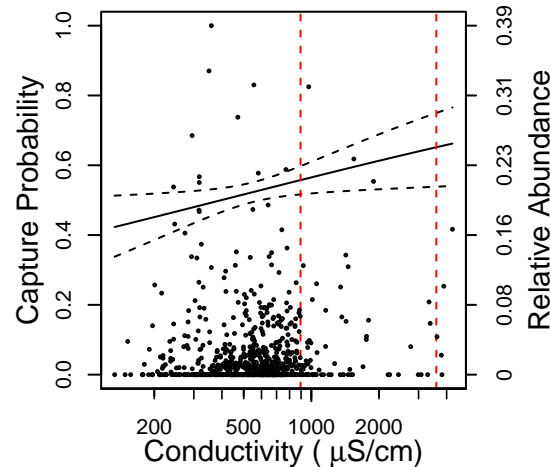
*Hydrochidae*



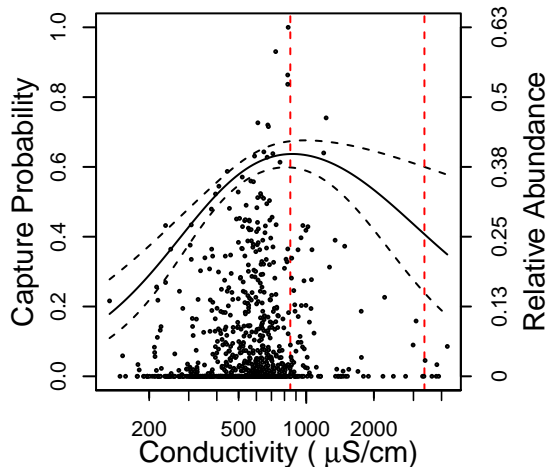
*Hydrometridae*



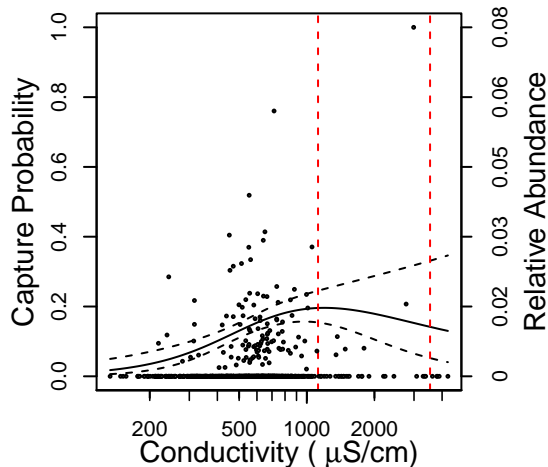
*Hydrophilidae*



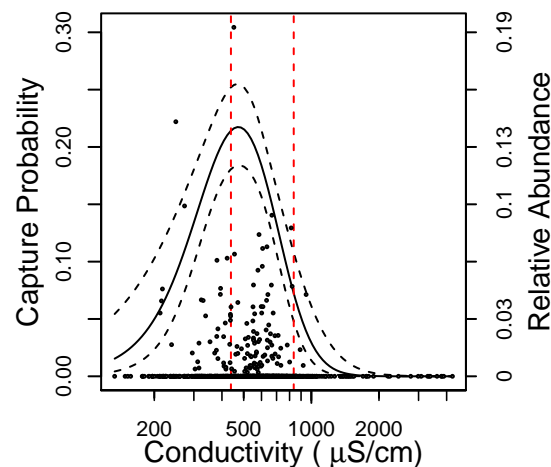
*Hydropsychidae*



*Hydroptilidae*

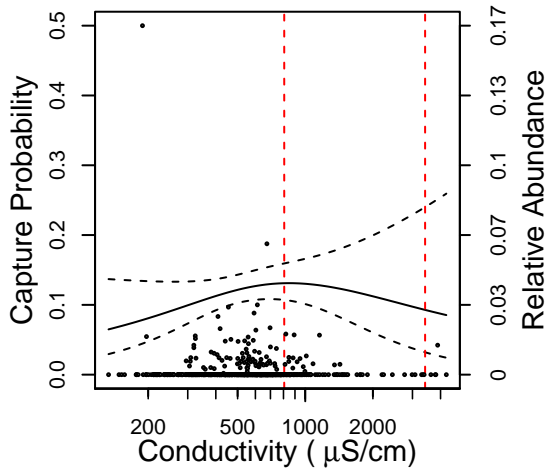


*Isonychiidae*

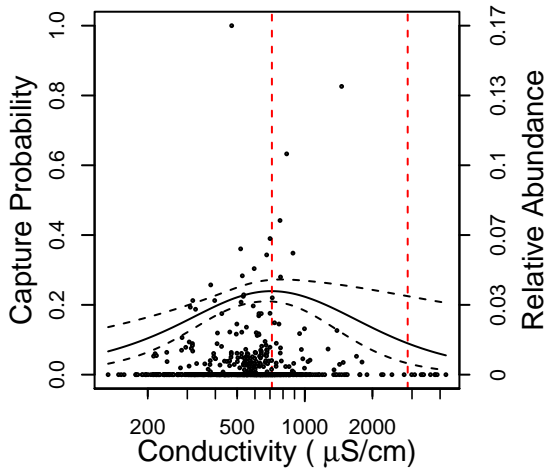


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

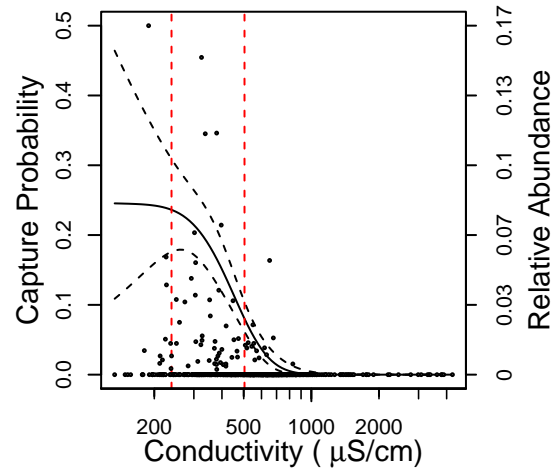
*Isotomidae*



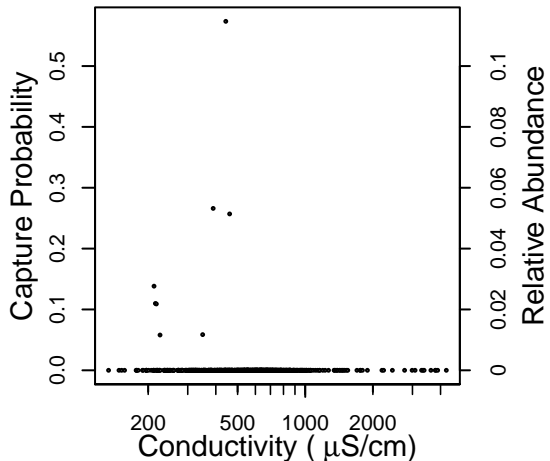
*Leptoceridae*



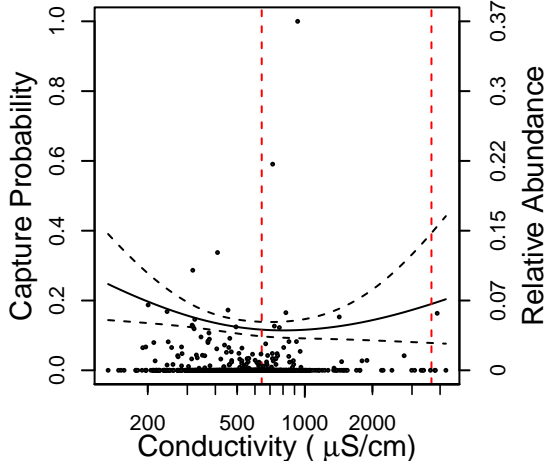
*Leptophlebiidae*



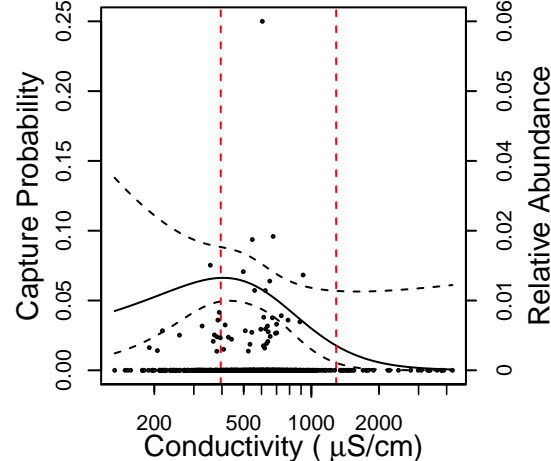
*Leuctridae*



*Libellulidae*

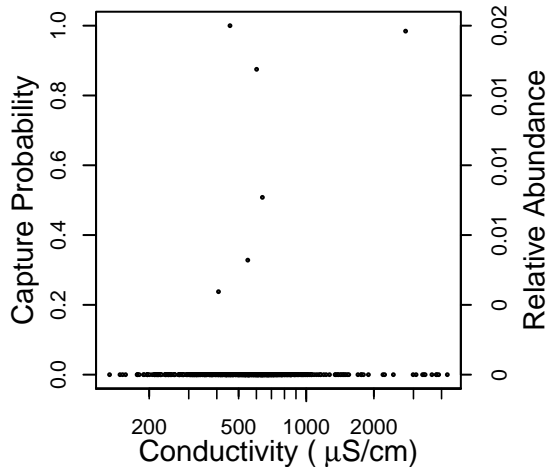


*Limnephilidae*

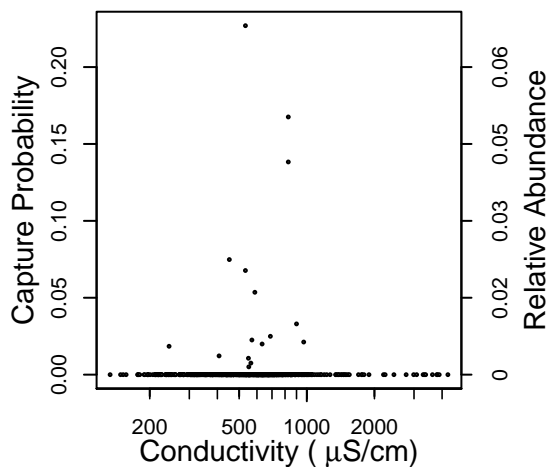


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

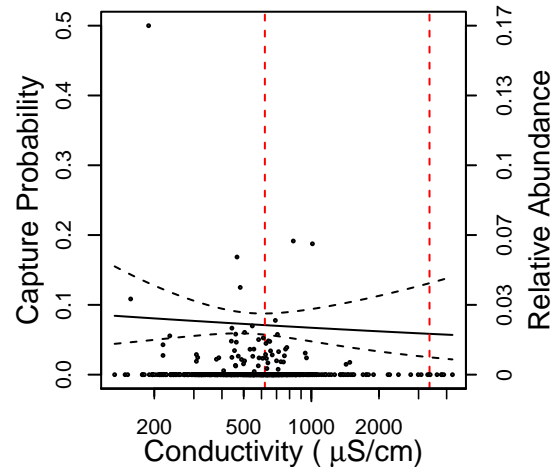
*Limnichidae*



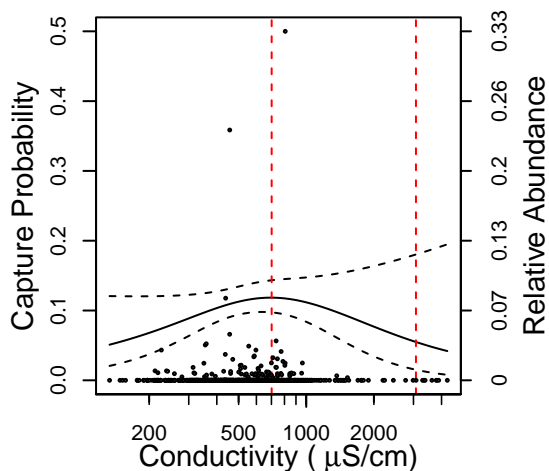
*Lumbricidae*



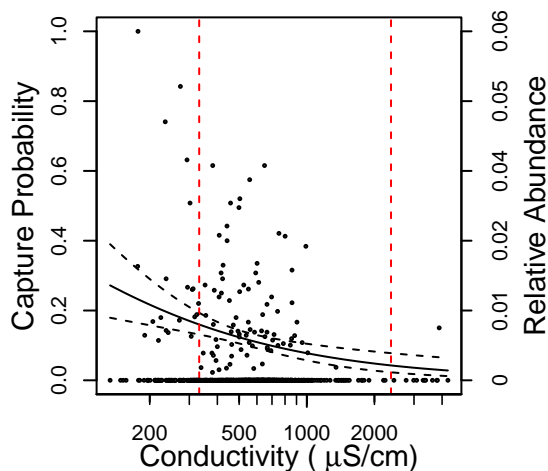
*Lumbriculidae*



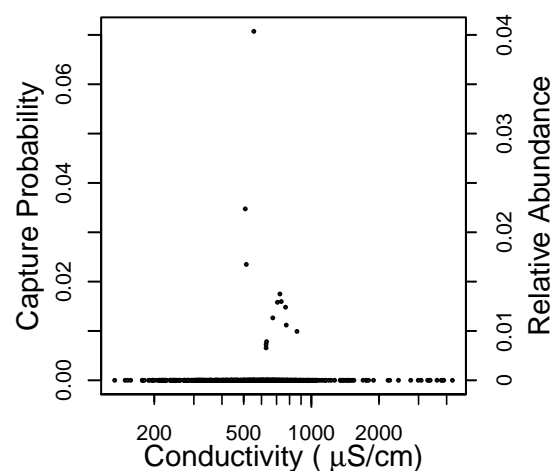
*Lymnaeidae*



*Mesoveliidae*

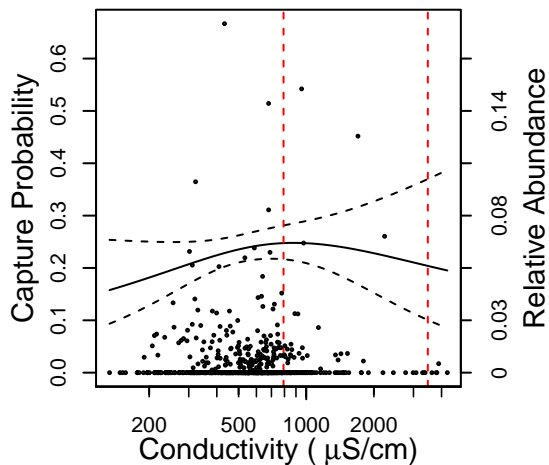


*Muscidae*

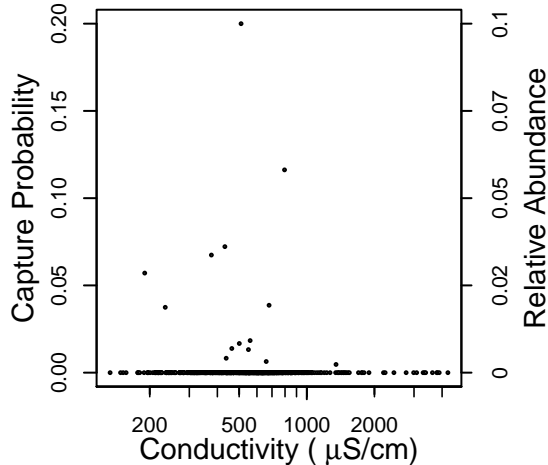


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

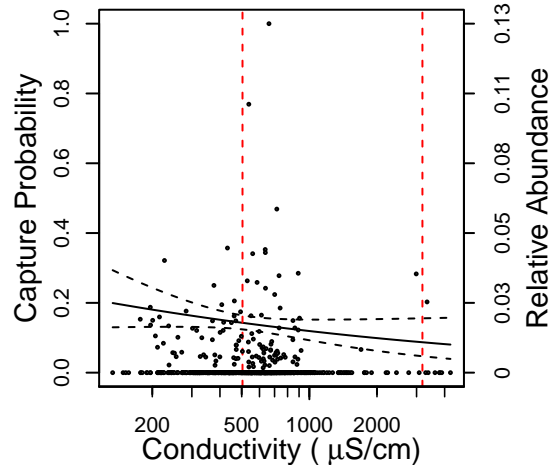
*Naididae*



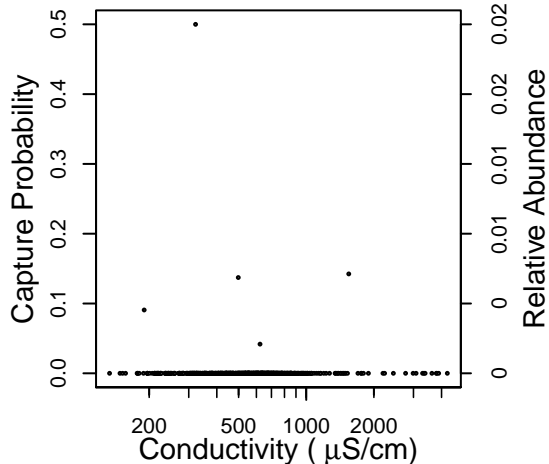
*Naucoridae*



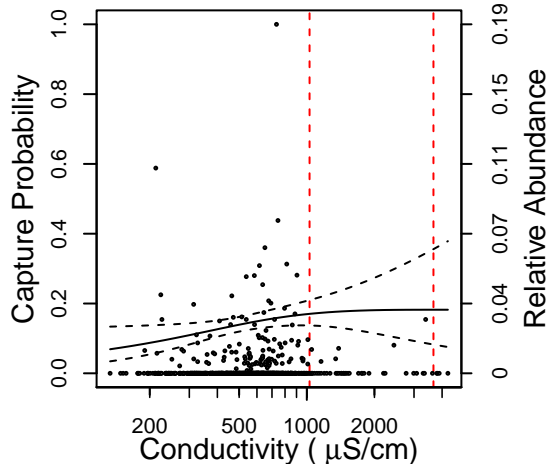
*Nepidae*



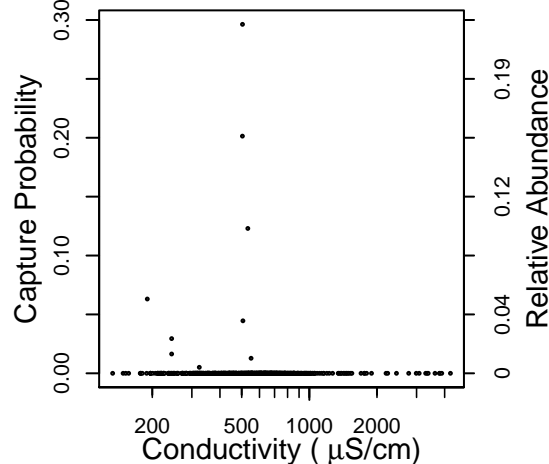
*Noteridae*



*Notonectidae*

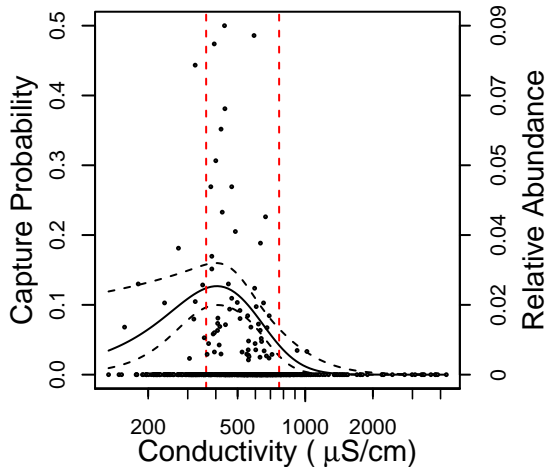


*Palaemonidae*

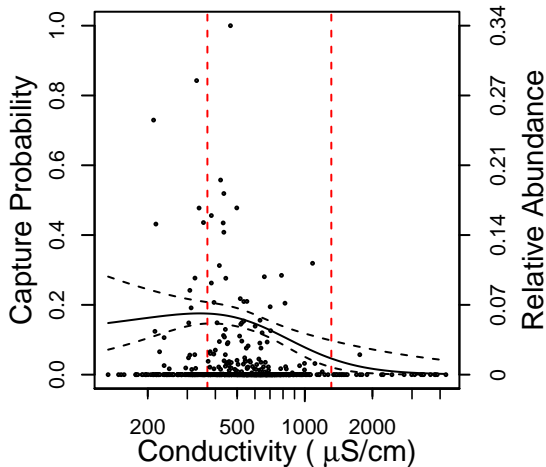


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

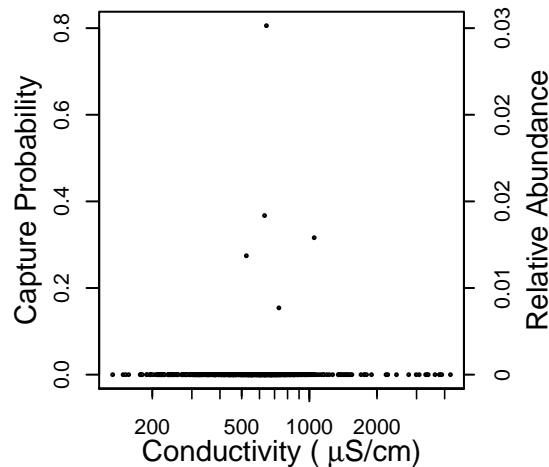
*Perlidae*



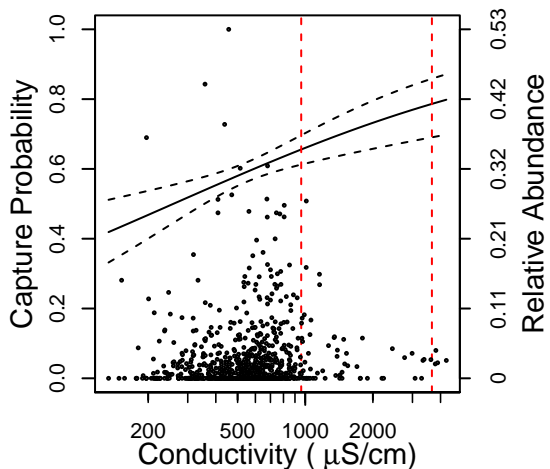
*Philopotamidae*



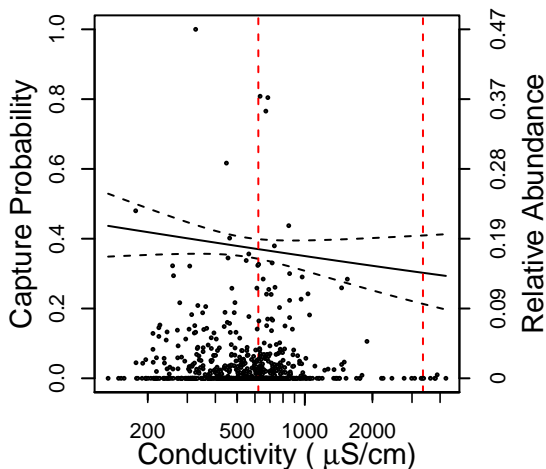
*Phryganeidae*



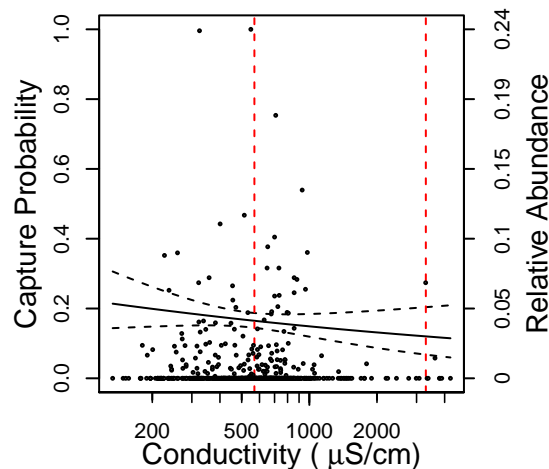
*Physidae*



*Pisidiidae*

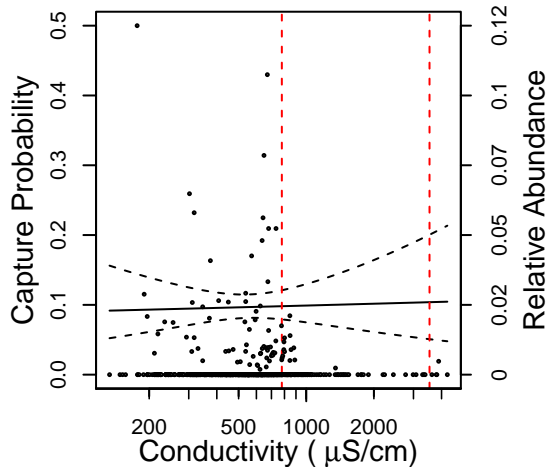


*Planorbidae*

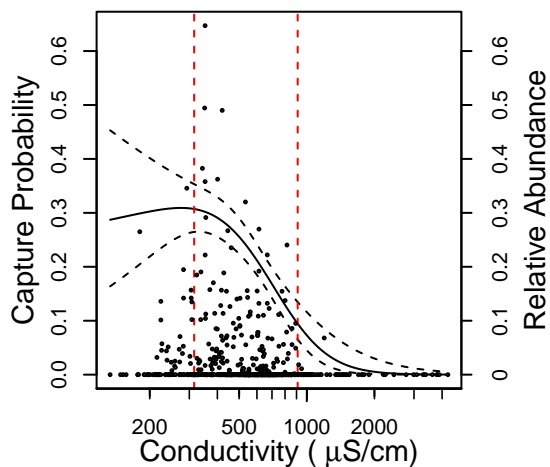


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

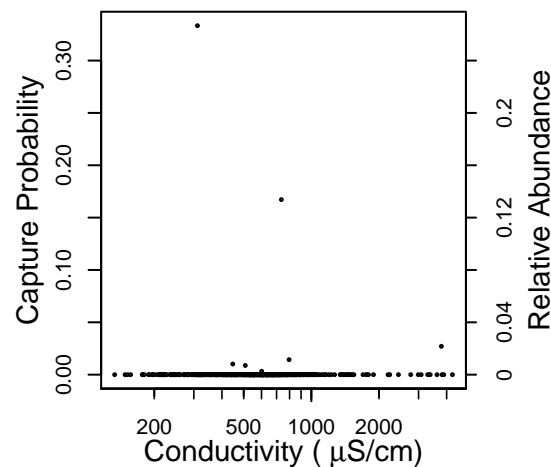
*Pleidae*



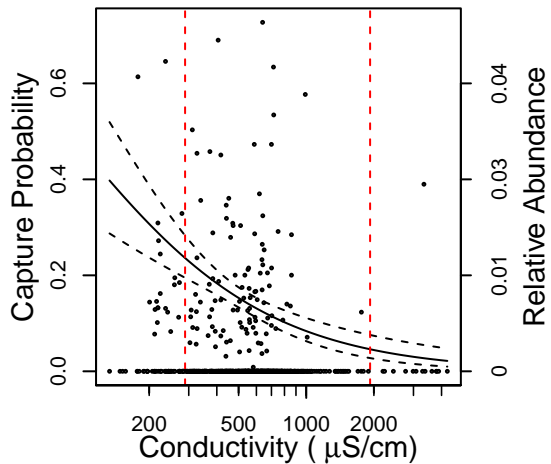
*Pleuroceridae*



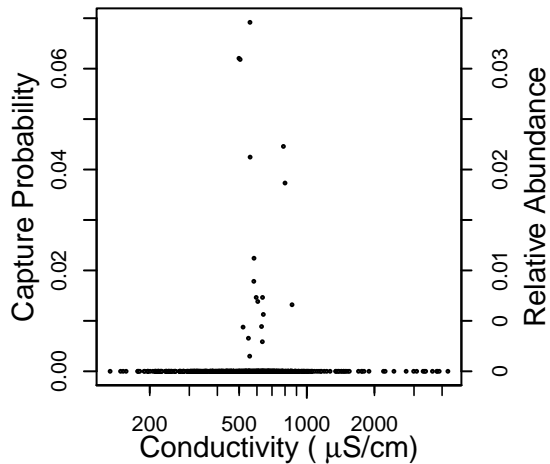
*Poduridae*



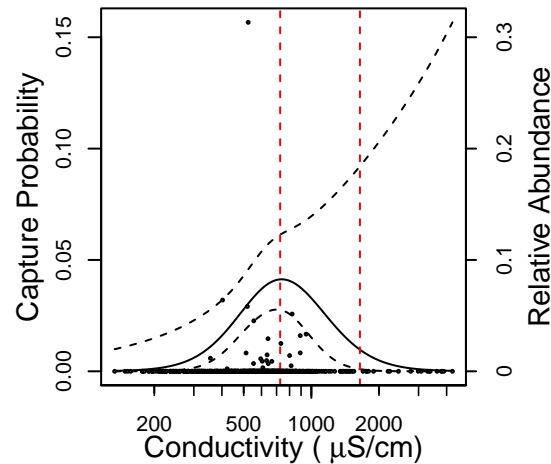
*Polycentropodidae*



*Polymitarcyidae*

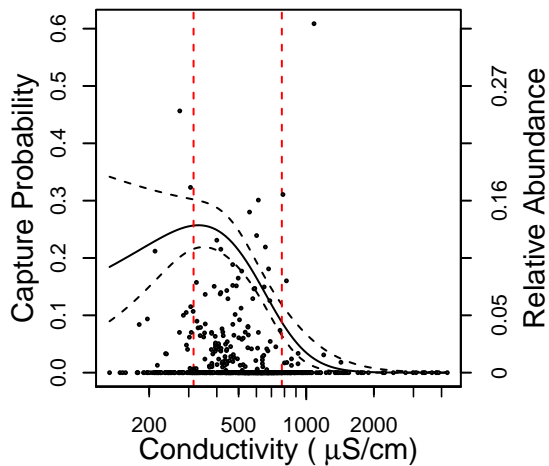


*Potamanthidae*

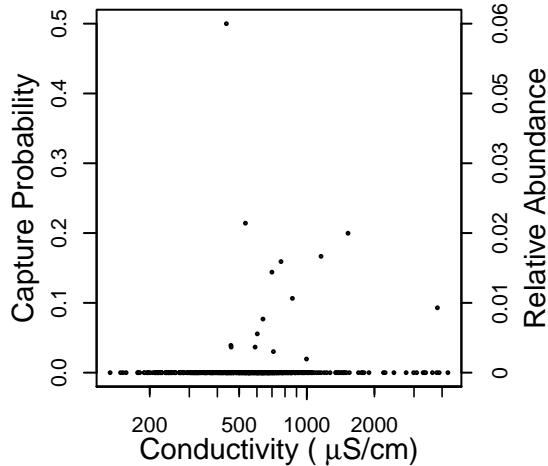


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

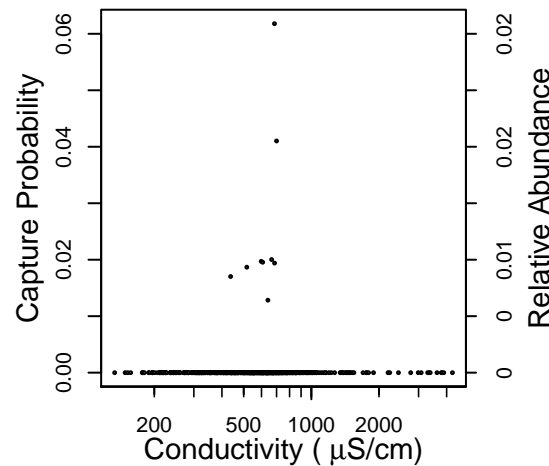
*Psephenidae*



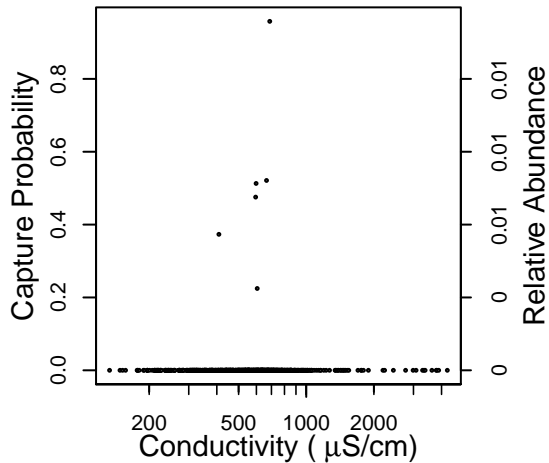
*Psychodidae*



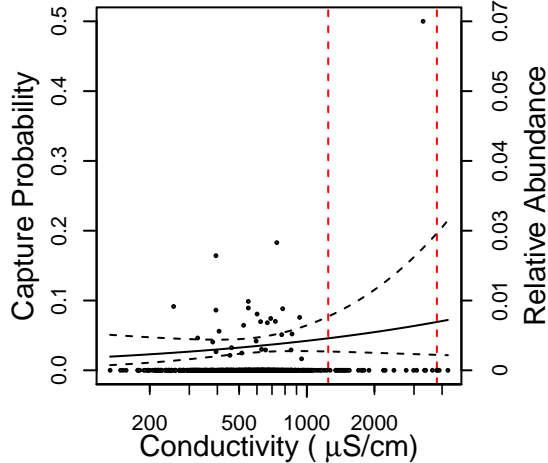
*Psychomyiidae*



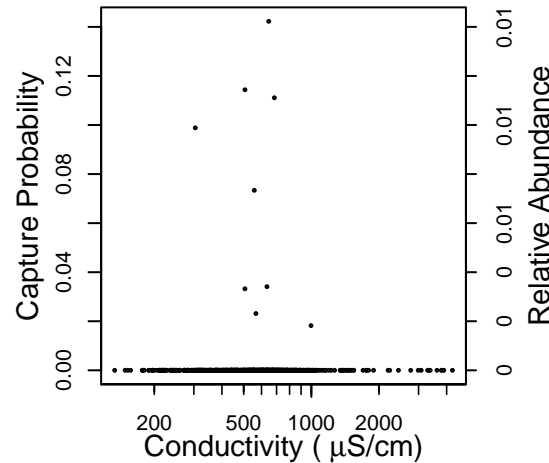
*Pteronarcyidae*



*Pyralidae*



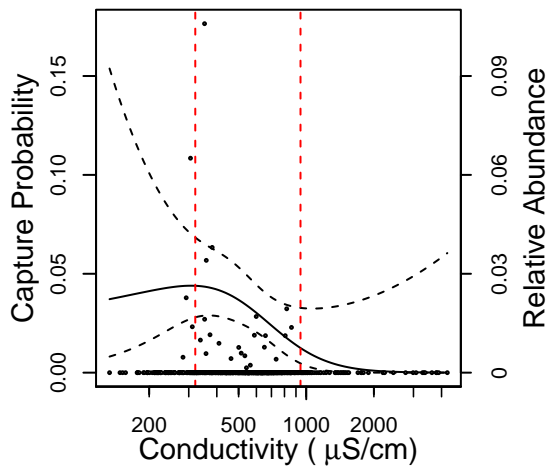
*Saldidae*



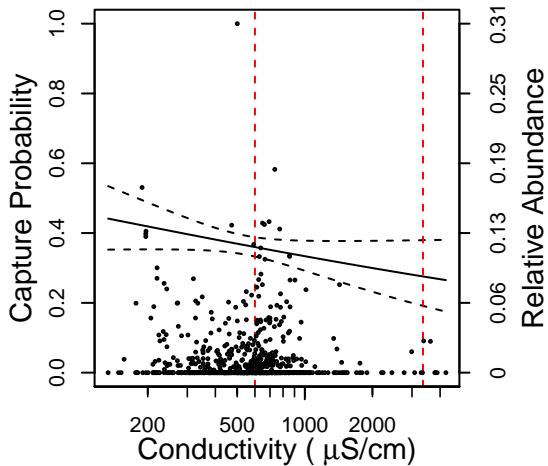


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

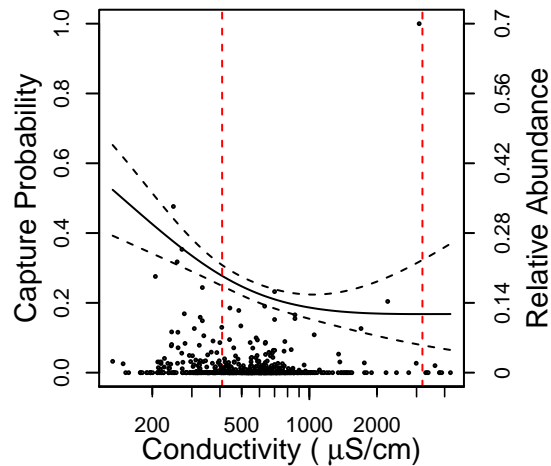
*Sciomyzidae*



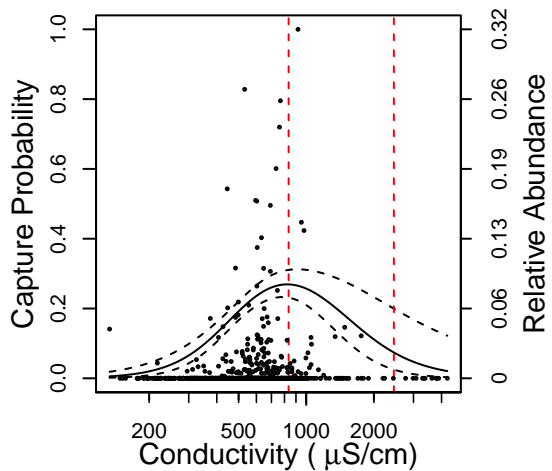
*Scirtidae*



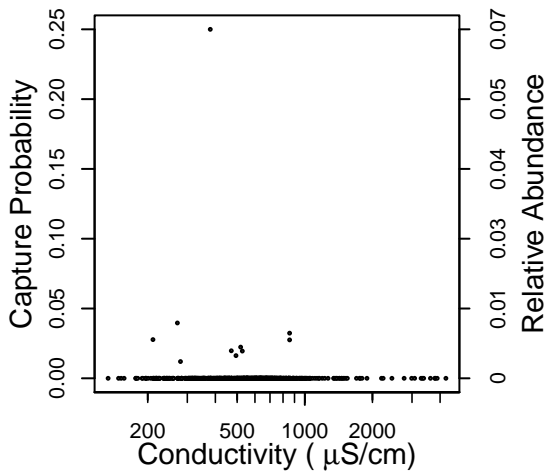
*Sialidae*



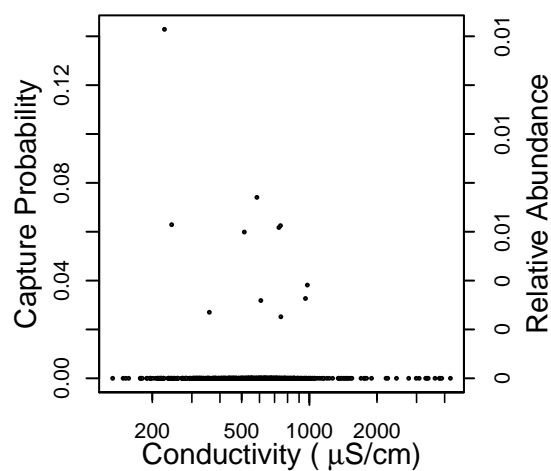
*Simuliidae*



*Sisyridae*

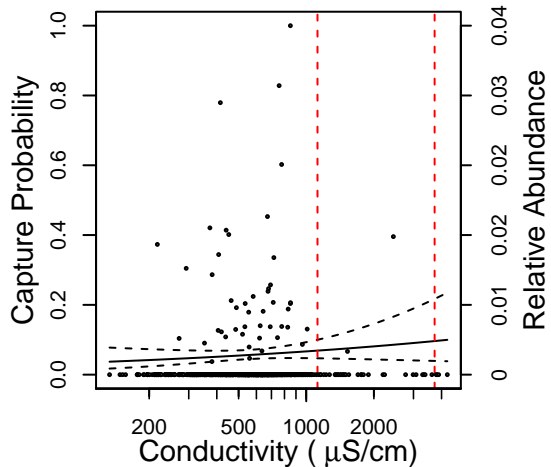


*Sminthuridae*

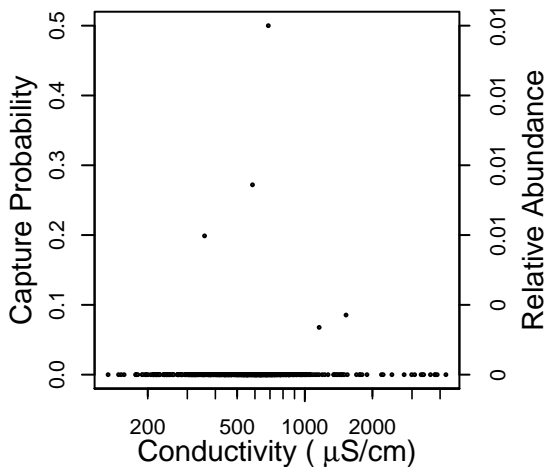


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

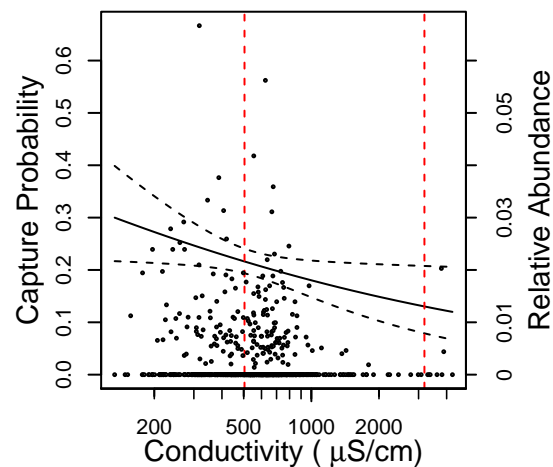
*Stratiomyidae*



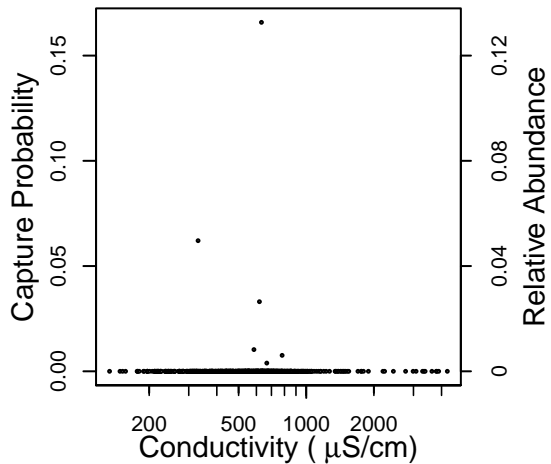
*Syrphidae*



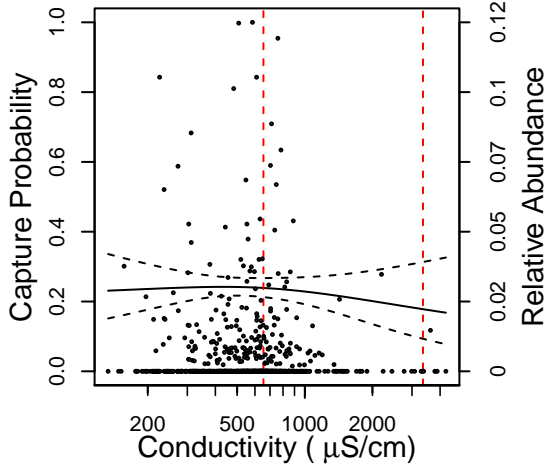
*Tabanidae*



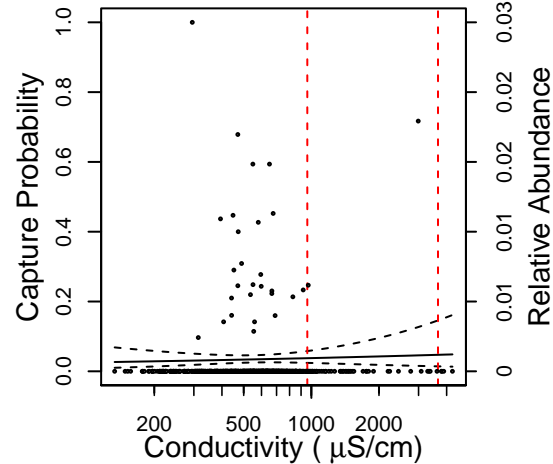
*Taeniopterygidae*



*Tipulidae*

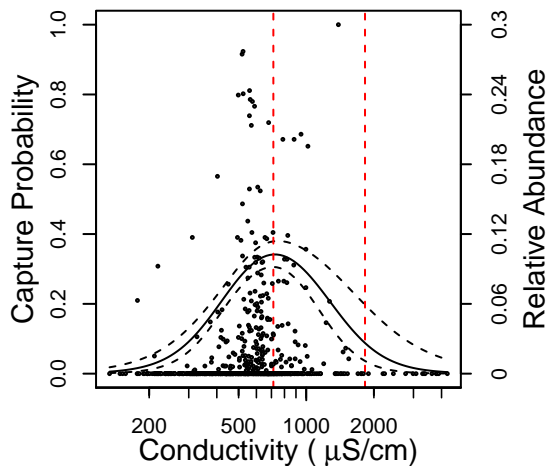


*Trichoptera*

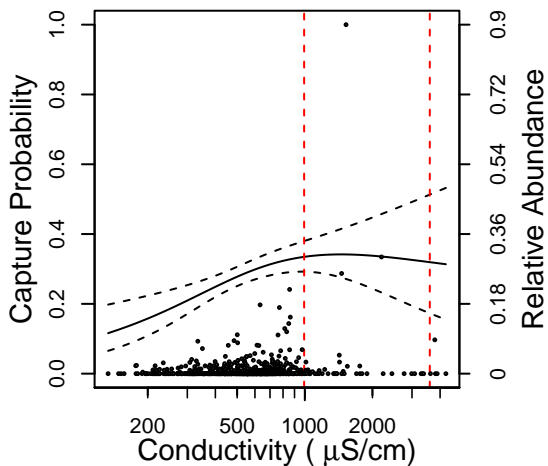


# Capture Probability of Macroinvertebrate Taxon Along Conductivity Gradient

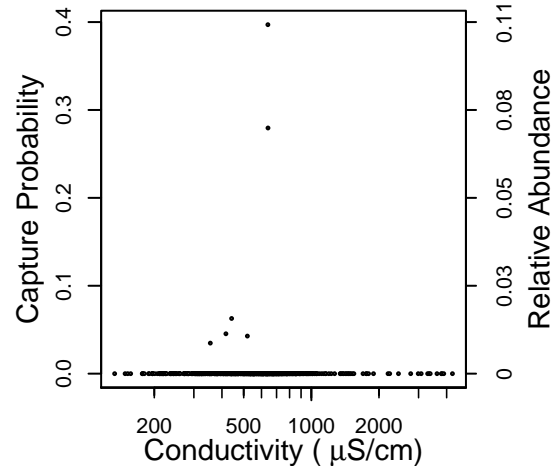
*Tricorythidae*



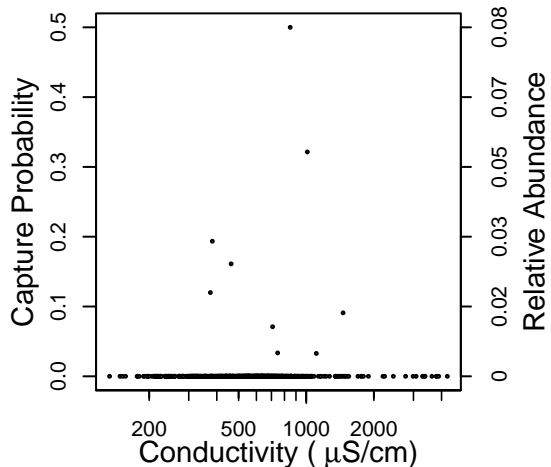
*Tubificidae*



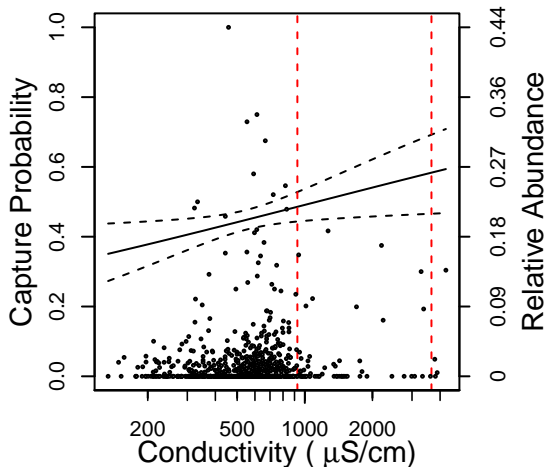
*Uenoidae*



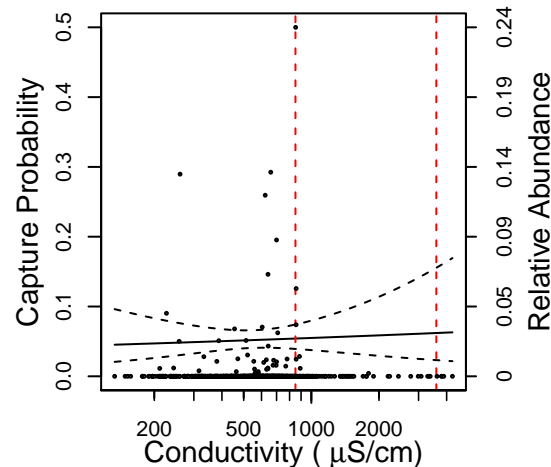
*Valvatidae*



*Veliidae*

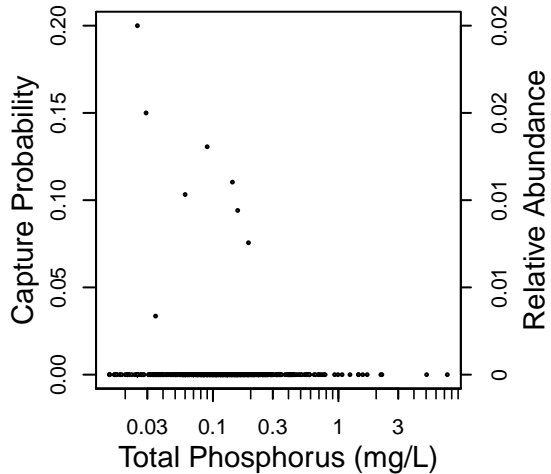


*Viviparidae*

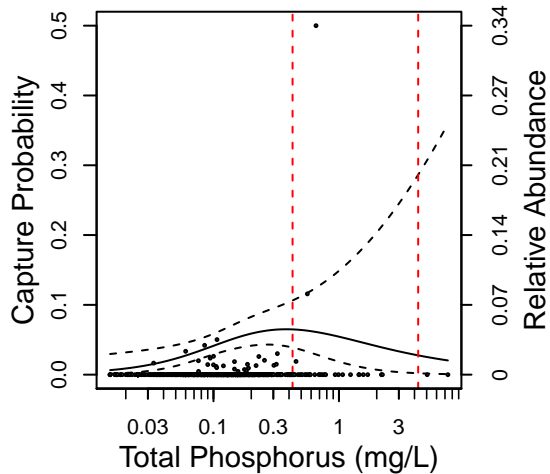


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

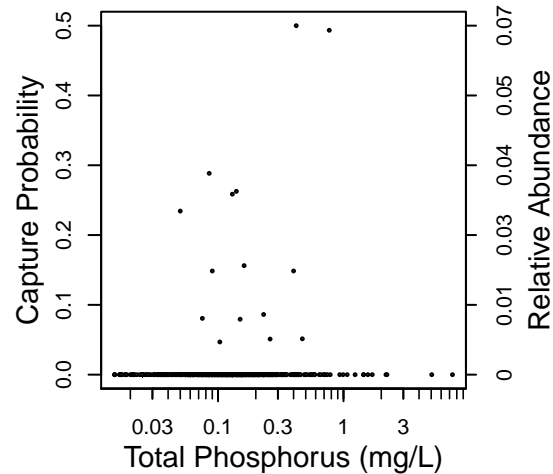
*Acerpenna pygmaea*



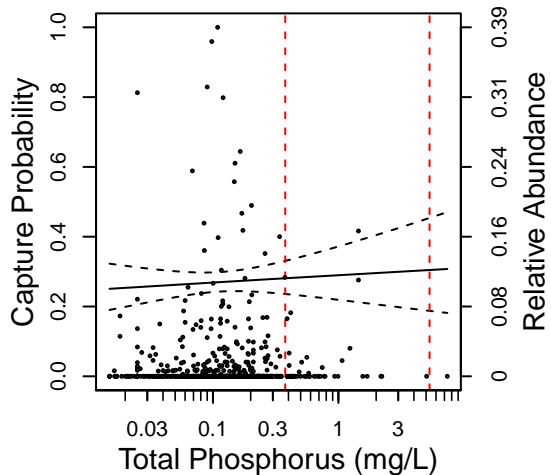
*Aeshna umbrosa*



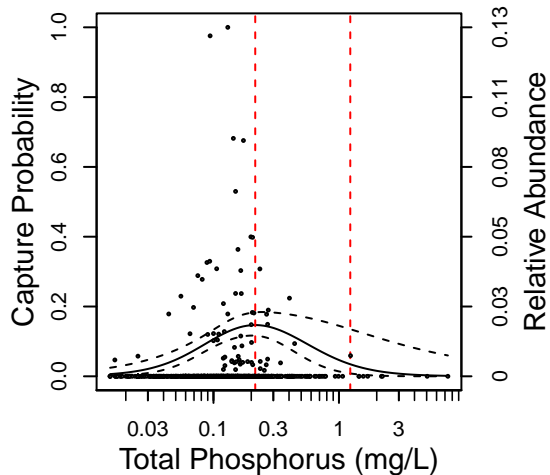
*Anax junius*



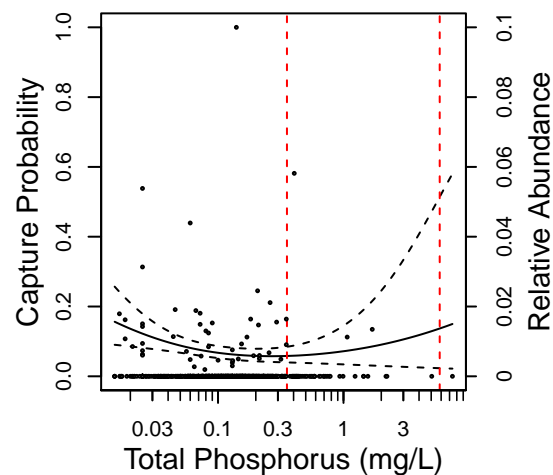
*Ancyronyx variegatus*



*Argia apicalis*

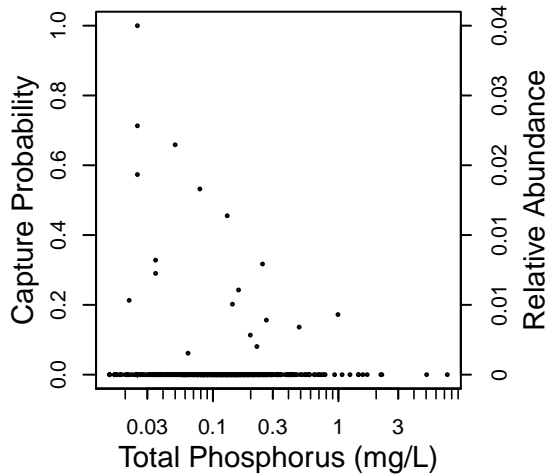


*Argia fumipennis violacea*

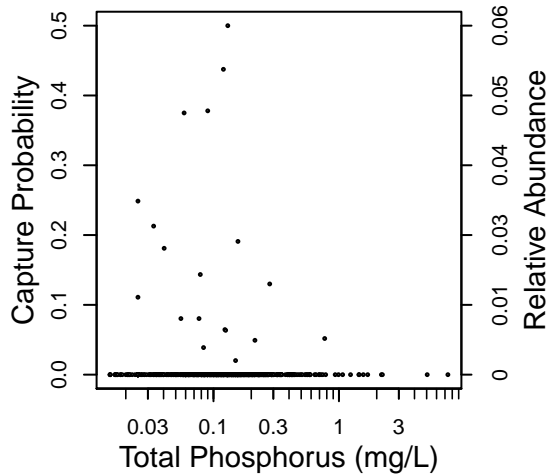


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

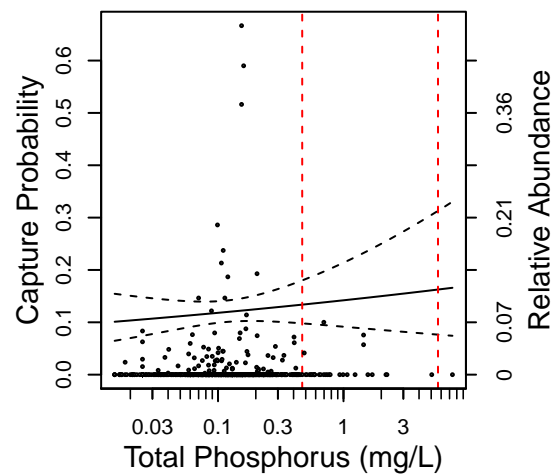
*Argia moesta*



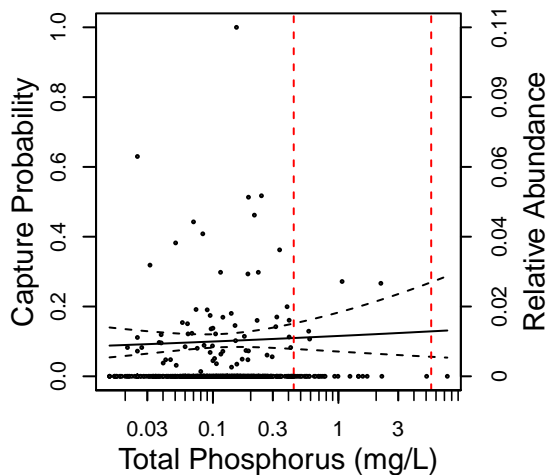
*Argia sedula*



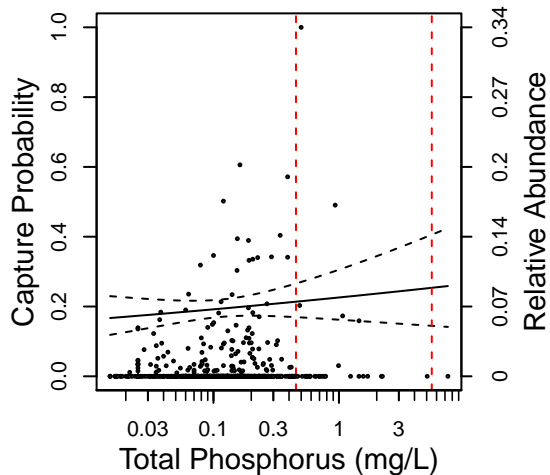
*Argia tibialis*



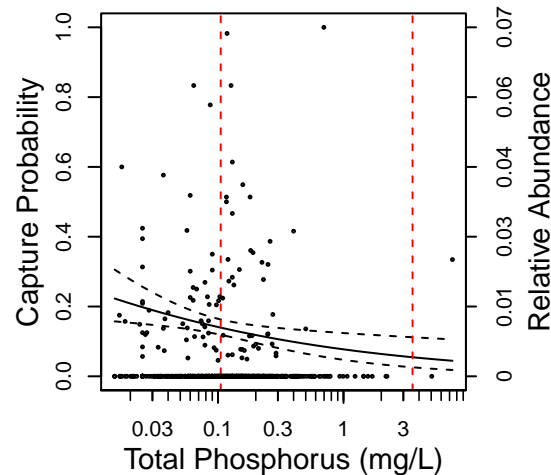
*Baetis flavistriga*



*Baetis intercalaris*

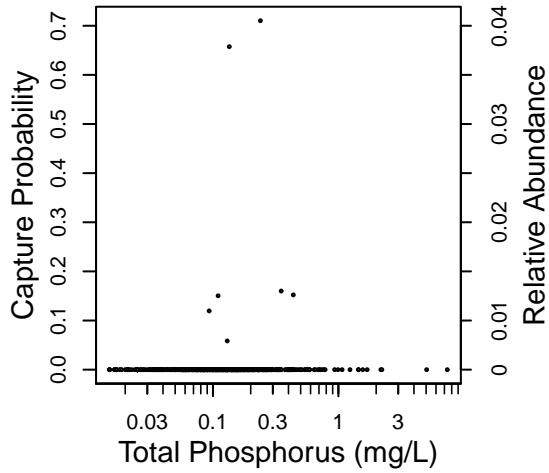


*Basiaeschna janata*

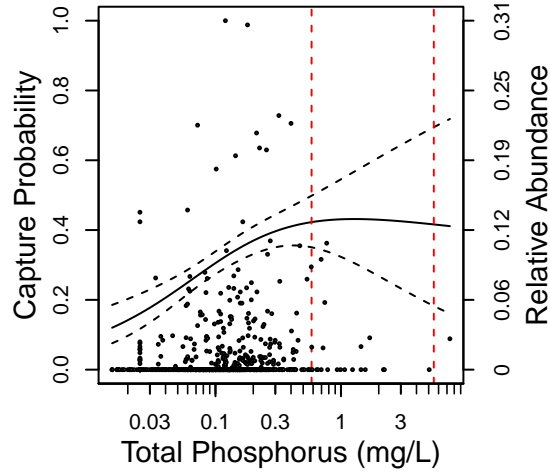


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

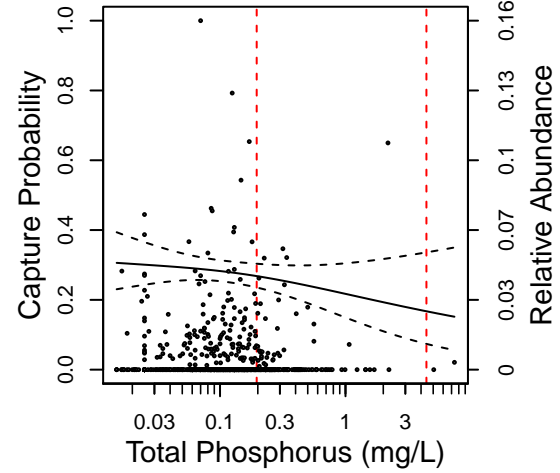
*Berosus infuscatus*



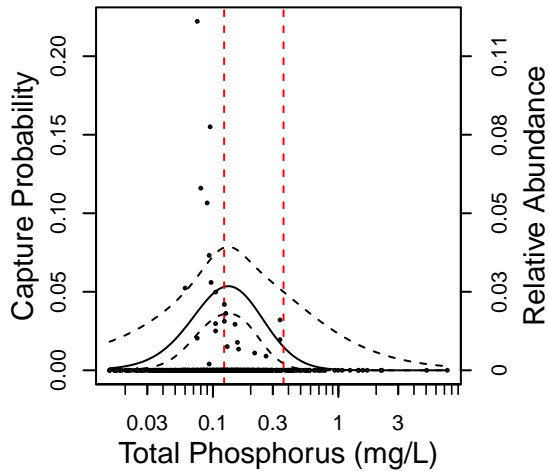
*Berosus peregrinus*



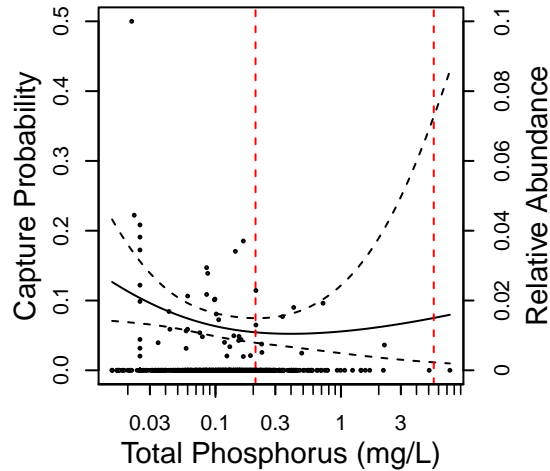
*Boyeria vinosa*



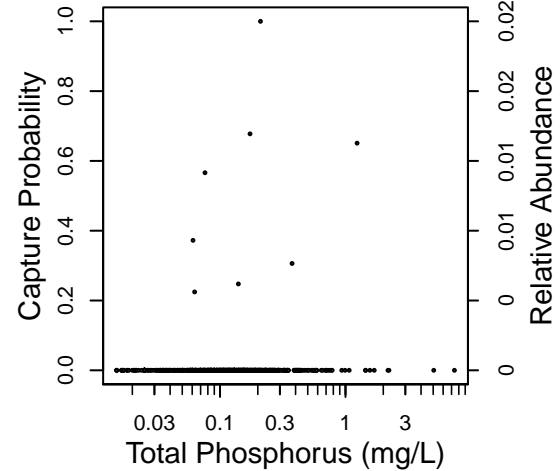
*Brachycentrus numerosus*



*Branchiura sowerbyi*

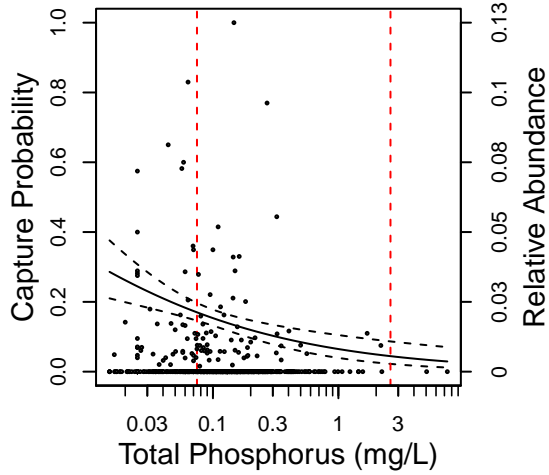


*Brillia flavifrons*

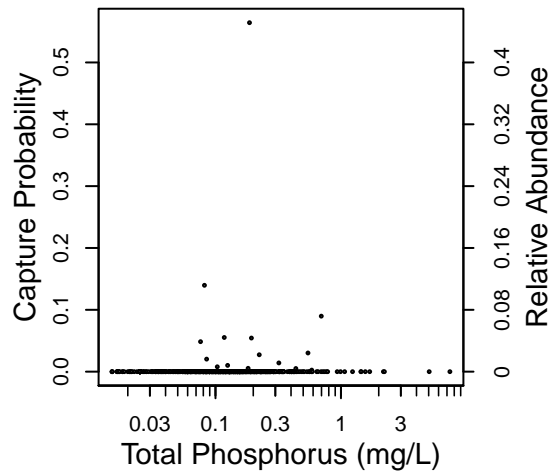


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

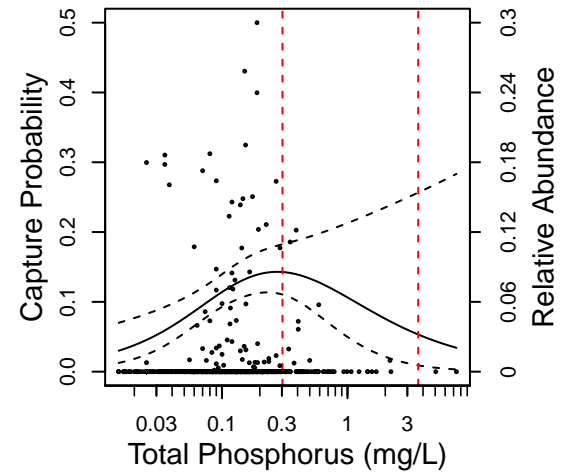
*Calopteryx maculata*



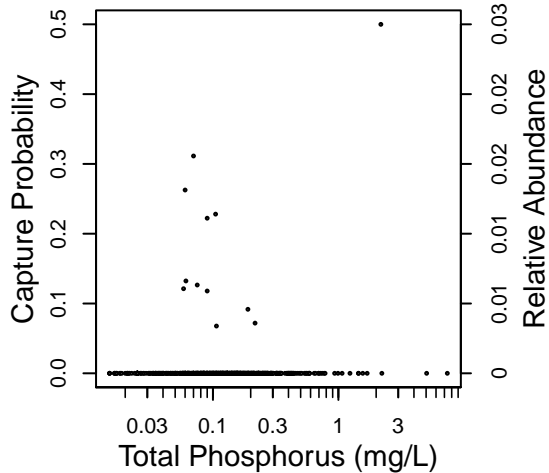
*Cambarus nebrascensis*



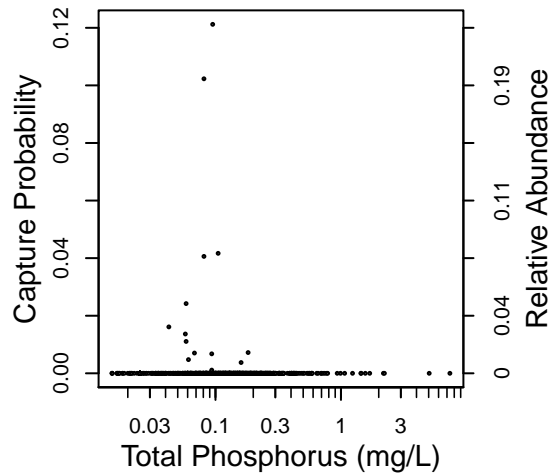
*Ceratopsyche checkerboard*



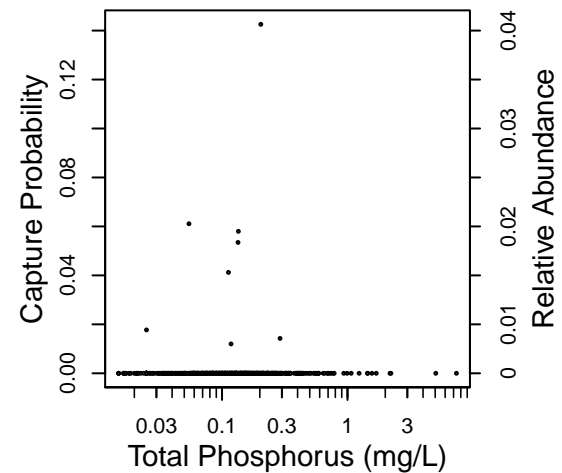
*Ceratopsyche slossonae*



*Ceratopsyche sparna*

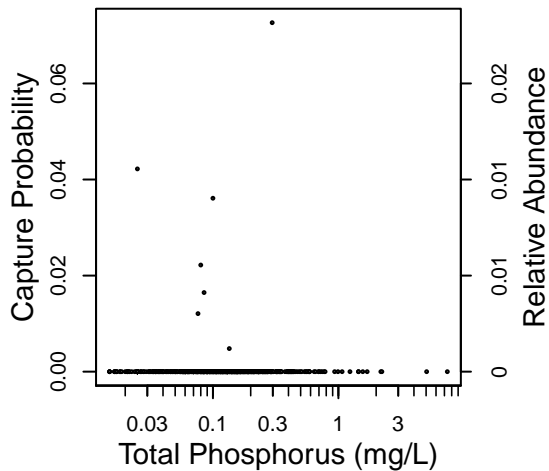


*Chauliodes pectinicornis*

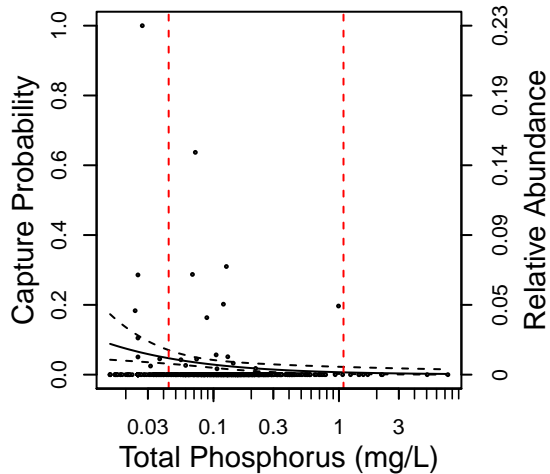


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

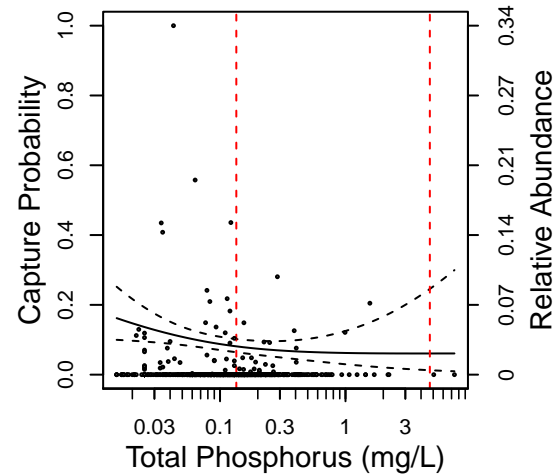
*Chauliodes rastricornis*



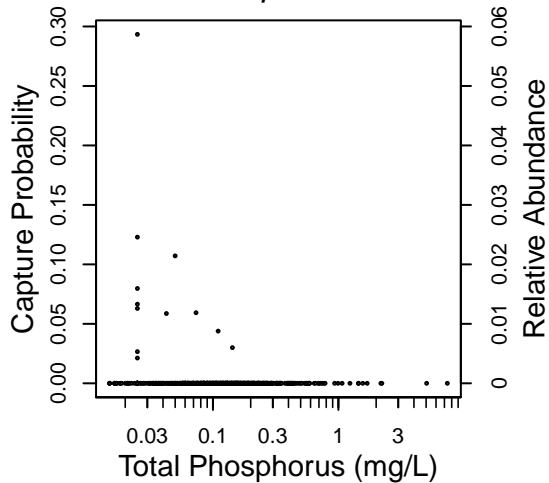
*Chimarra aterrima*



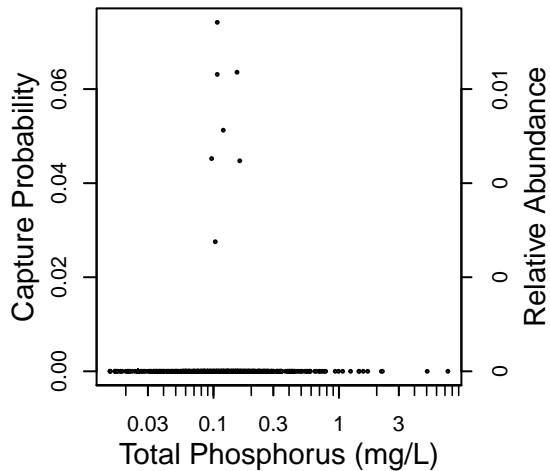
*Chimarra obscura*



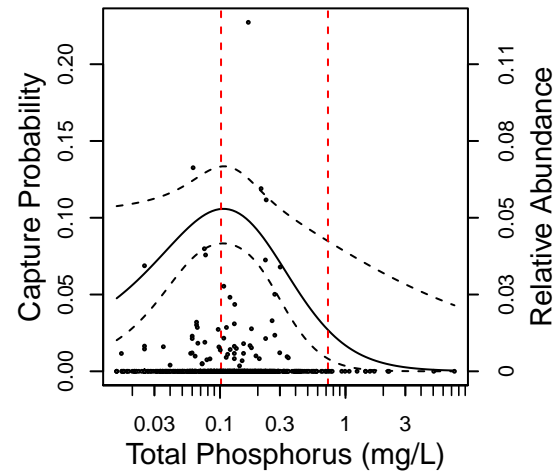
*Choroterpes basalis*



*Climacia areolaris*



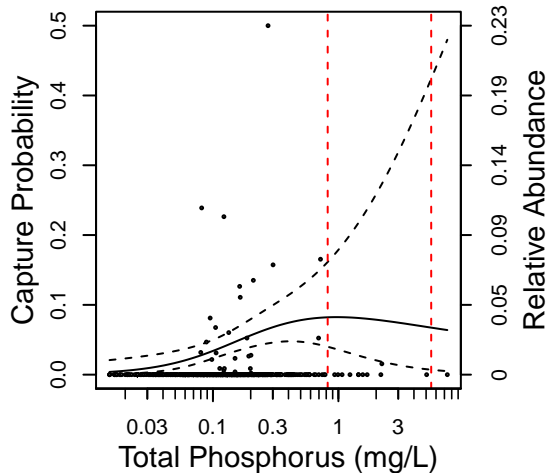
*Clinotanytus pinguis*



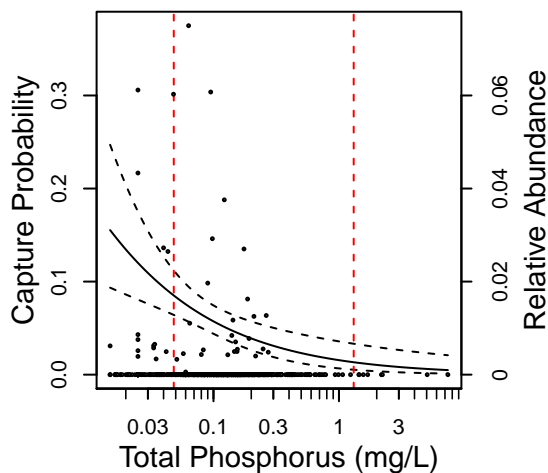


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

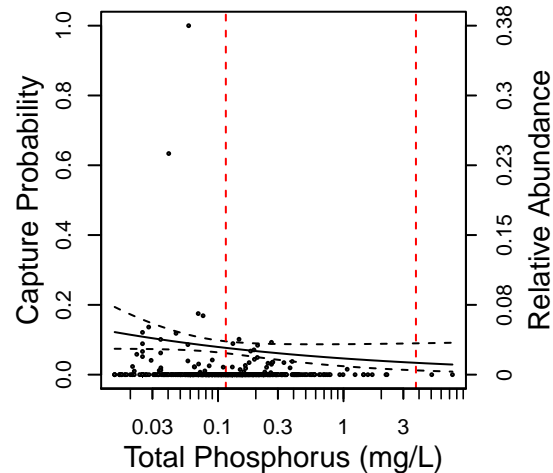
*Coptotomus loticus*



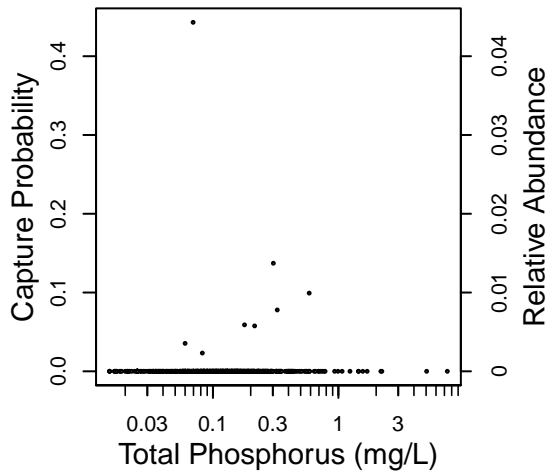
*Corydalus cornutus*



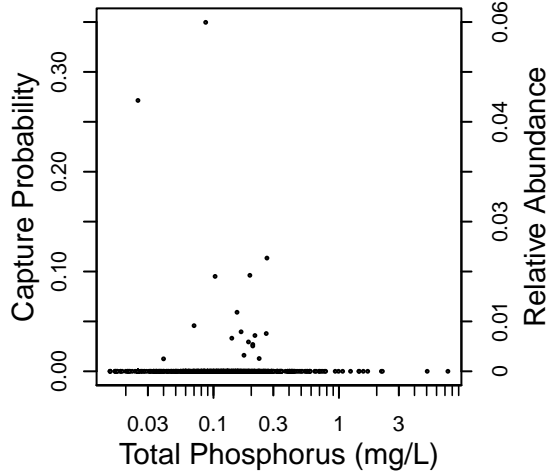
*Cricotopus (cricotopus)*



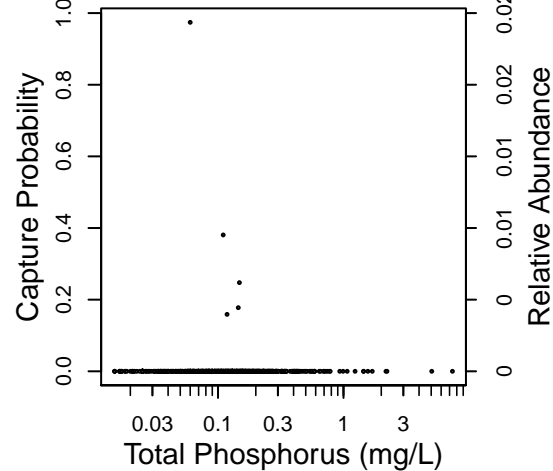
*Cricotopus sylvestris* group



*Cricotopus trifascia*

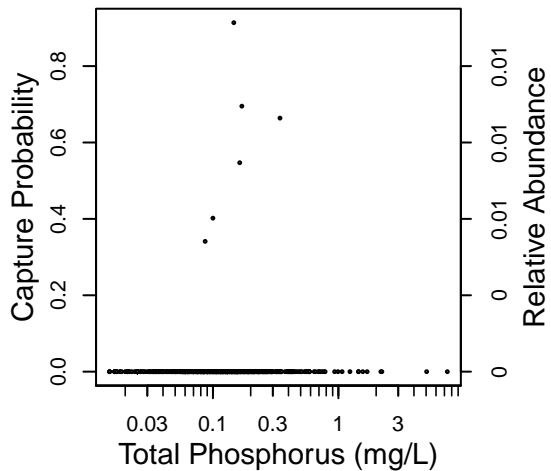


*Didymops transversa*

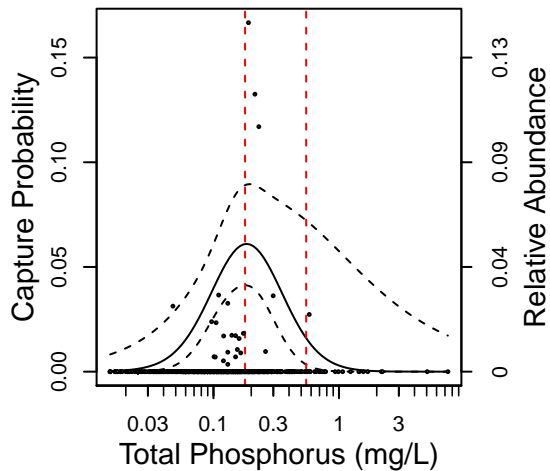


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

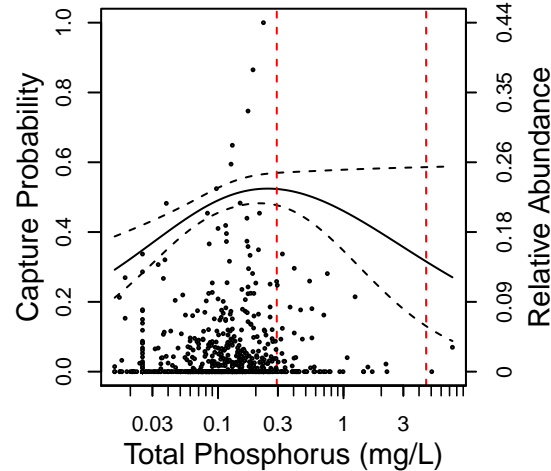
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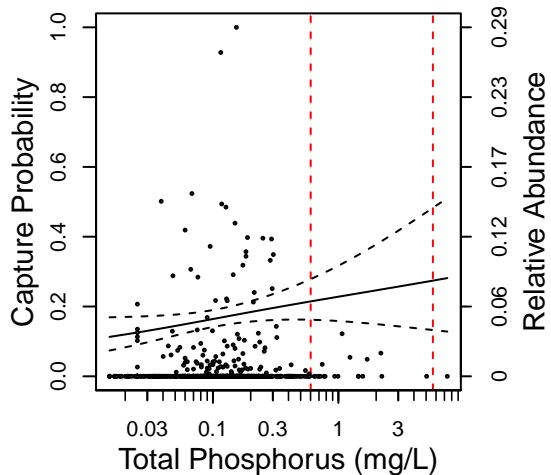
*Dubiraphia bivittata*



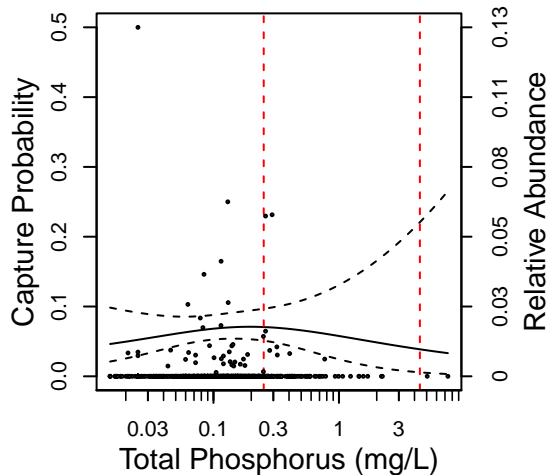
*Dubiraphia minima group*



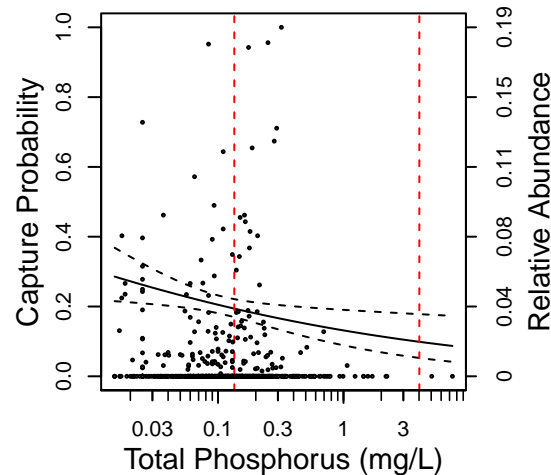
*Dubiraphia quadrinotata*



*Enallagma basidens*

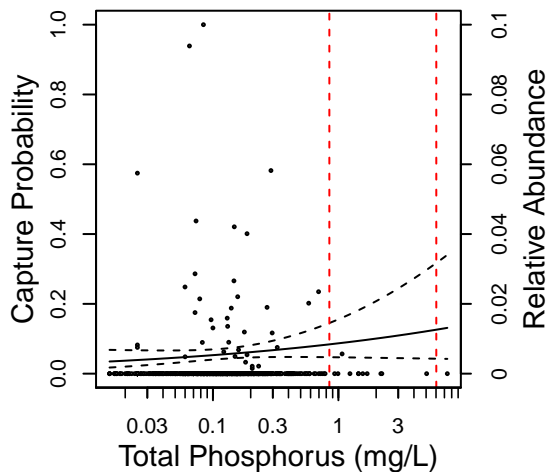


*Enallagma divagans*

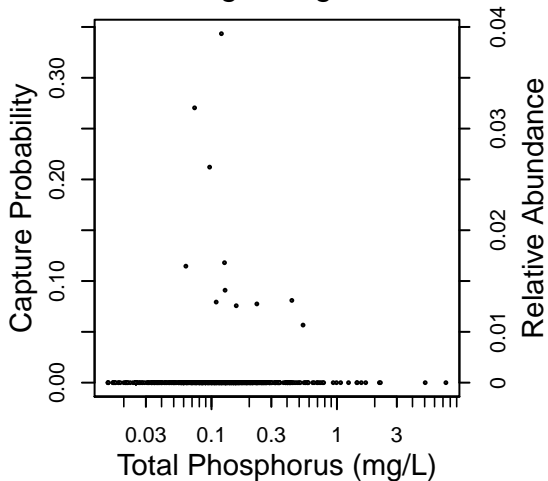


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

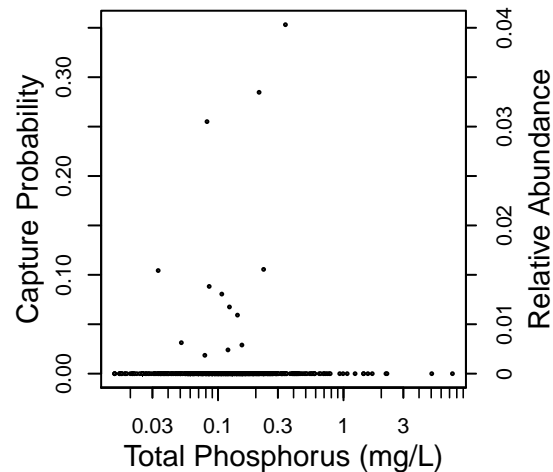
*Enallagma exsulans*



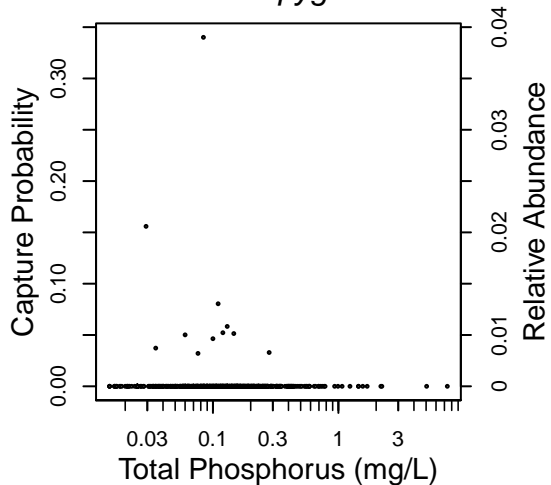
*Enallagma signatum*



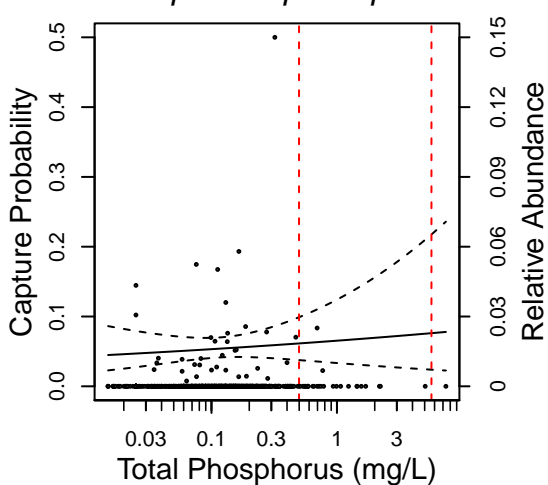
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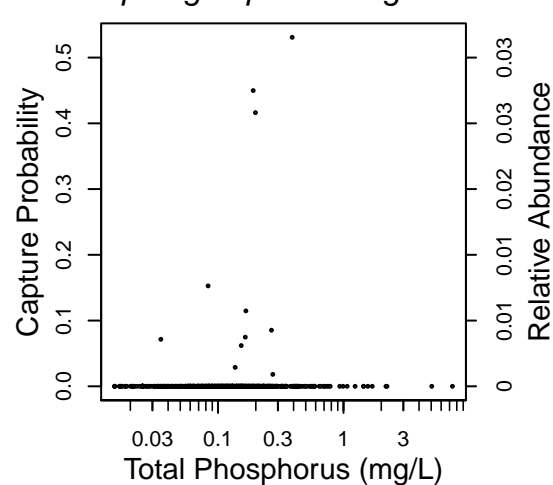
*Enochrus pygmaeus*



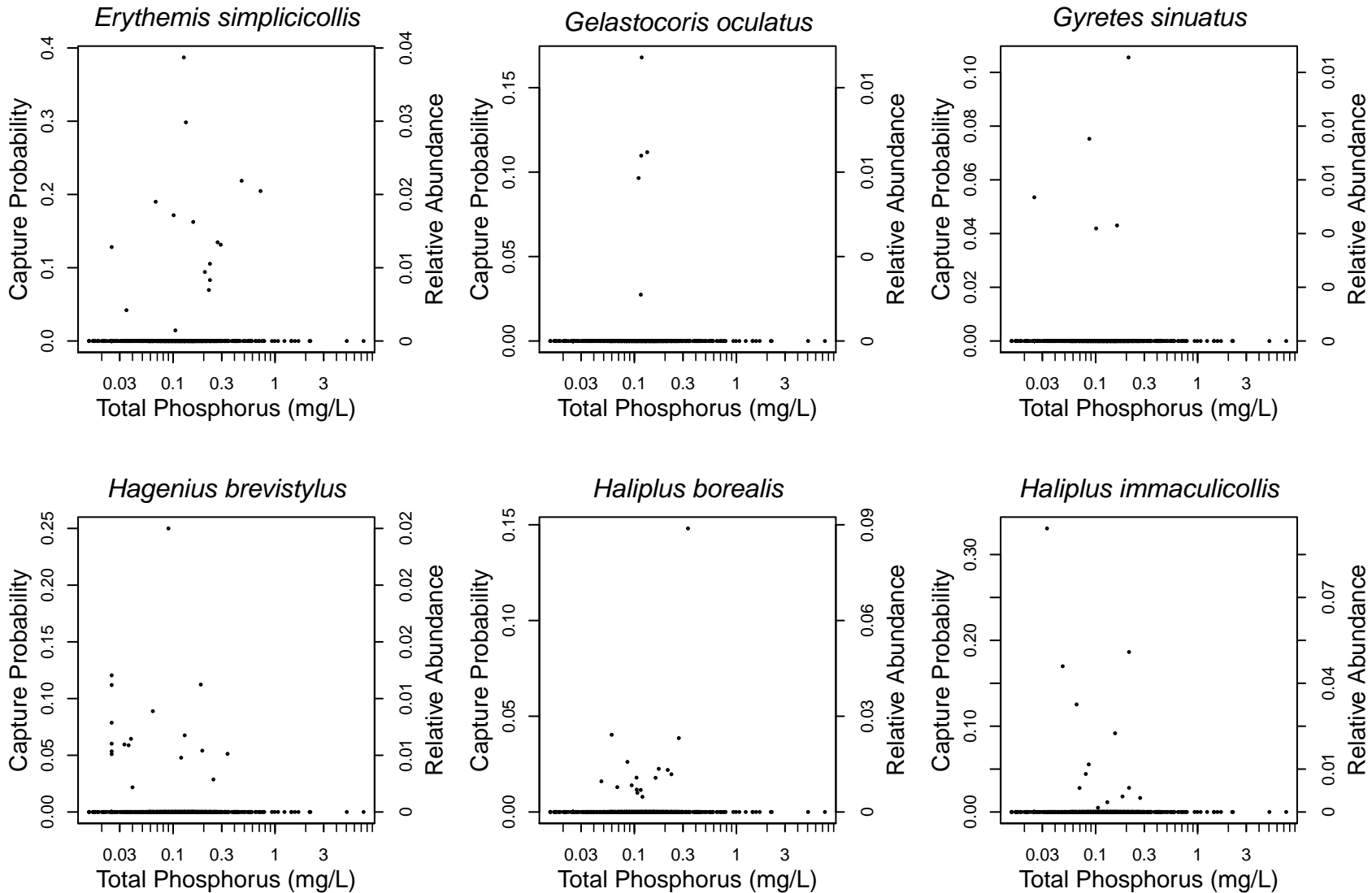
*Epitheca princeps*



*Erpetogomphus designatus*

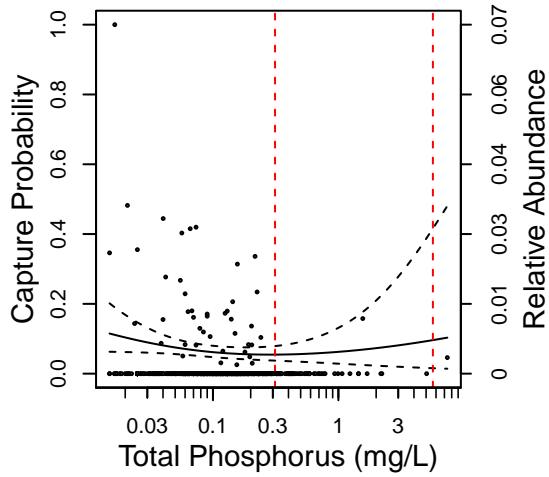


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

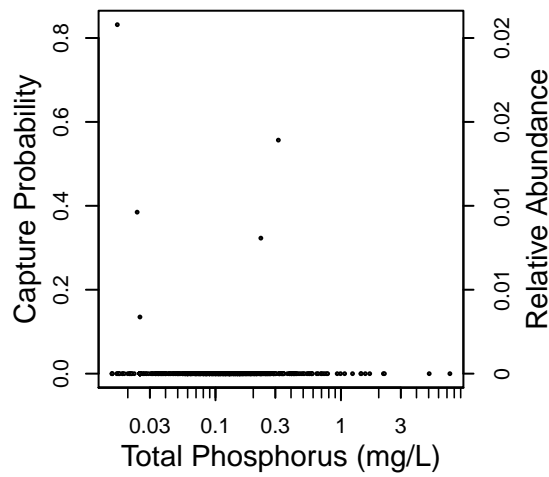


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

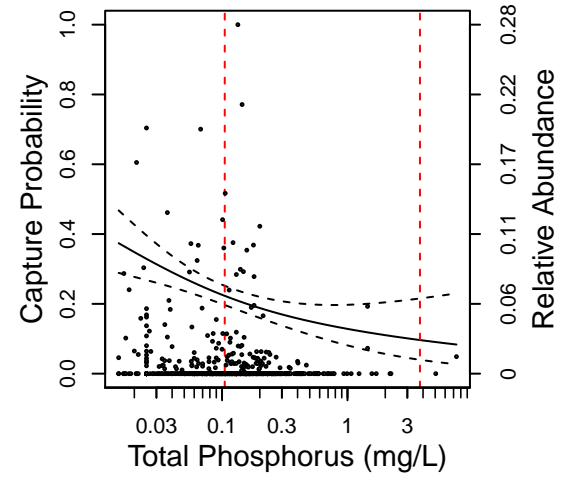
*Helichus basalis*



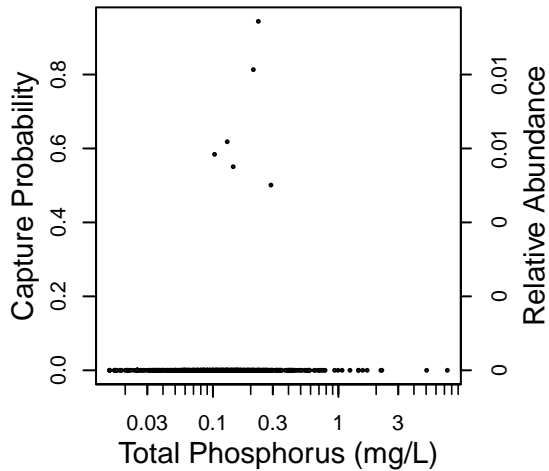
*Helichus fastigiatus*



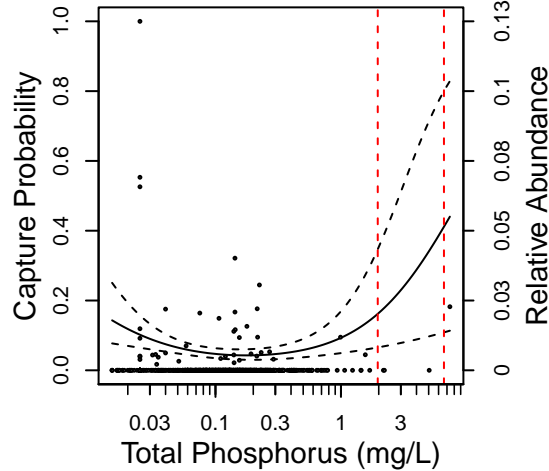
*Helichus lithophilus*



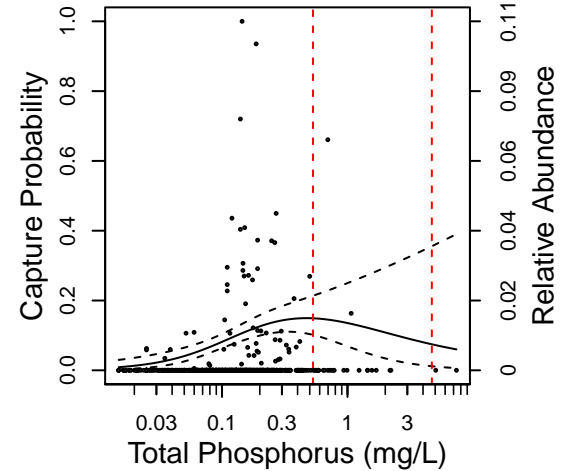
*Helichus striatus*



*Helicopsyche borealis*

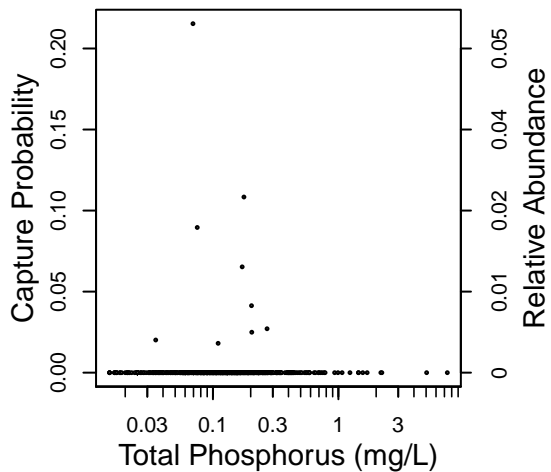


*Hetaerina americana*

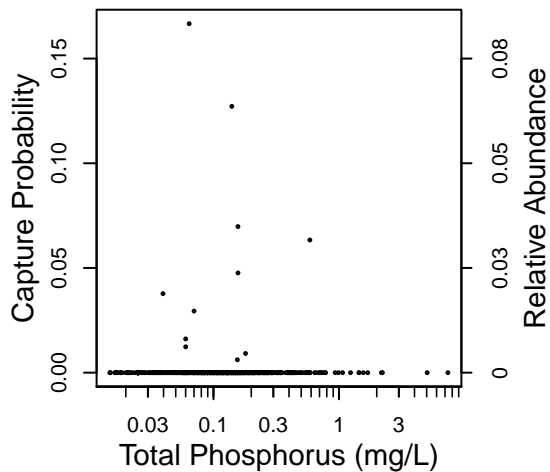


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

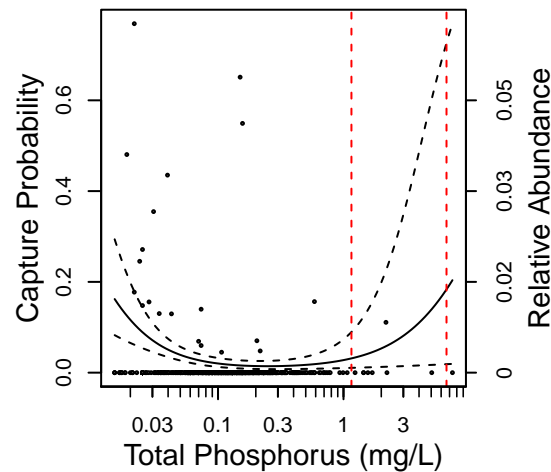
*Hetaerina titia*



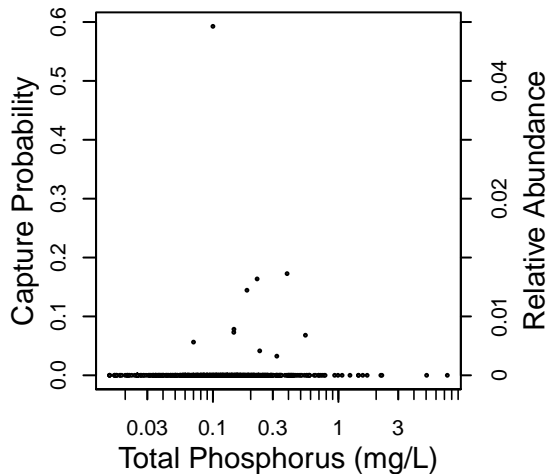
*Heterosternuta ohionis*



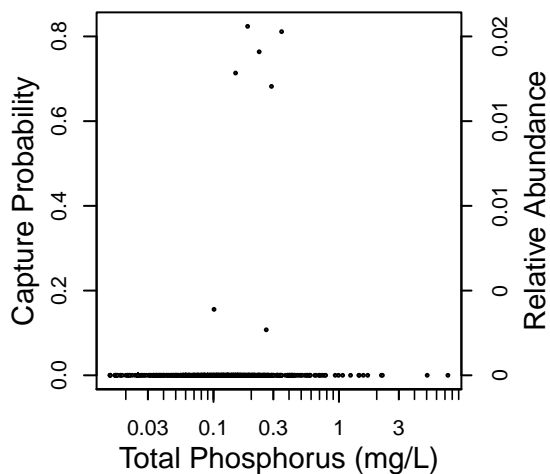
*Heterosternuta pulcher*



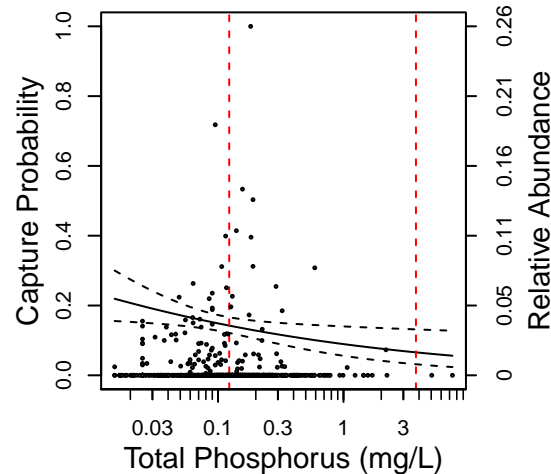
*Heterosternuta wickhami*



*Hydropsyche aerata*

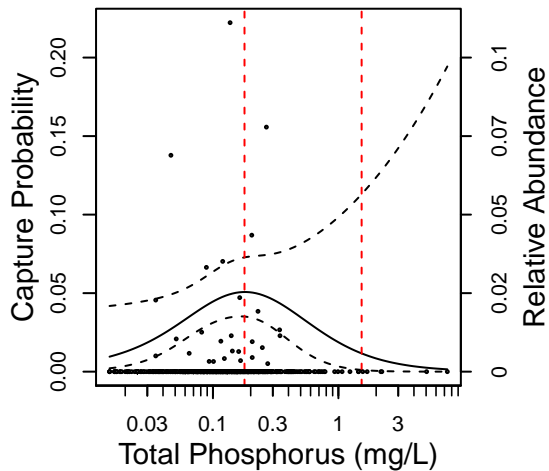


*Hydropsyche betteni* group

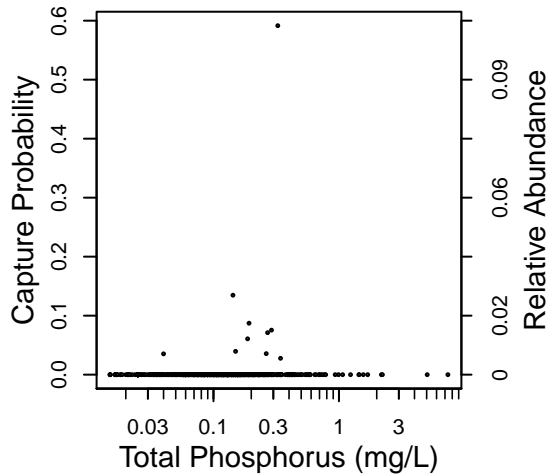


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

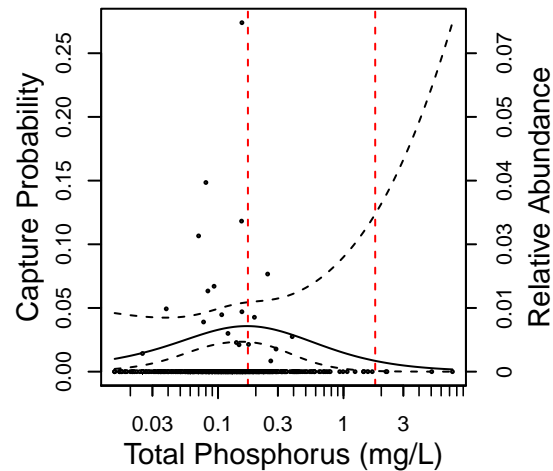
*Hydropsyche bidens*



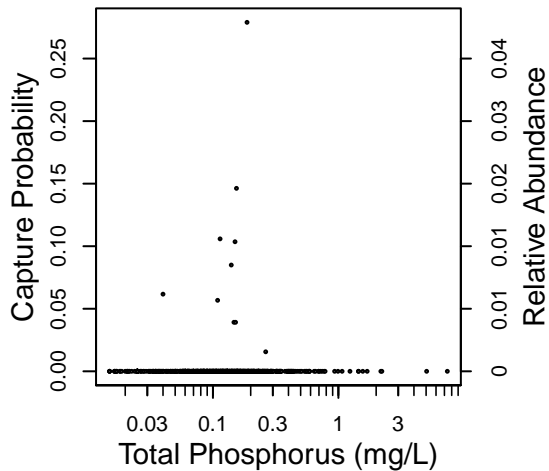
*Hydropsyche demora*



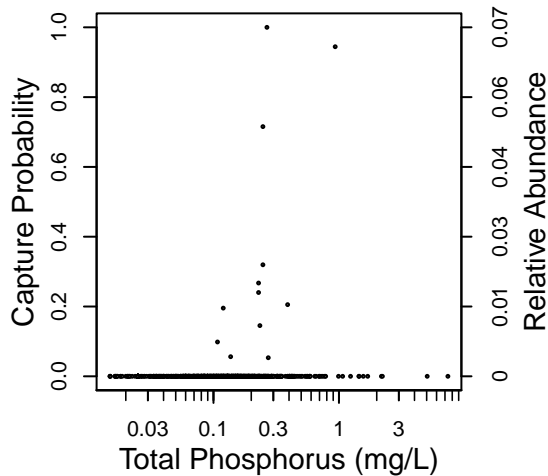
*Hydropsyche dicantha*



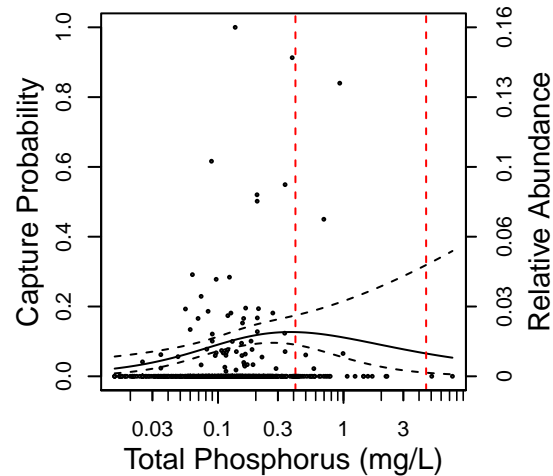
*Hydropsyche frisoni*



*Hydropsyche orris*

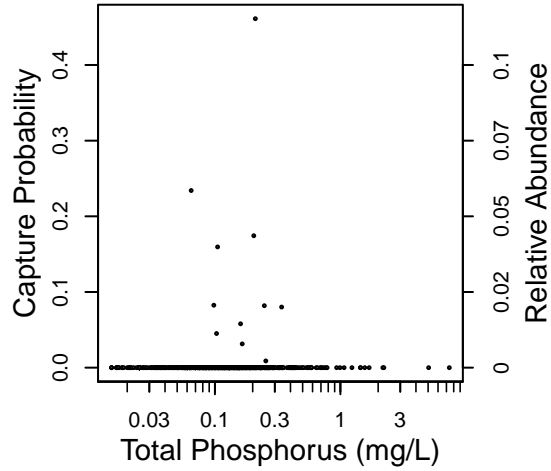


*Hydropsyche simulans*

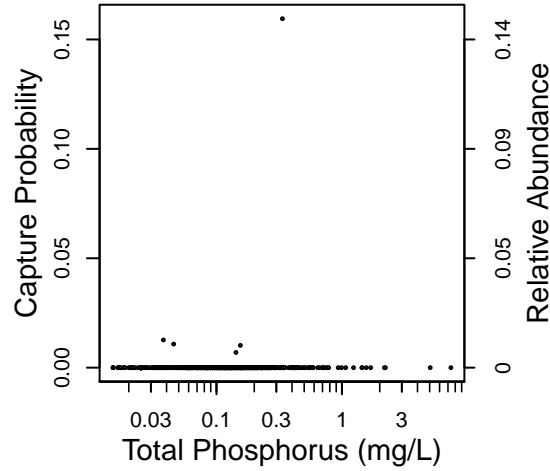


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

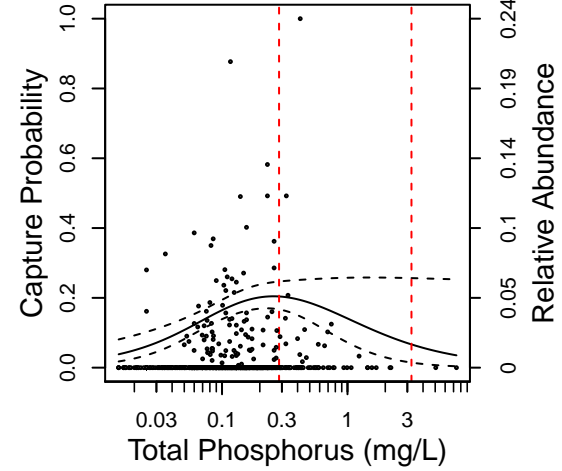
*Hydropsyche venularis*



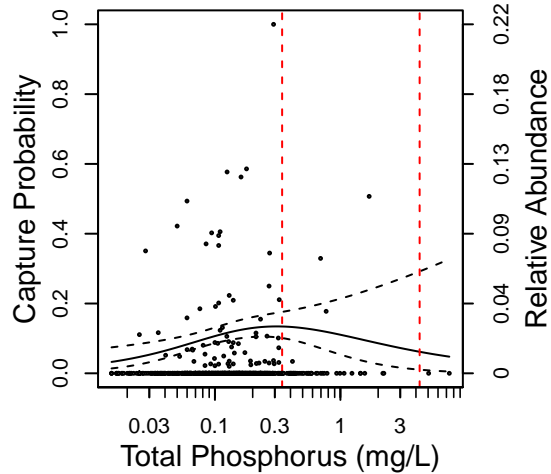
*Hydrovatus pustulatus*



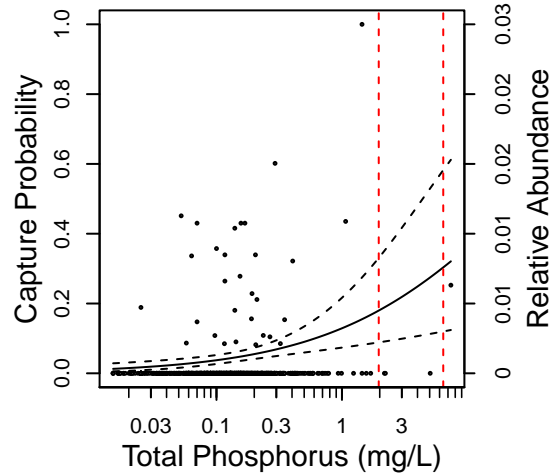
*Ischnura posita*



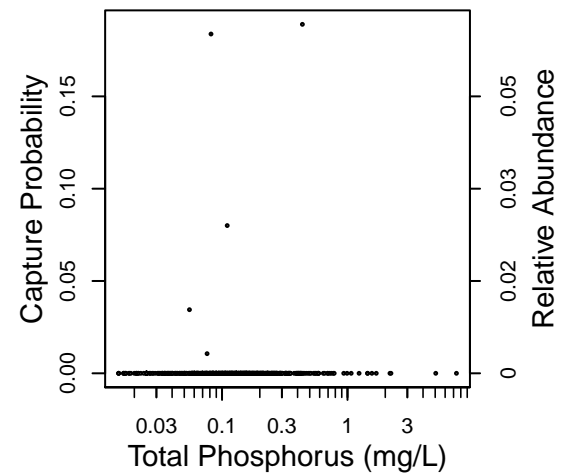
*Ischnura verticalis*



*Labrundinia pilosella*



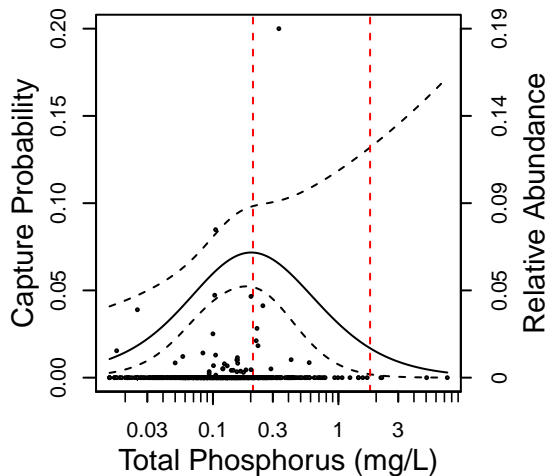
*Laccophilus fasciatus*



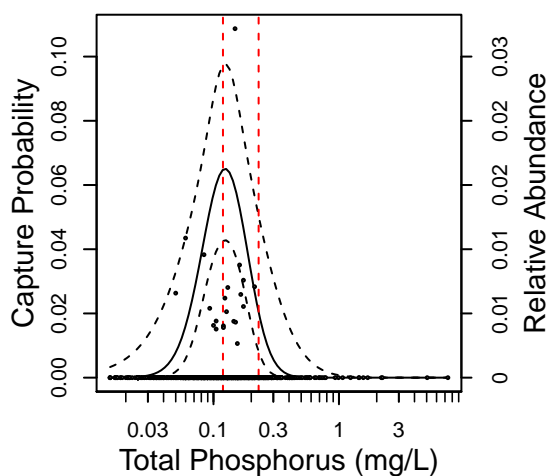


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

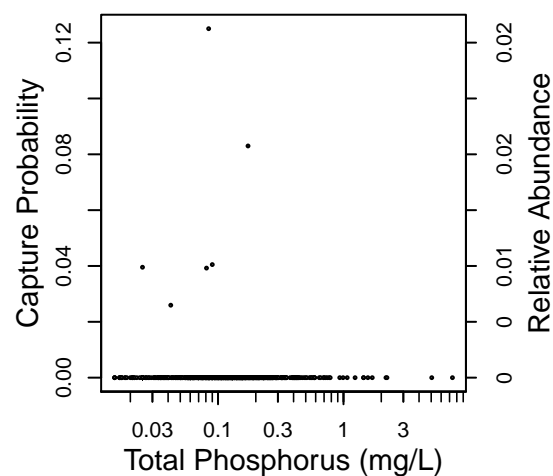
*Laccophilus maculosus*



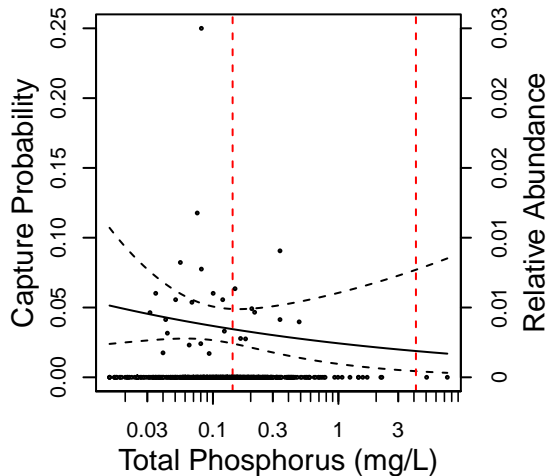
*Liodessus affinis complex*



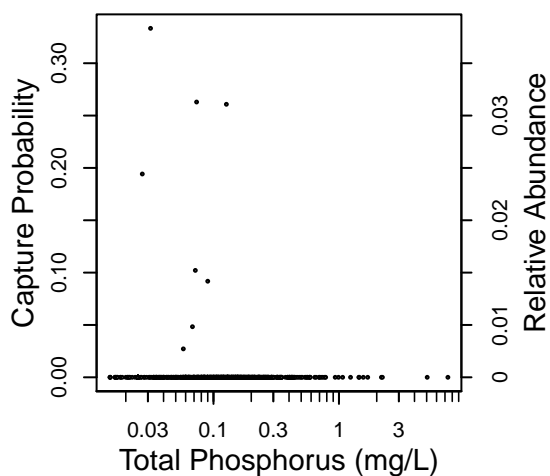
*Lype diversa*



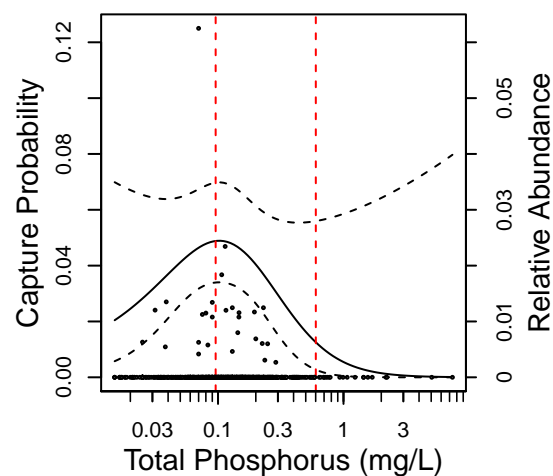
*Maccaffertium exiguum*



*Maccaffertium luteum*

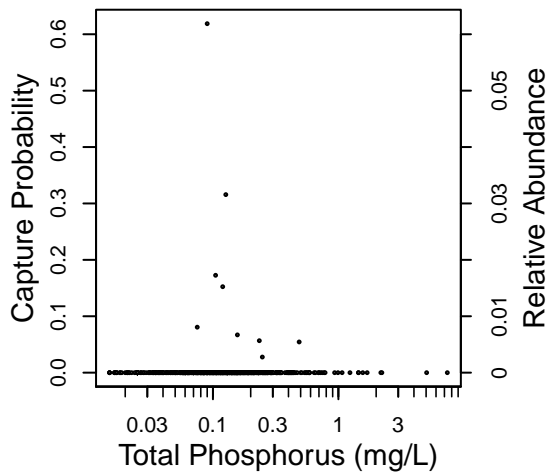


*Maccaffertium mediopunctatum*

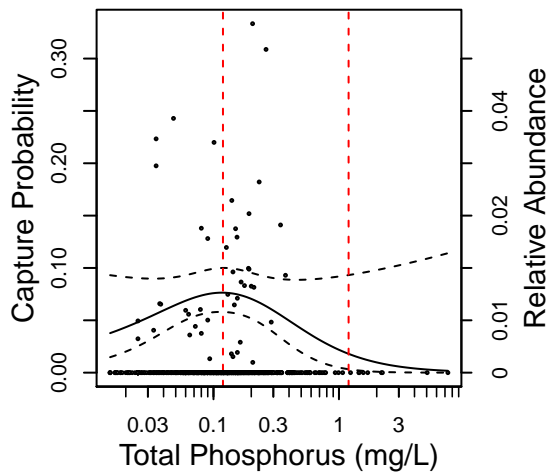


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

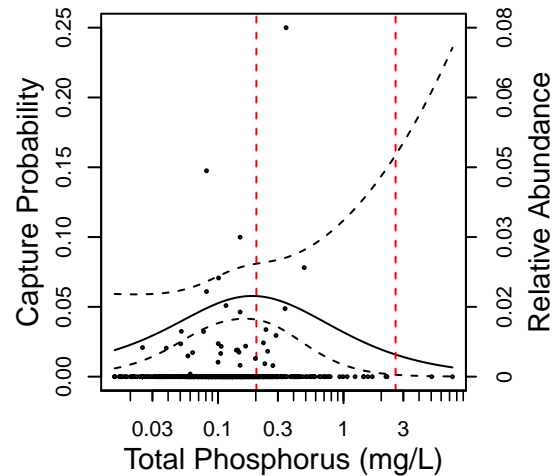
*Maccaffertium mexicanum integrum*



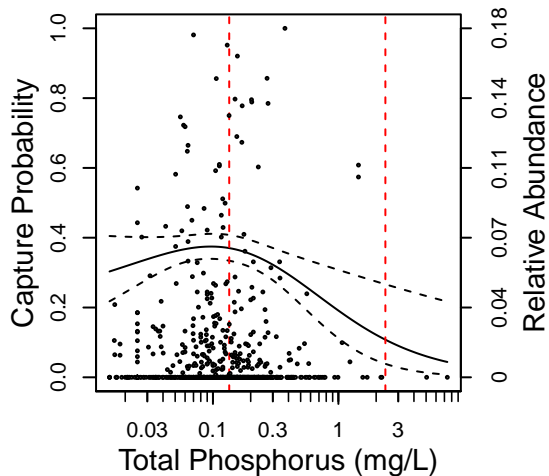
*Maccaffertium pulchellum*



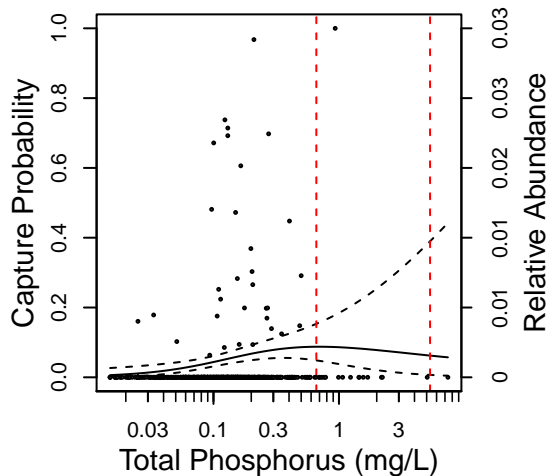
*Maccaffertium terminatum*



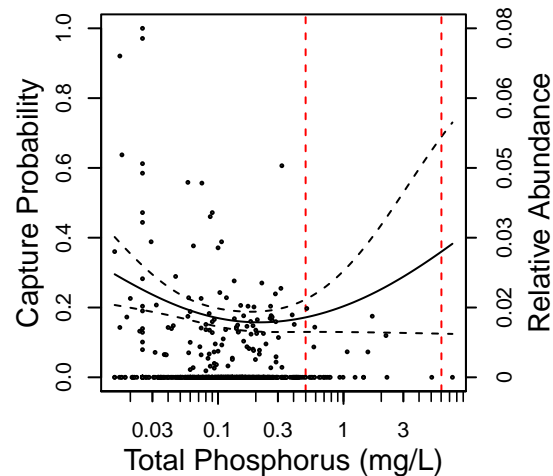
*Macronychus glabratus*



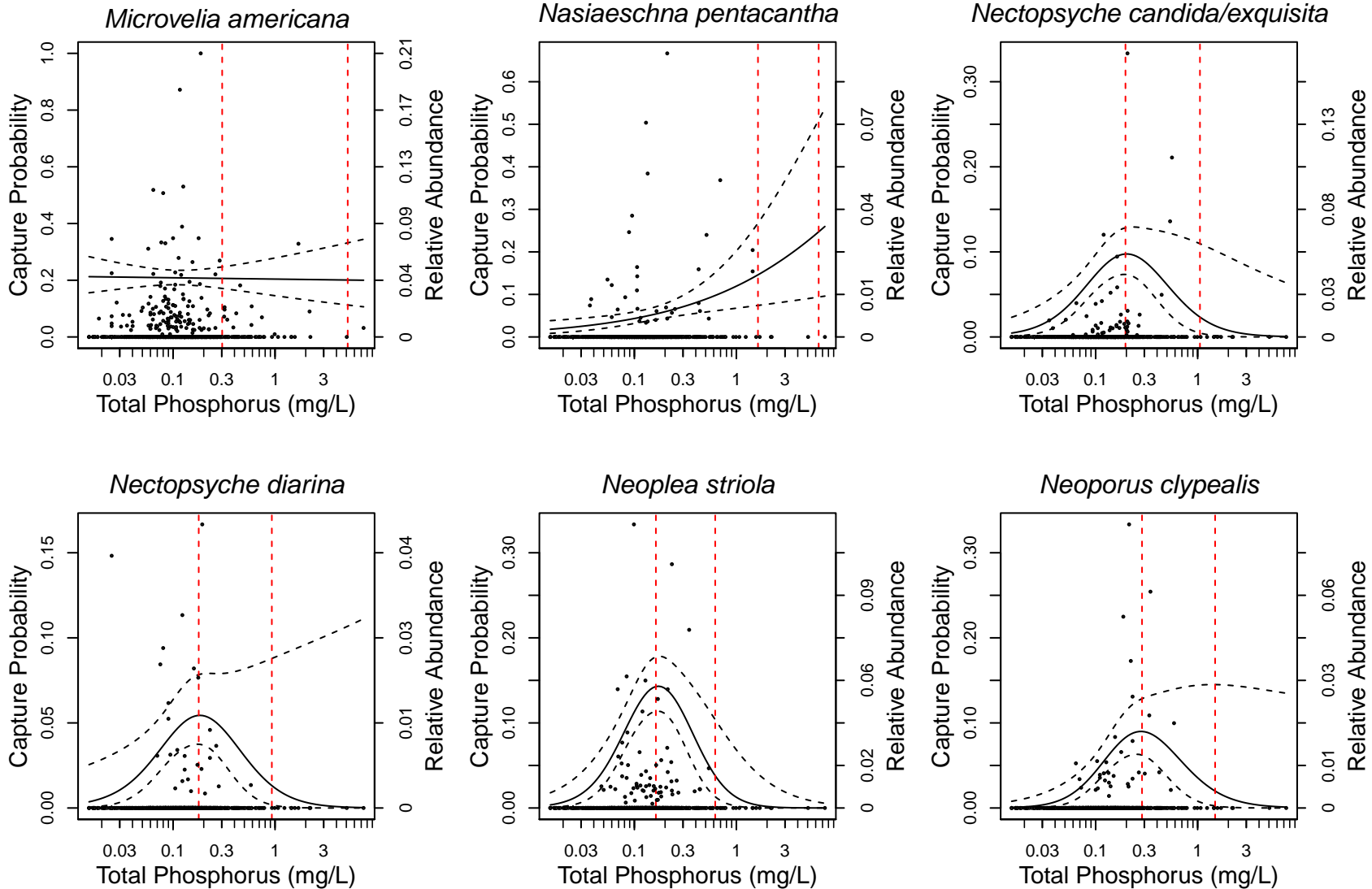
*Metrobates hesperius*



*Microtendipes pedellus group*

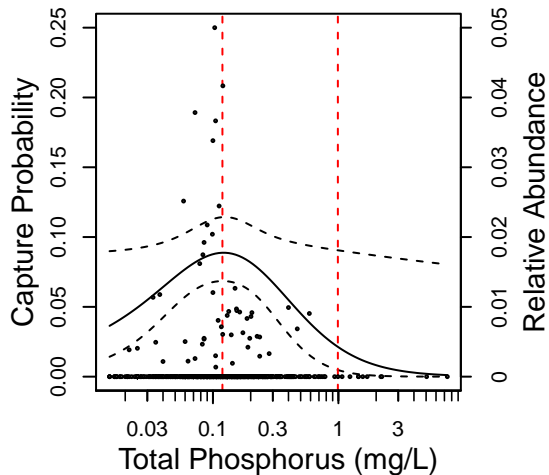


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

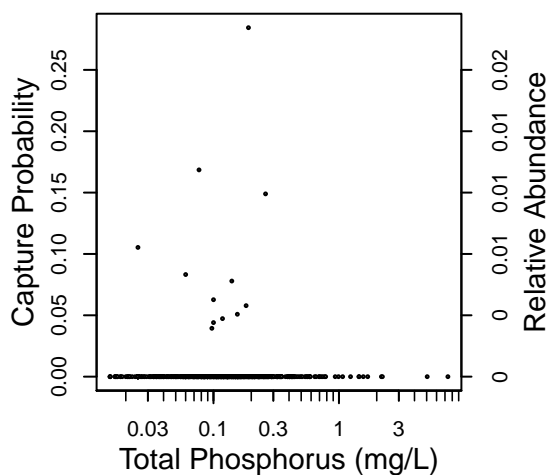


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

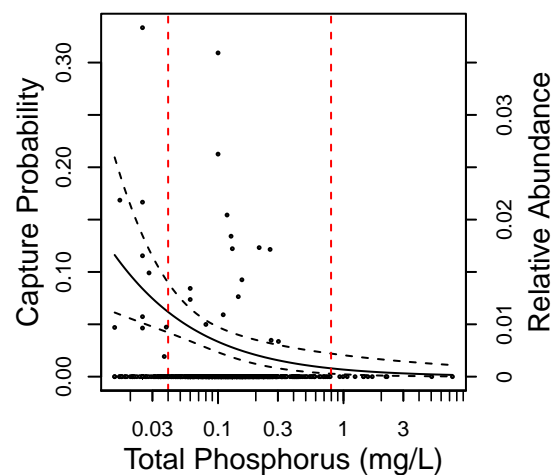
*Neoporus dimidiatus*



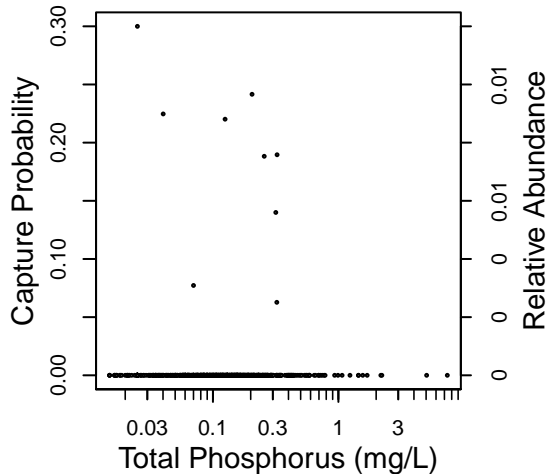
*Neoporus striatopunctatus*



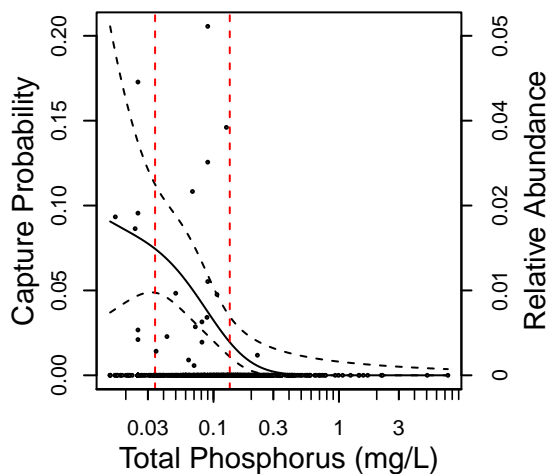
*Neoporus tennetum*



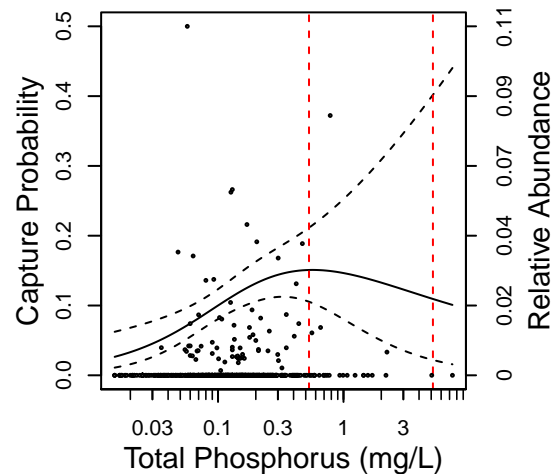
*Nepa apiculata*



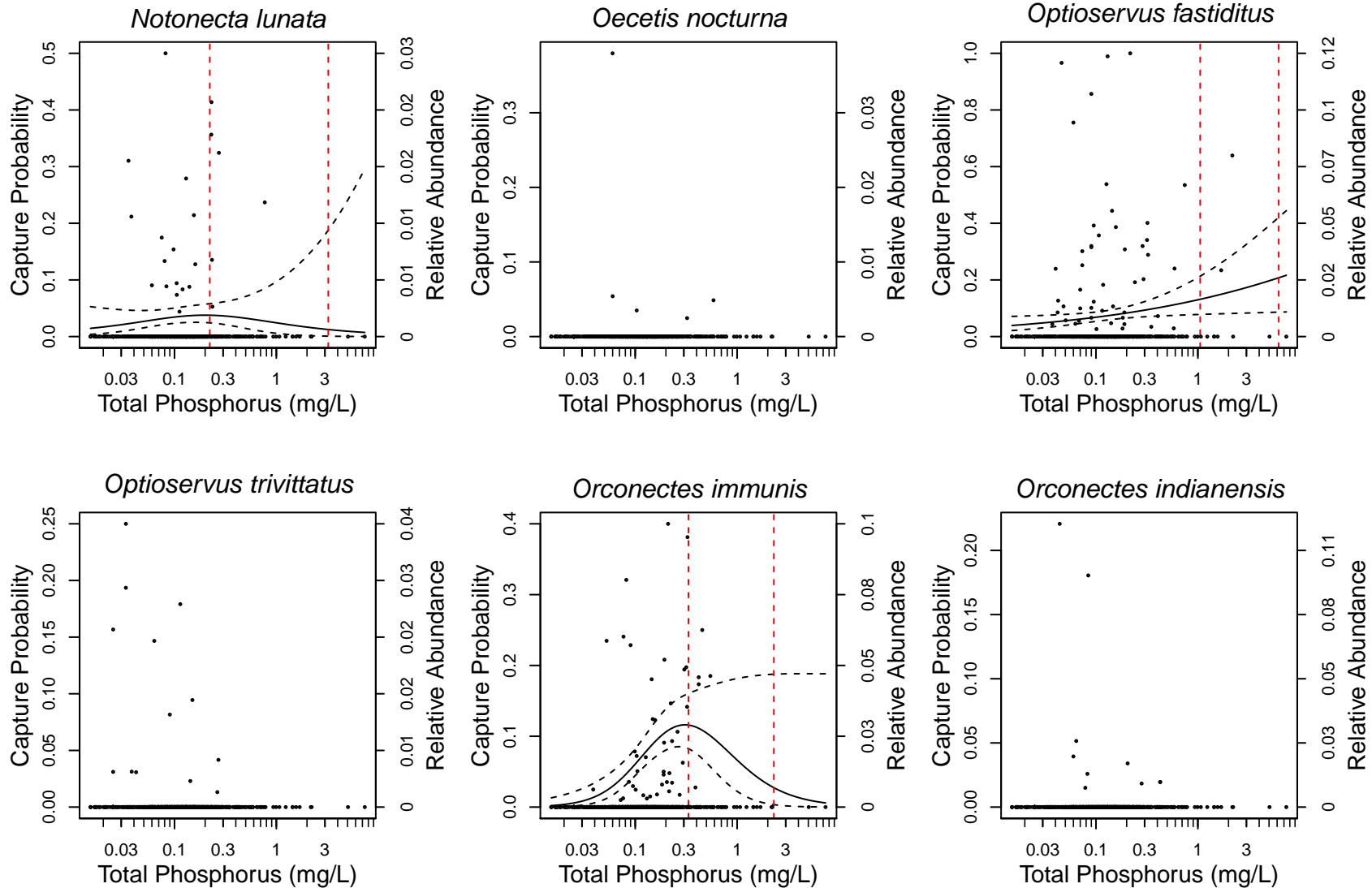
*Nigronia serricornis*



*Notonecta irrorata*

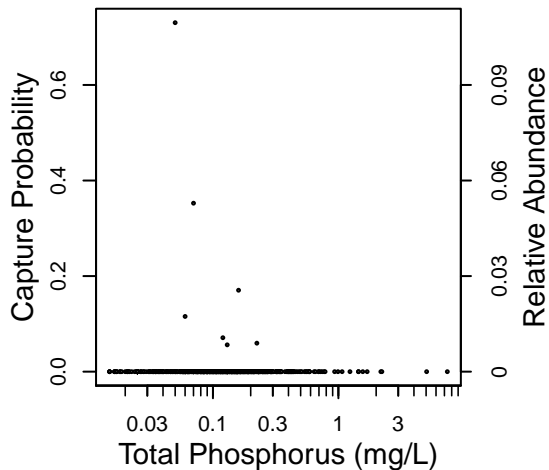


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

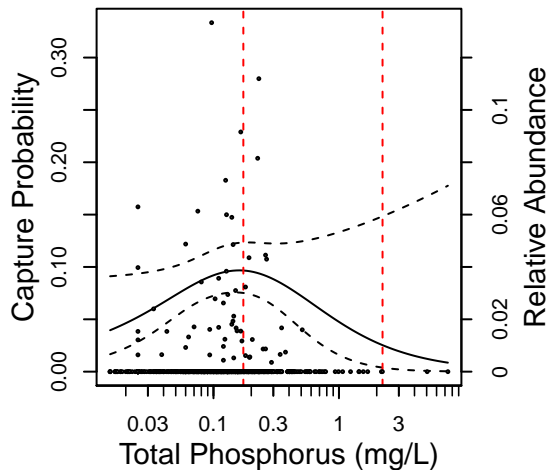


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

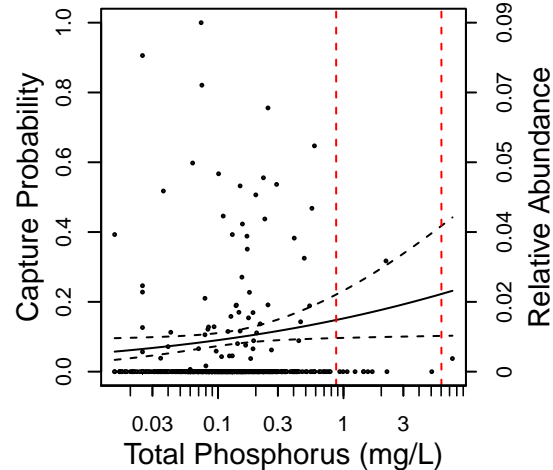
*Orconectes juvenilis*



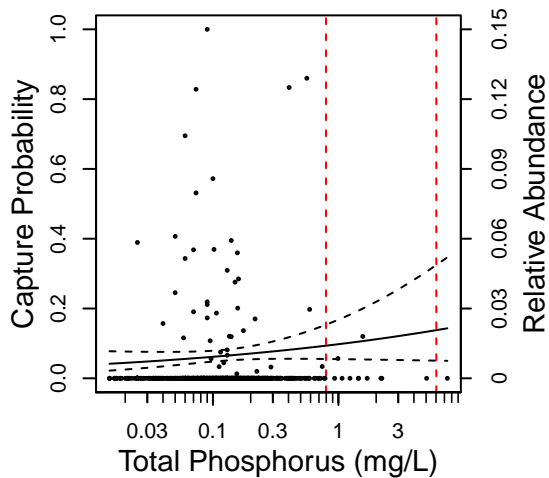
*Orconectes propinquus*



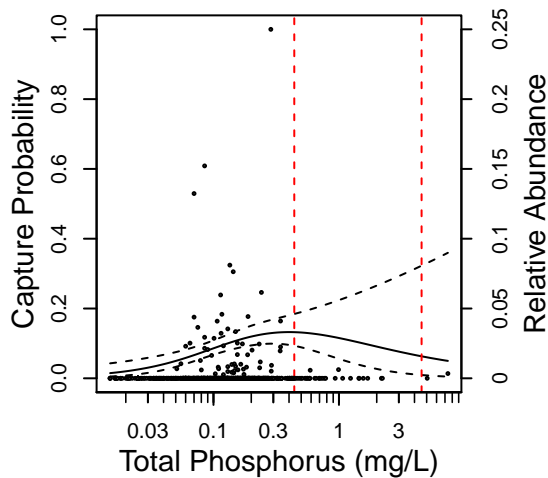
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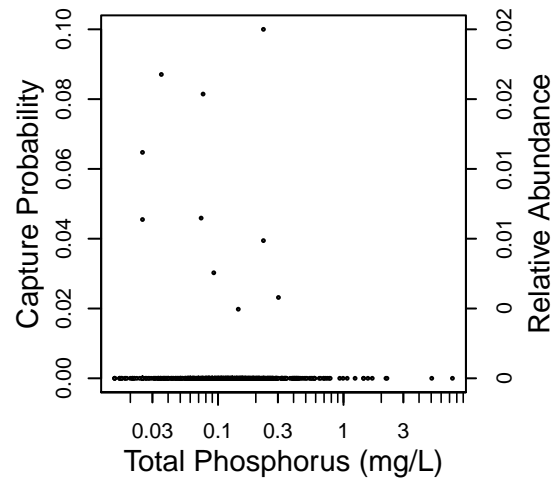
*Orconectes sloanii*



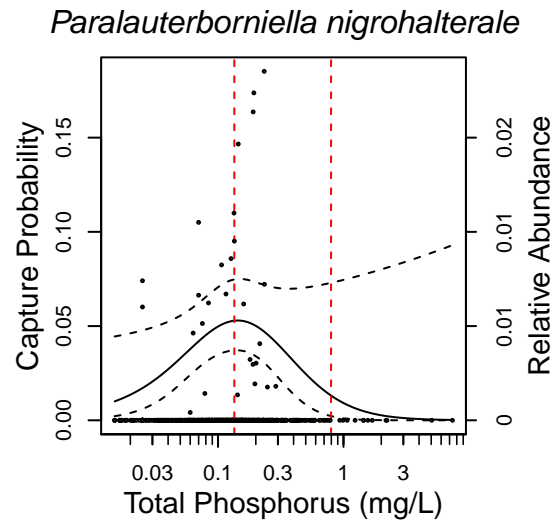
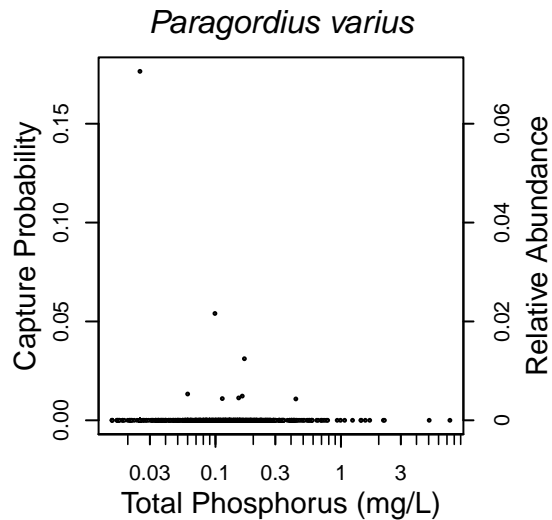
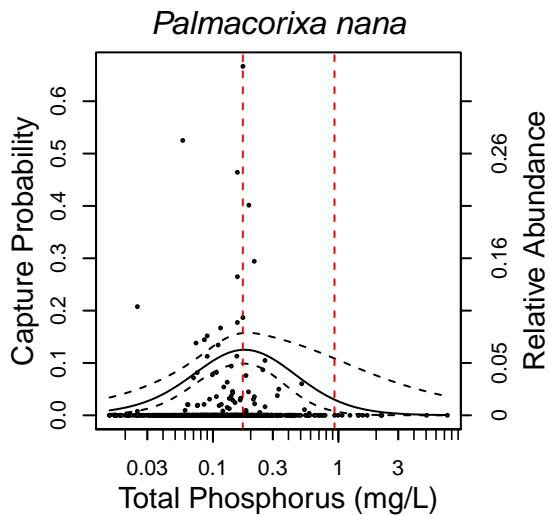
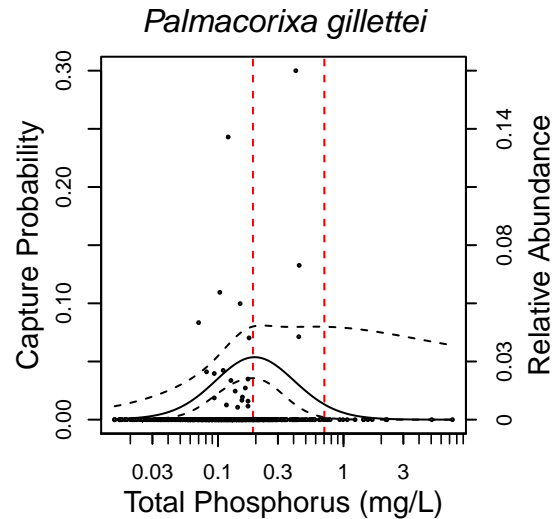
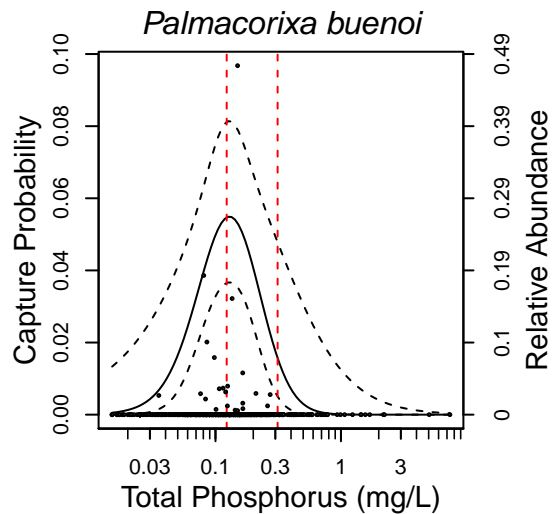
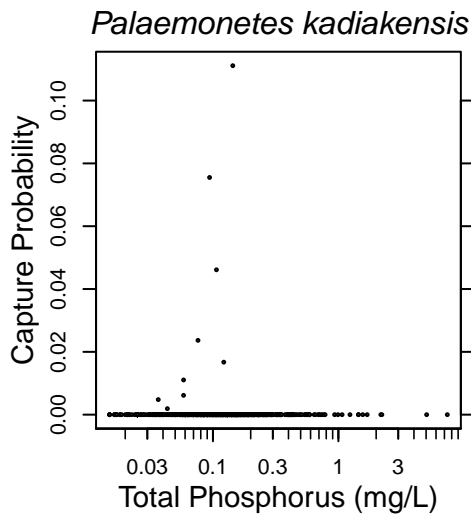
*Orconectes virilis*



*Pachydiplax longipennis*

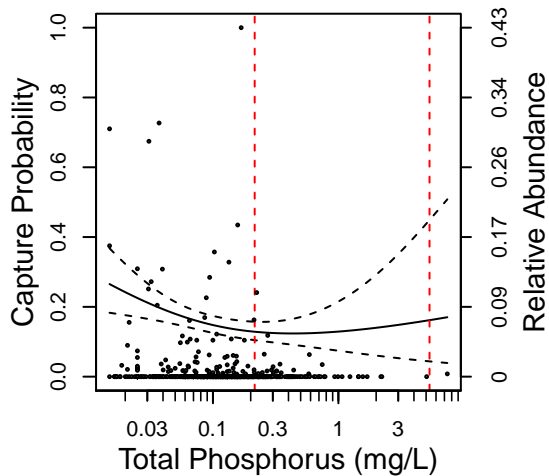


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

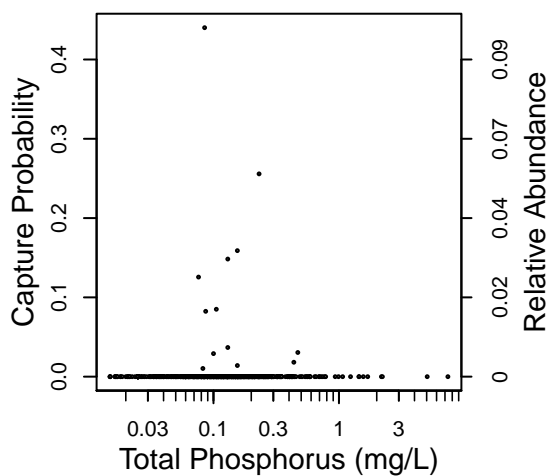


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

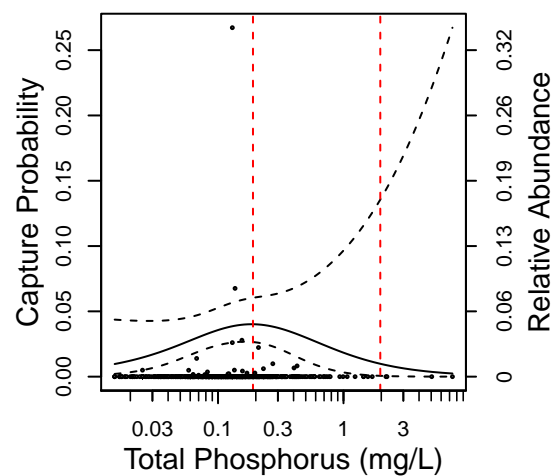
*Paratendipes albimanus*



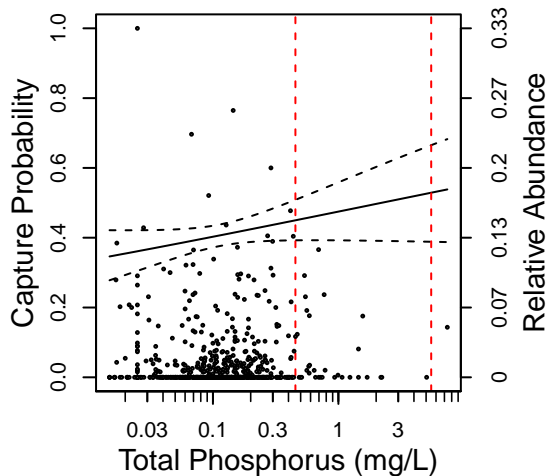
*Pelocoris femoratus*



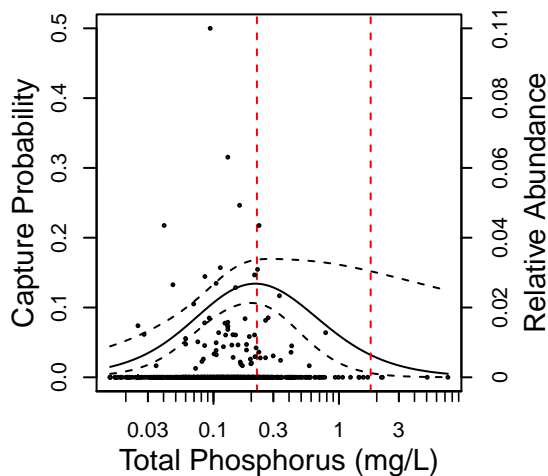
*Peltodytes dunavani*



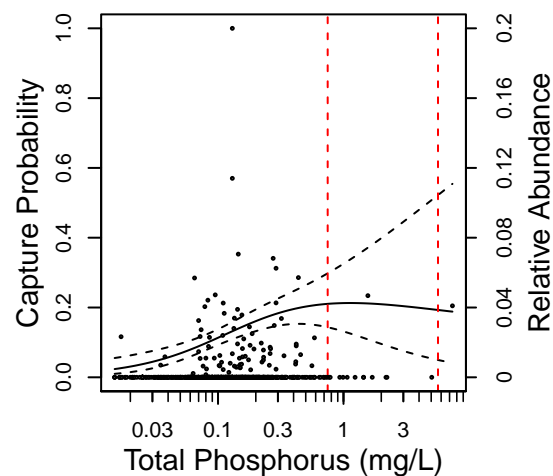
*Peltodytes duodecimpunctatus*



*Peltodytes edentulus*



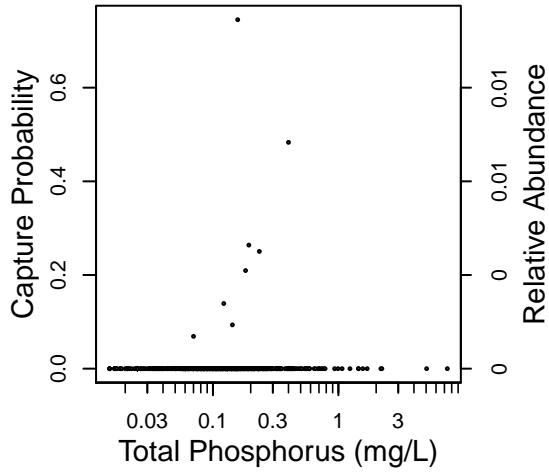
*Peltodytes lengi*



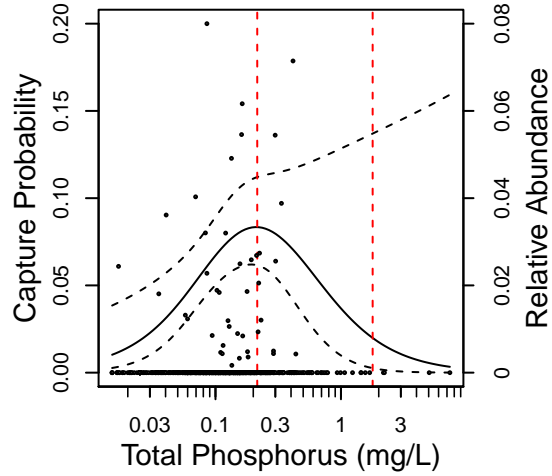


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

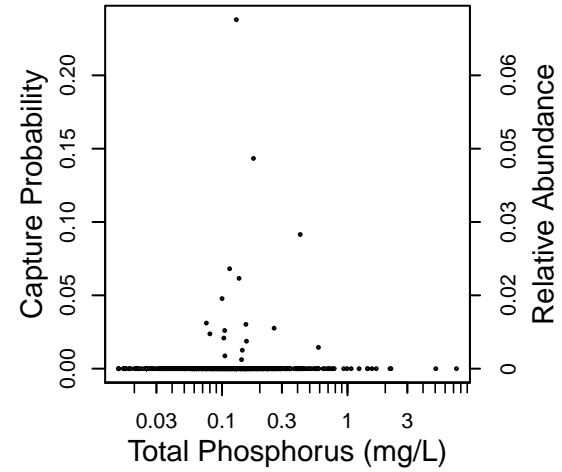
*Peltodytes litoralis*



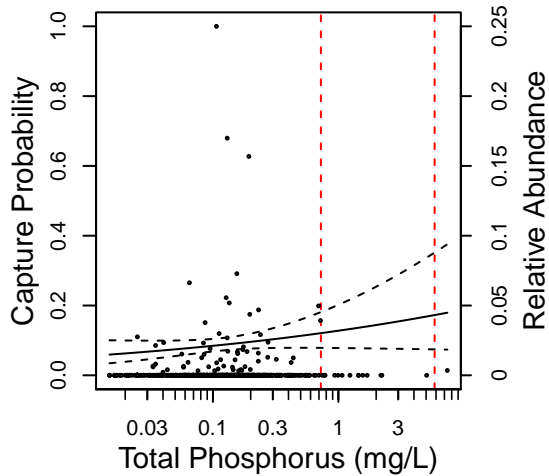
*Peltodytes muticus*



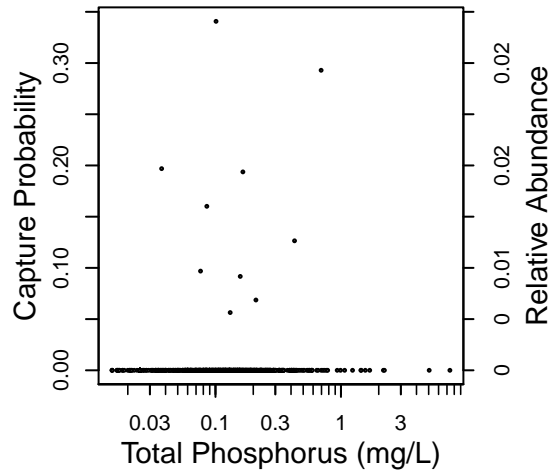
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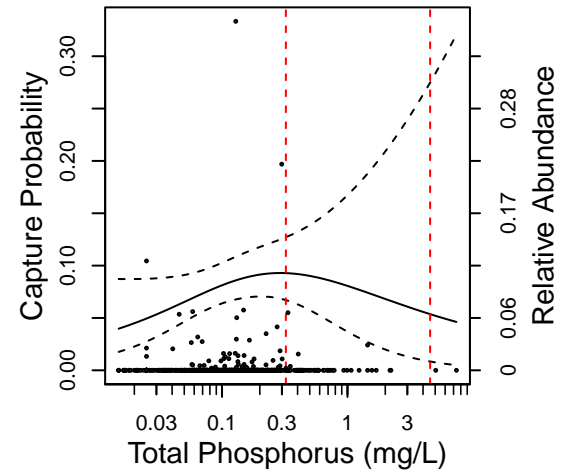
*Peltodytes sexmaculatus*



*Perithemis tenera*

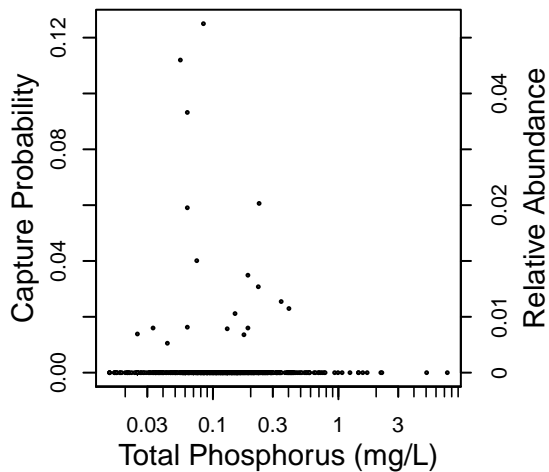


*Plathemis lydia*

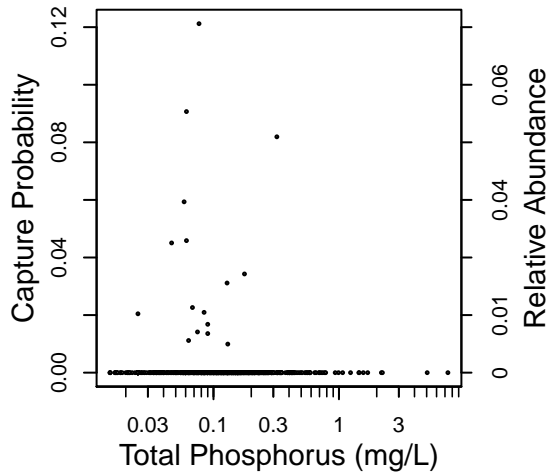


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

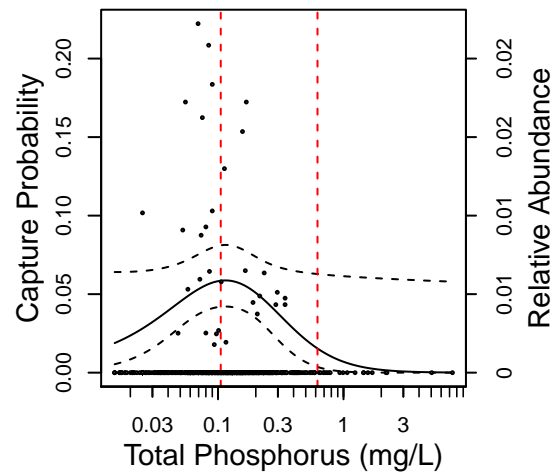
*Polypedilum (tripodura)*



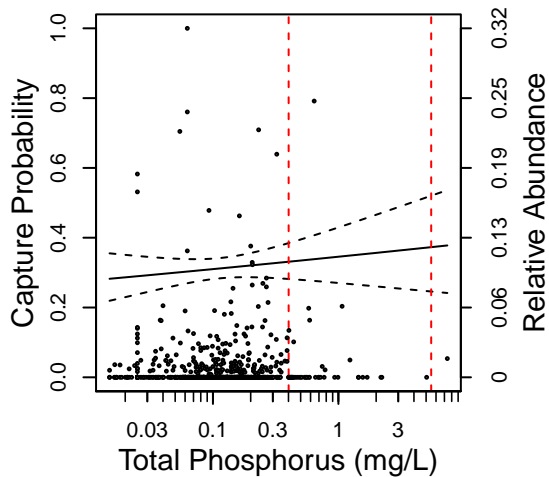
*Polypedilum aviceps*



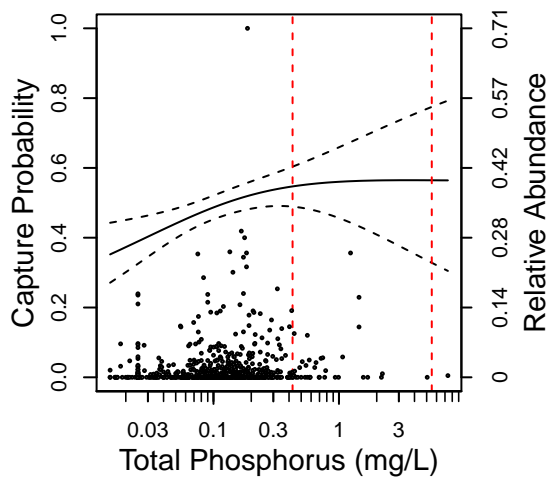
*Polypedilum fallax* group



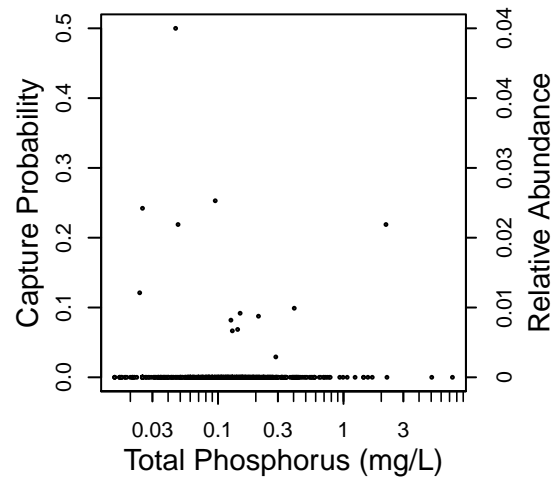
*Polypedilum flavum*



*Polypedilum illinoense* group

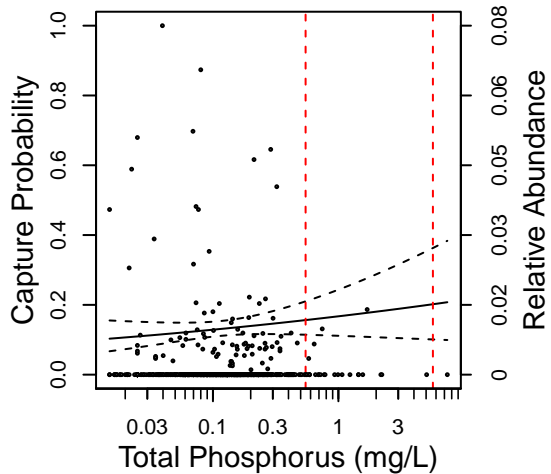


*Polypedilum laetum* group

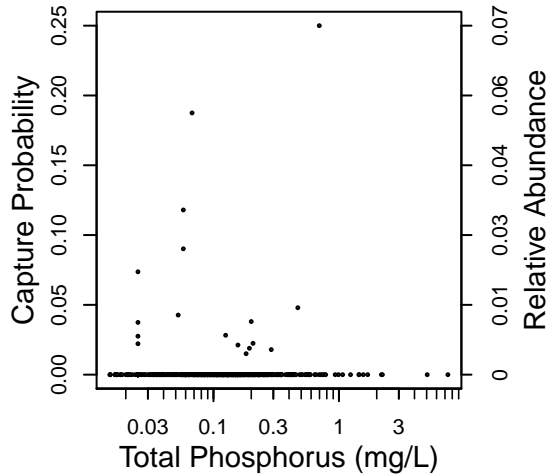


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

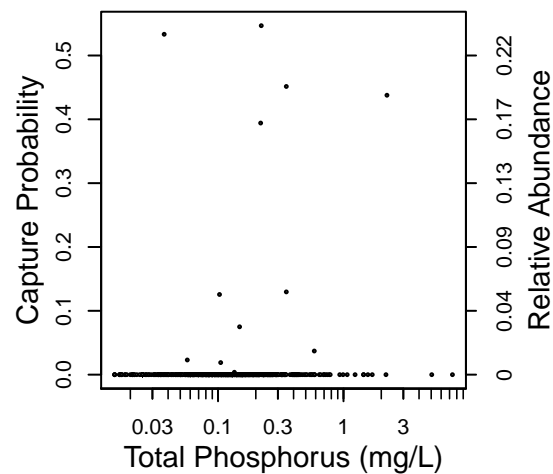
*Polypedilum scalaenum* group



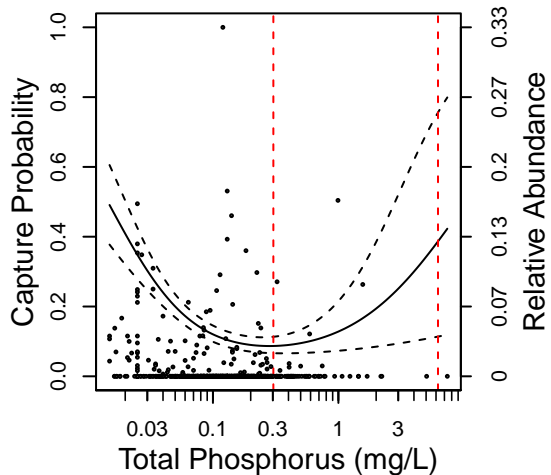
*Progomphus obscurus*



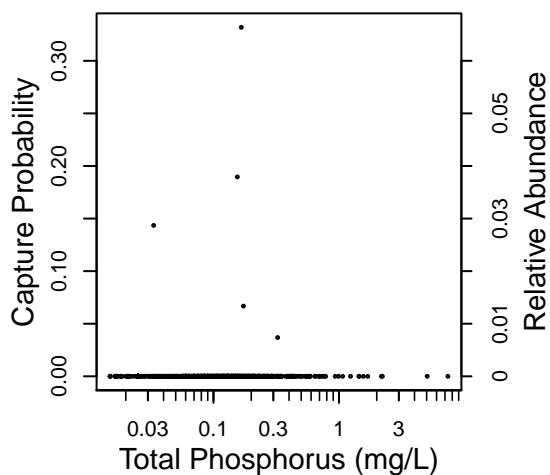
*Psectrotanypus dyari*



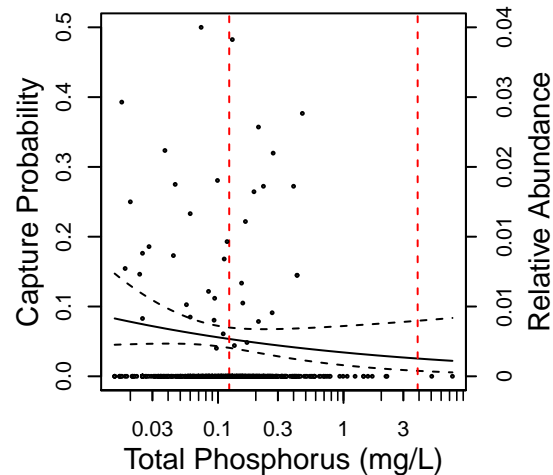
*Psephenus herricki*



*Ranatra australis*

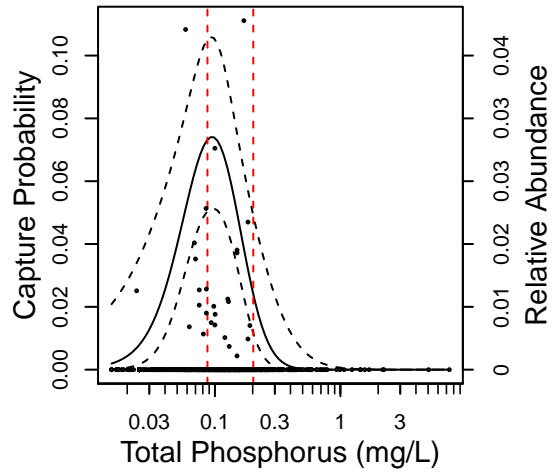


*Ranatra buenoi*

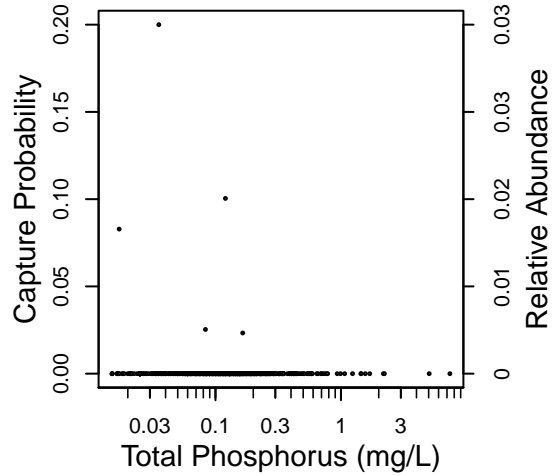


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

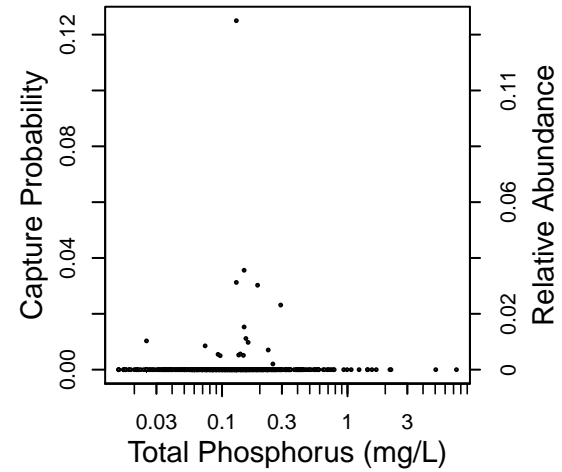
*Ranatra fusca*



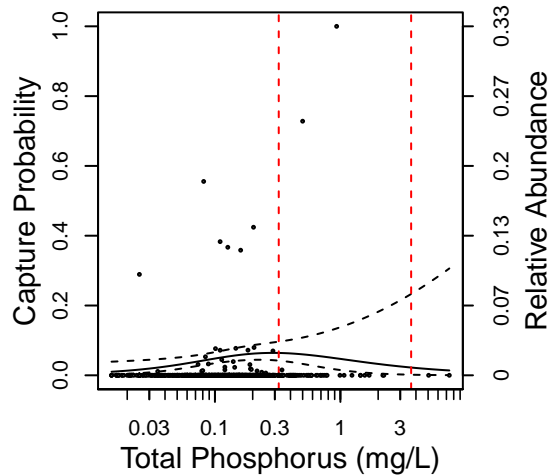
*Ranatra kirkaldyi*



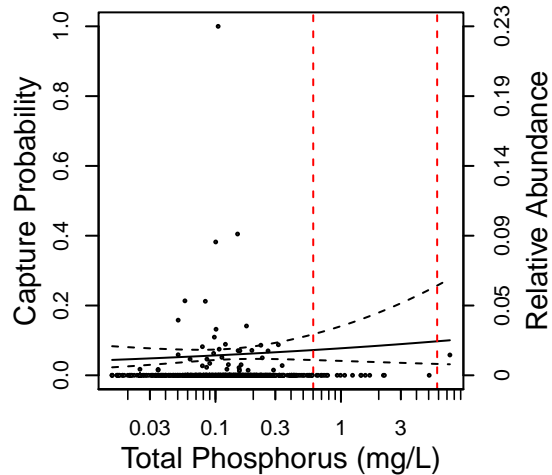
*Ranatra nigra*



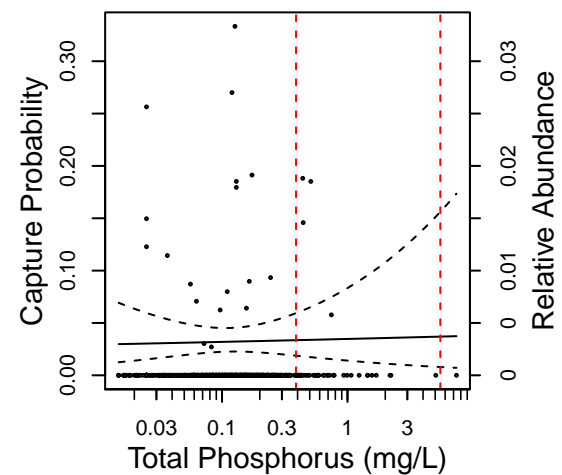
*Rhagovelia obesa*



*Rhagovelia oriander*

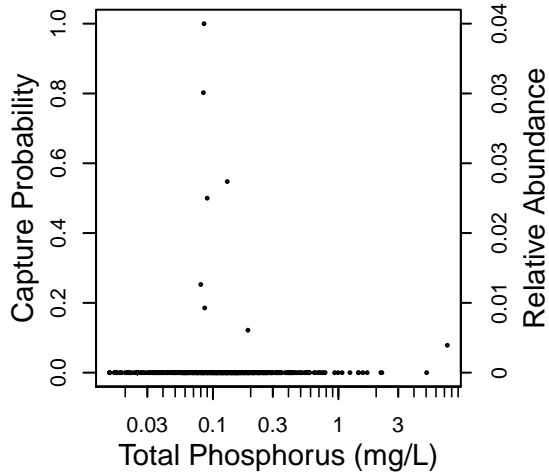


*Rheumatobates palosi*

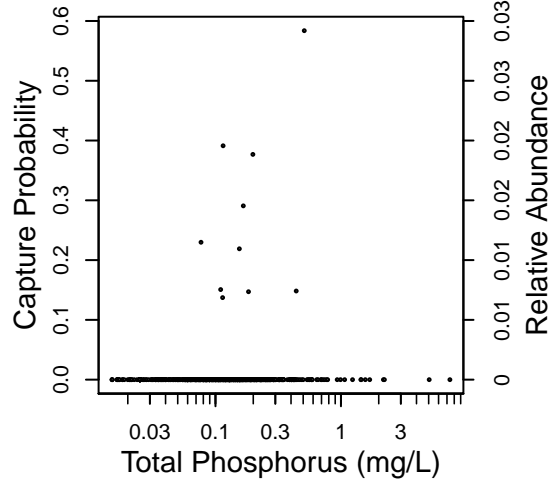


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

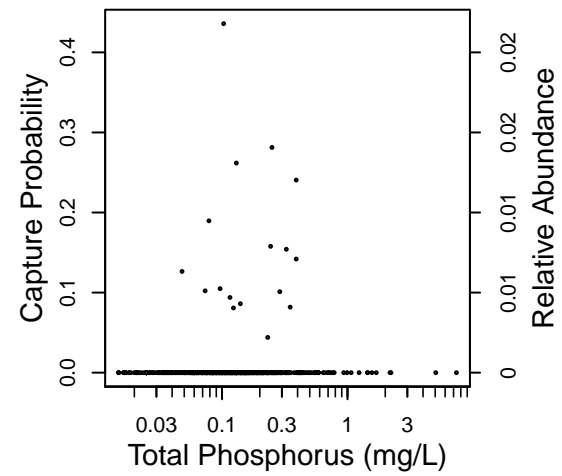
*Rheumatobates rileyi*



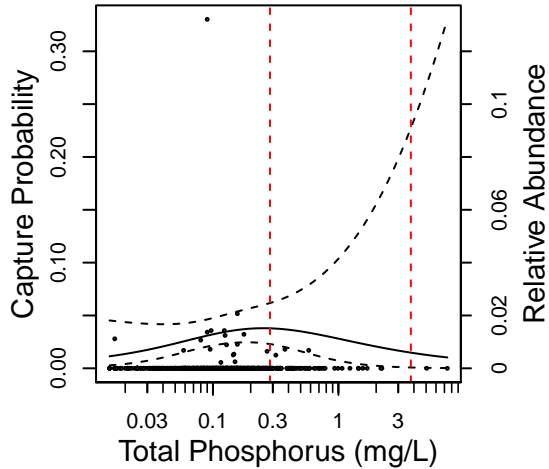
*Rheumatobates tenuipes*



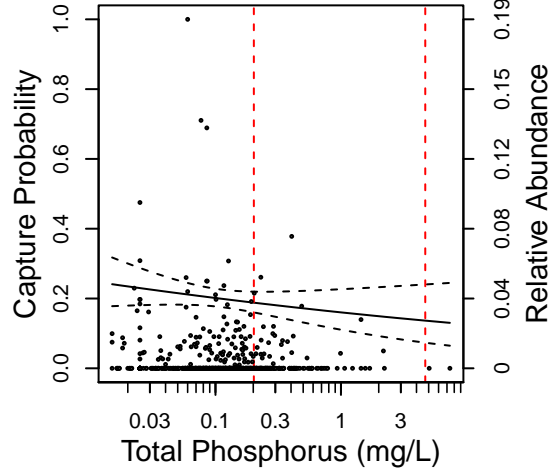
*Saetheria tylus*



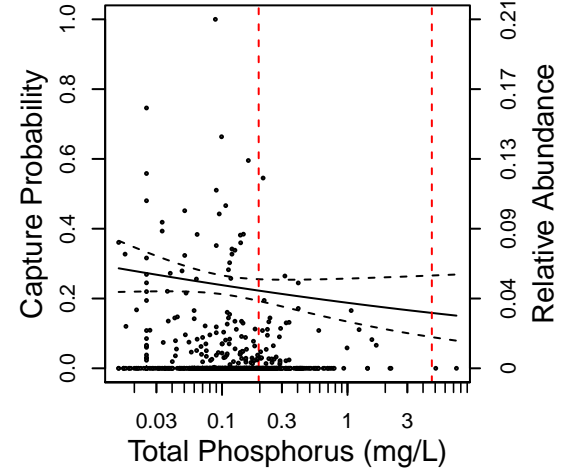
*Sperchopsis tessellata*



*Stenacron interpunctatum*

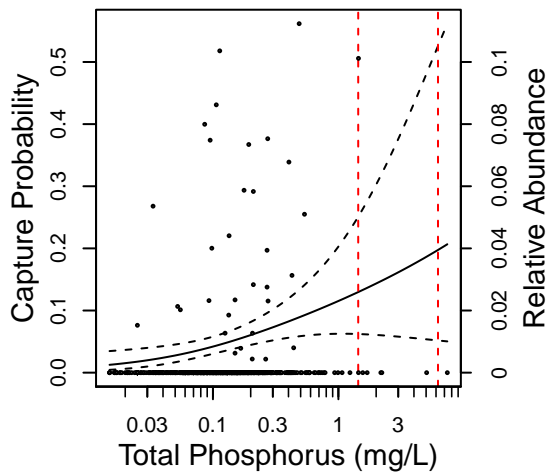


*Stenelmis crenata*

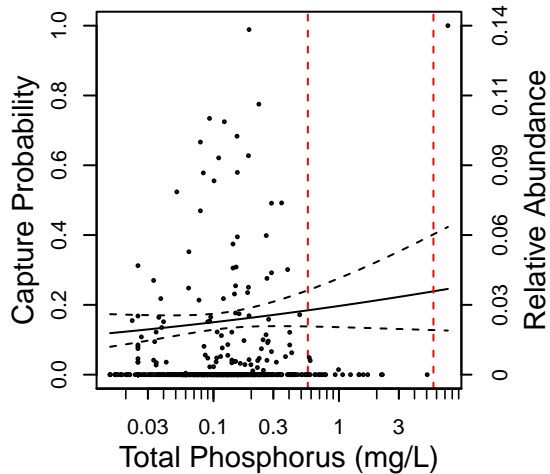


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

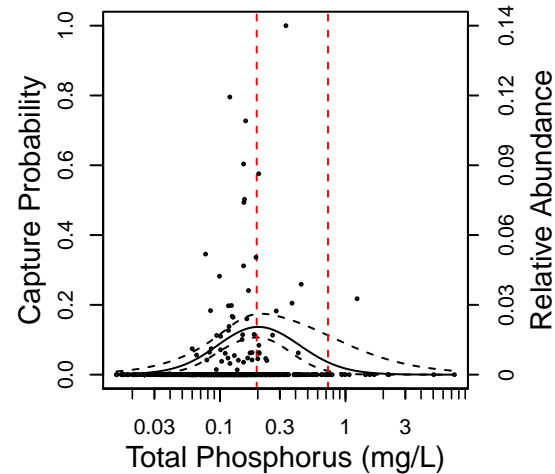
*Stenelmis grossa*



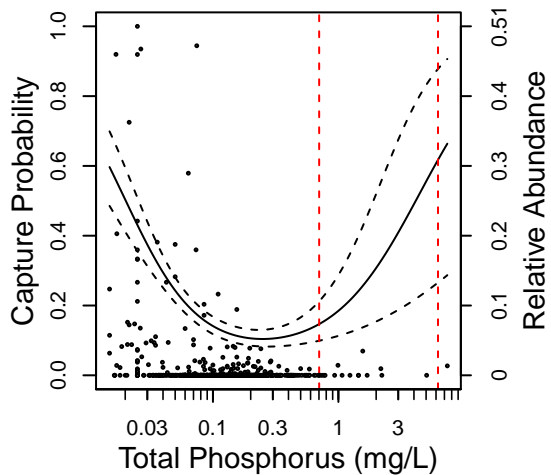
*Stenelmis sexlineata*



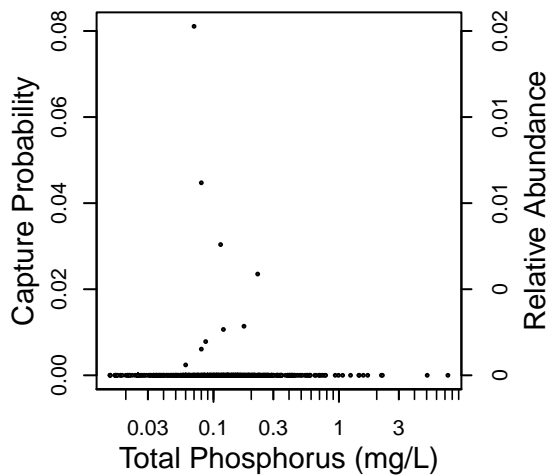
*Stenelmis vittipennis*



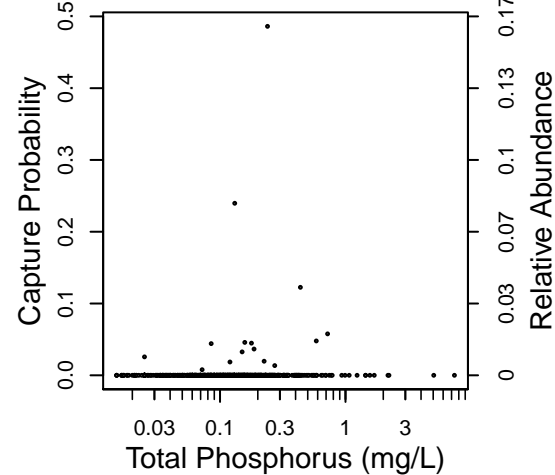
*Stenonema femoratum*



*Sublettea coffmani*

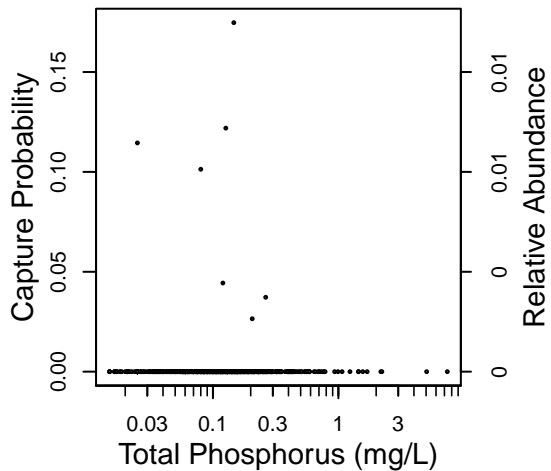


*Tanytus neopunctipennis*

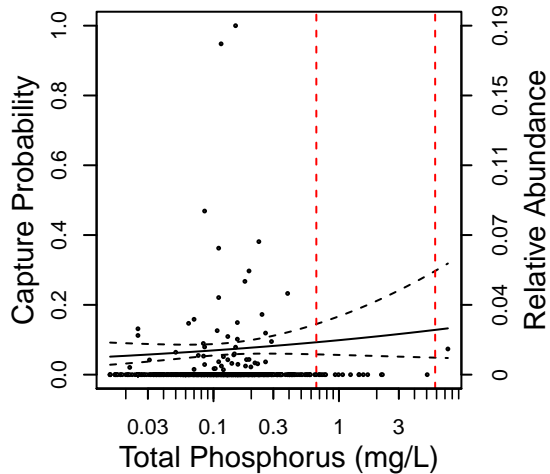


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

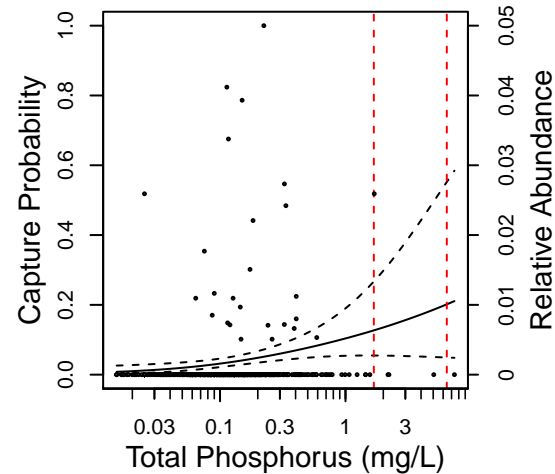
*Telopelopia okoboji*



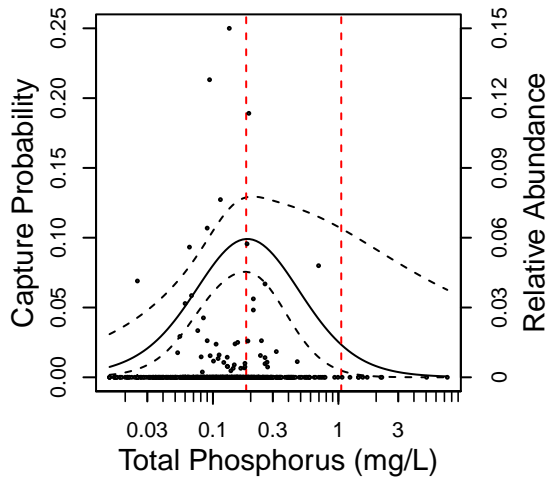
*Trepobates inermis/knighti*



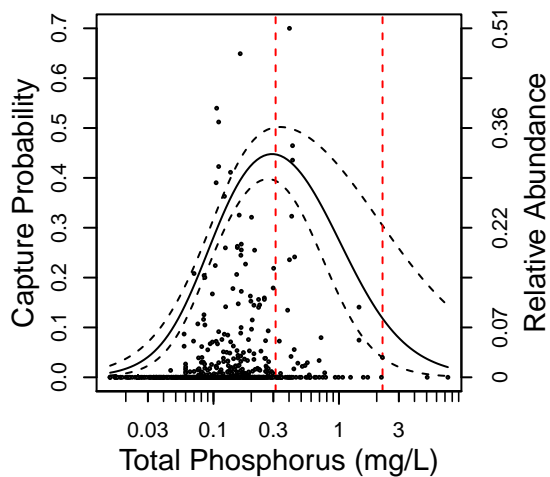
*Trepobates pictus*



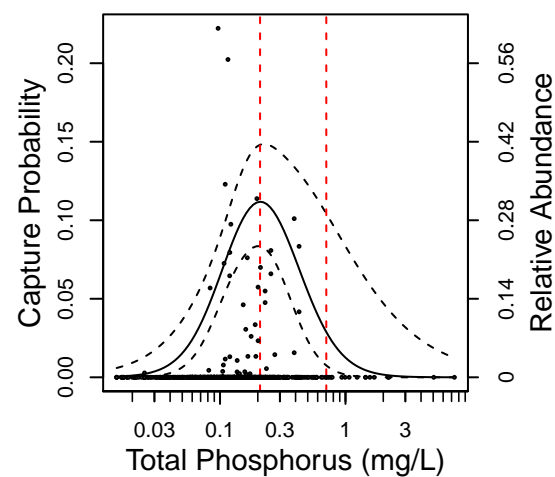
*Trepobates subnitidus*



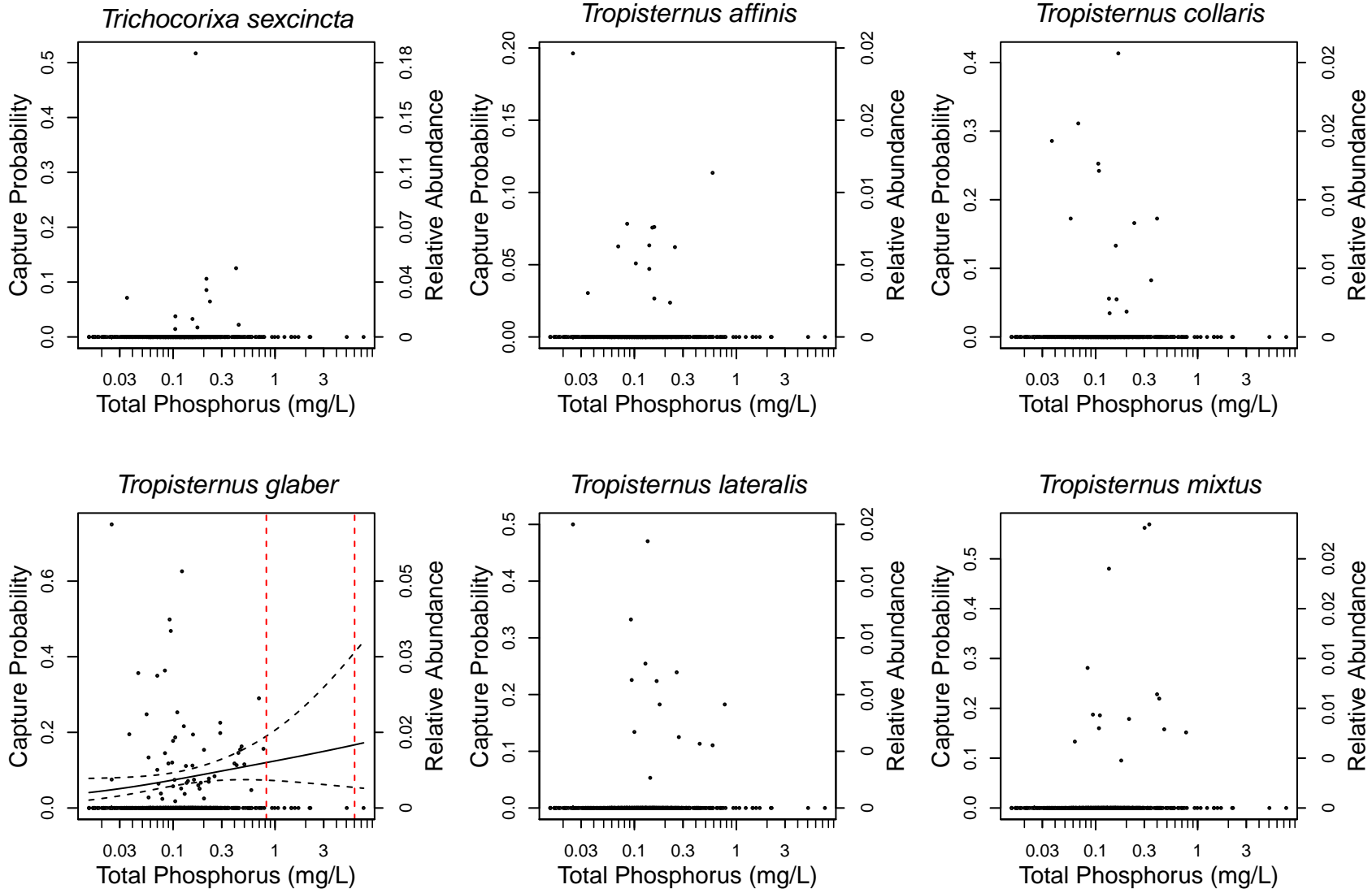
*Trichocorixa calva*



*Trichocorixa kanza*



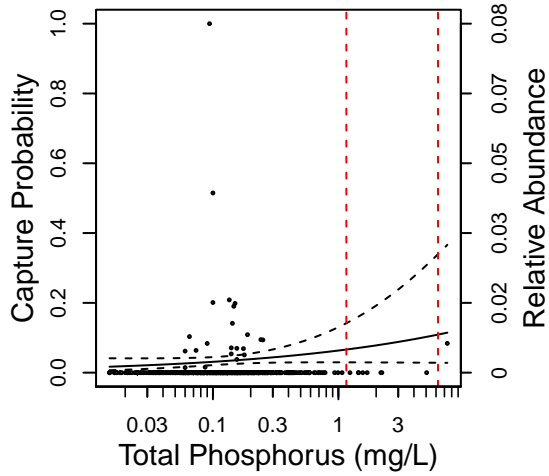
# Capture Probability of Macroinvertebrate Taxon Along TP Gradient



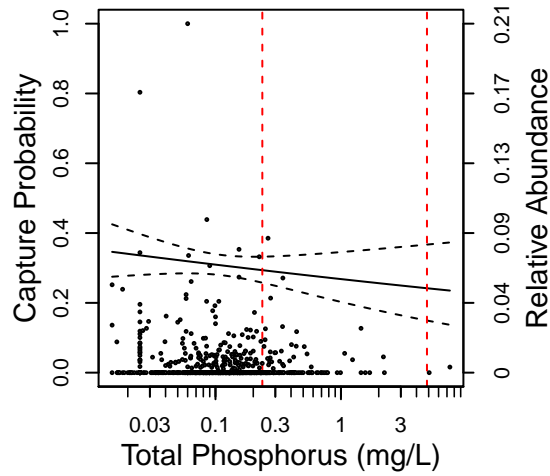


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

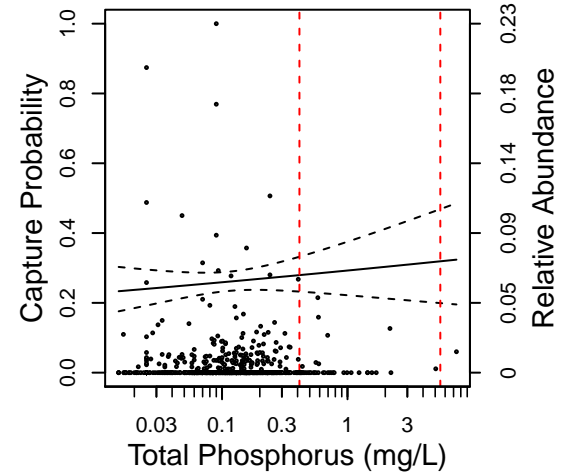
*Tropisternus natator*



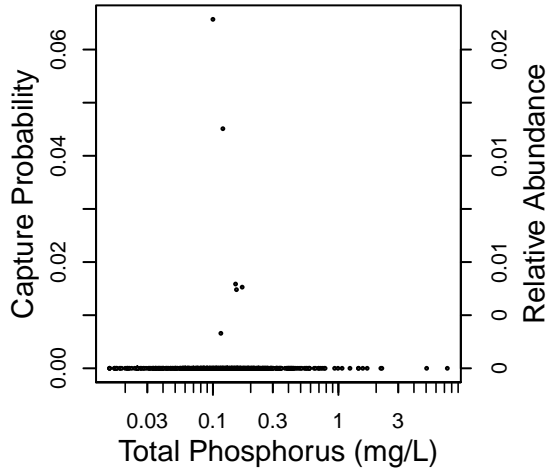
*Ablabesmyia*



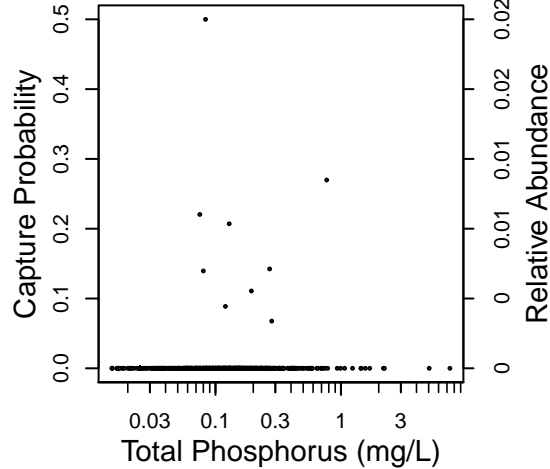
*Acari*



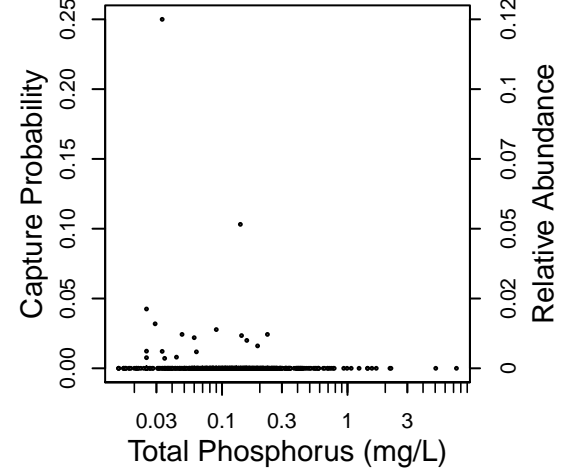
*Acentrella*



*Acentria*

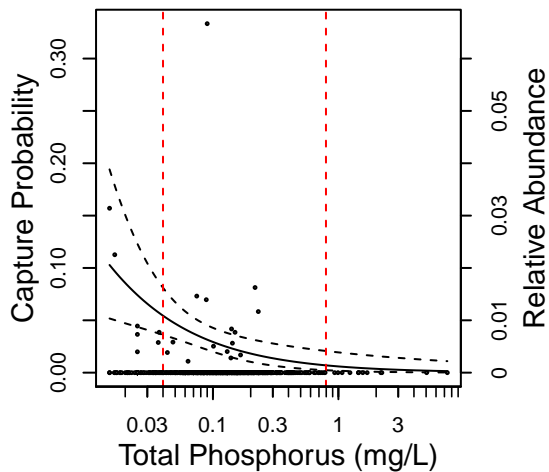


*Acerpenna*

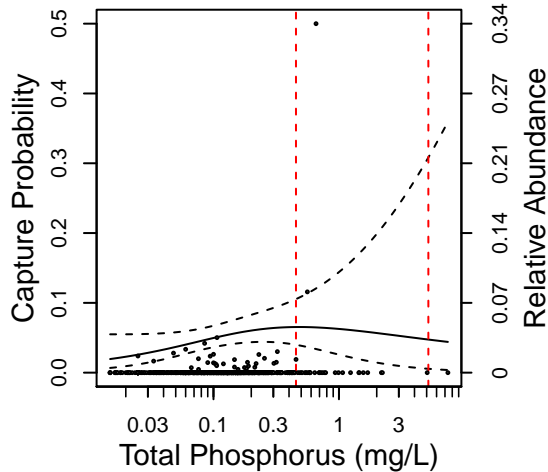


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

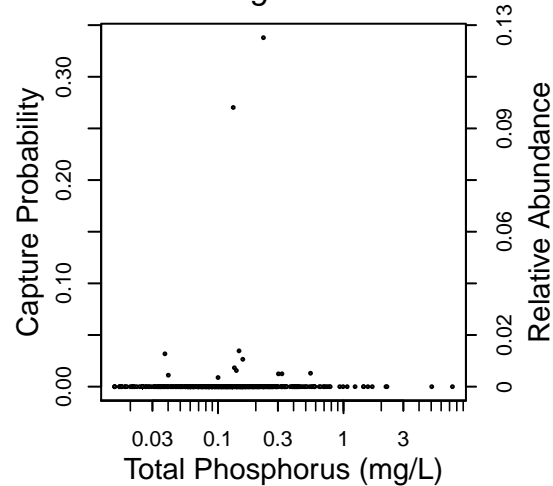
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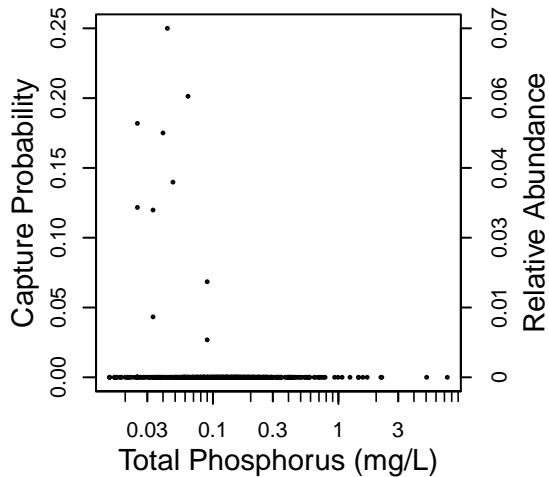
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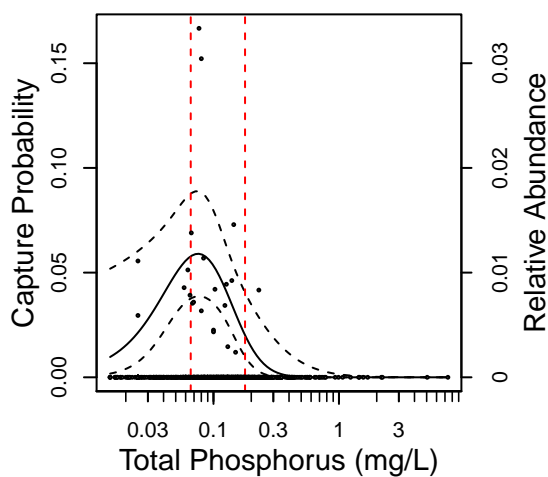
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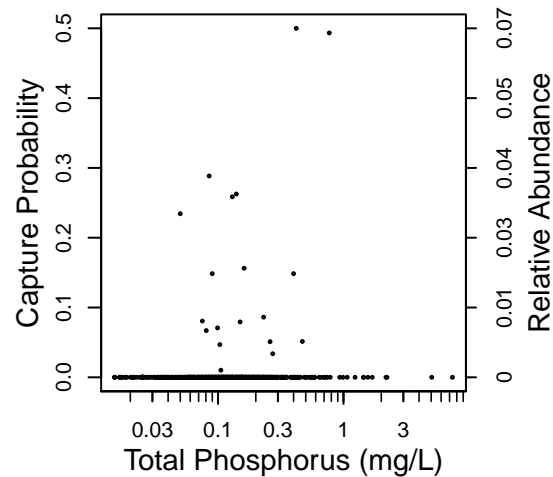
*Agnetina*



*ANACAENA*

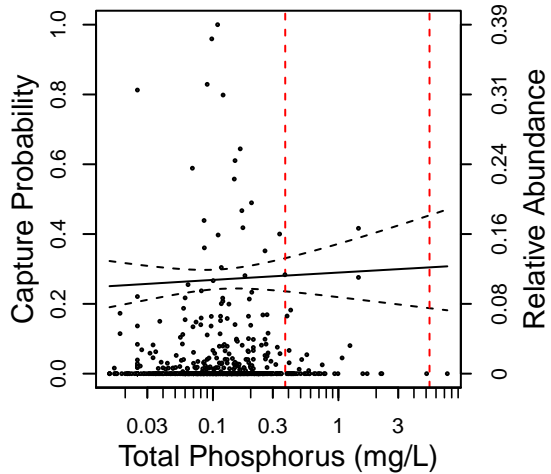


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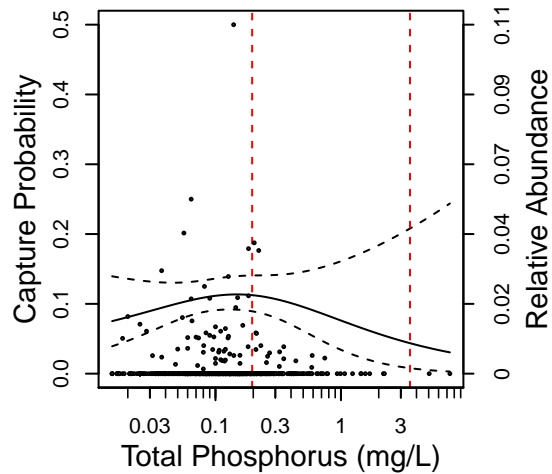


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

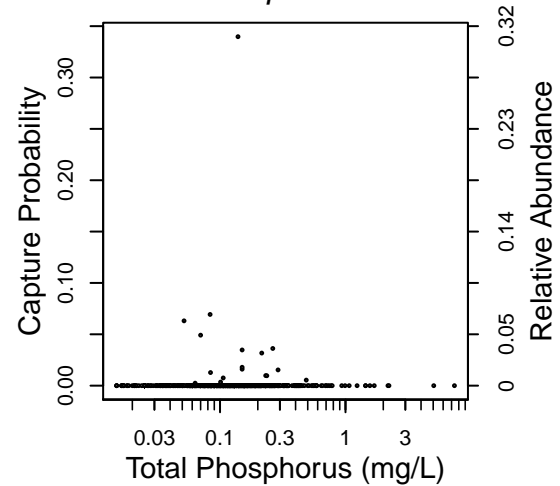
*Ancyronyx*



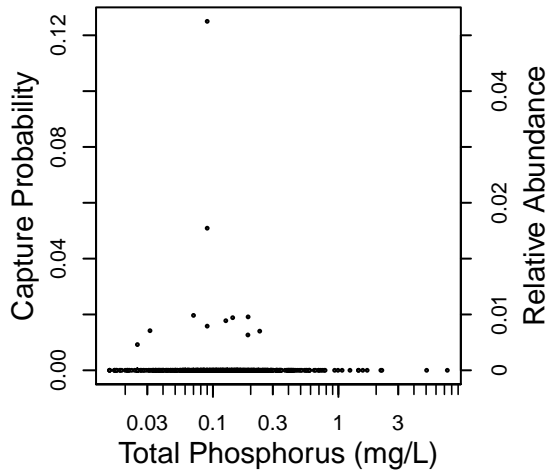
*Anopheles*



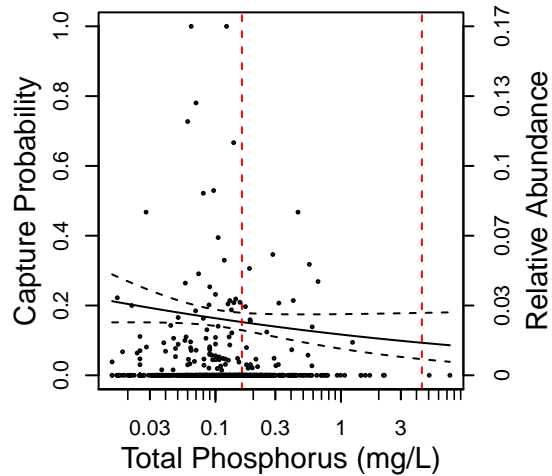
*Anthopotamus*



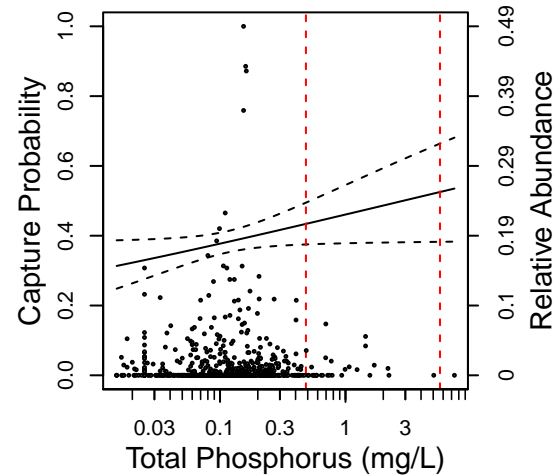
*Antocha*



*Aquarius*

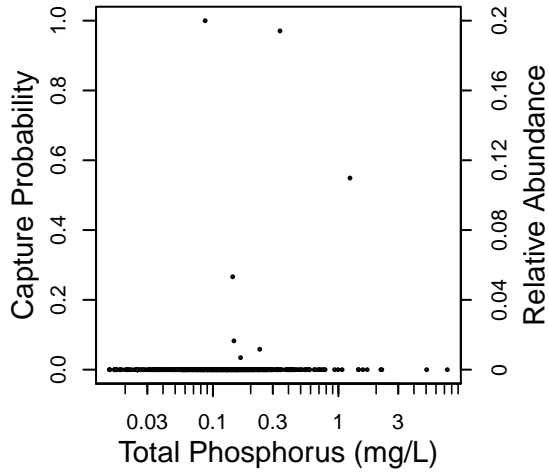


*Argia*

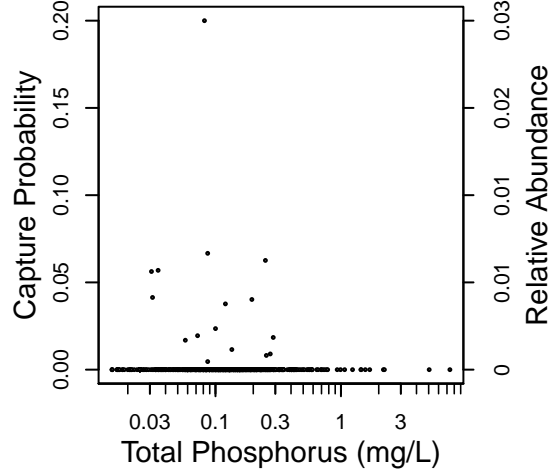


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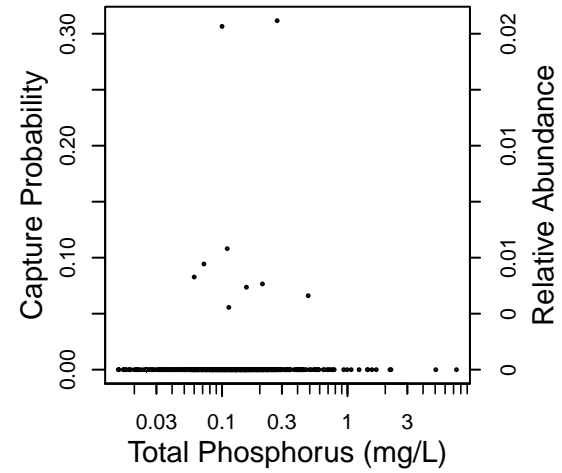
*Asellus*



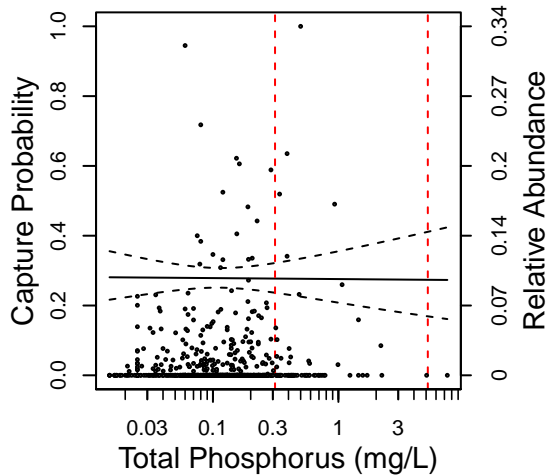
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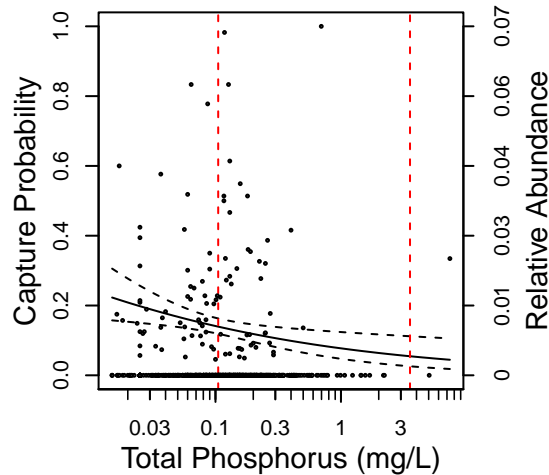
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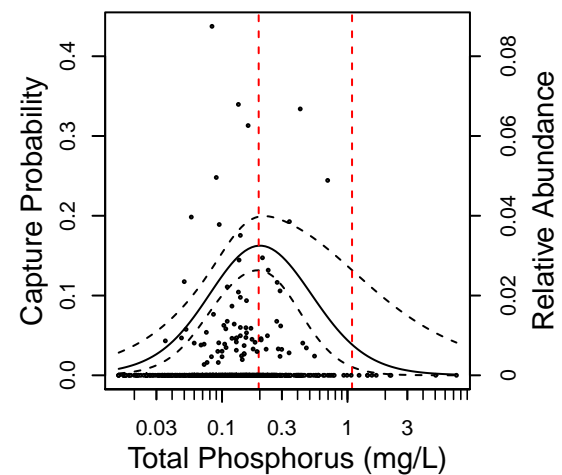
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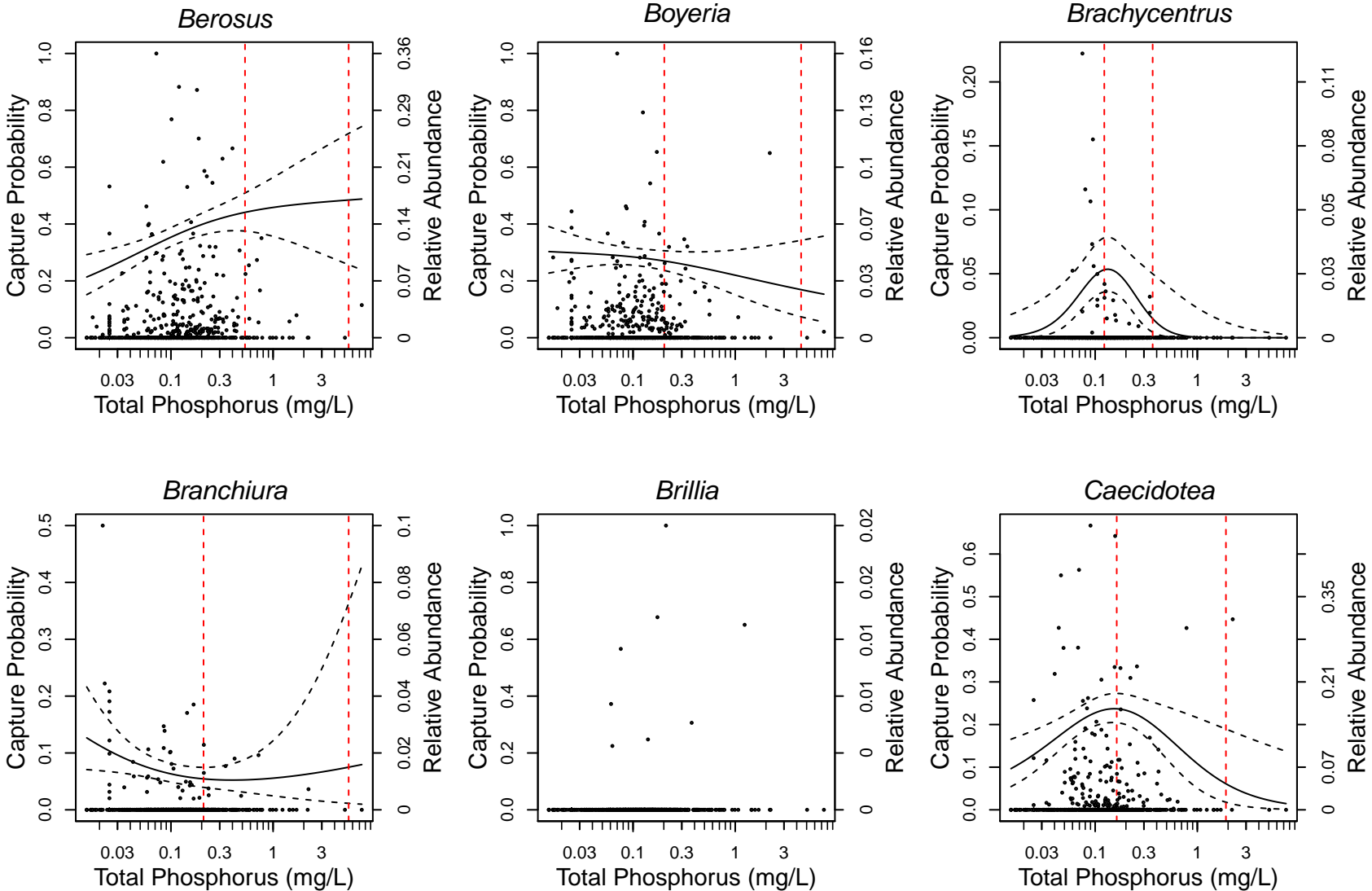
*Basiaeschna*



*Belostoma*

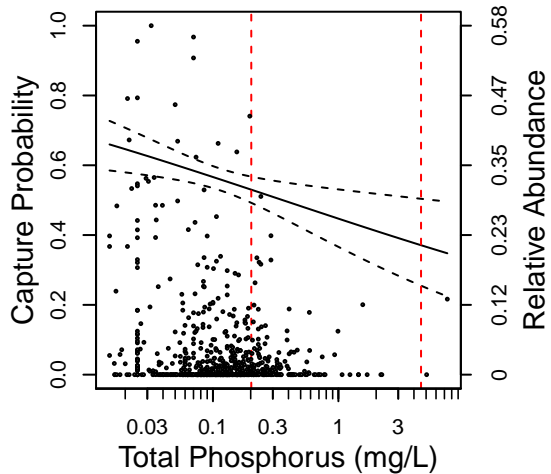


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

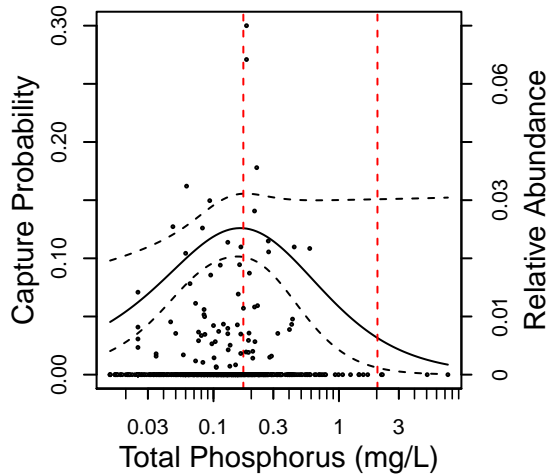


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

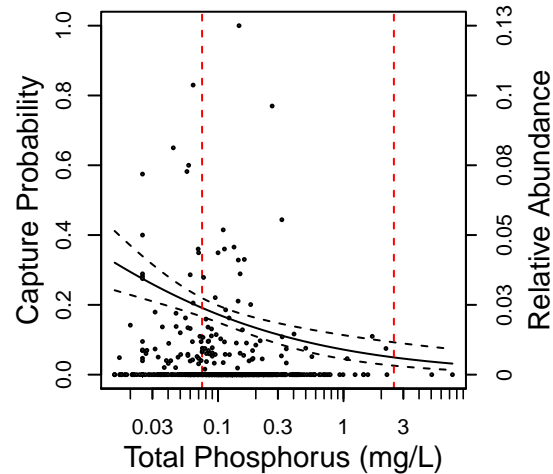
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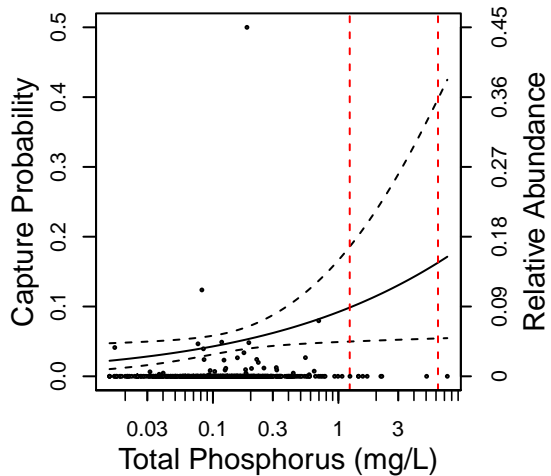
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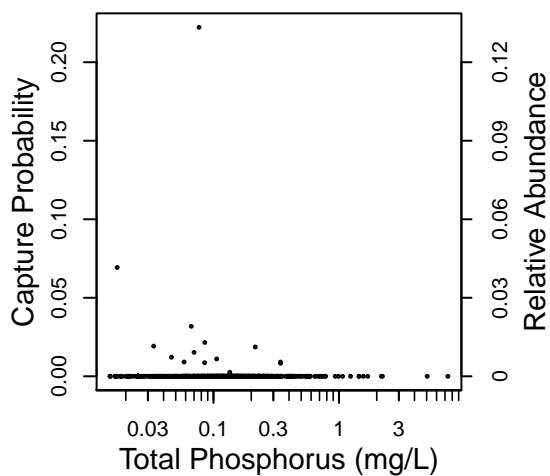
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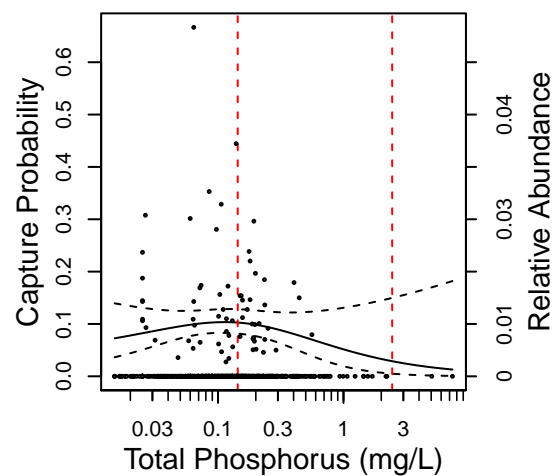
*Cambarus*



*Campeloma*

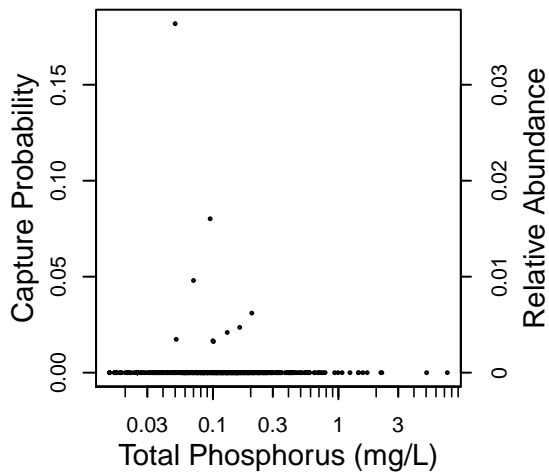


*Centroptilum*

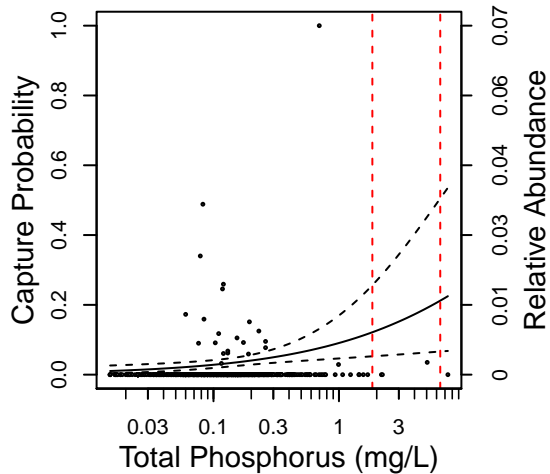


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

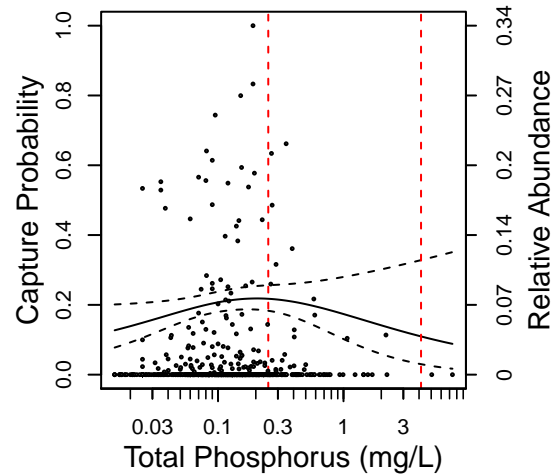
*Ceraclea*



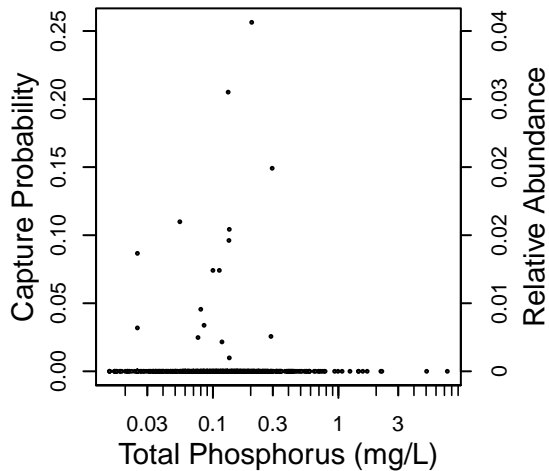
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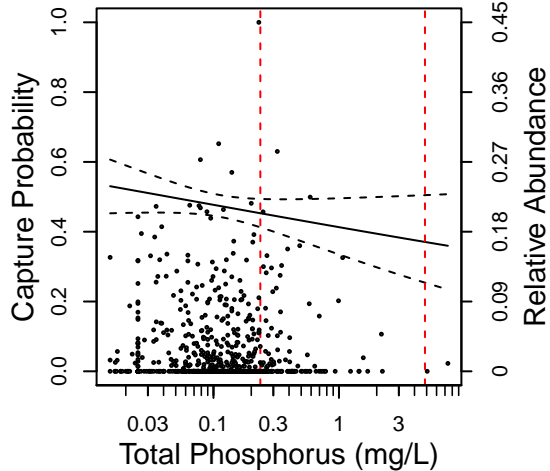
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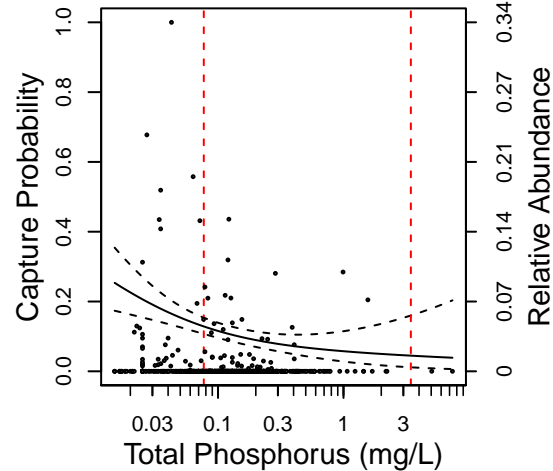
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*Cheumatopsyche*

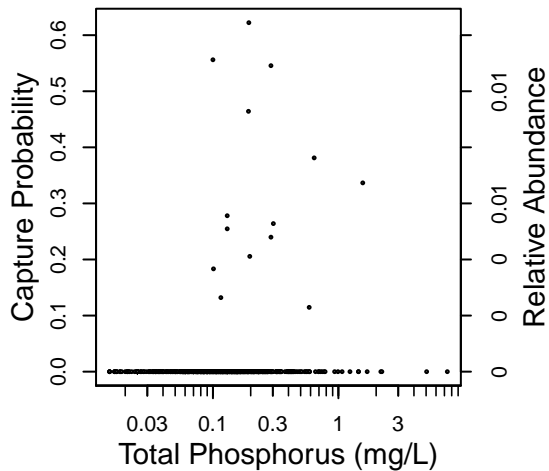


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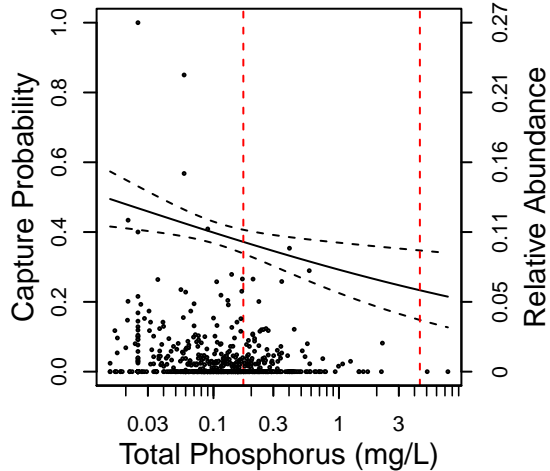


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

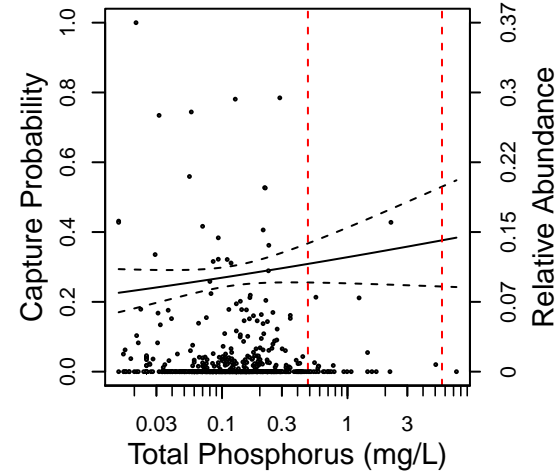
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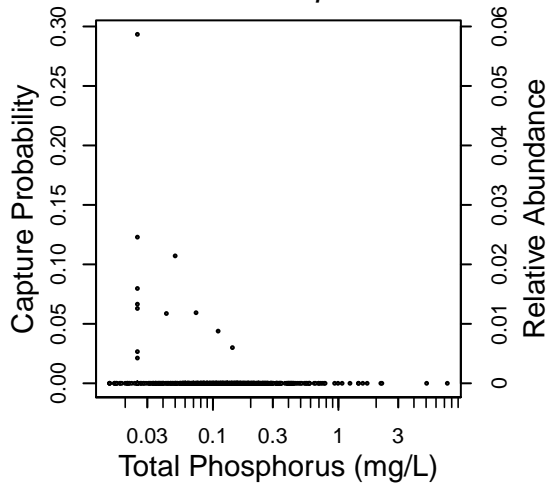
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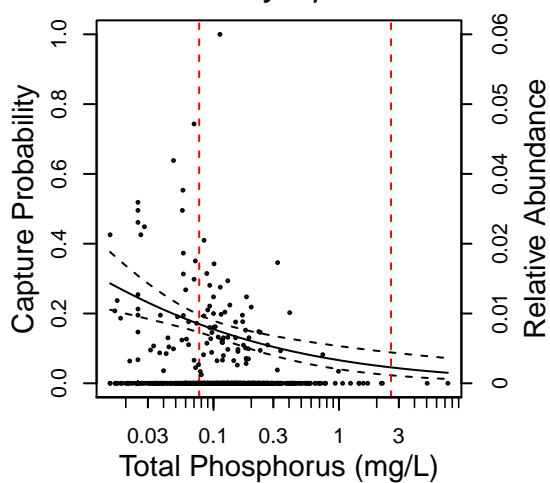
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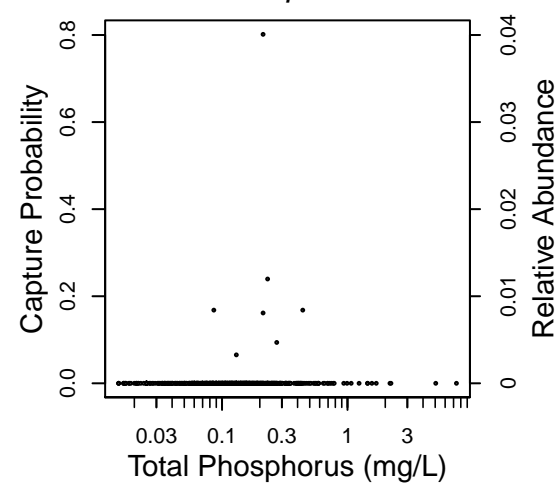
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*Chrysops*



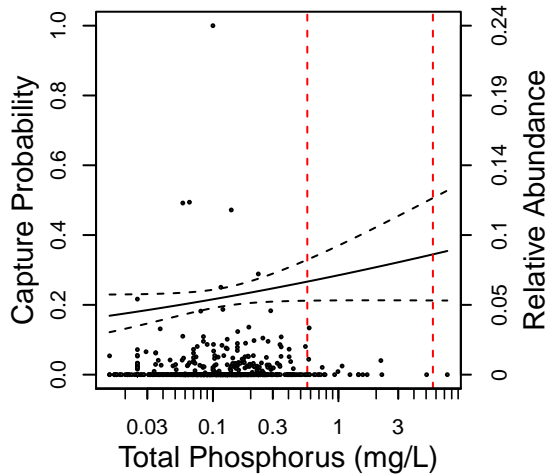
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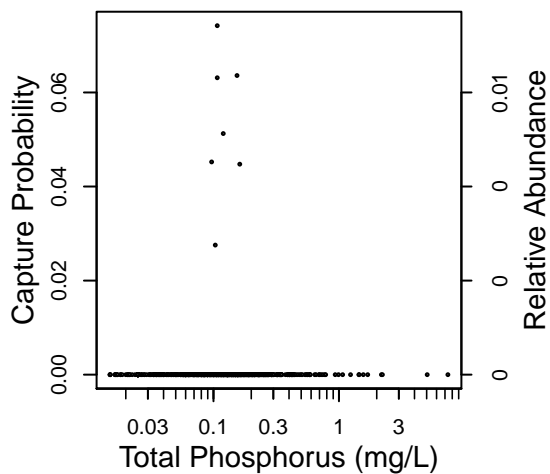


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

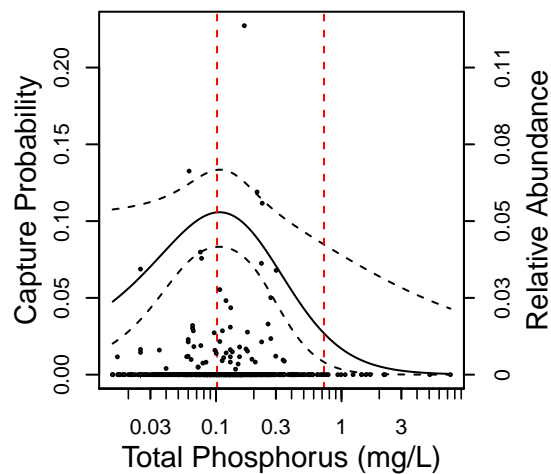
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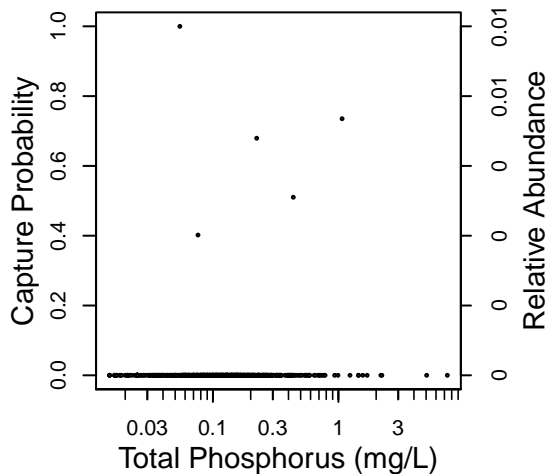
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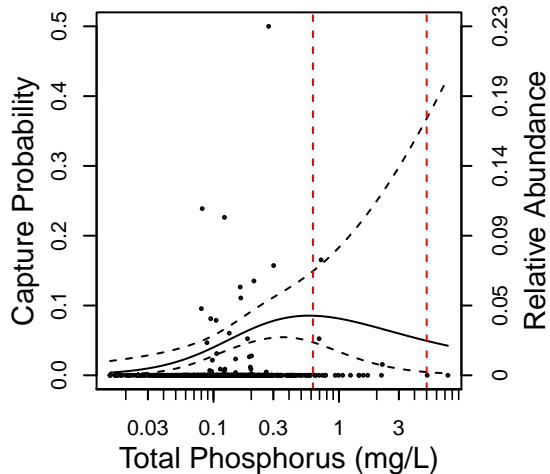
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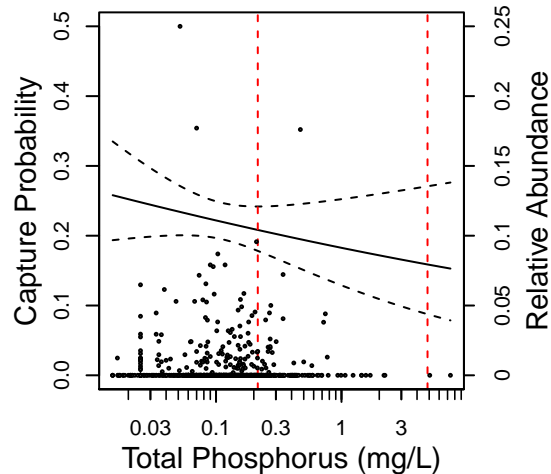
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*Coptotomus*

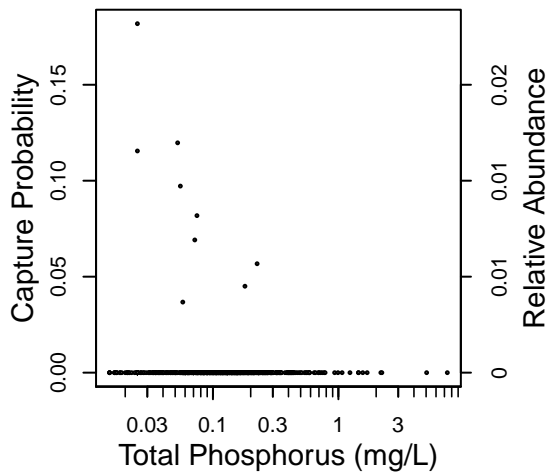


*Corbicula*

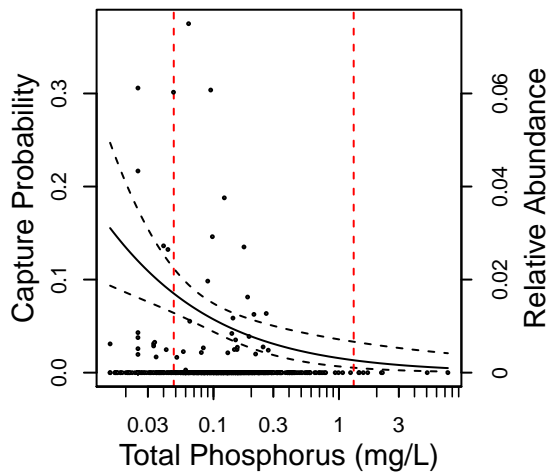


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

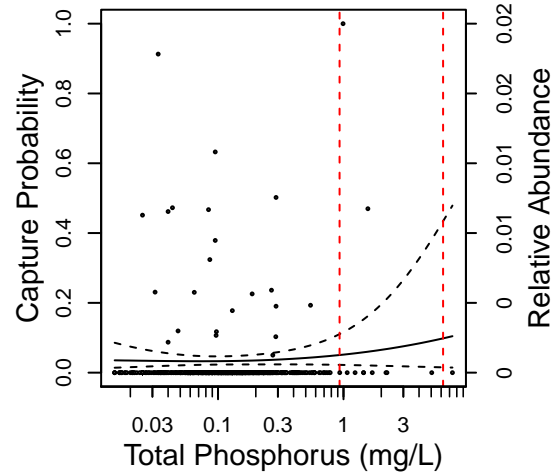
*Cordulegaster*



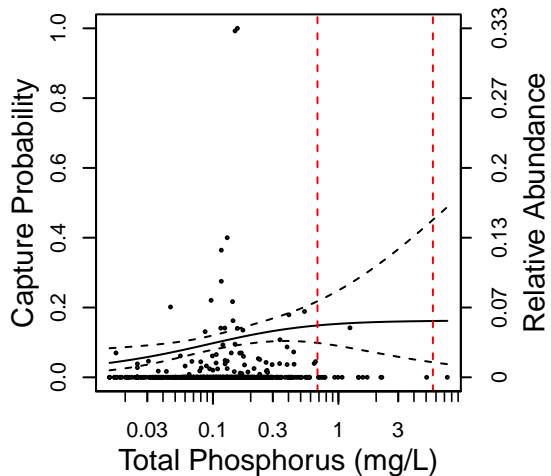
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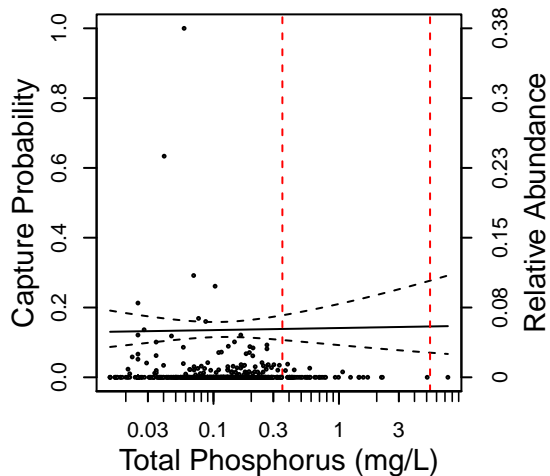
*Corynoneura*



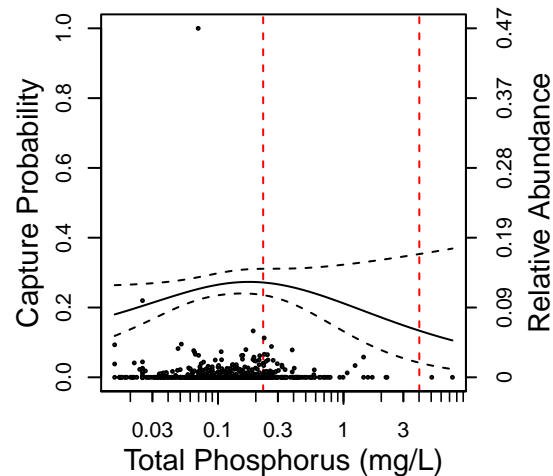
*Crangonyx*



*Cricotopus*

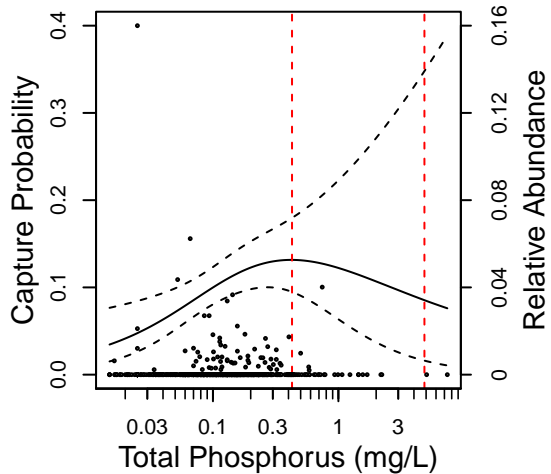


*Cryptochironomus*

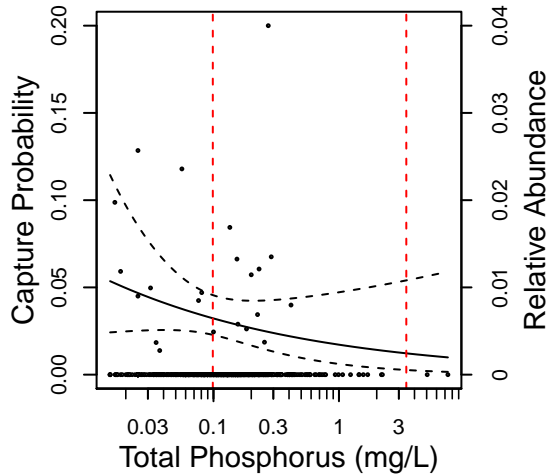


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

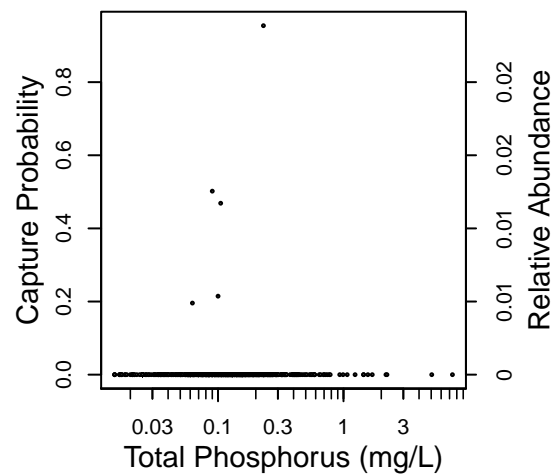
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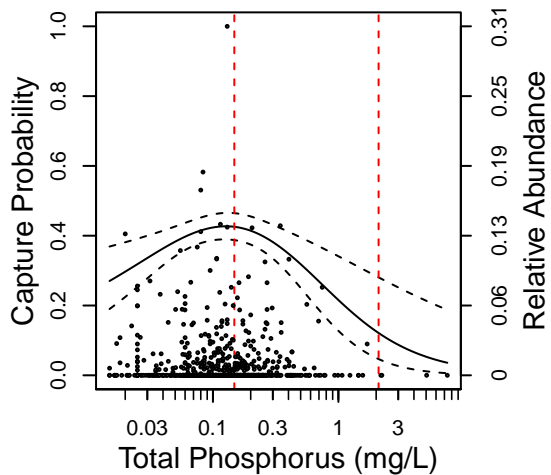
*Culicoides*



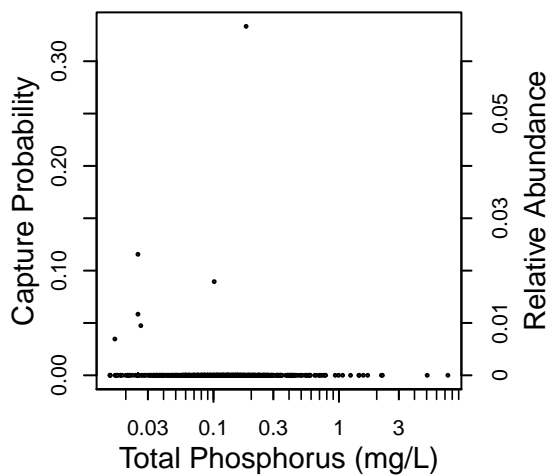
*Cymbiodyta*



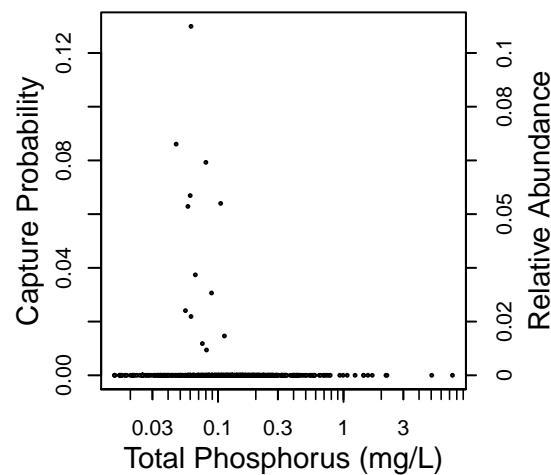
*Cyphon*



*Dasyhelea*

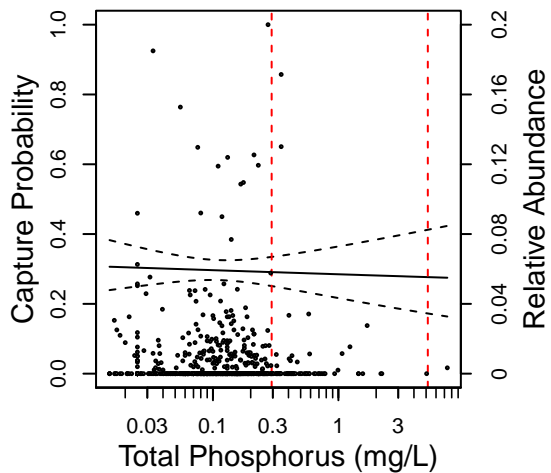


*Dicranota*

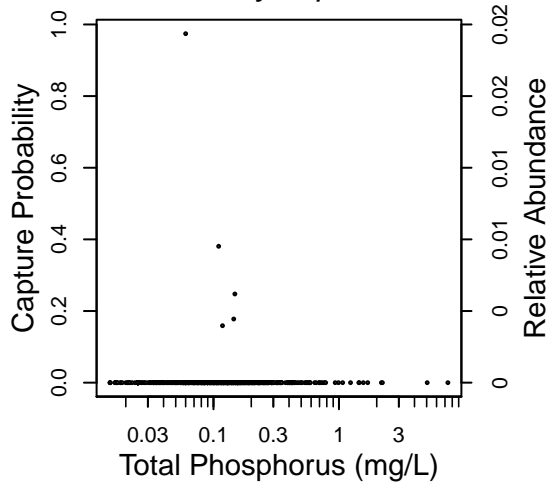


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

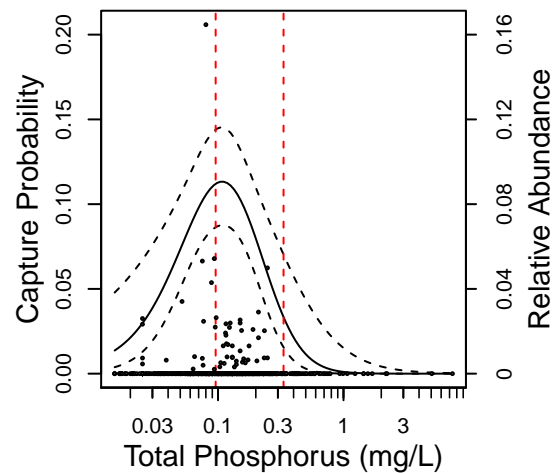
*Dicrotendipes*



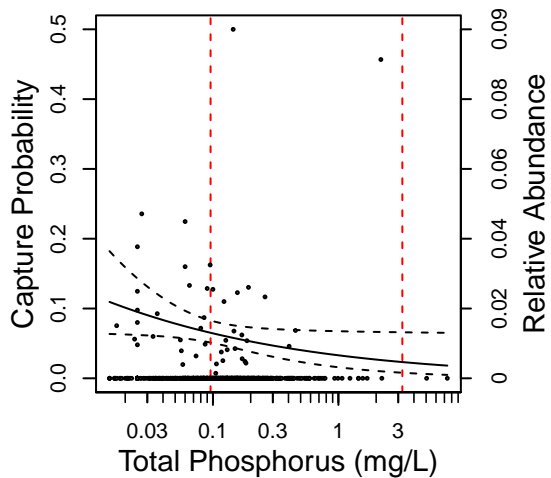
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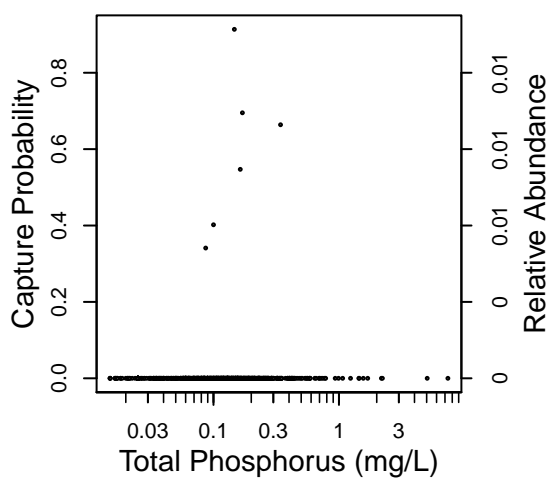
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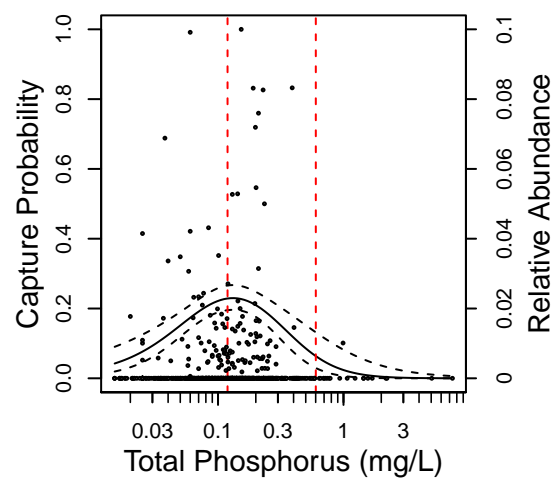
*Dixella*



*Dreissena*

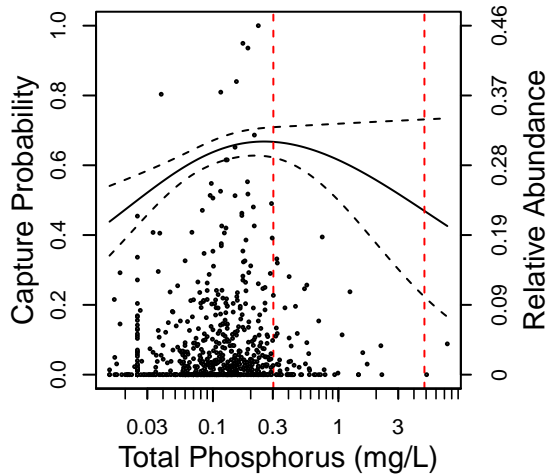


*Dromogomphus*

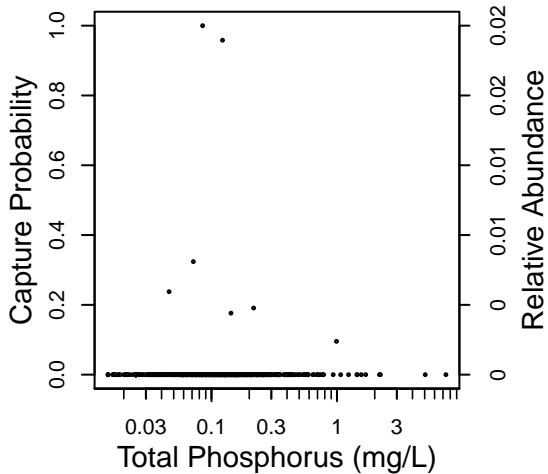


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

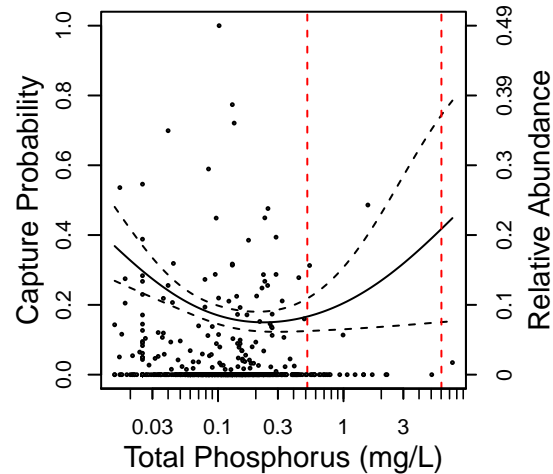
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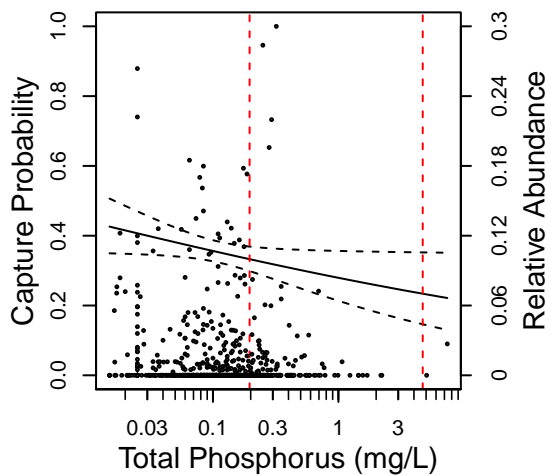
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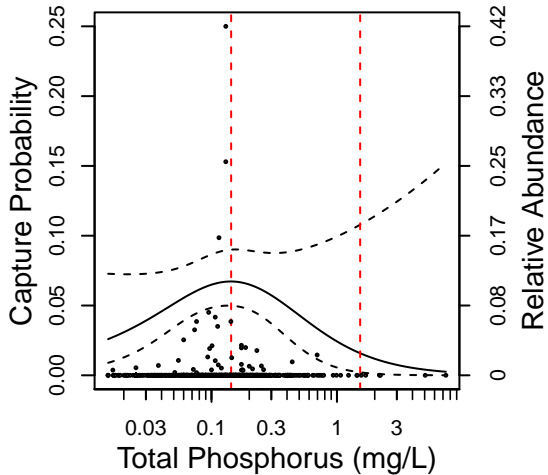
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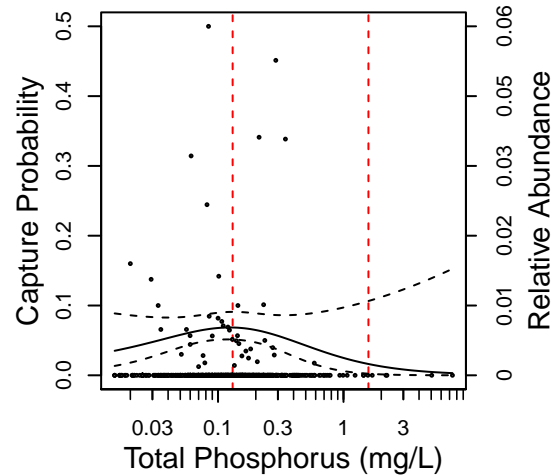
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*Endochironomus*

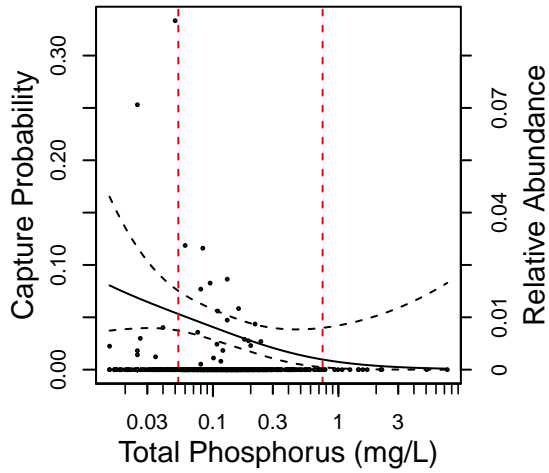


*Enochrus*

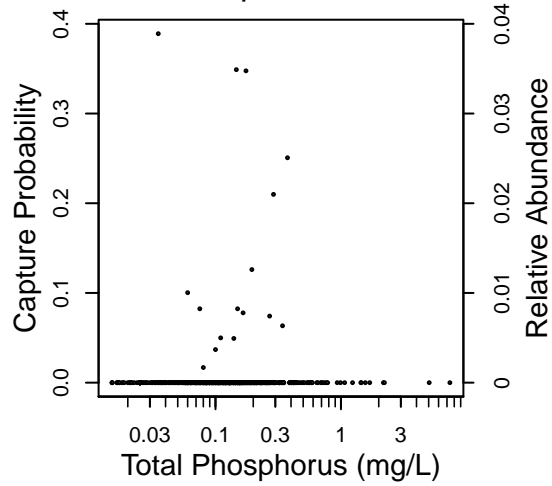


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

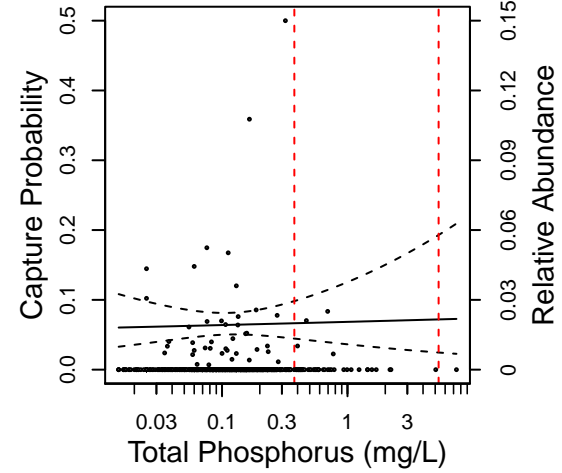
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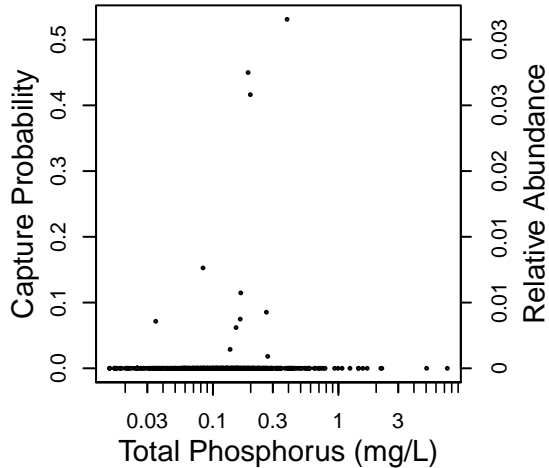
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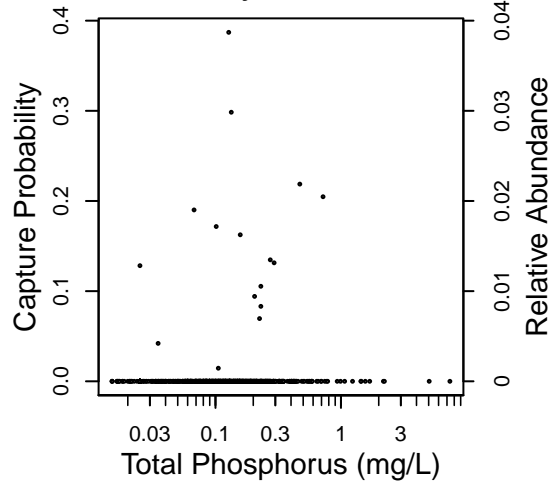
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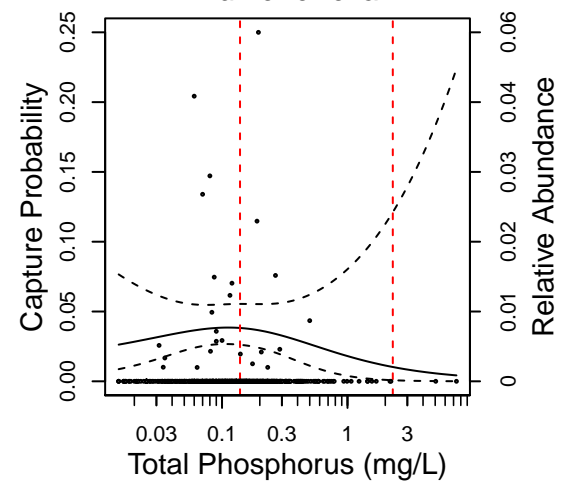
*Erpetogomphus*



*Erythemis*

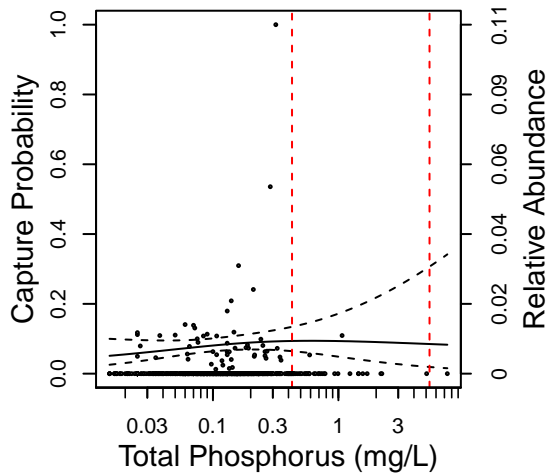


*Eukiefferiella*

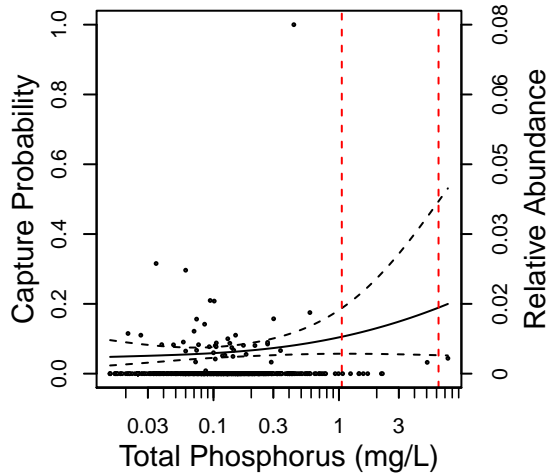


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

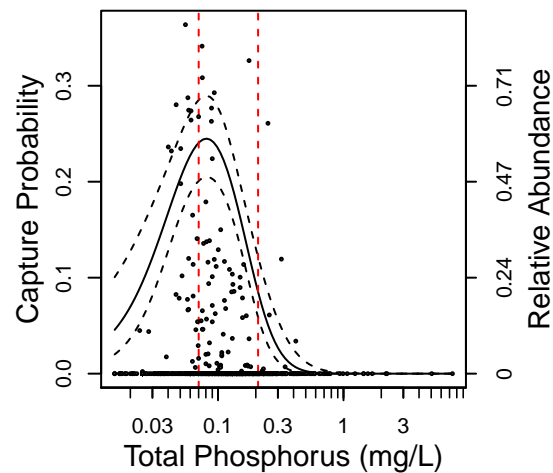
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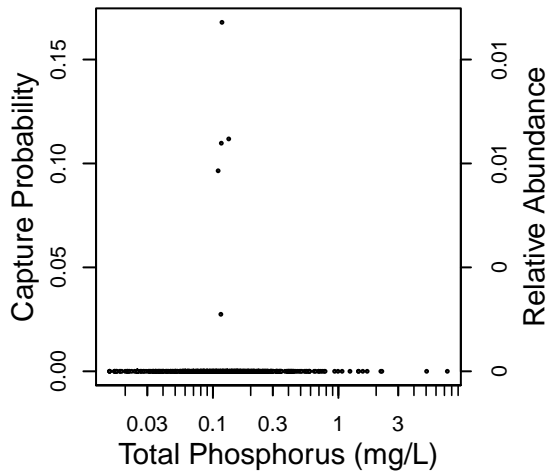
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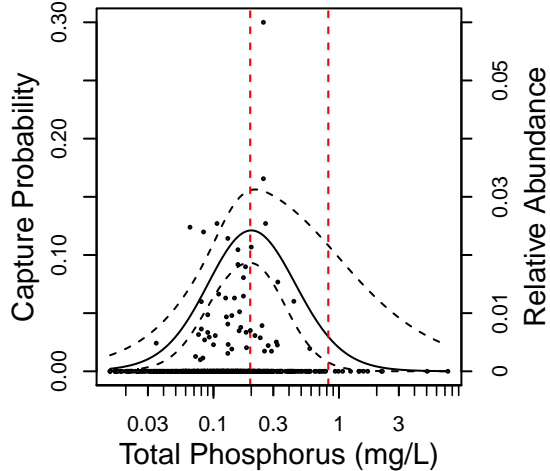
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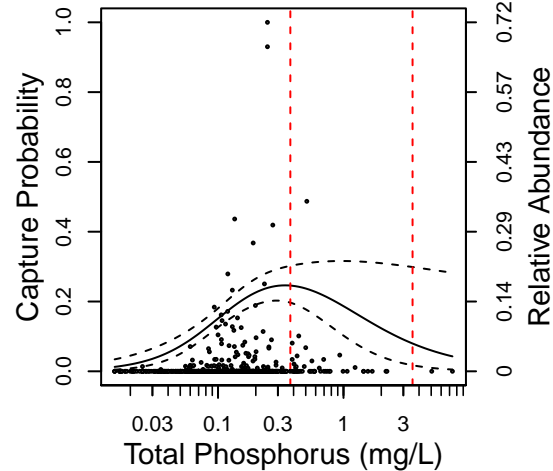
*Gelastocoris*



*Gerris*

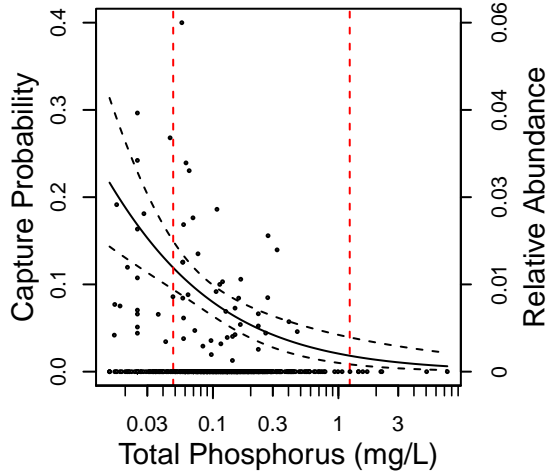


*Glyptotendipes*

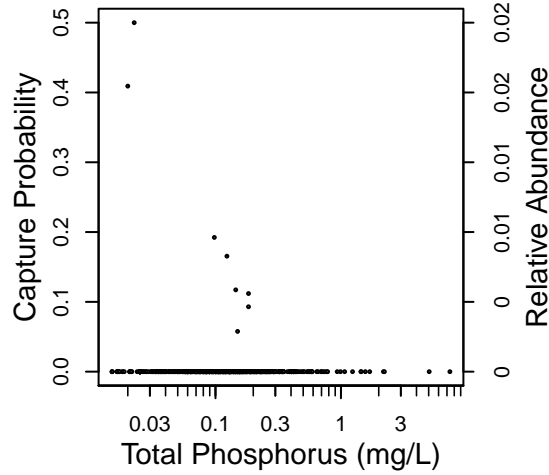


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

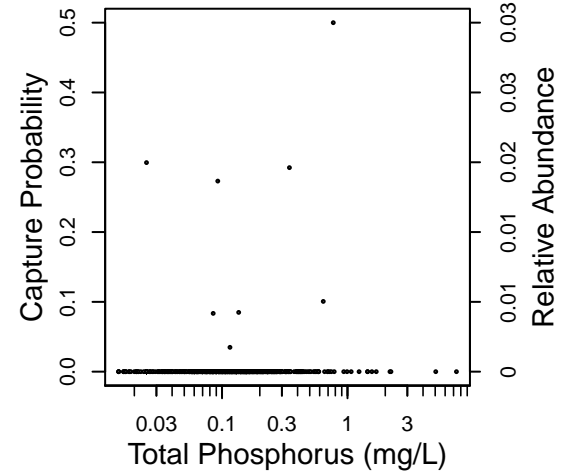
*Gomphus*



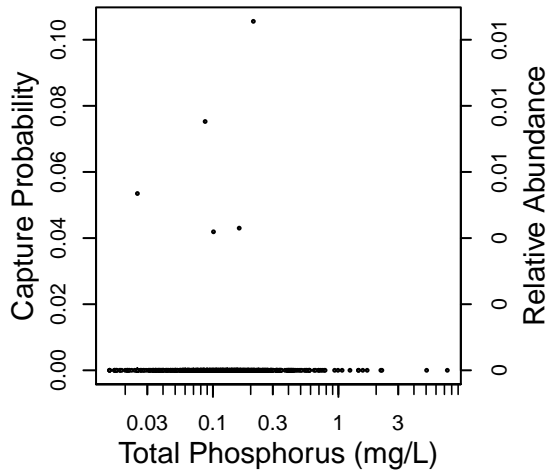
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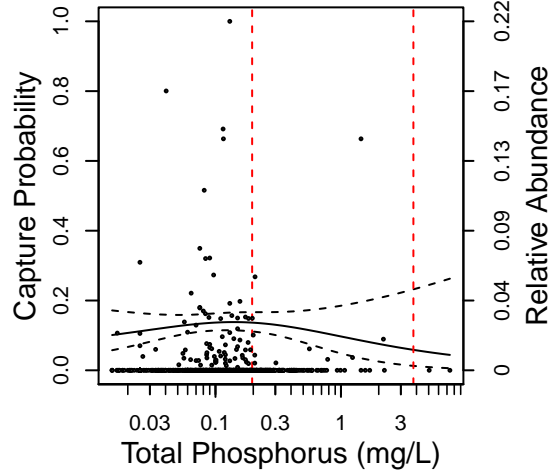
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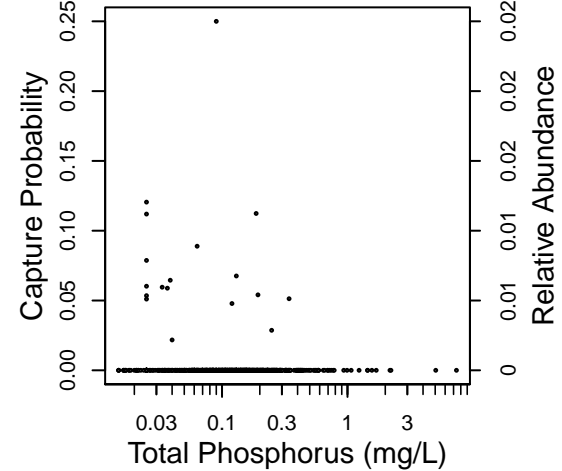
*Gyretes*



*Gyrinus*



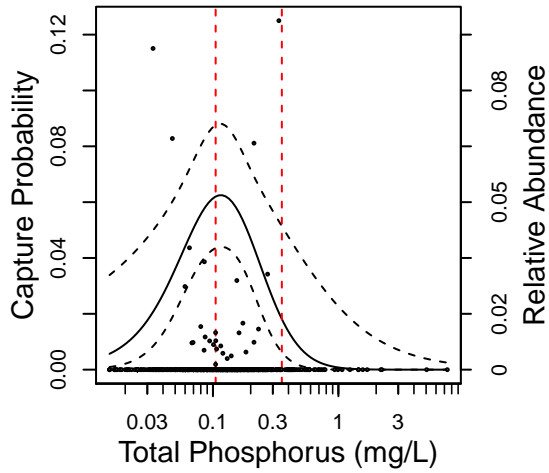
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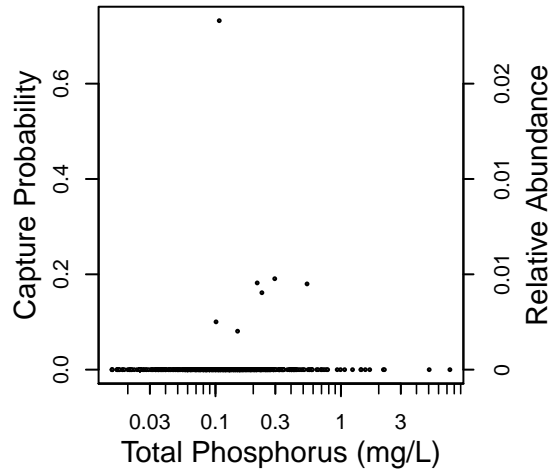


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

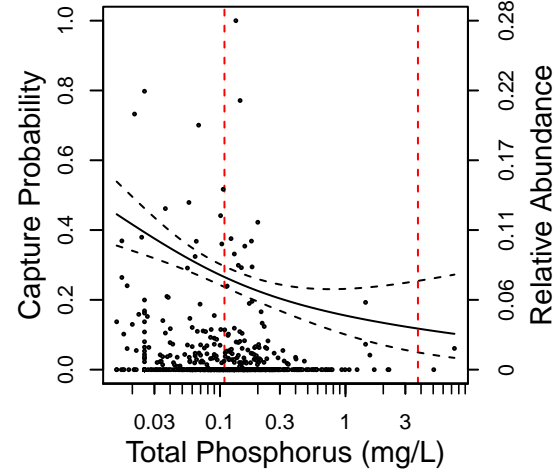
*Haliplus*



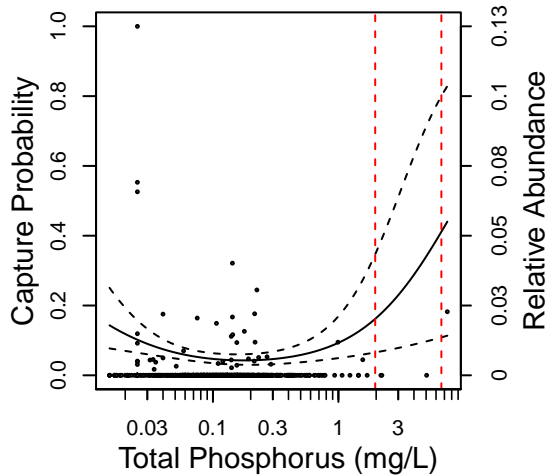
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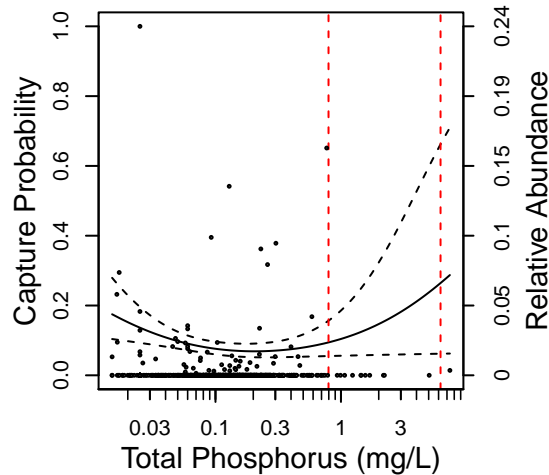
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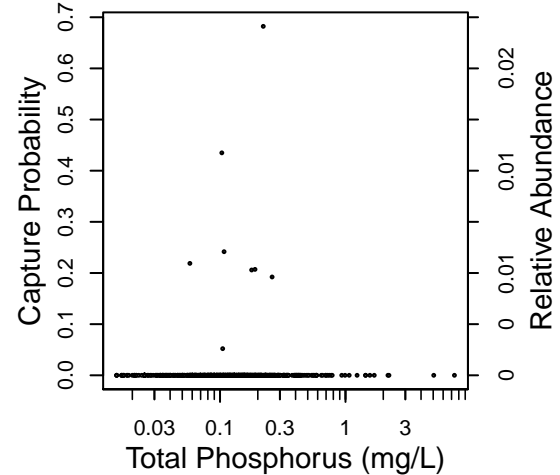
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*Helisoma*

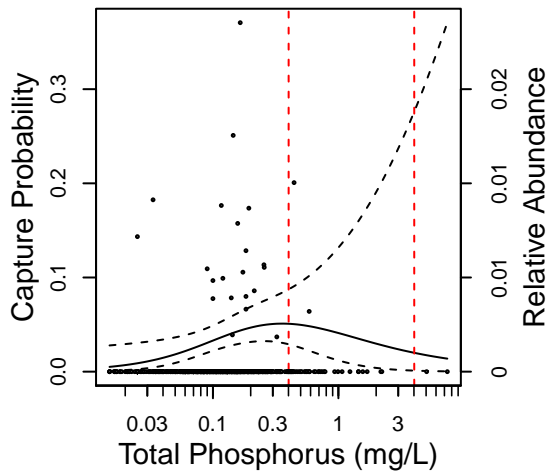


*Helochaeres*

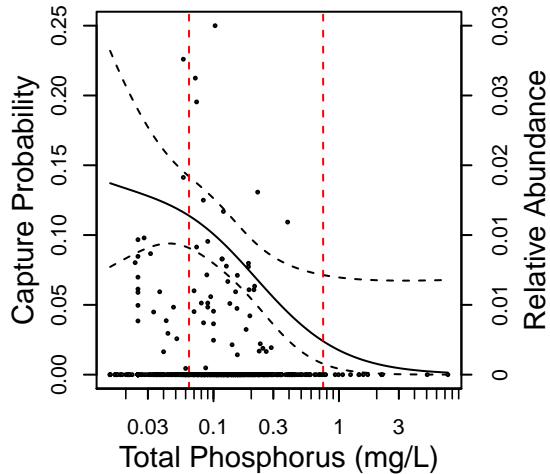


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

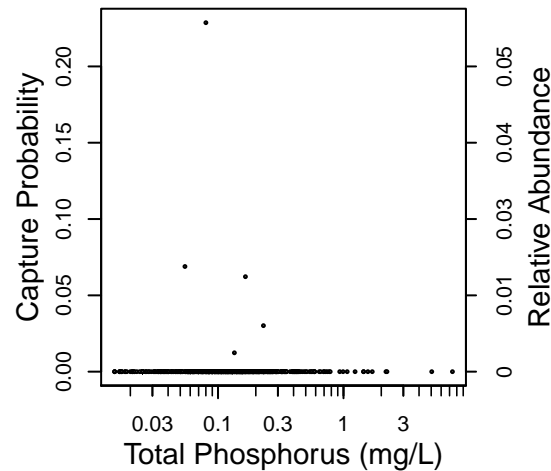
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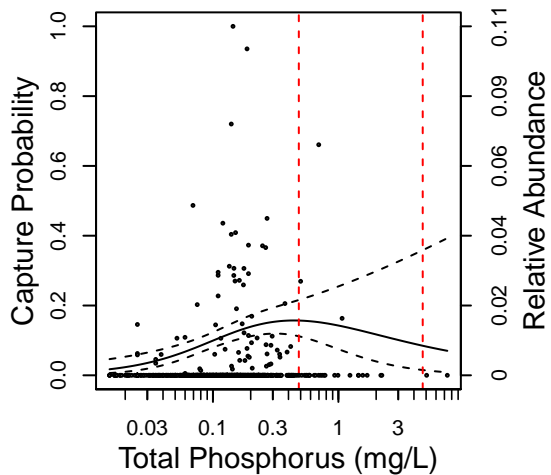
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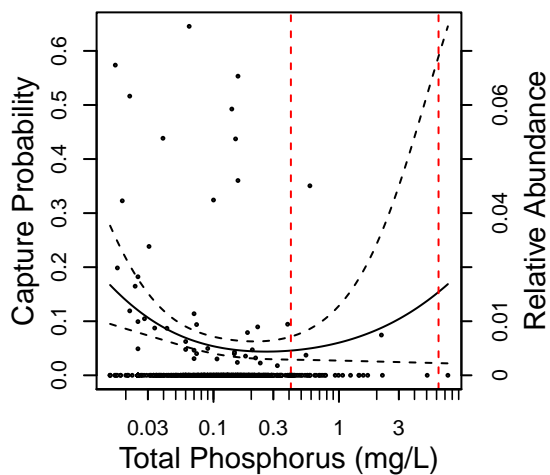
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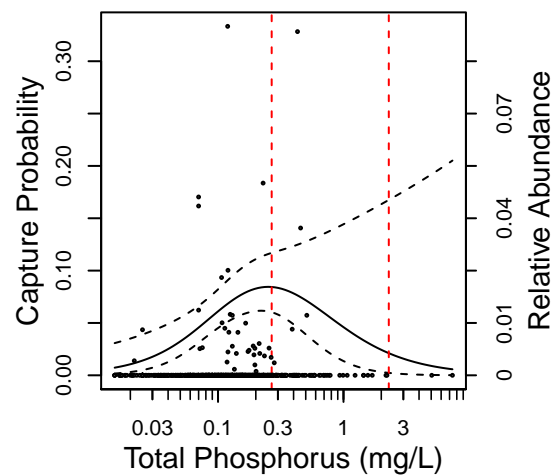
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*Heterosternuta*

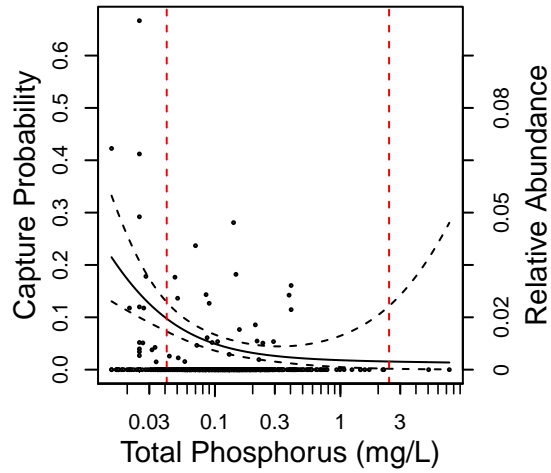


*Hexagenia*

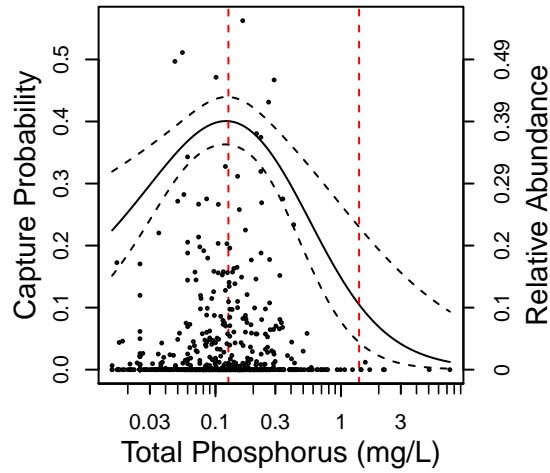


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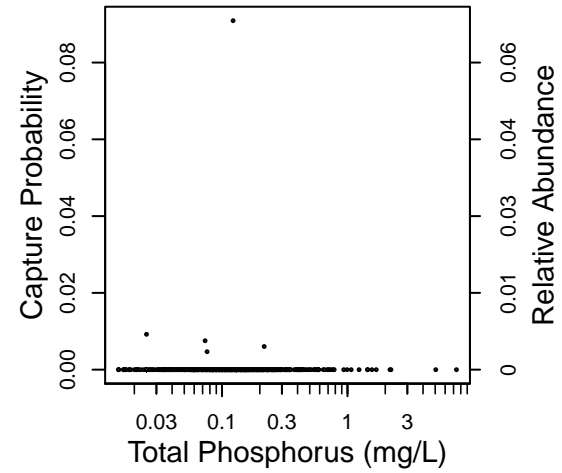
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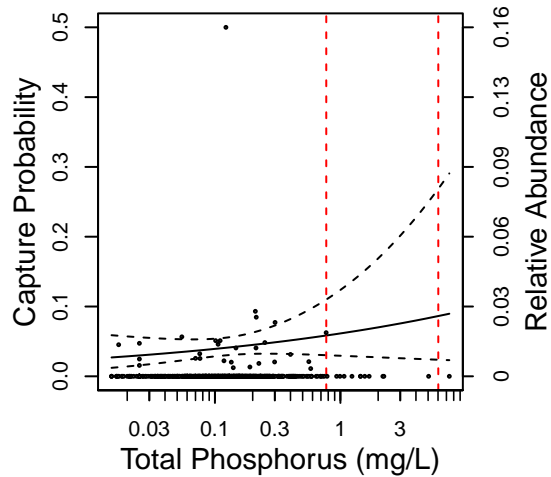
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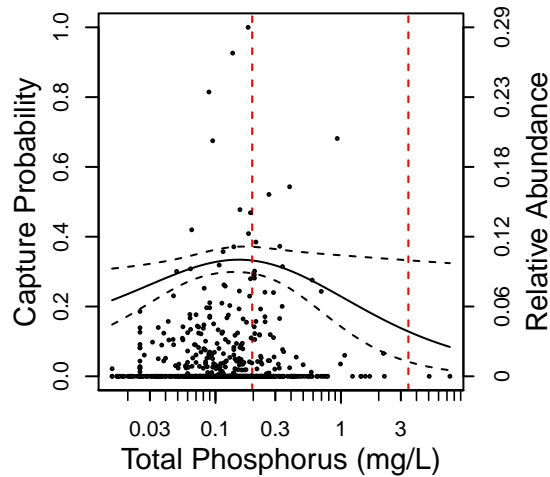
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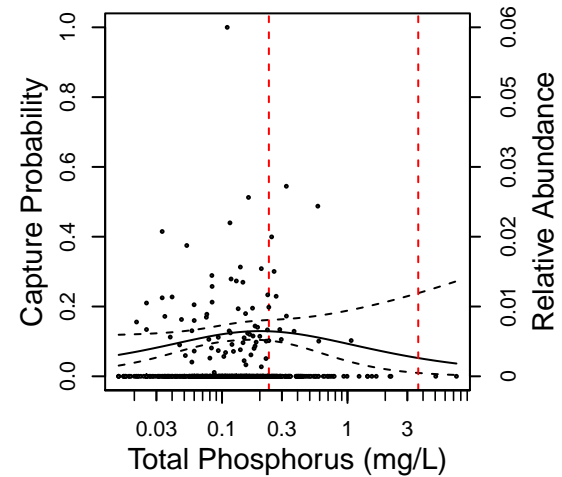
*Hydrochus*



*Hydropsyche*

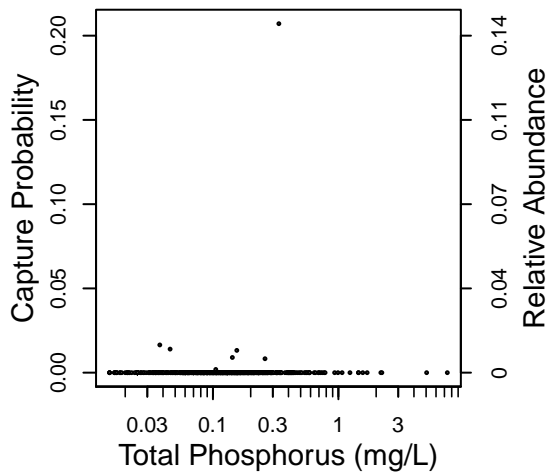


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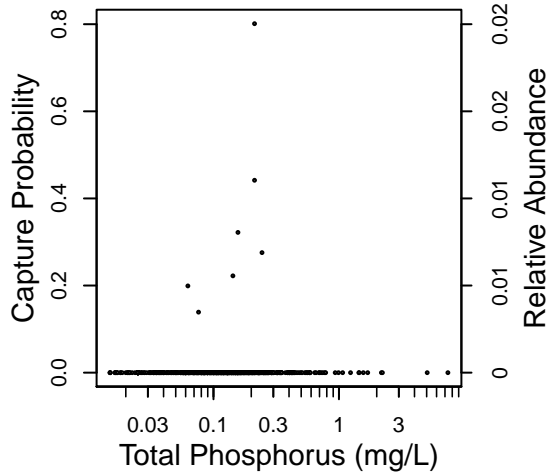


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

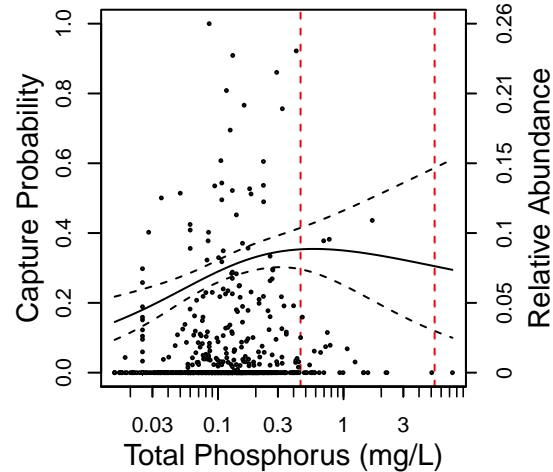
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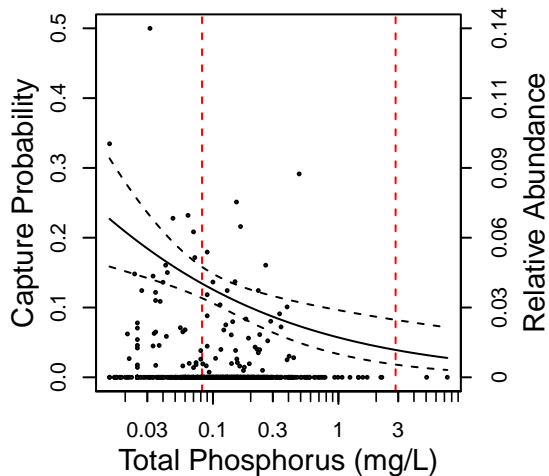
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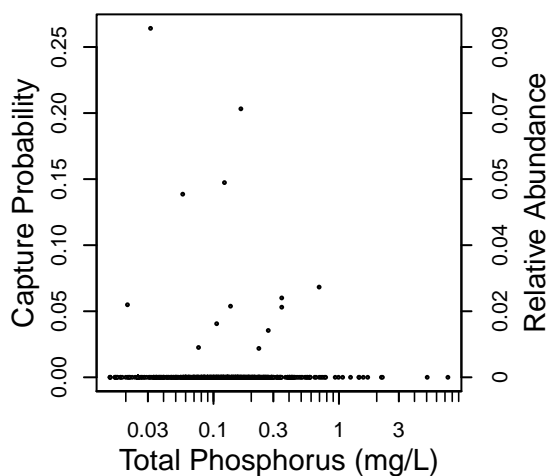
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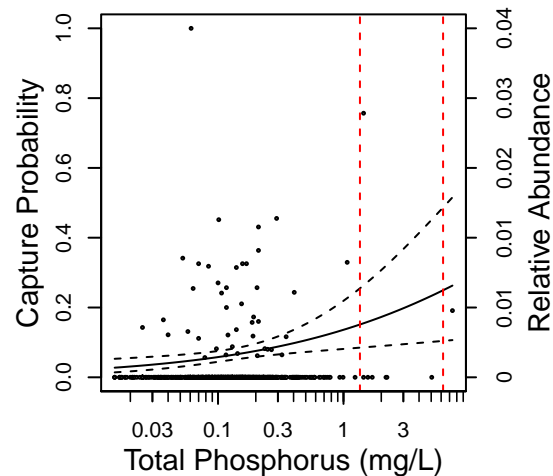
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*Kiefferulus*

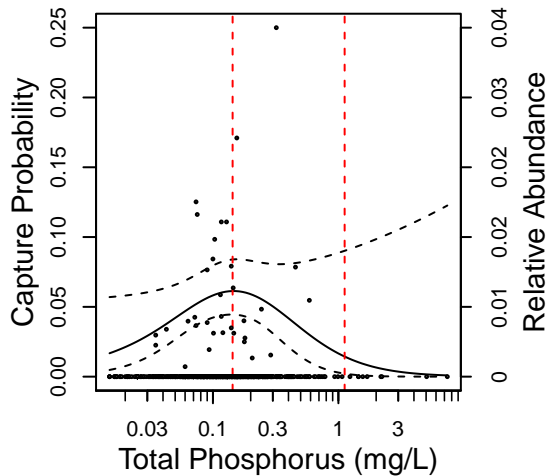


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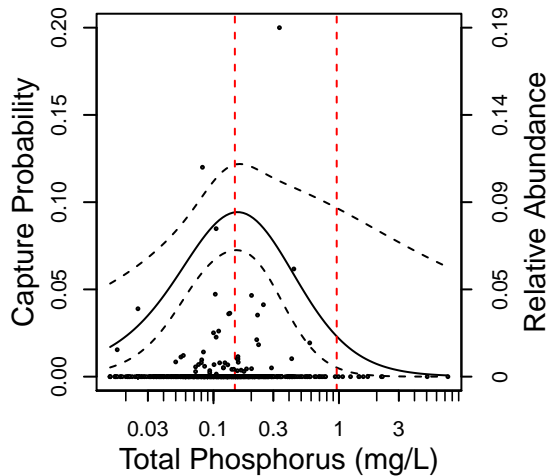


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

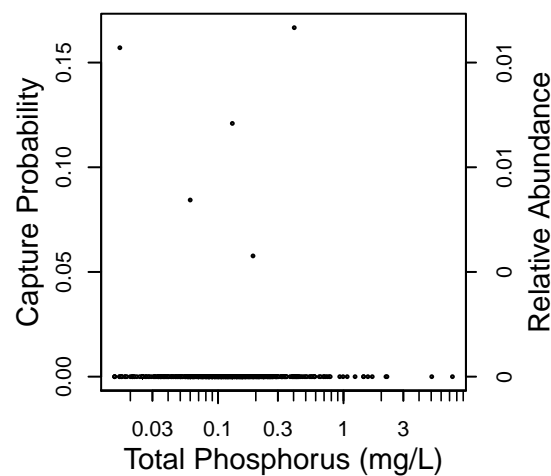
*Laccobius*



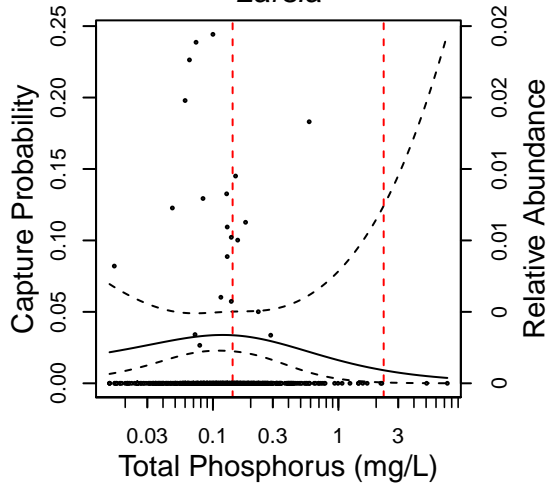
*Laccophilus*



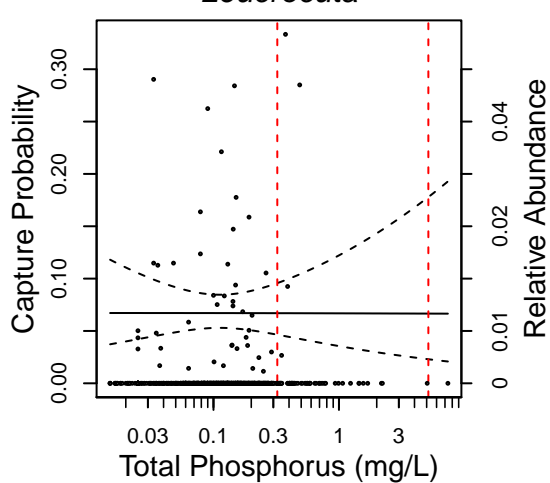
*Laevapex*



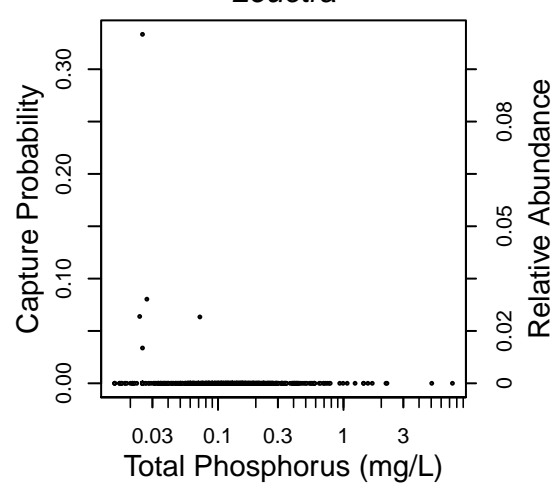
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*Leucrocuta*

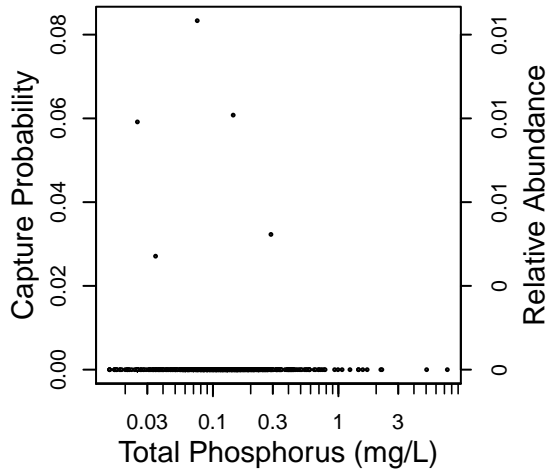


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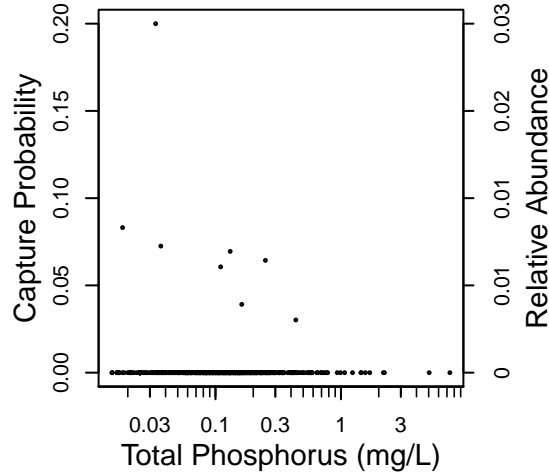


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

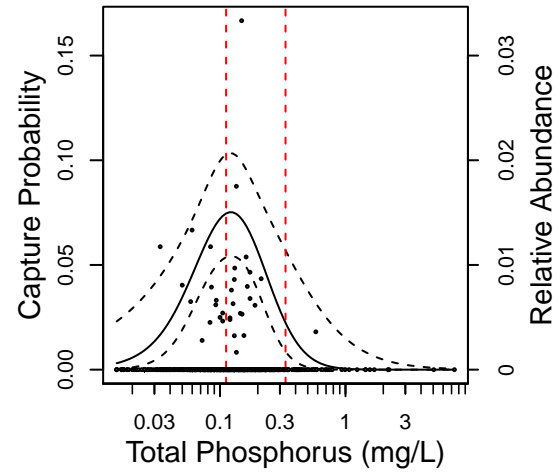
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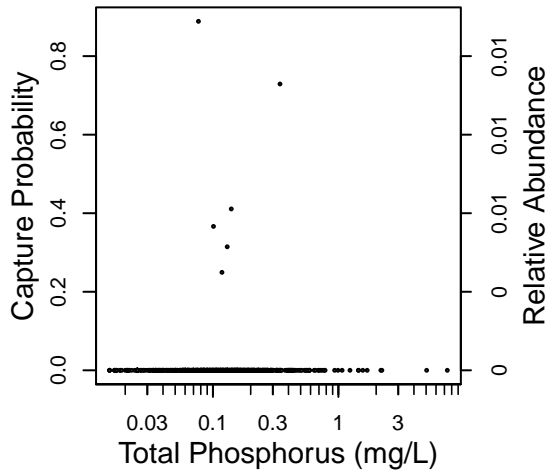
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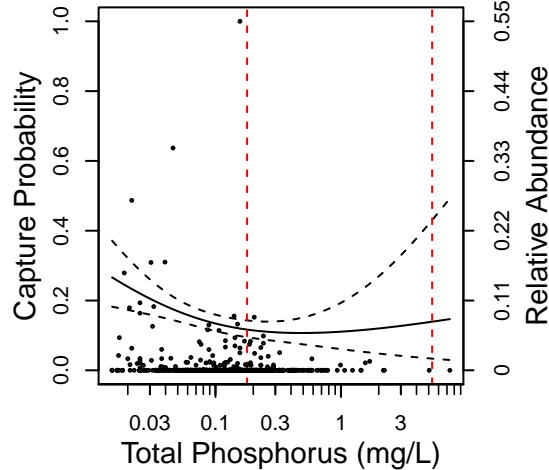
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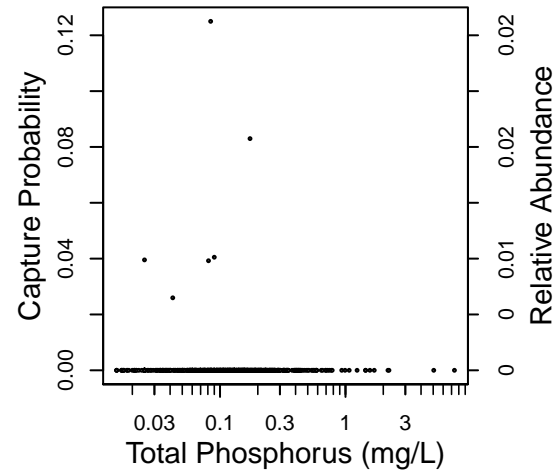
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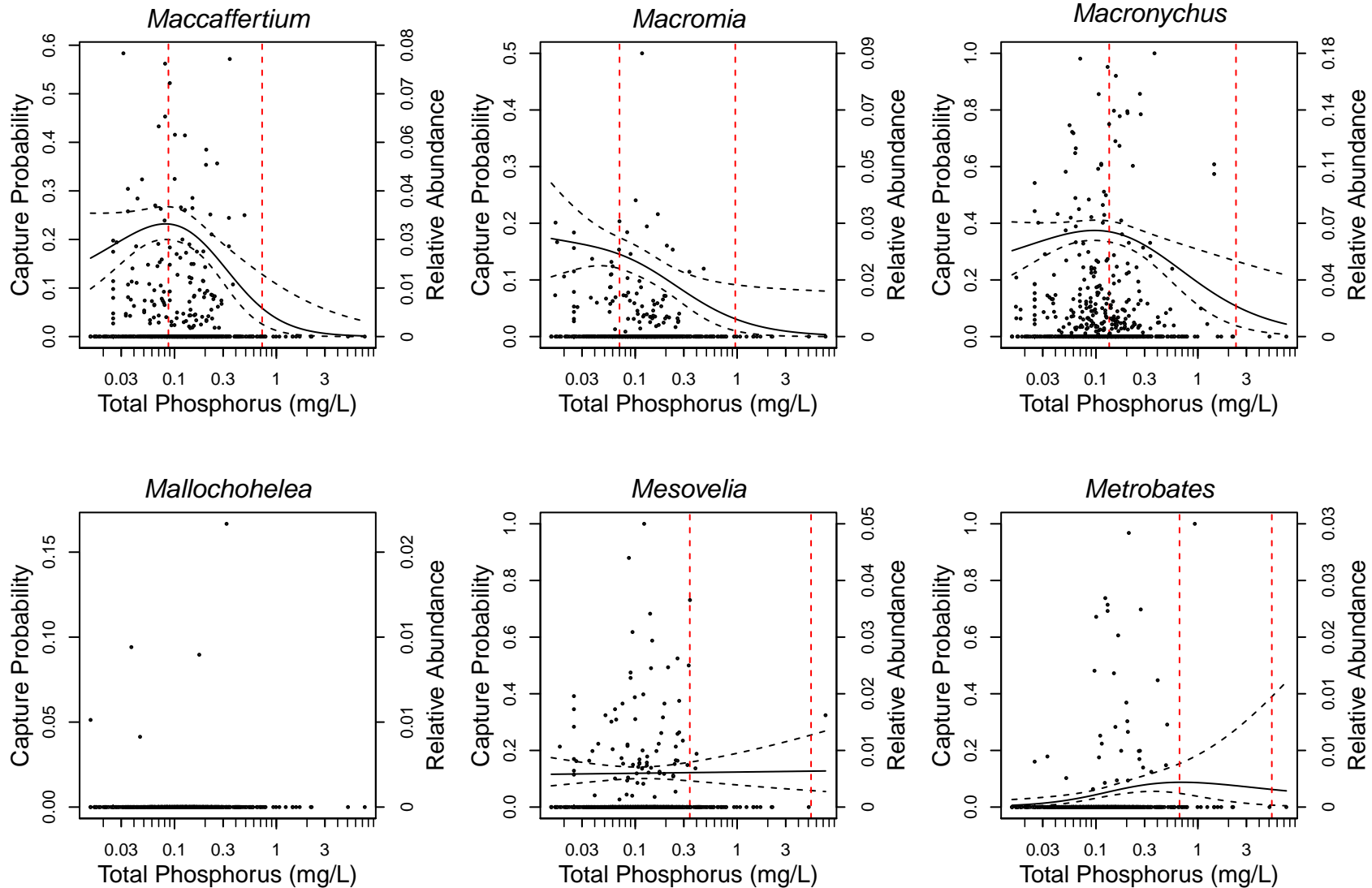
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*Lype*

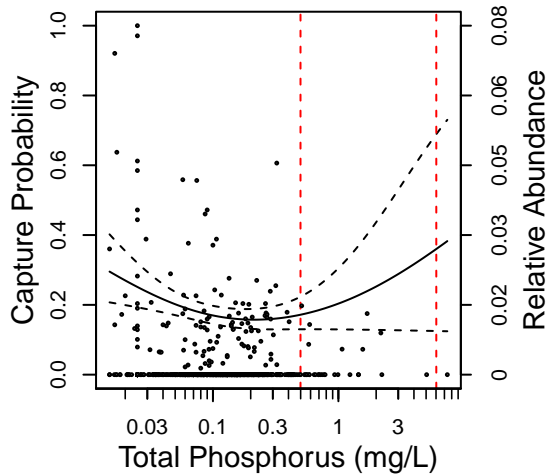


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

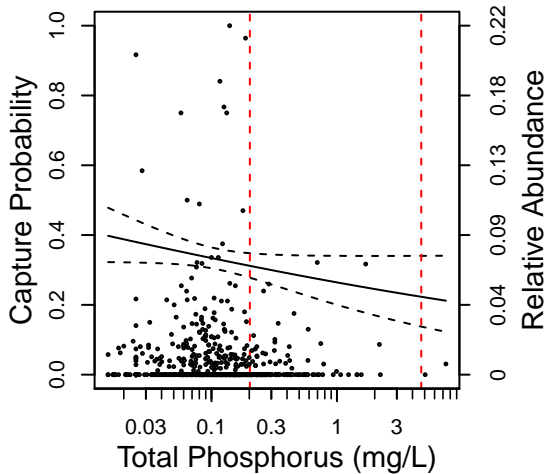


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

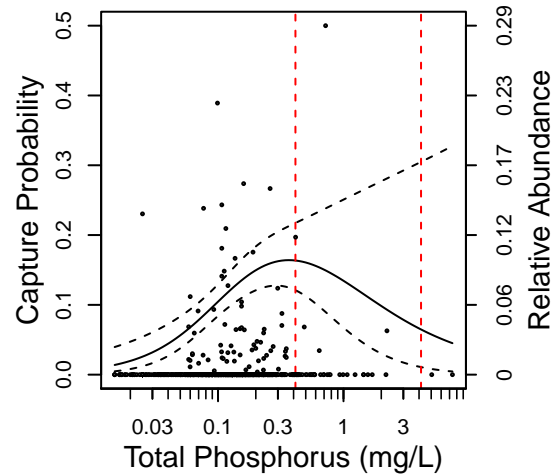
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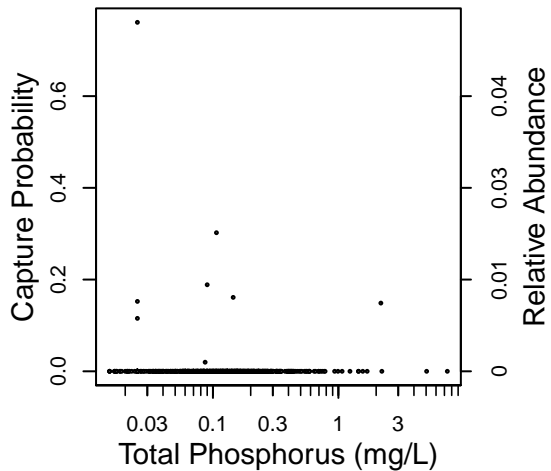
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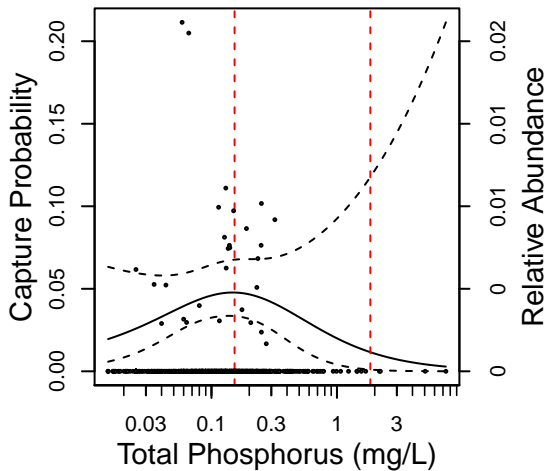
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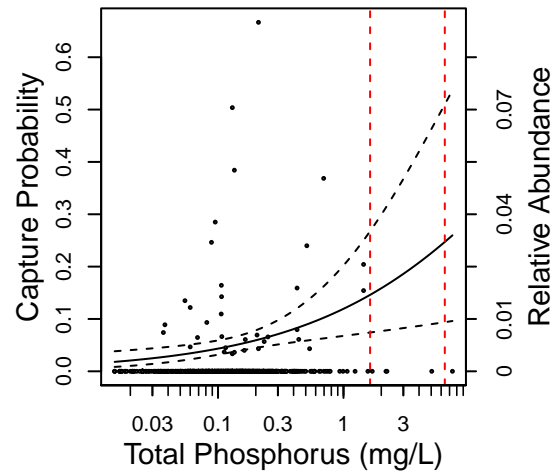
*Mystacides*



*Nanocladius*



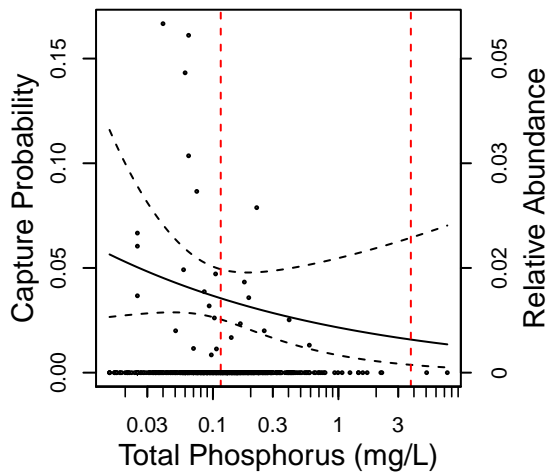
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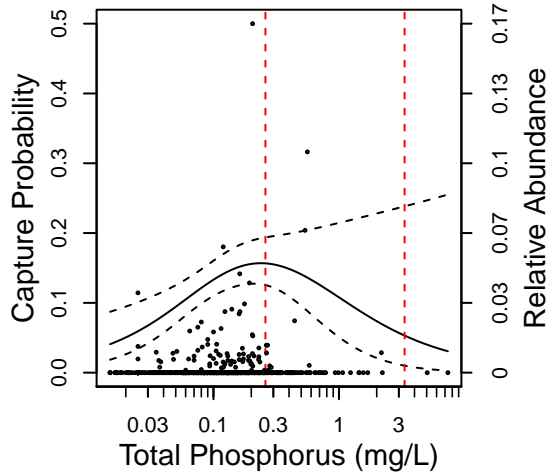


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

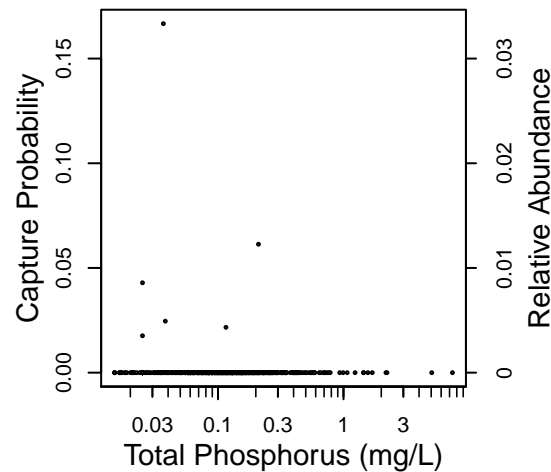
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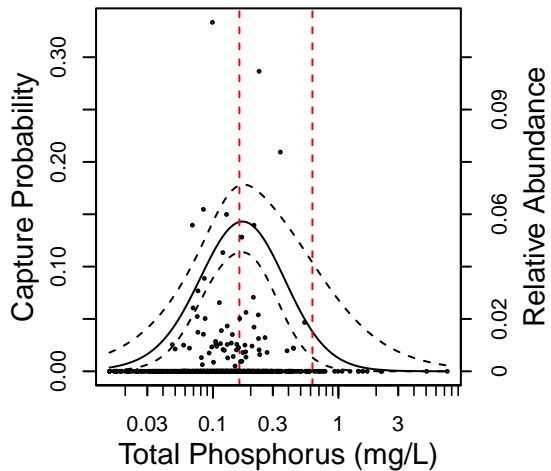
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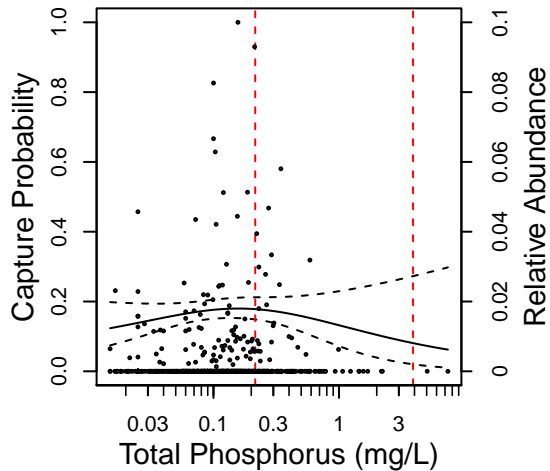
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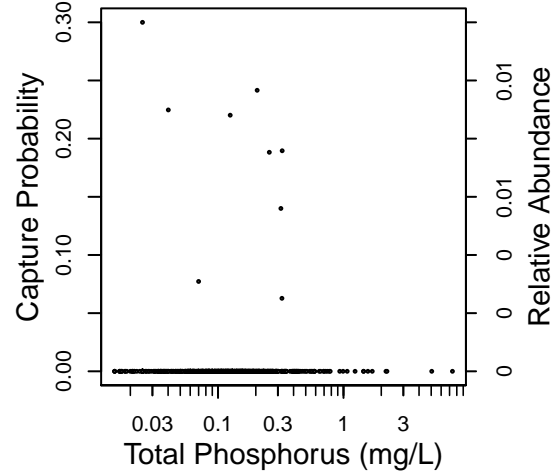
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*Neoporus*

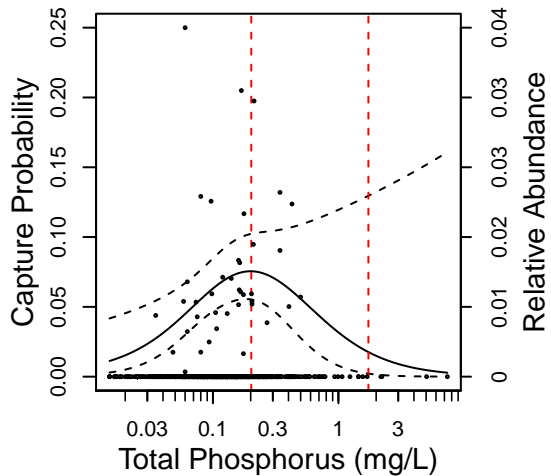


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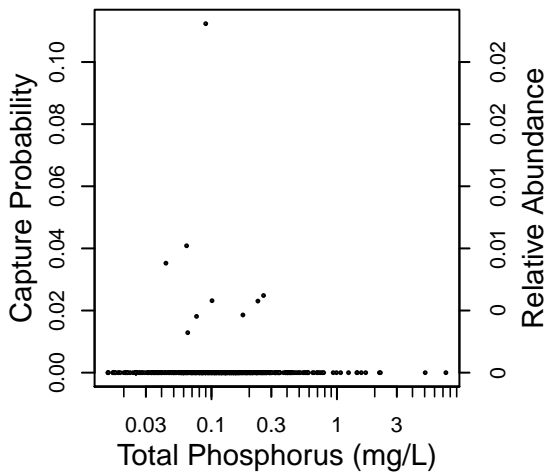


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

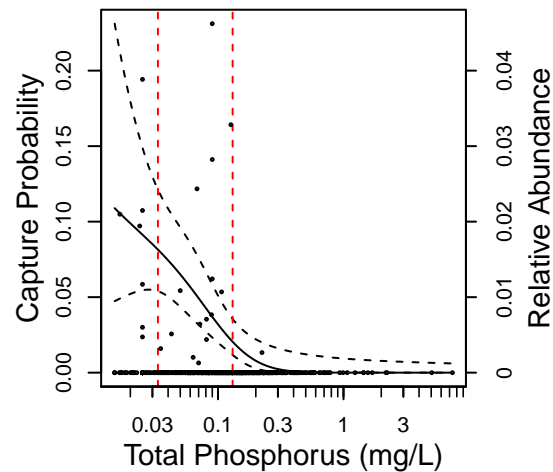
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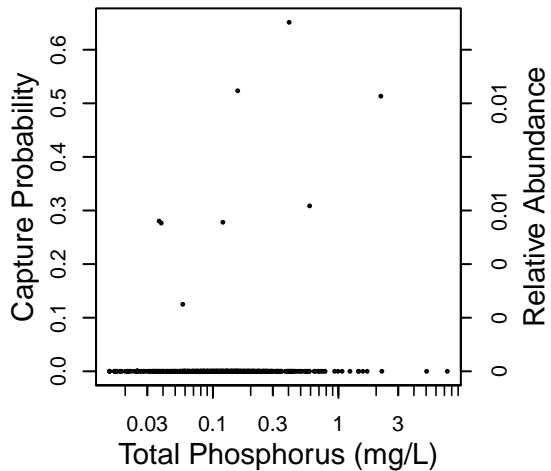
*Neurocordulia*



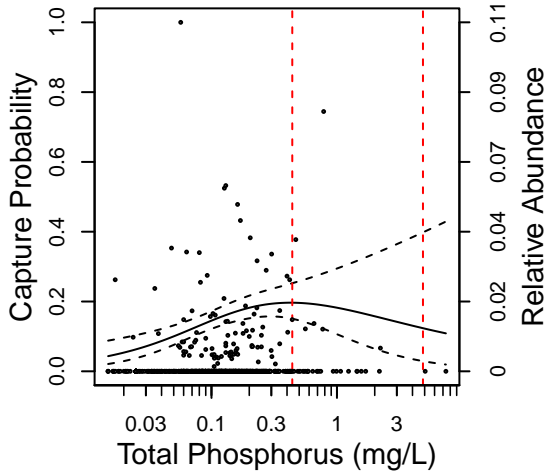
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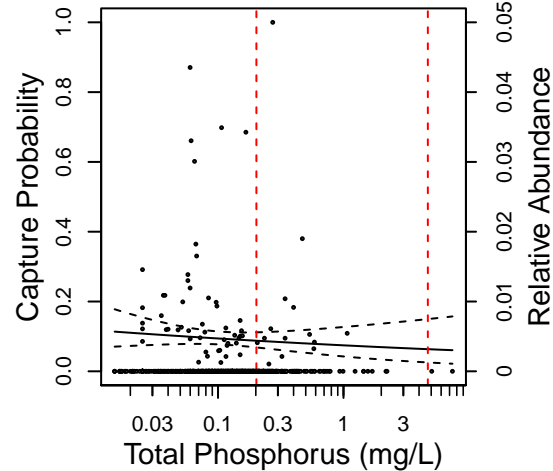
*Nilotanytus*



*Notonecta*

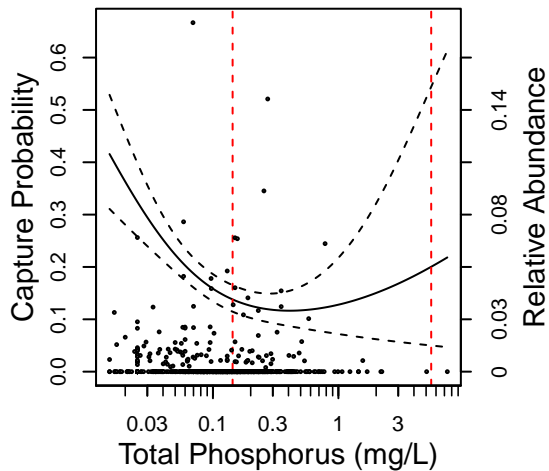


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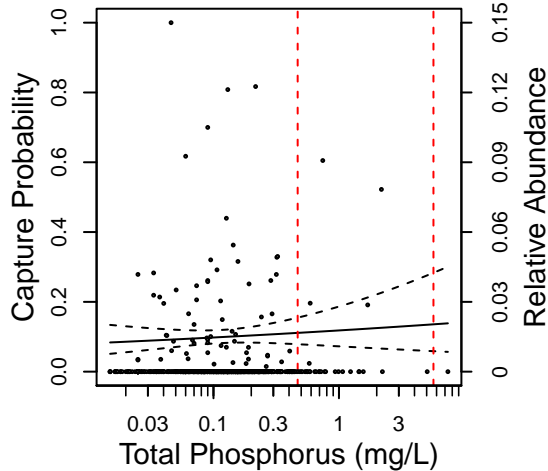


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

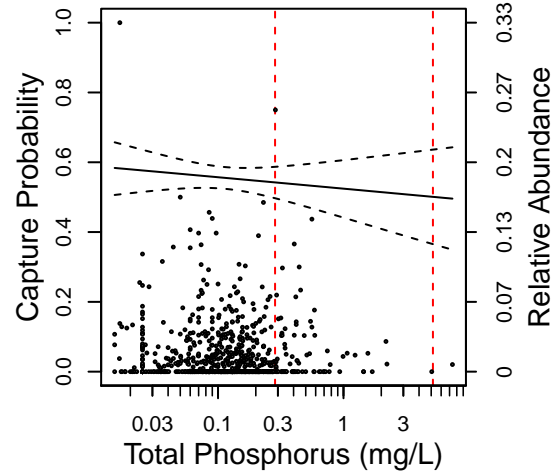
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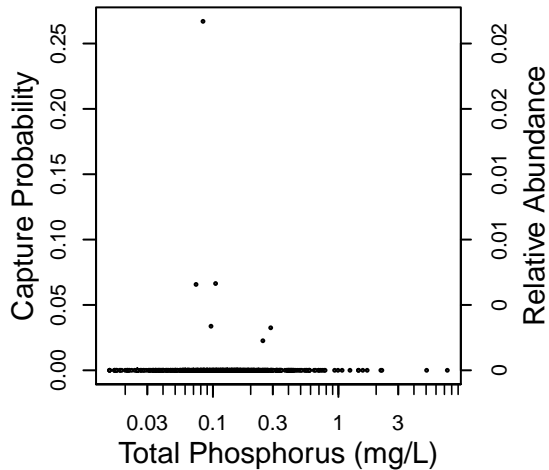
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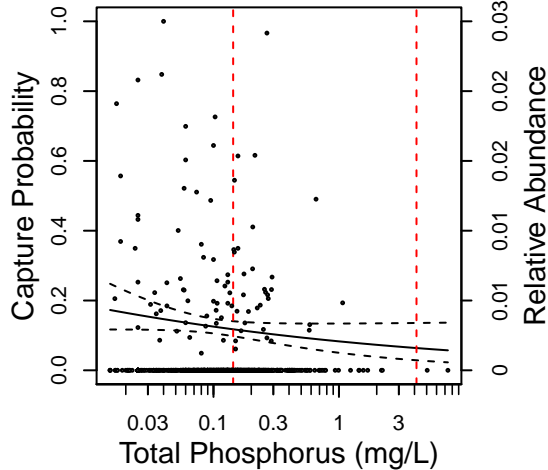
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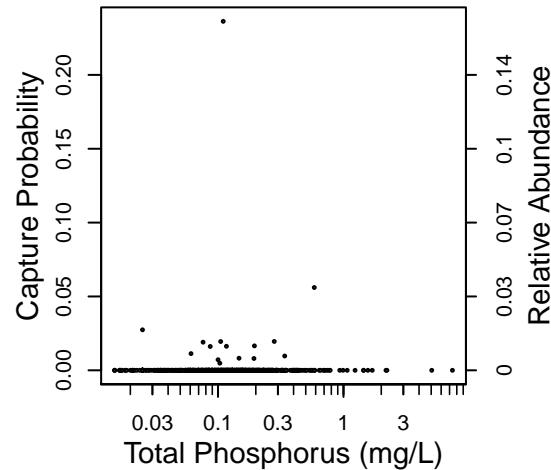
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*Orthoclaadiinae*

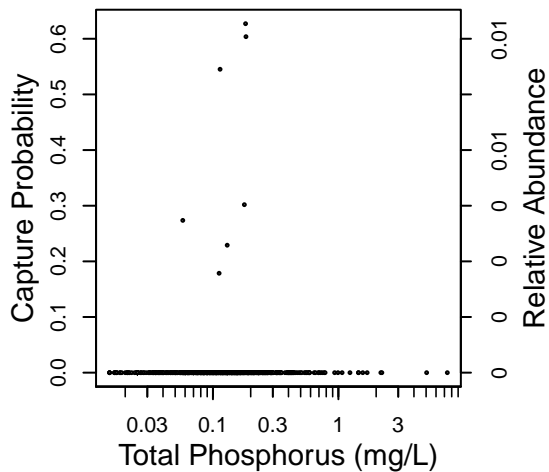


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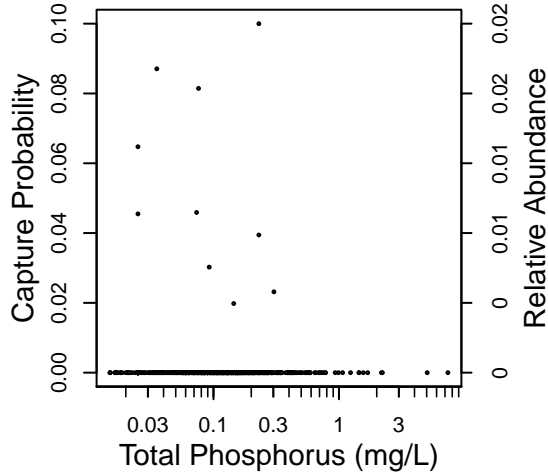


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

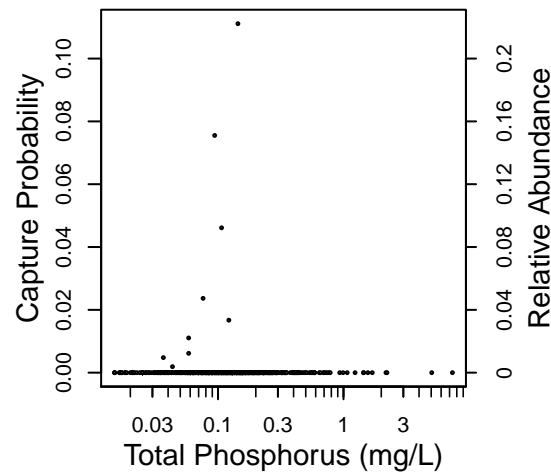
*Oxyethira*



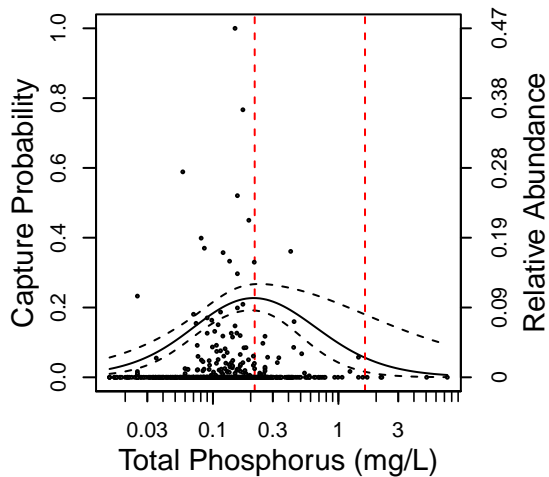
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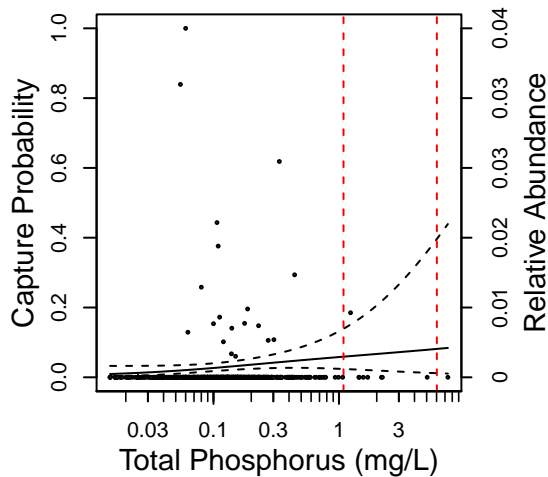
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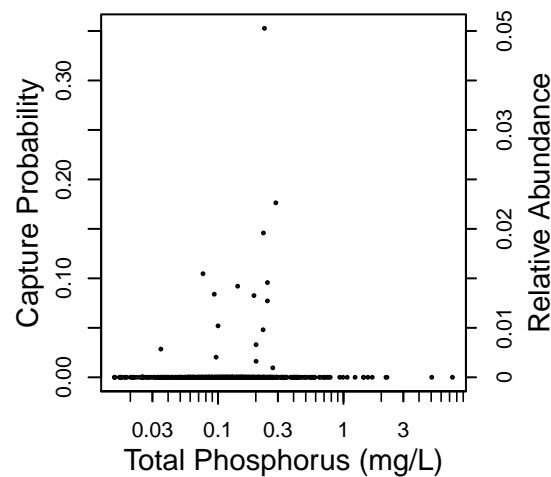
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*Parachironomus*

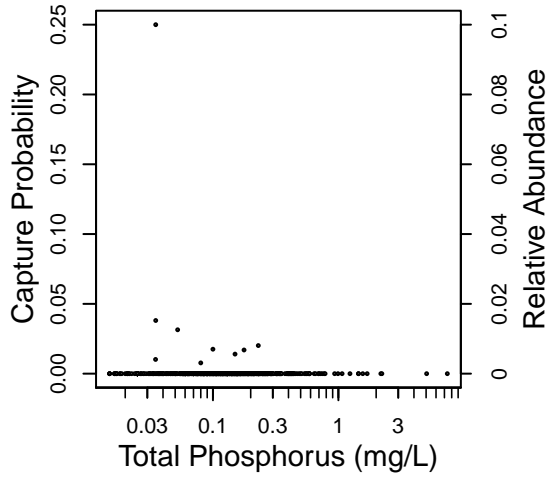


*Paracladopelma*

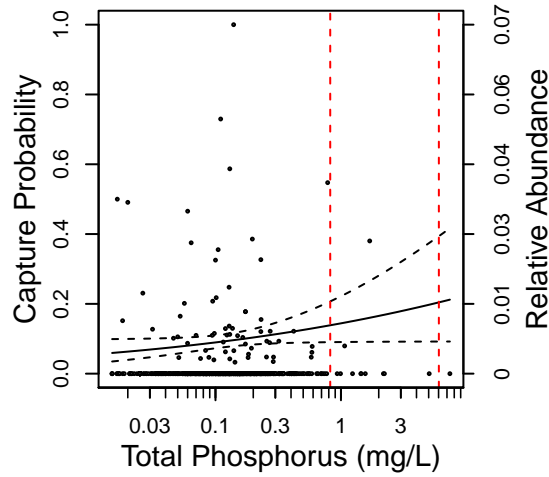


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

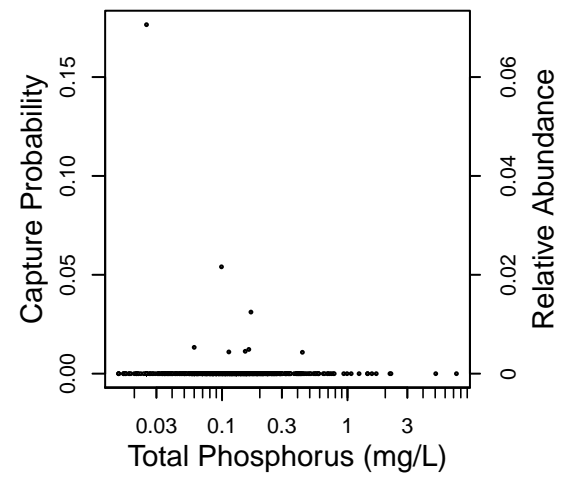
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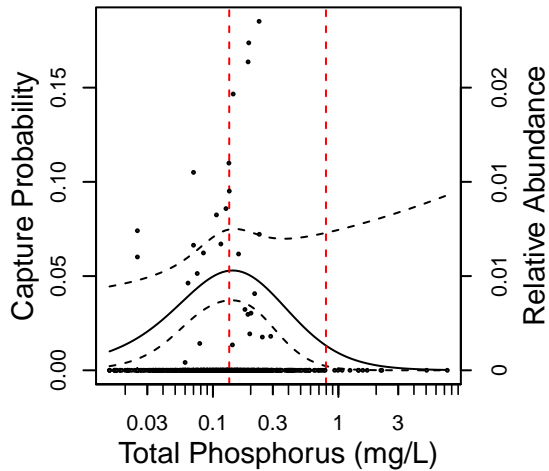
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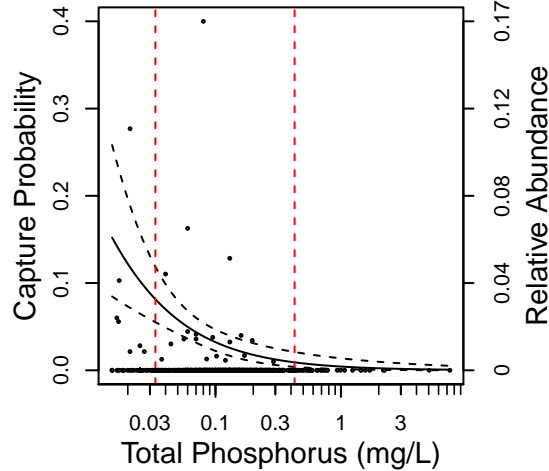
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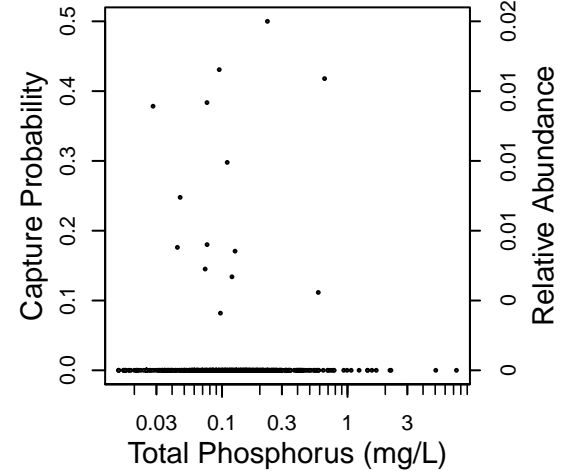
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*Paraleptophlebia*

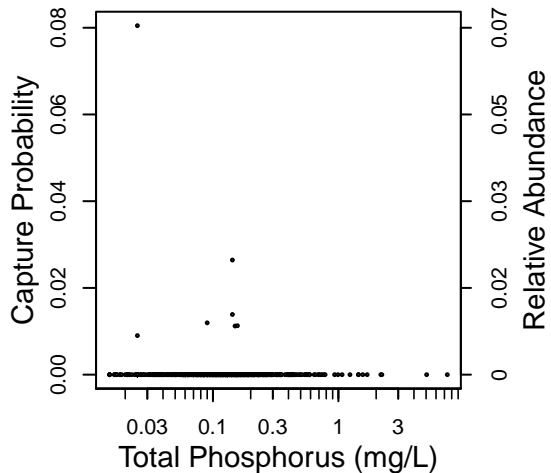


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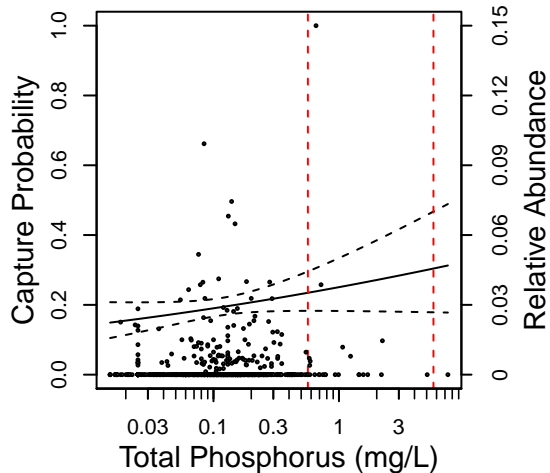


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

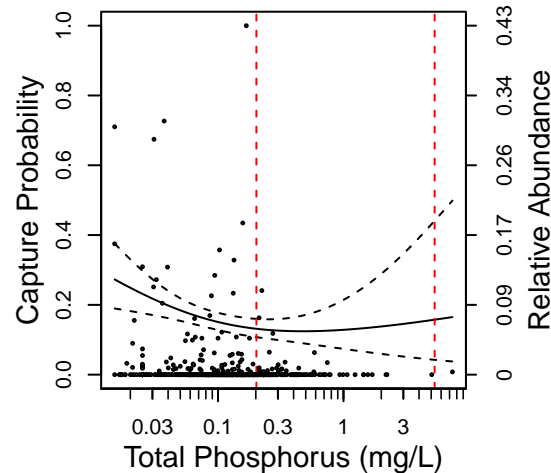
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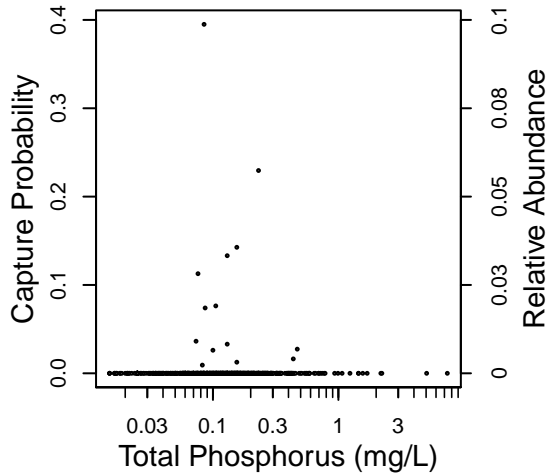
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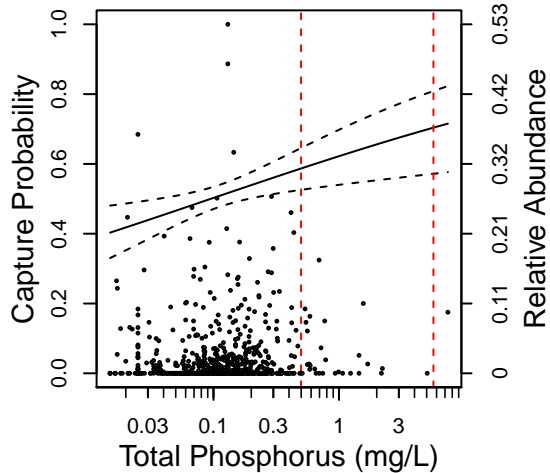
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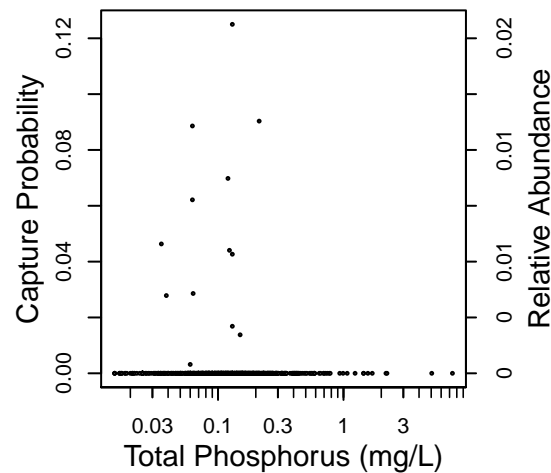
*Pelocoris*



*Peltodytes*

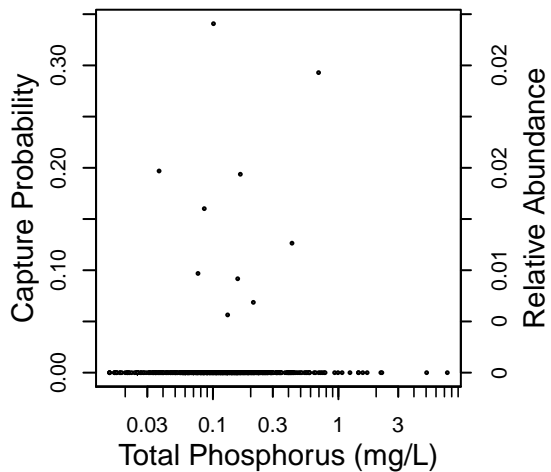


*Pentaneura*

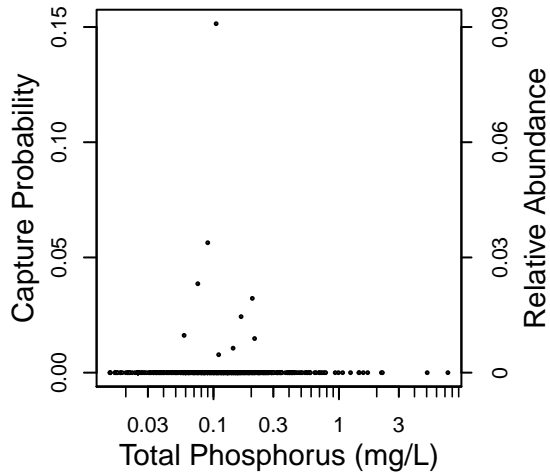


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

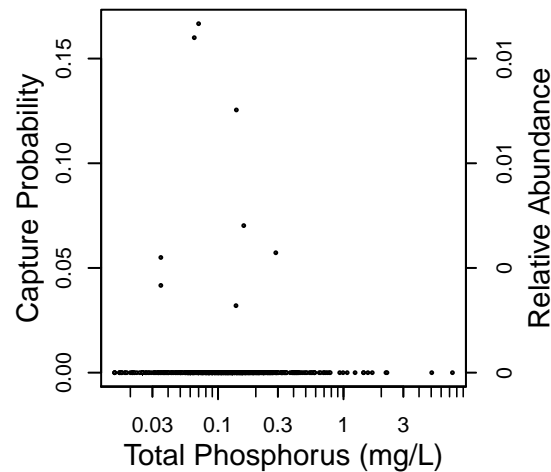
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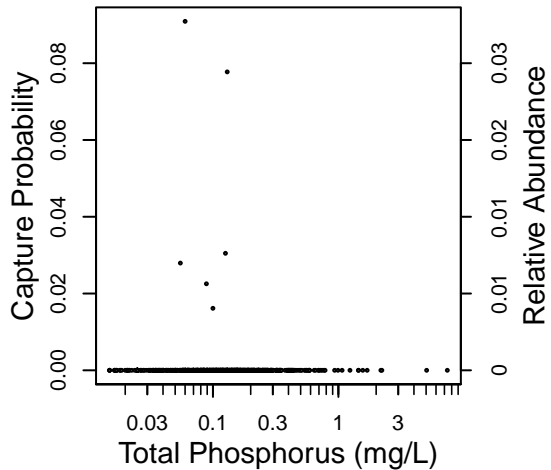
*Perlesta*



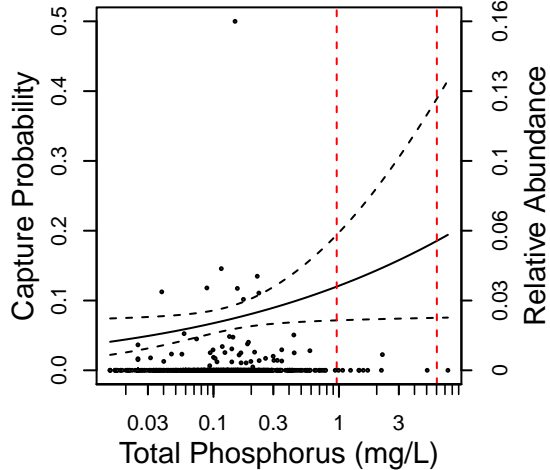
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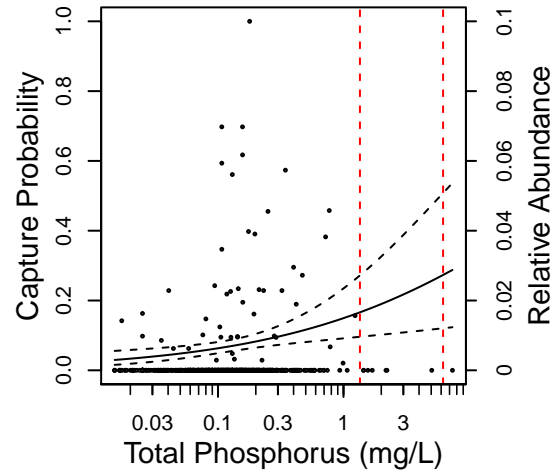
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*Pisidium*

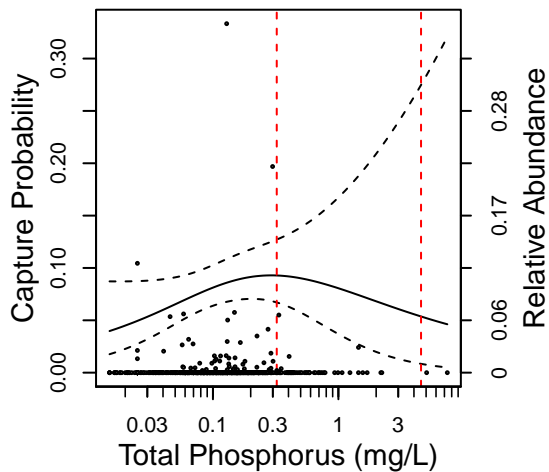


*Planorbella*

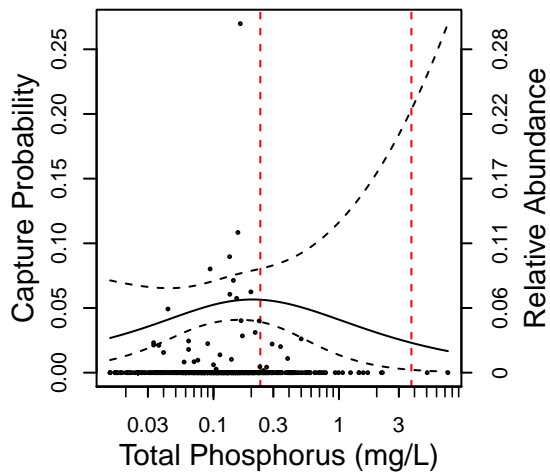


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

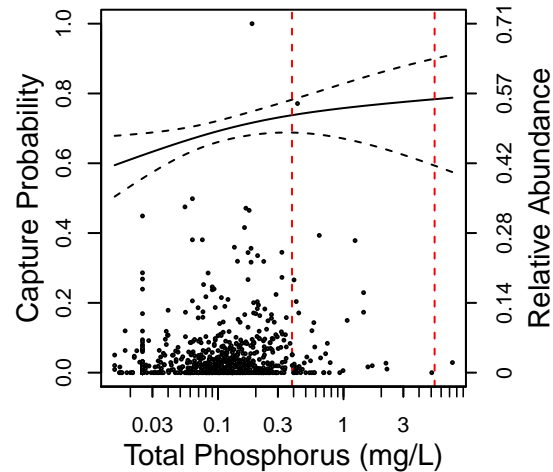
*Plathemis*



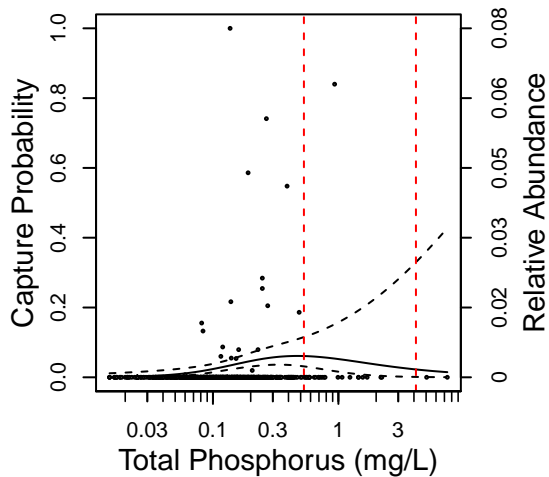
*Pleurocera*



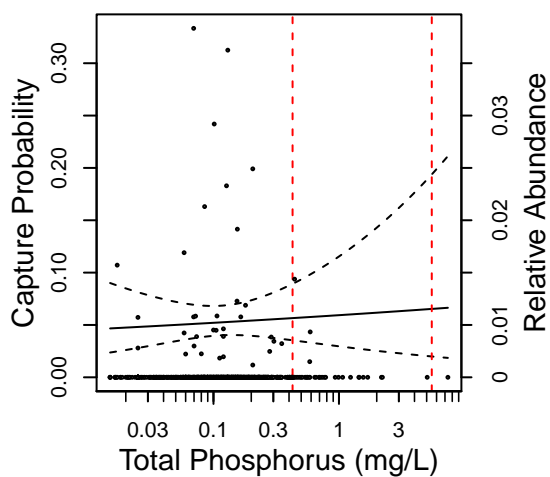
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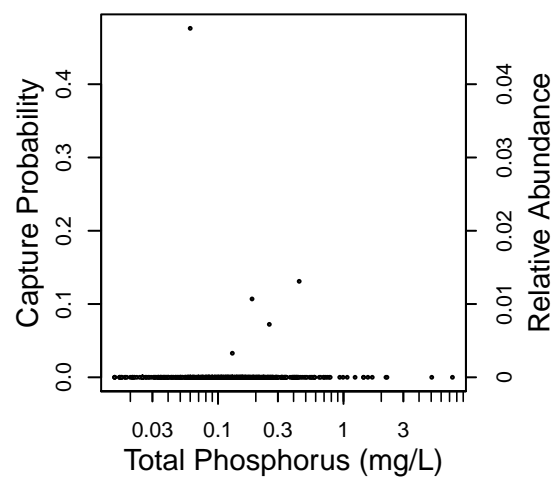
*Potamyia*



*Probezzia*



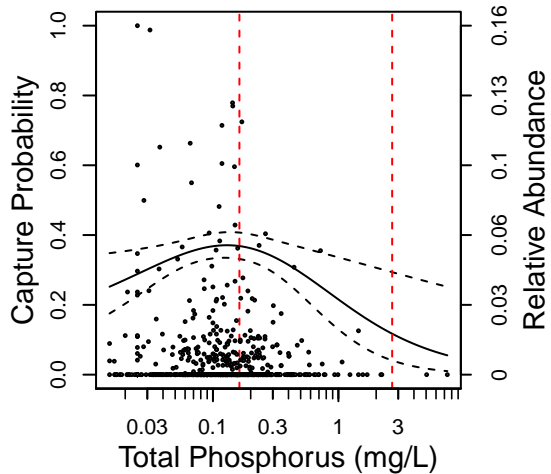
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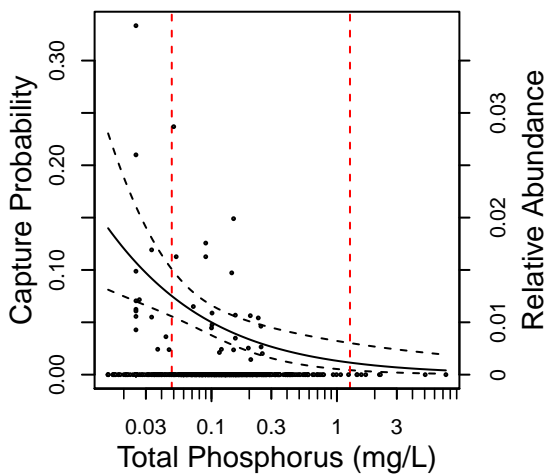


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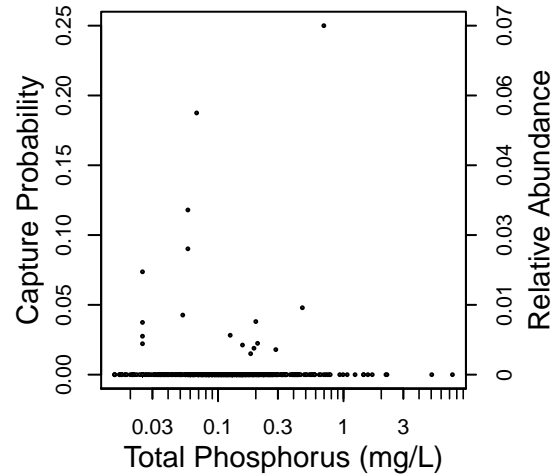
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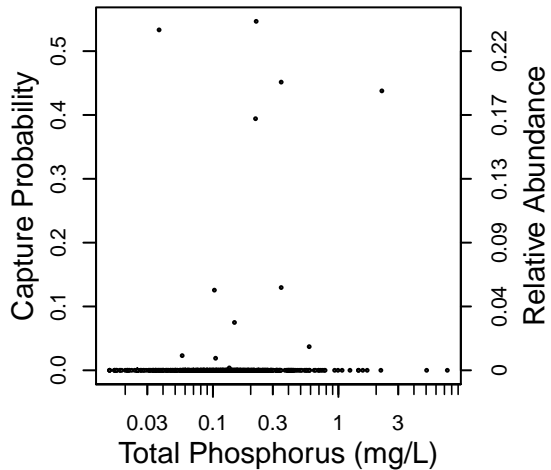
*Procloeon*



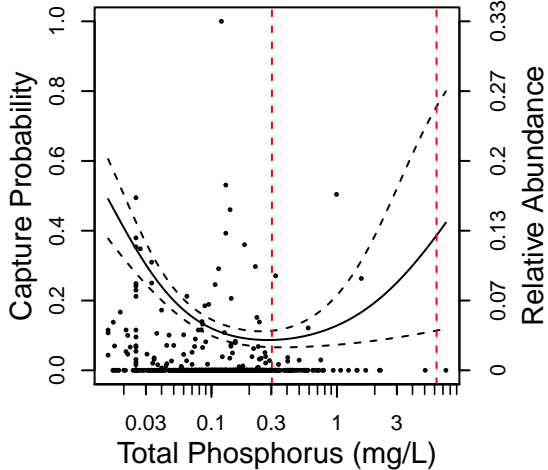
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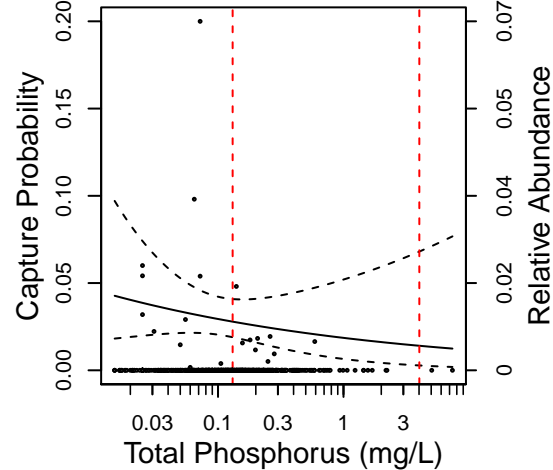
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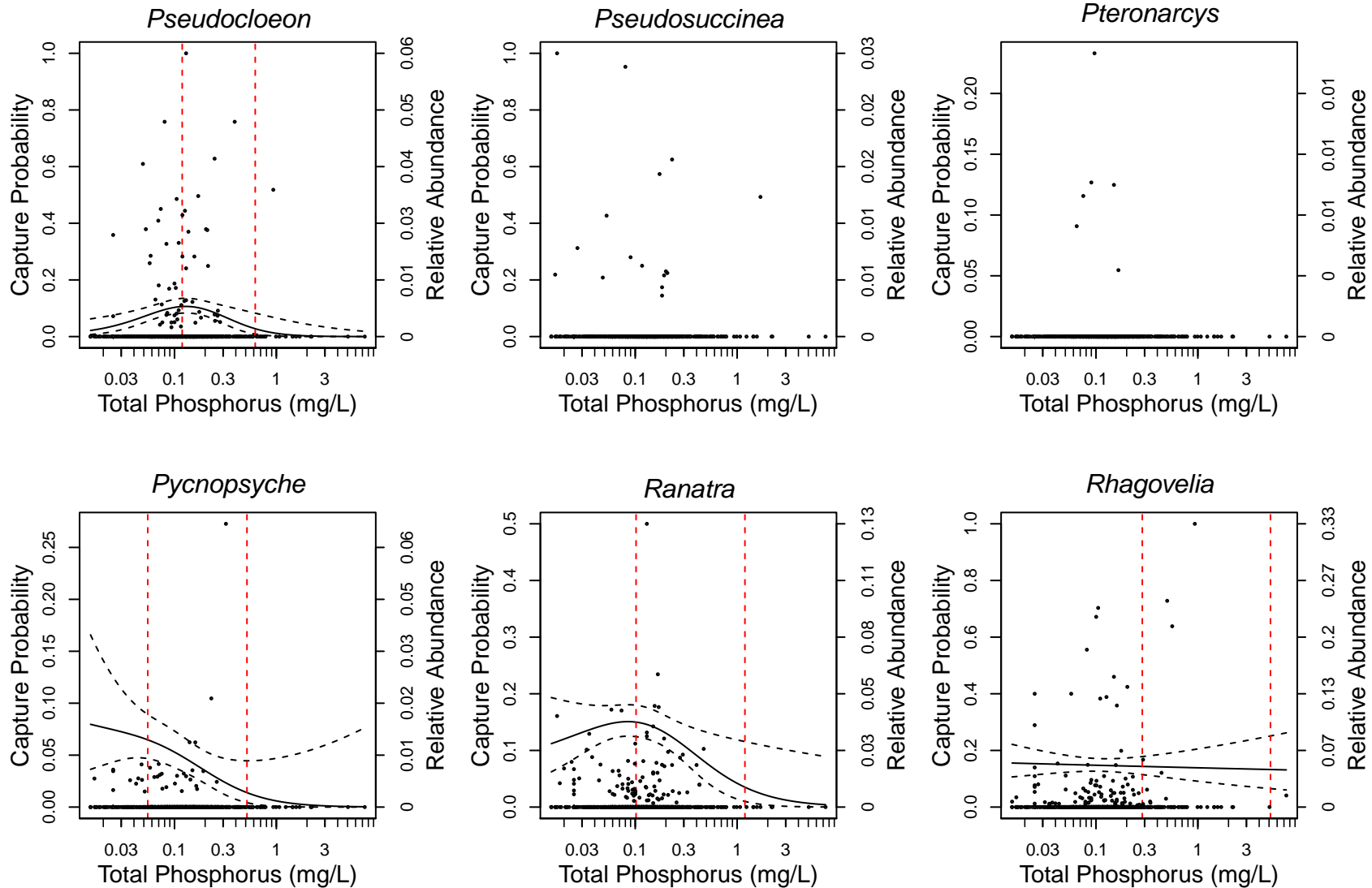
*Psephenus*



*Pseudochironomus*

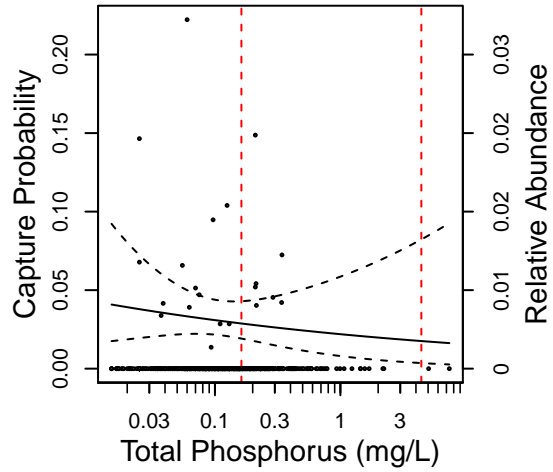


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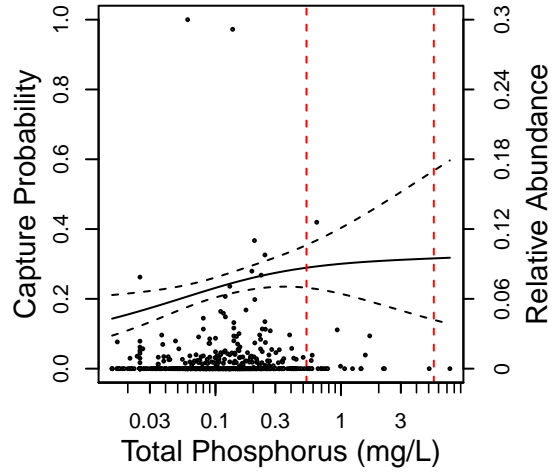


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

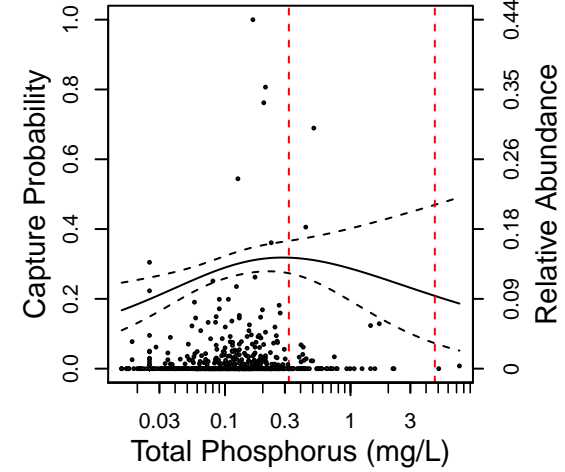
*Rheocricotopus*



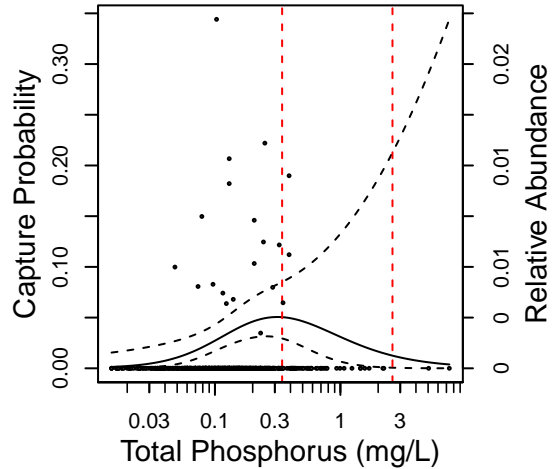
*Rheotanytarsus*



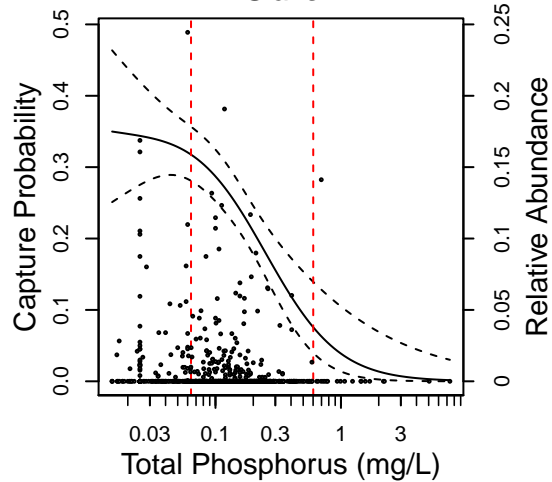
*Rheumatobates*



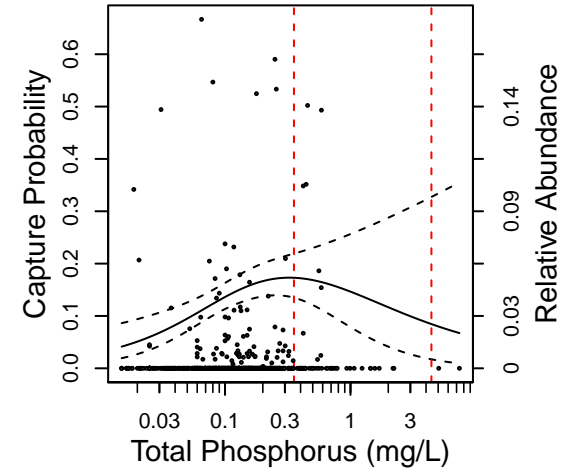
*Saetheria*



*Sialis*

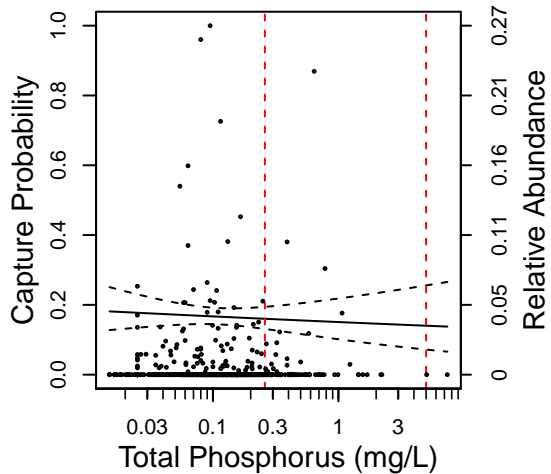


*Sigara*

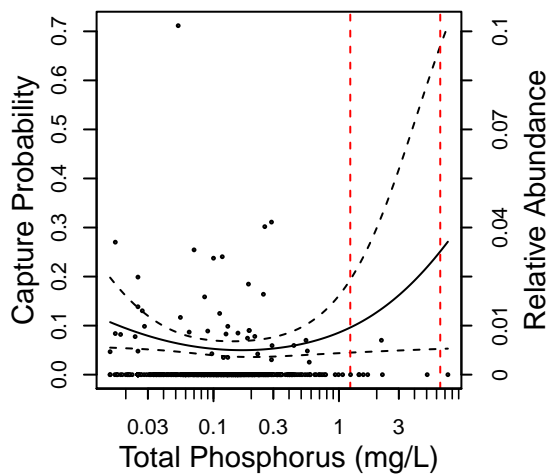


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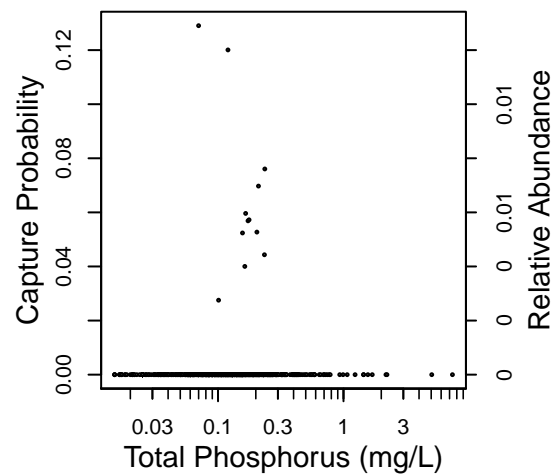
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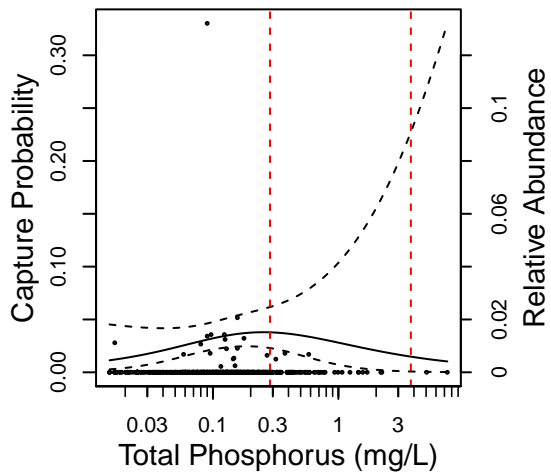
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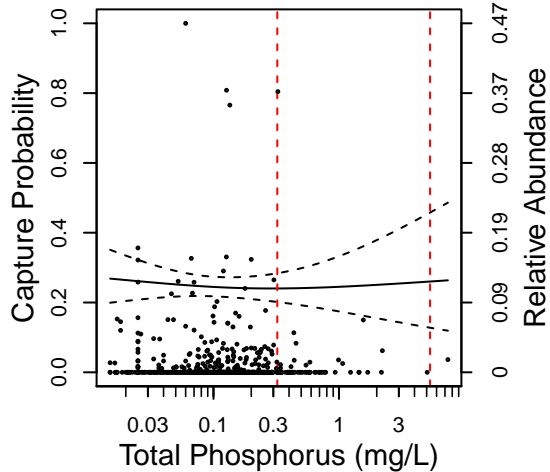
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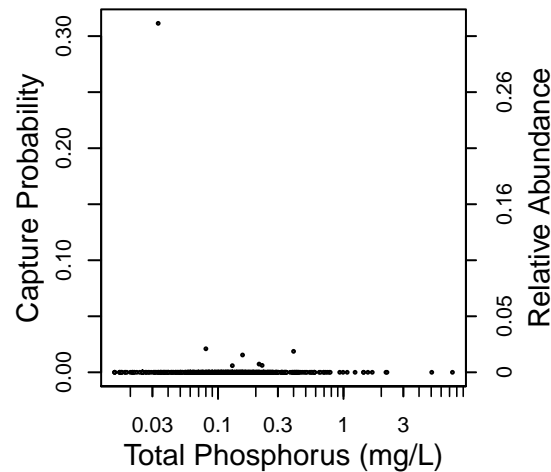
*Sperchopsis*



*Sphaerium*

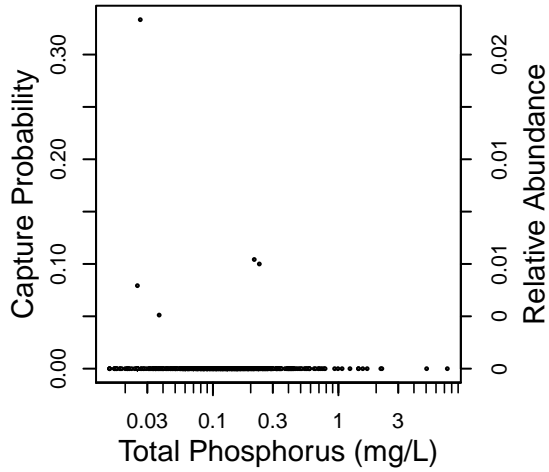


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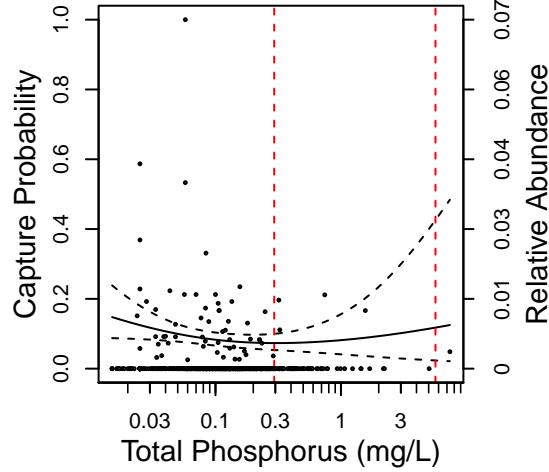


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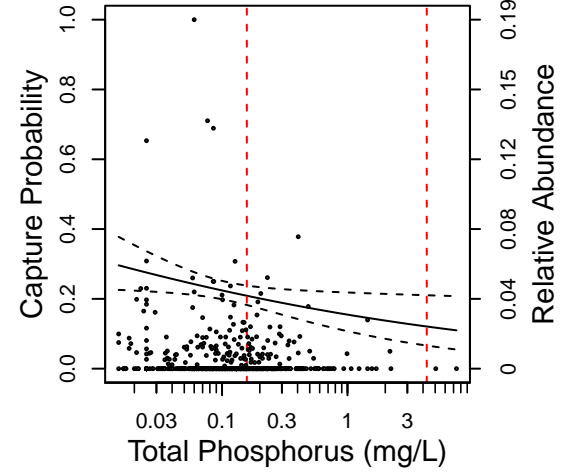
*Stempellina*



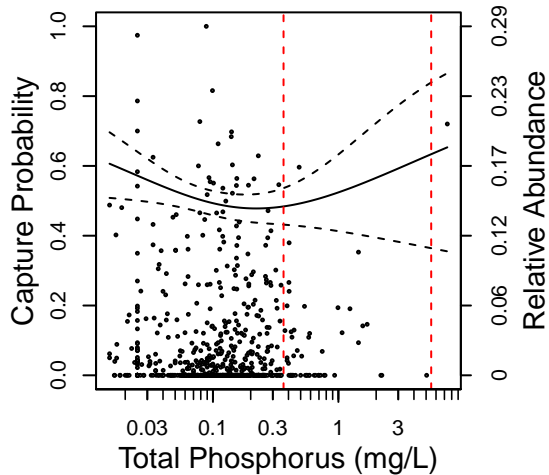
*Stempellinella*



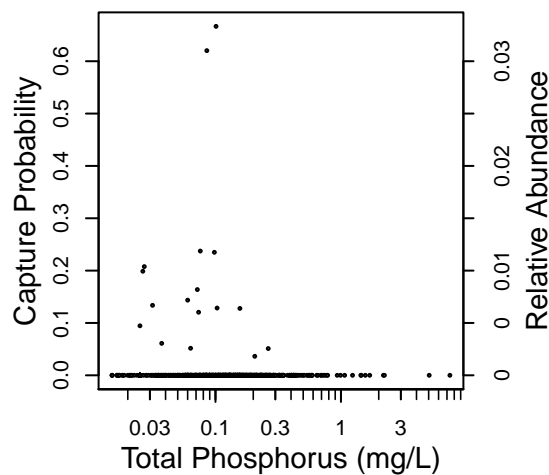
*Stenacron*



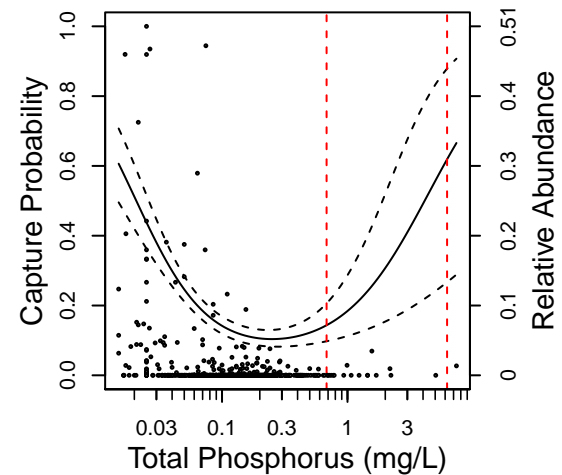
*Stenelmis*



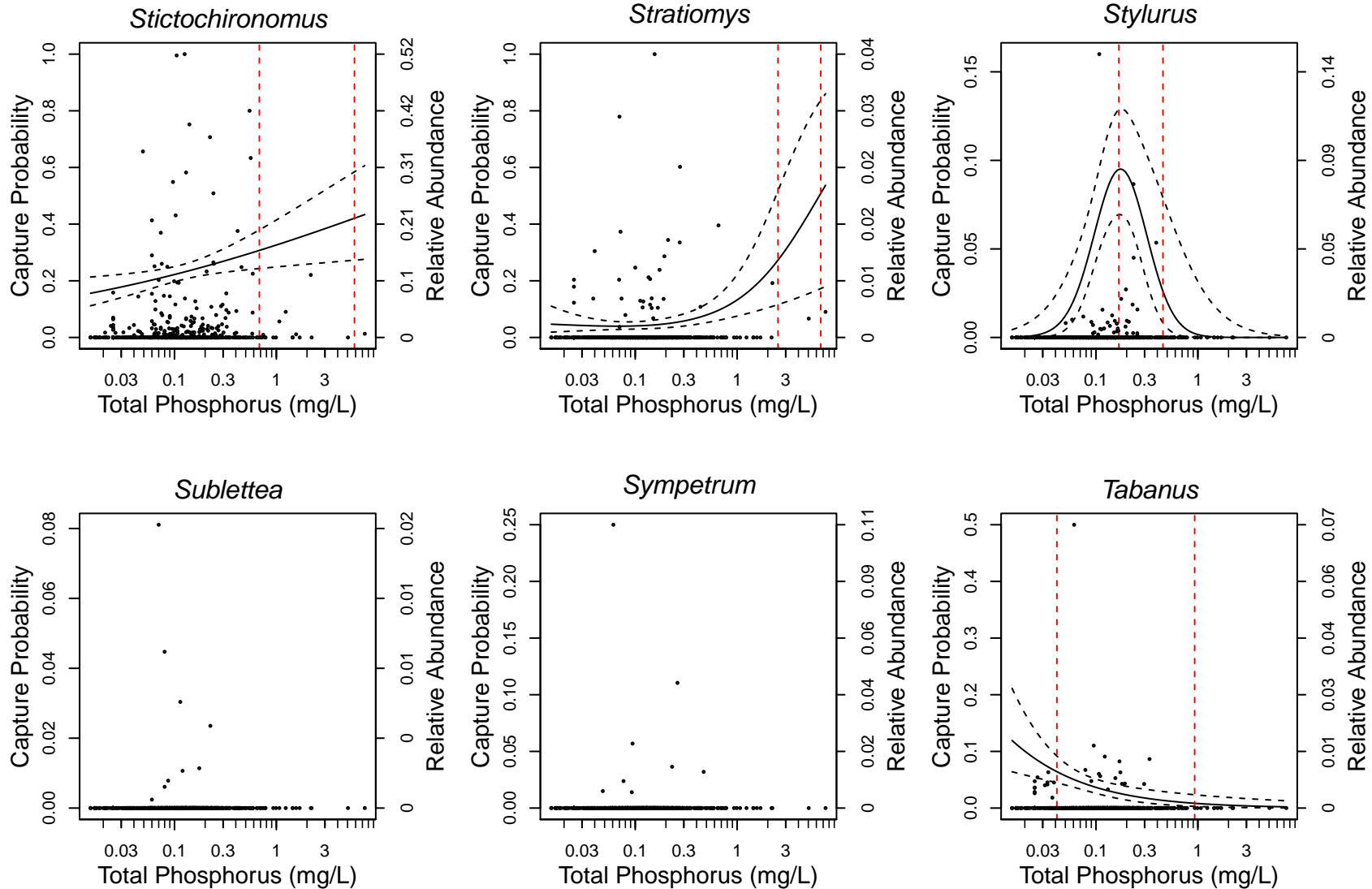
*Stenochironomus*



*Stenonema*

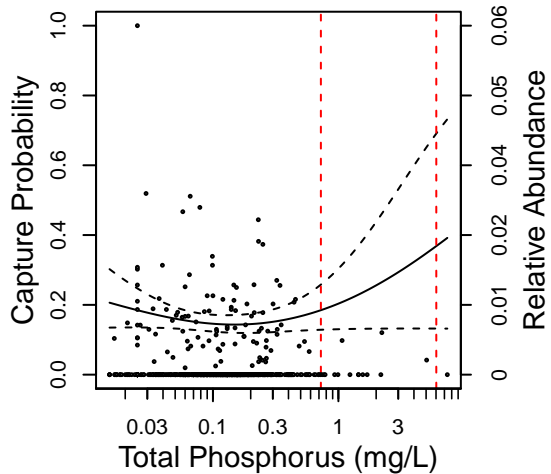


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

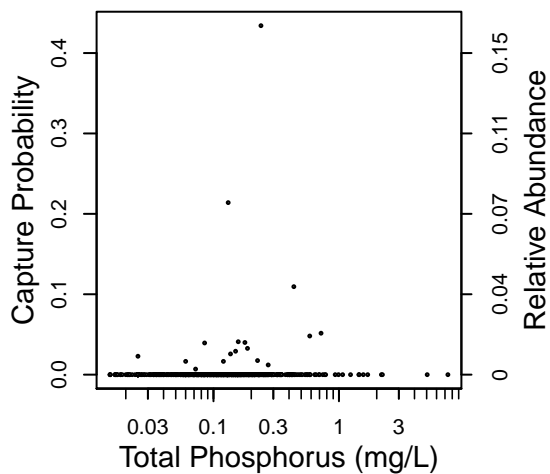


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

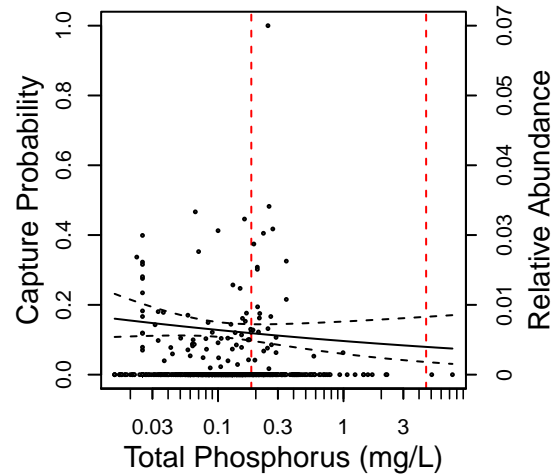
*Tanypodinae*



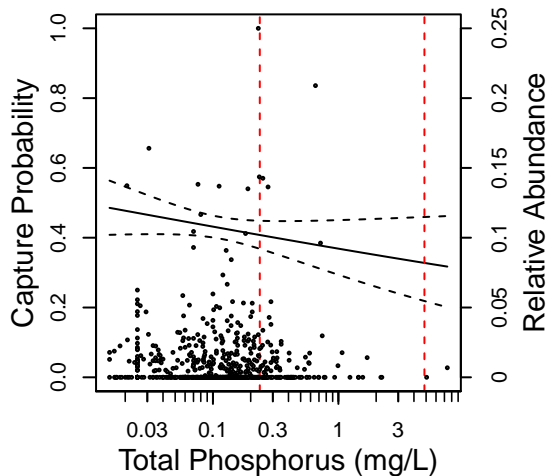
*Tanypus*



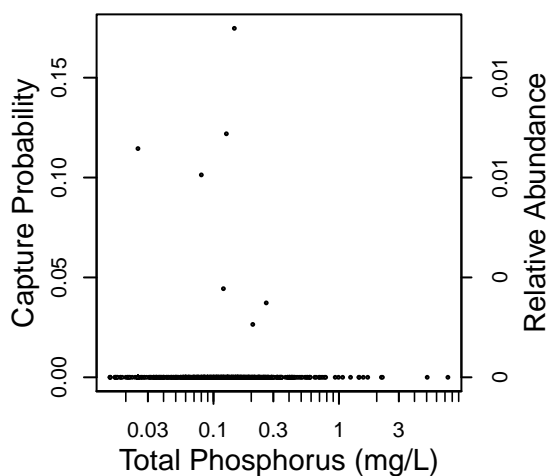
*Tanytarsini*



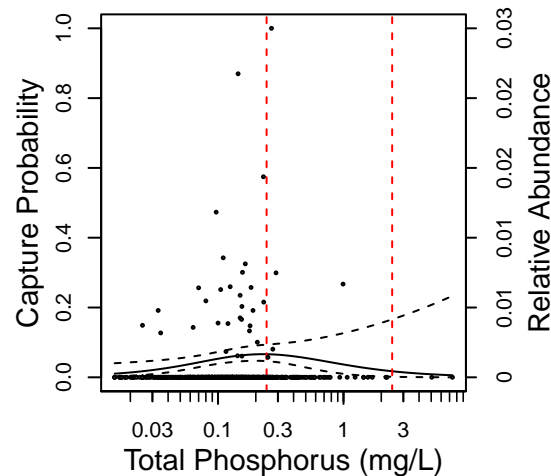
*Tanytarsus*



*Telopelopia*

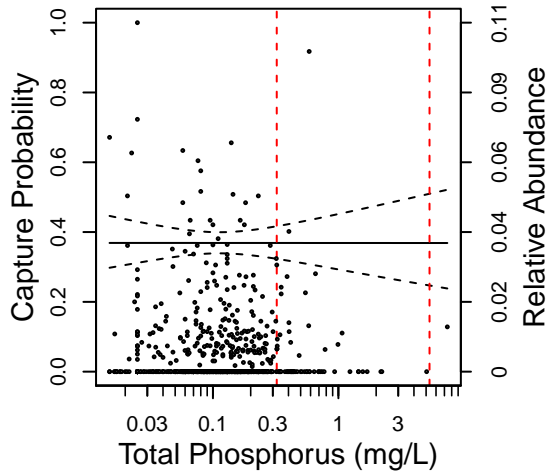


*Thienemanniella*

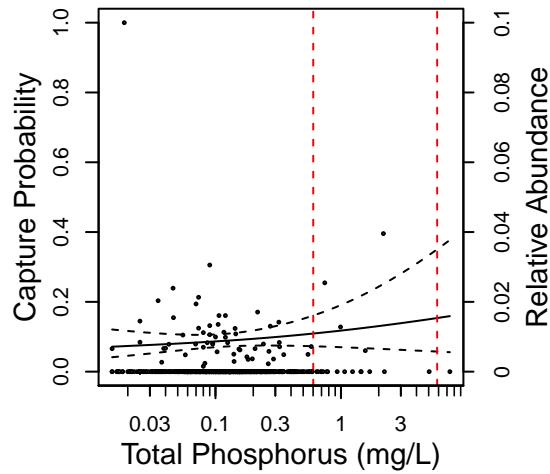


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

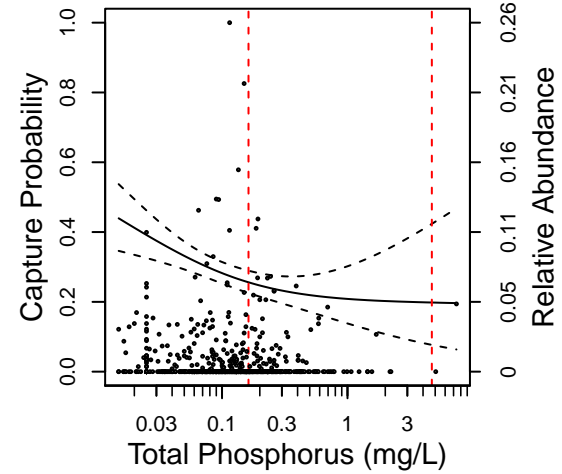
*Thienemannimyia*



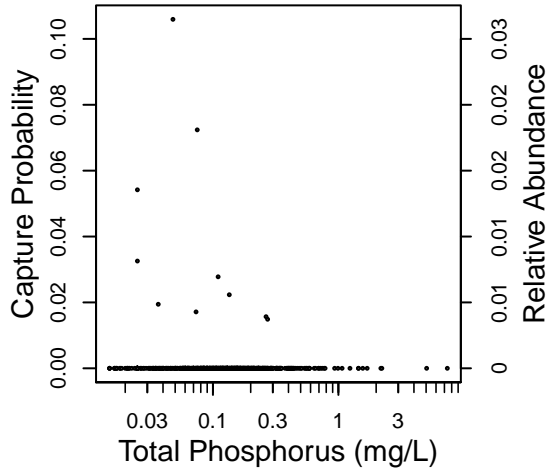
*Tipula*



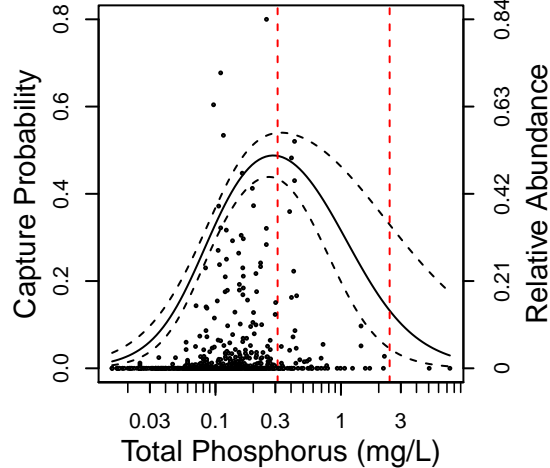
*Trepobates*



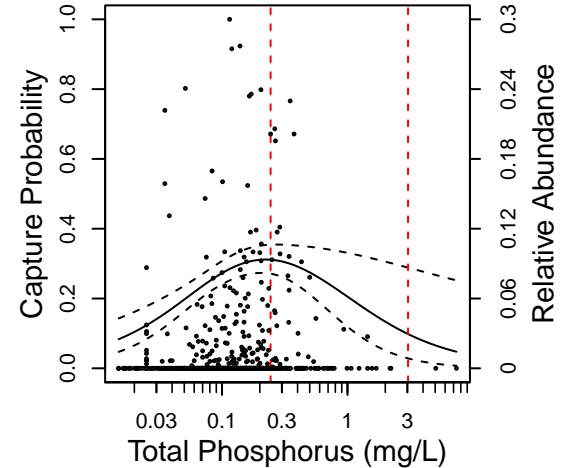
*Triaenodes*



*Trichocorixa*



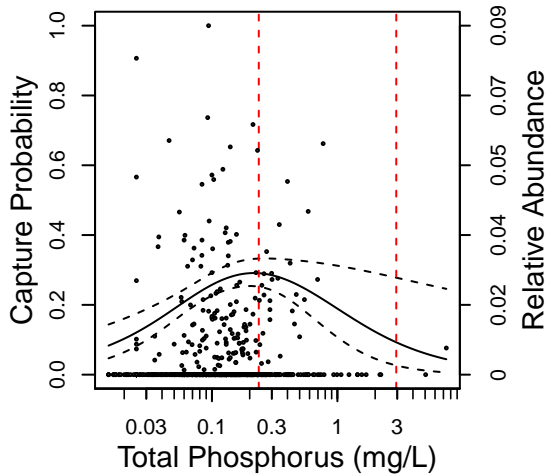
*Tricorythodes*



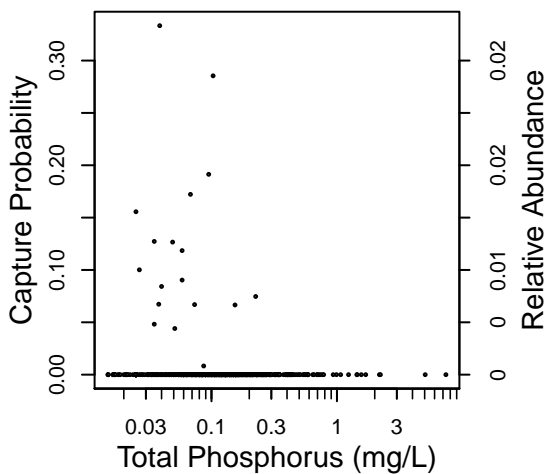


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

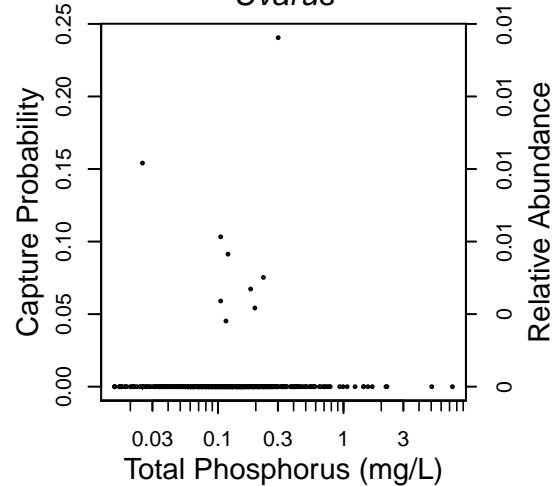
*Tropisternus*



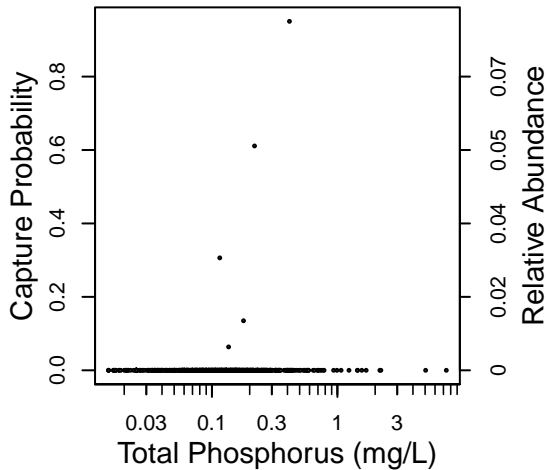
*Tvetenia*



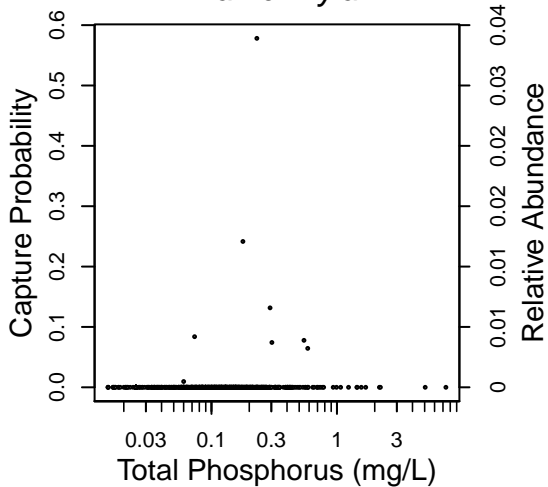
*Uvarus*



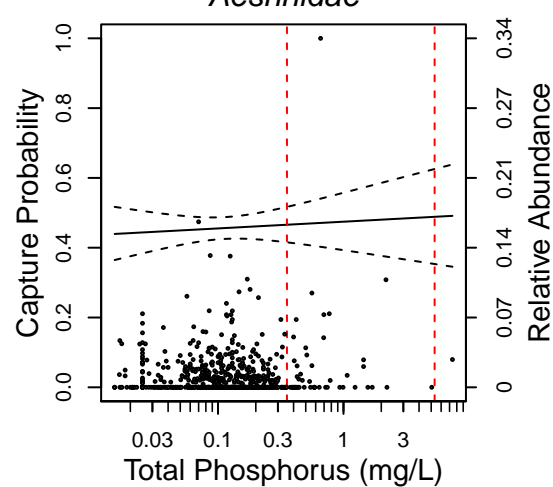
*Valvata*



*Zavrelimyia*

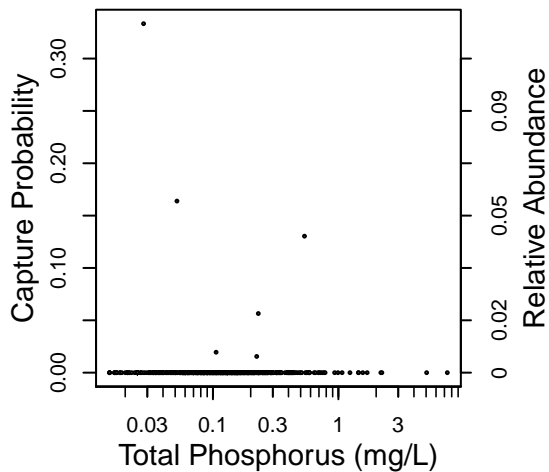


*Aeshnidae*

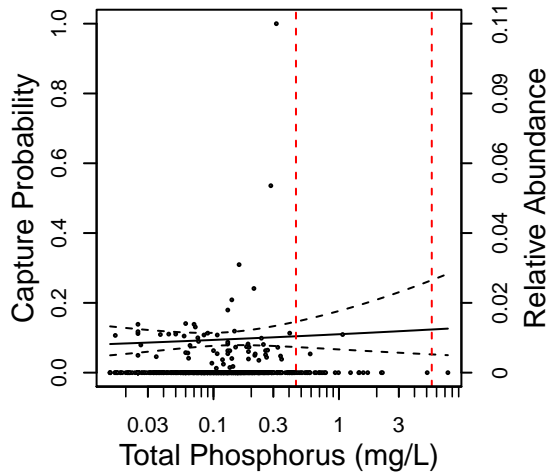


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

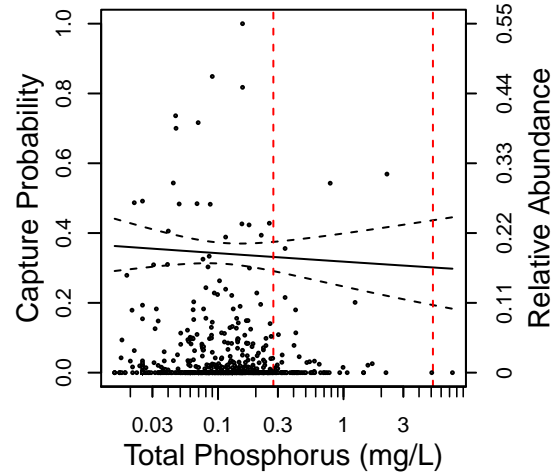
*Amphipoda*



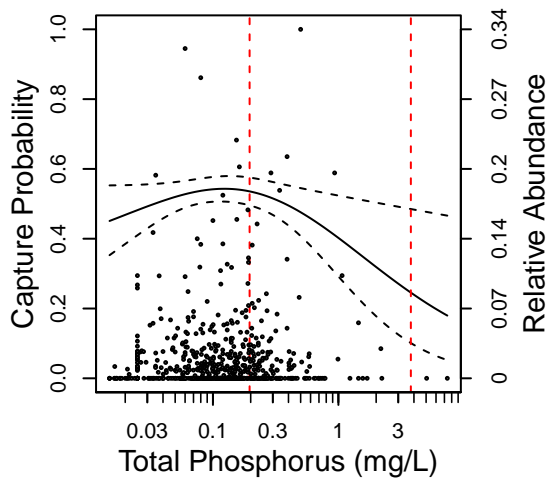
*Ancylidae*



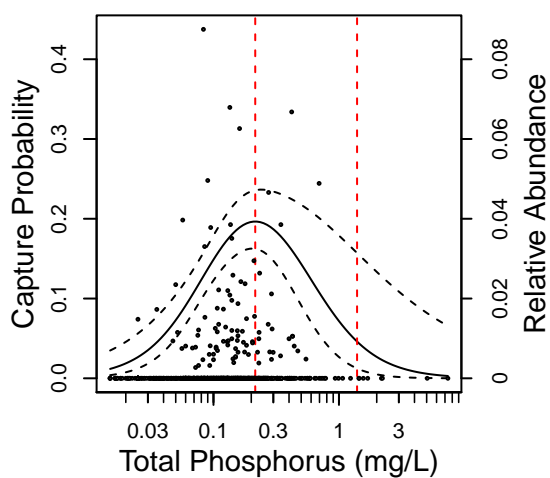
*Asellidae*



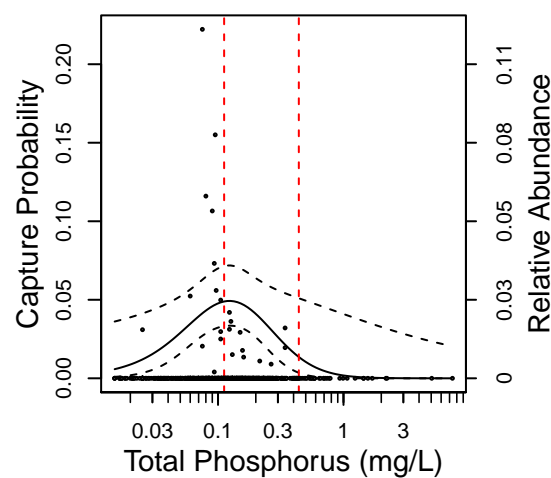
*Baetidae*



*Belostomatidae*

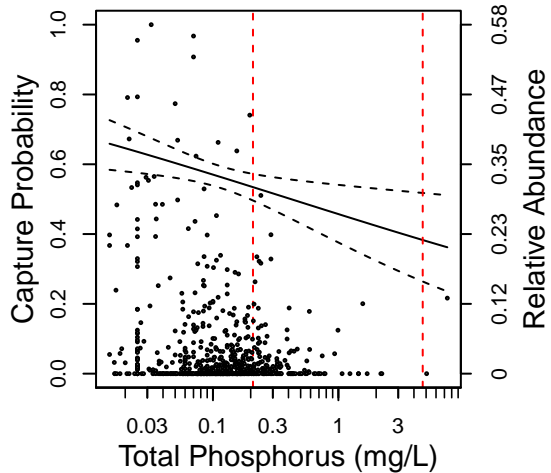


*Brachycentridae*

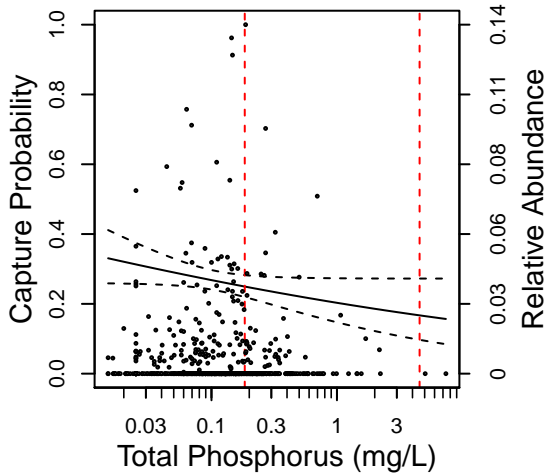


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

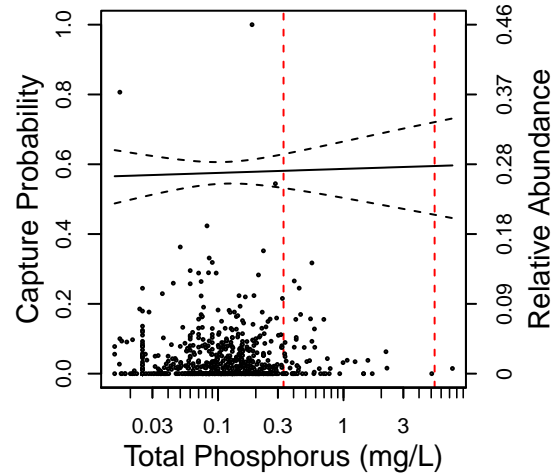
*Caenidae*



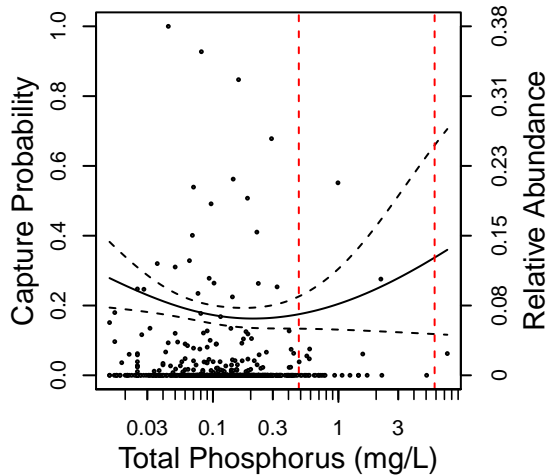
*Calopterygidae*



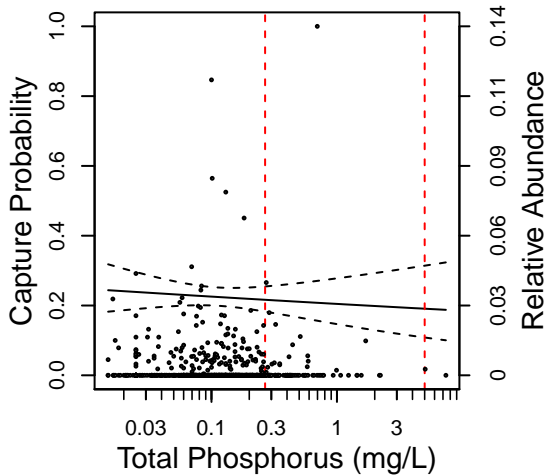
*Cambaridae*



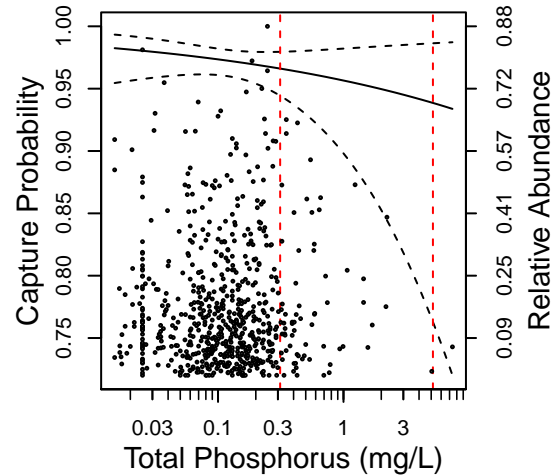
*Cambarincolidae*



*Ceratopogonidae*

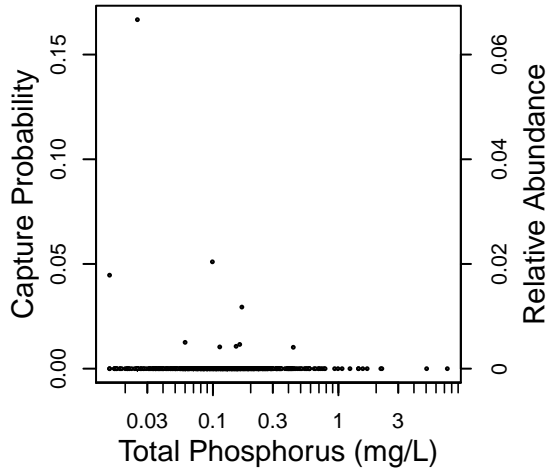


*Chironomidae*

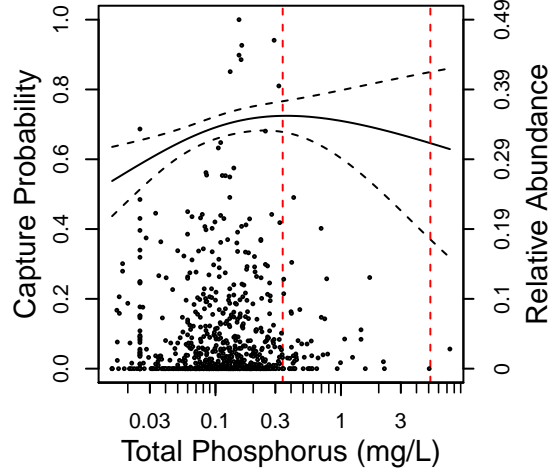


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

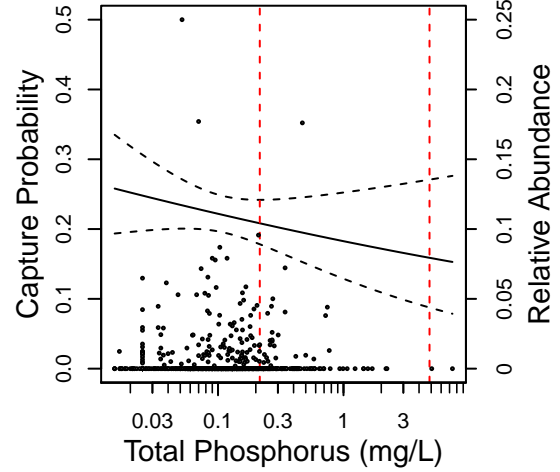
*Chordodidae*



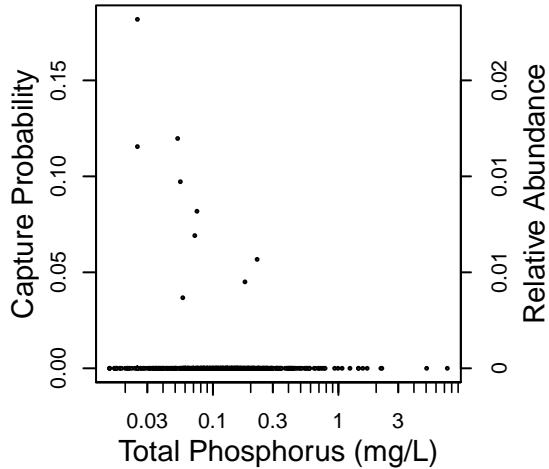
*Coenagrionidae*



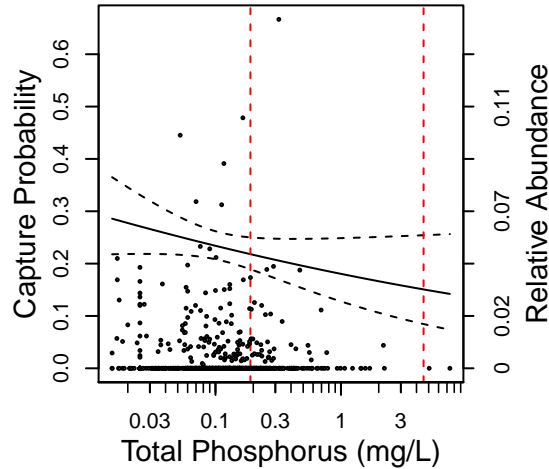
*Corbiculidae*



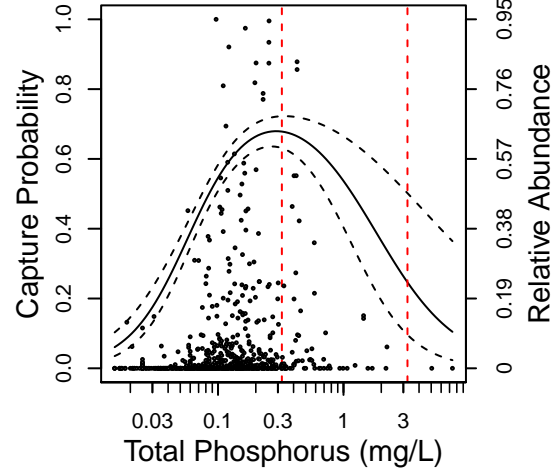
*Cordulegastridae*



*Corduliidae*

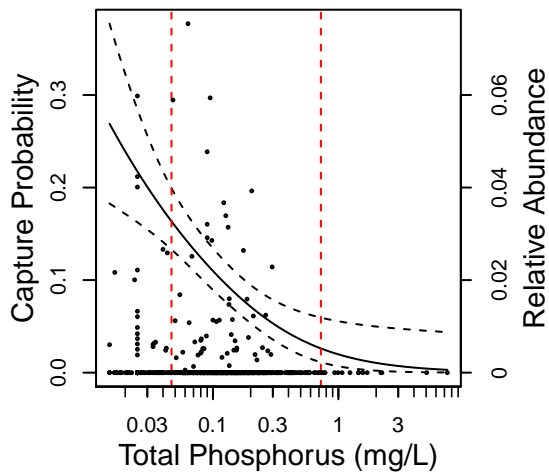


*Corixidae*

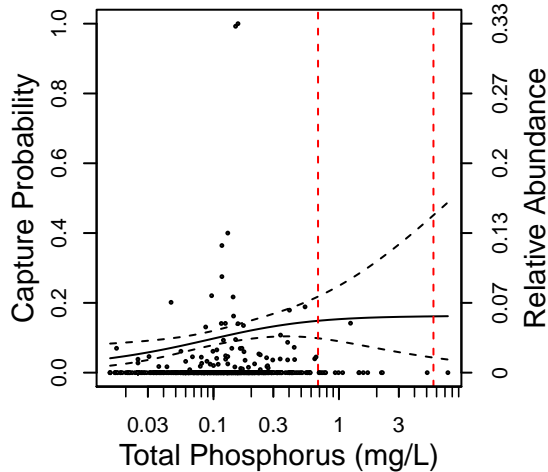


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

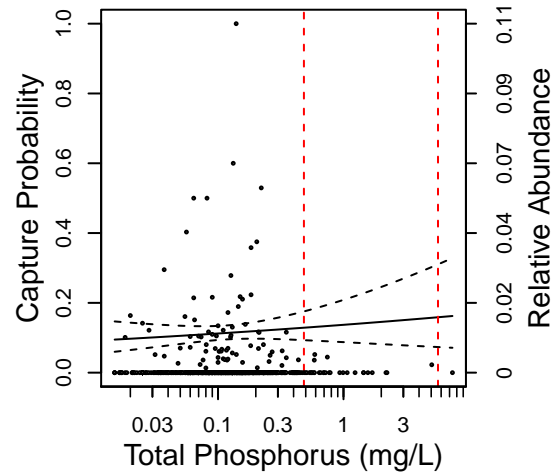
*Corydalidae*



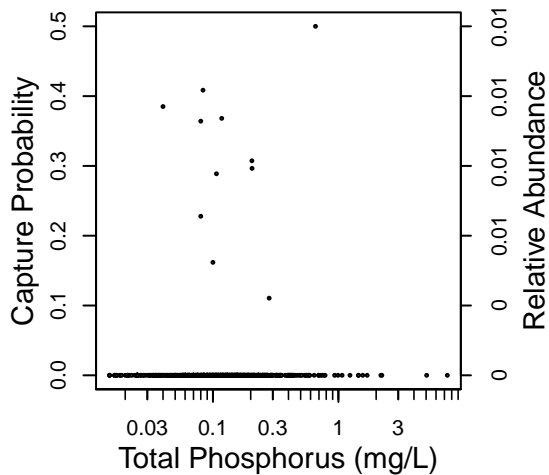
*Crangonyctidae*



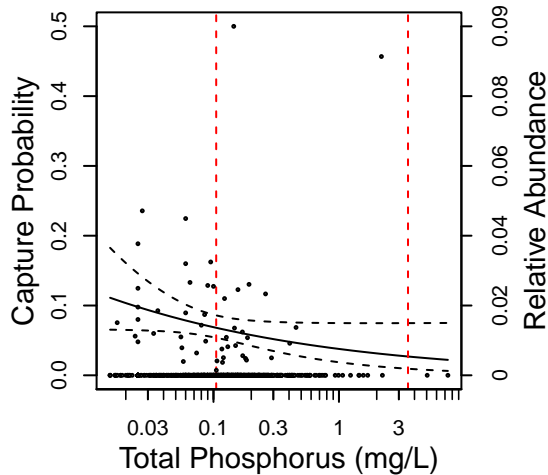
*Culicidae*



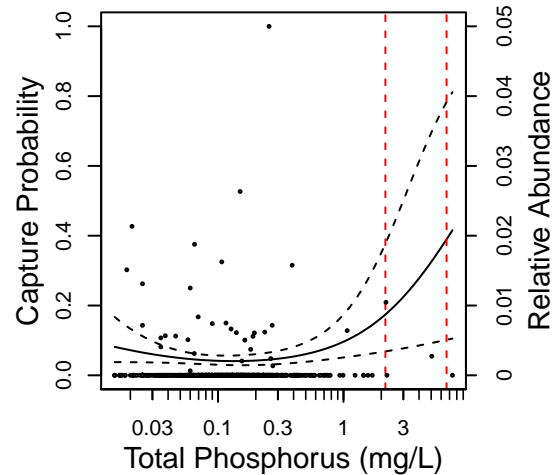
*Curculionidae*



*Dixidae*

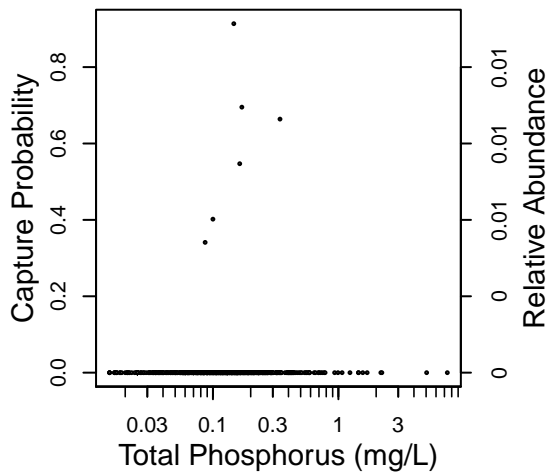


*Dorylaimidae*

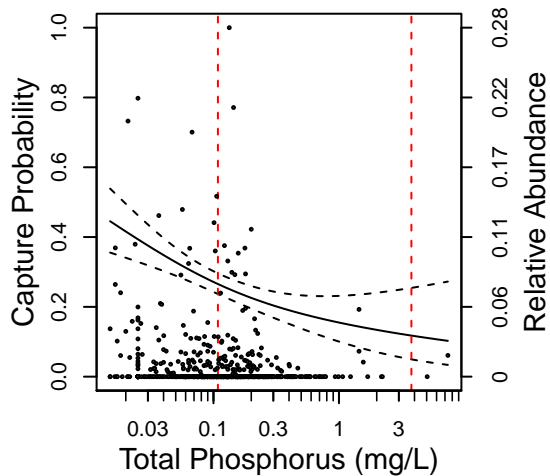


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

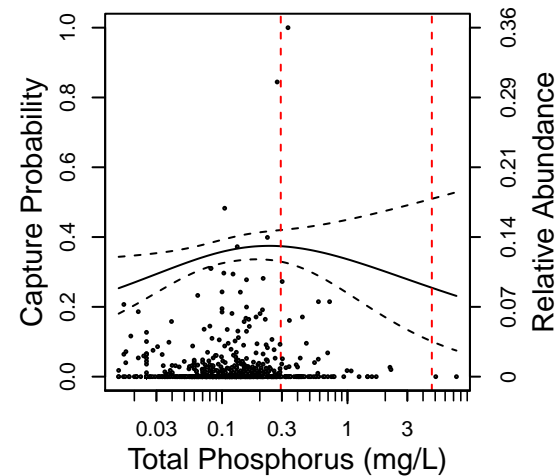
*Dreissenidae*



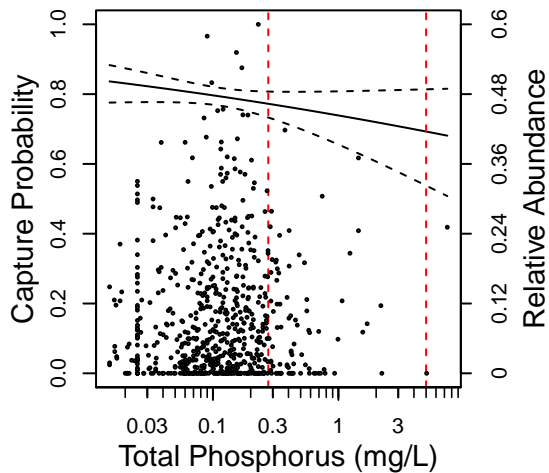
*Dryopidae*



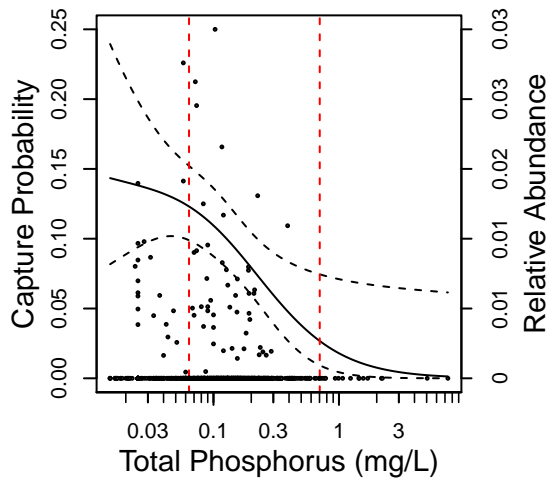
*Dytiscidae*



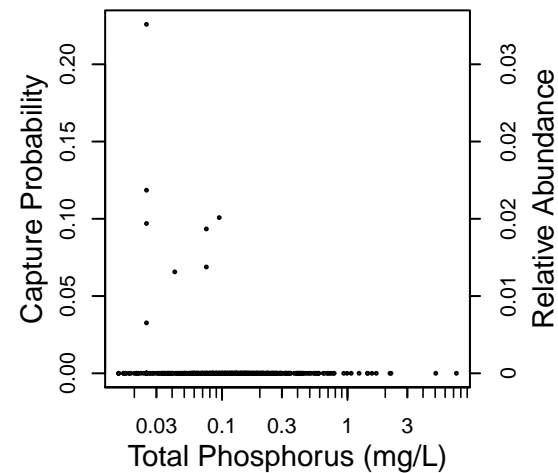
*Elmidae*



*Empididae*

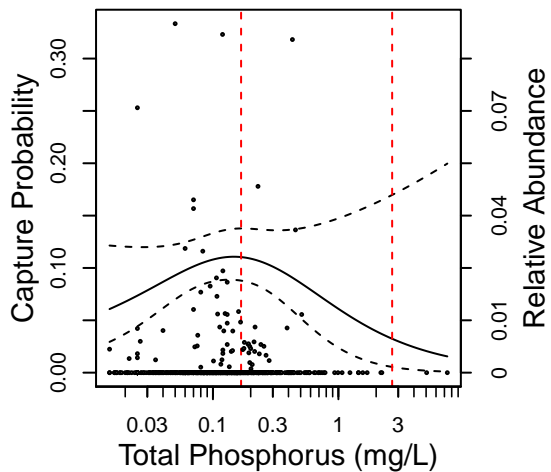


*Ephemerellidae*

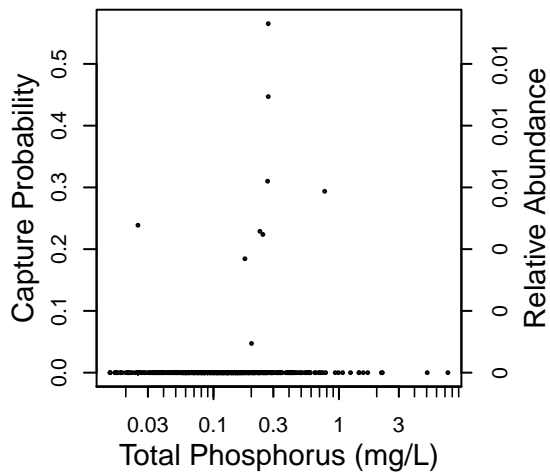


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

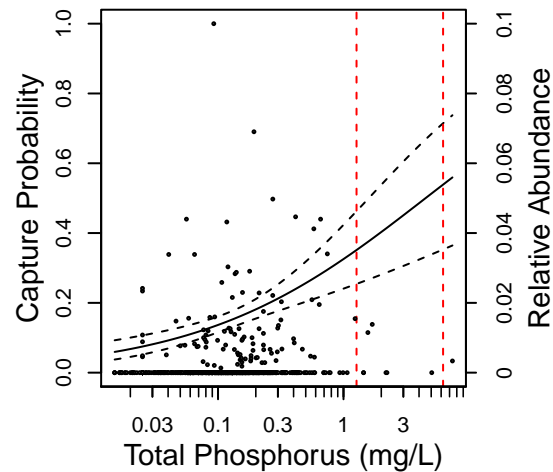
*Ephemeridae*



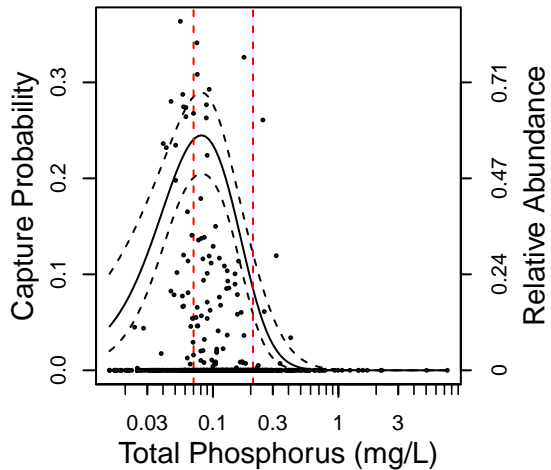
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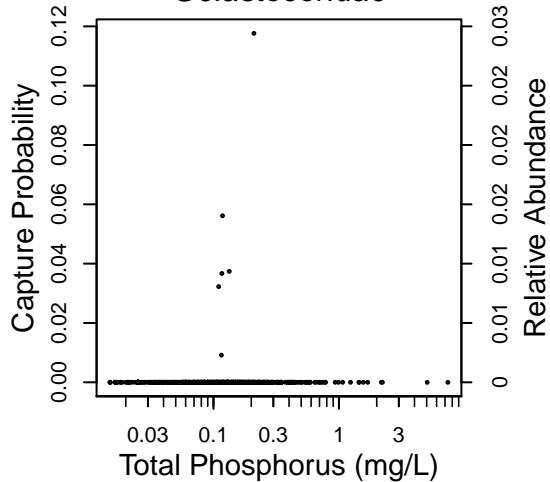
*Erpobdellidae*



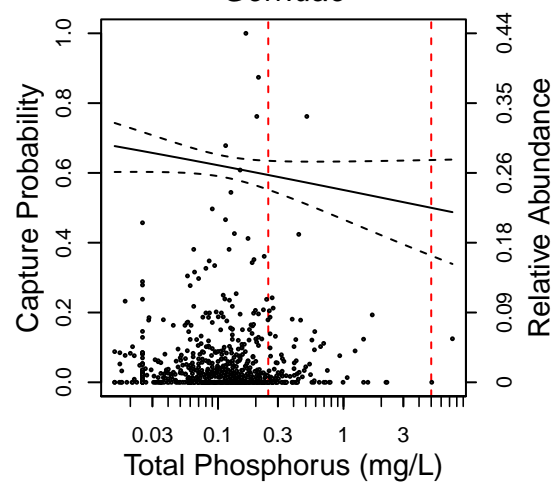
*Gammaridae*



*Gelastocoridae*

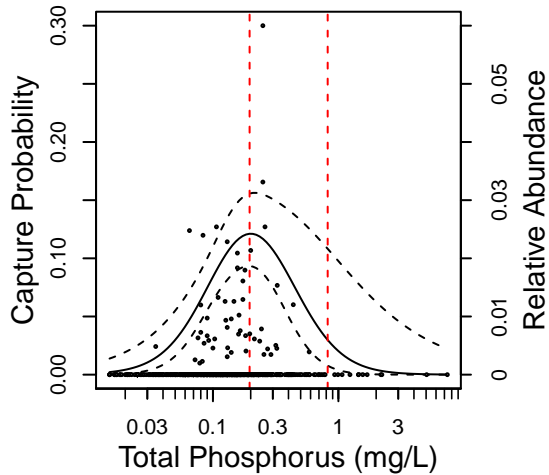


*Gerridae*

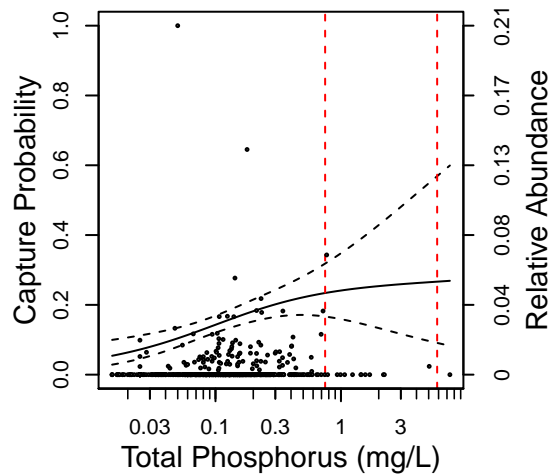


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

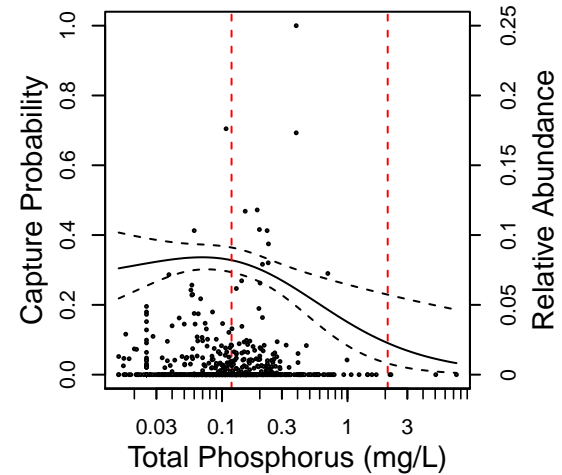
## *GERRIDAE*



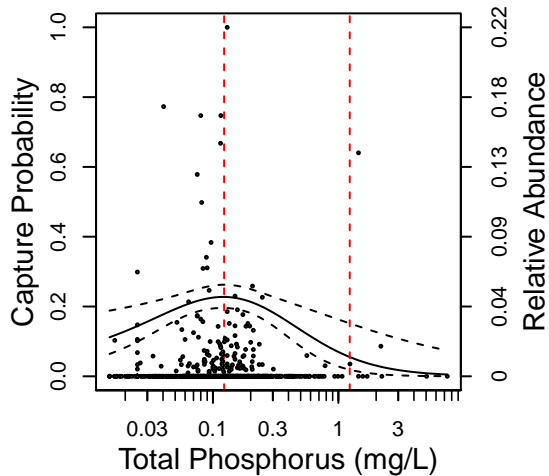
## *Glossiphoniidae*



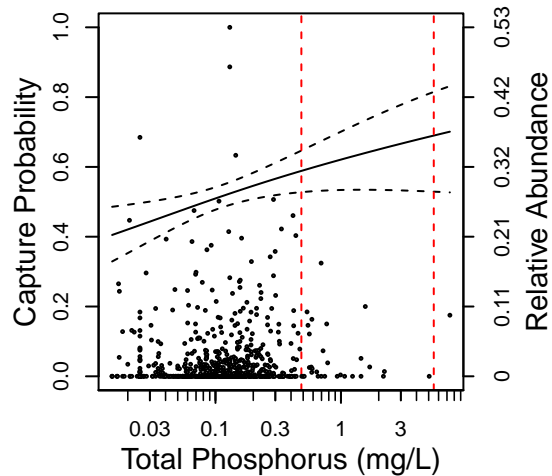
## *Gomphidae*



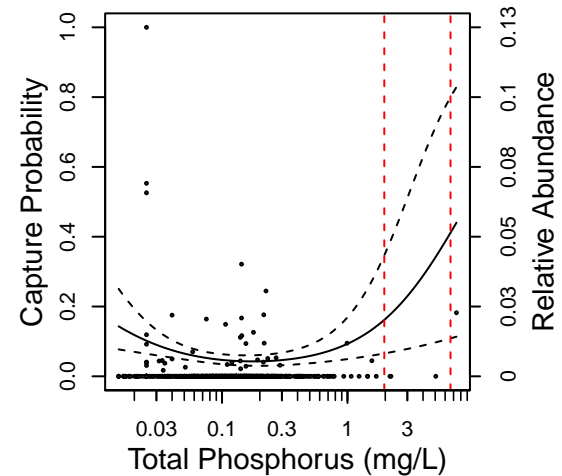
## *Gyrinidae*



## *Haliplidae*



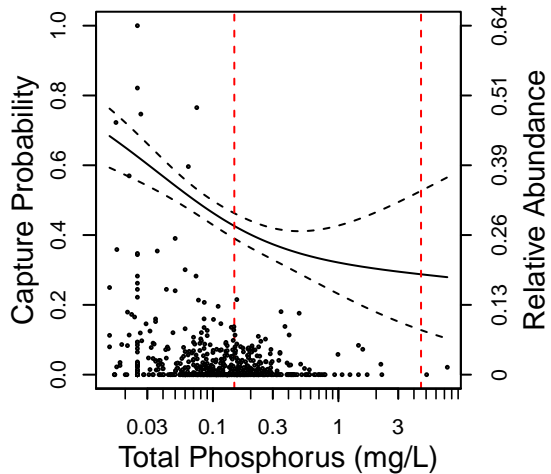
## *Helicopsychidae*



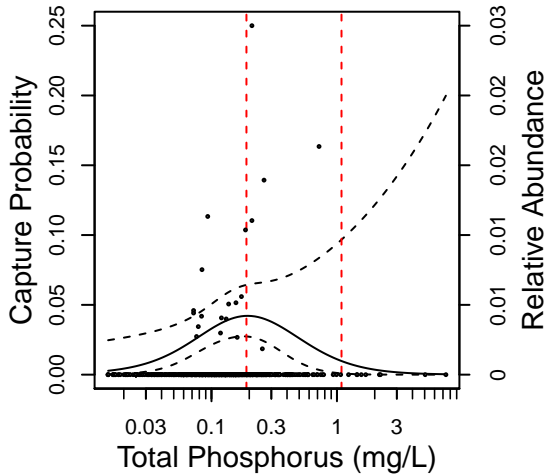


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

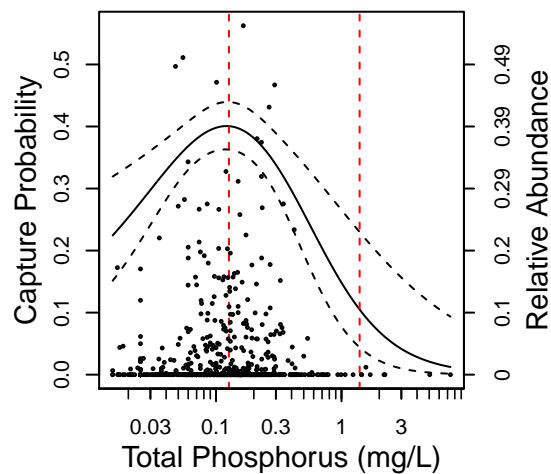
*Heptageniidae*



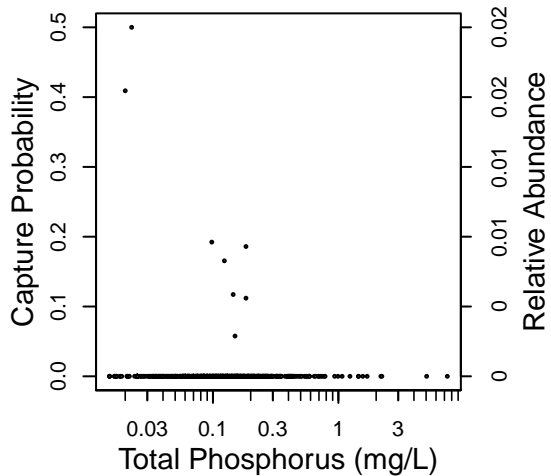
*Heteroceridae*



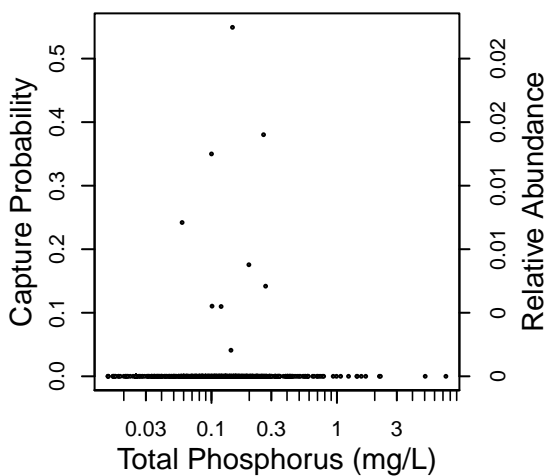
*Hyalellidae*



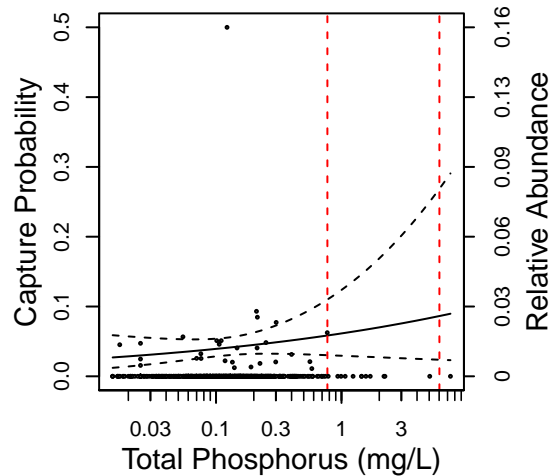
*Hydraenidae*



*Hydrobiidae*

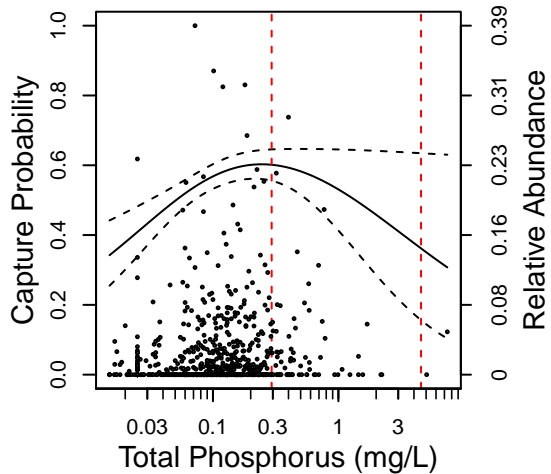


*Hydrochidae*

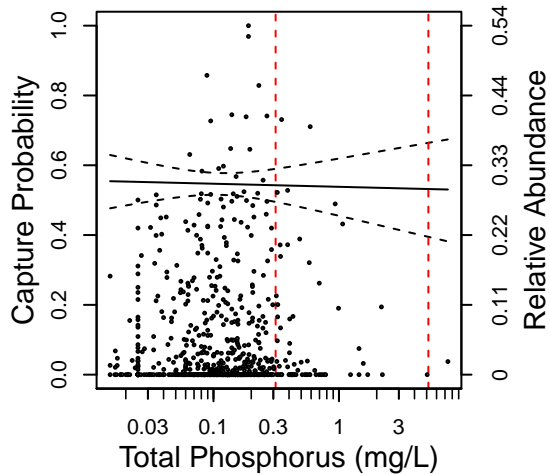


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

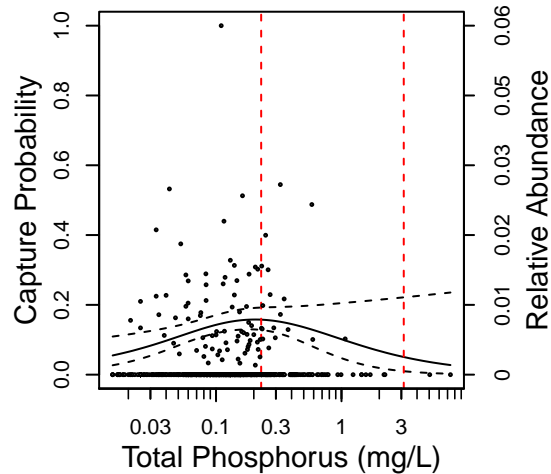
*Hydrophilidae*



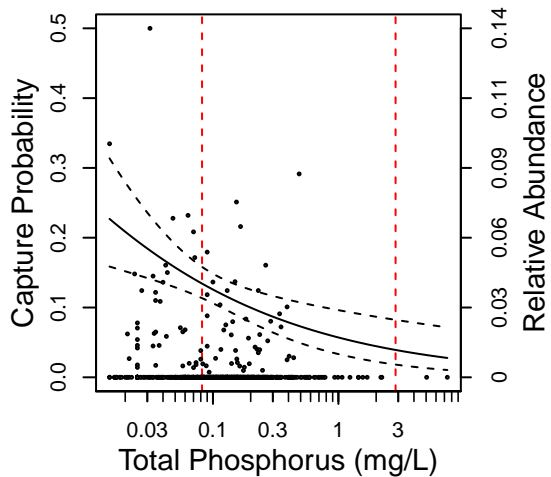
*Hydropsychidae*



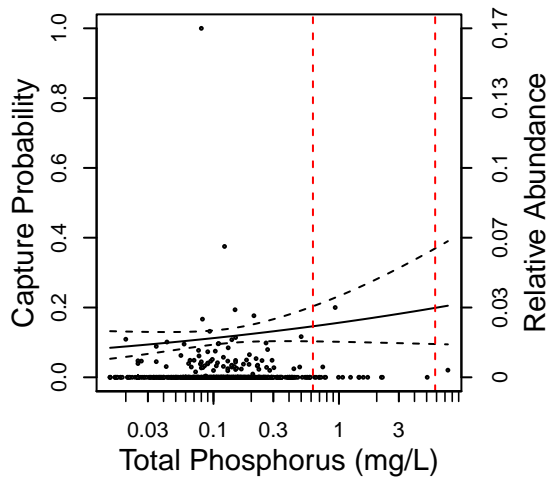
*Hydroptilidae*



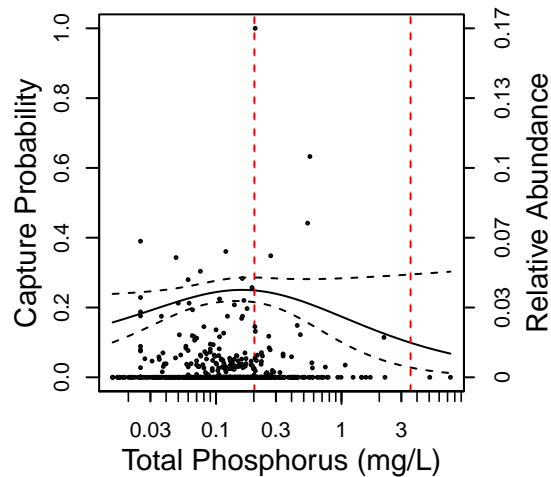
*Isonychiidae*



*Isotomidae*

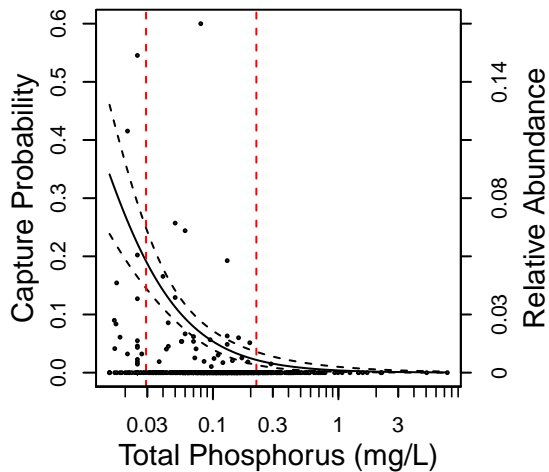


*Leptoceridae*

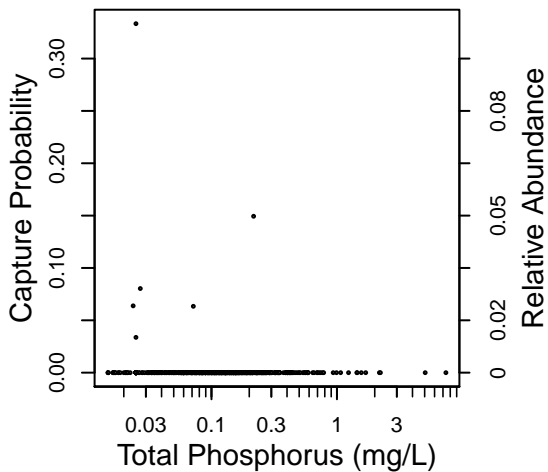


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

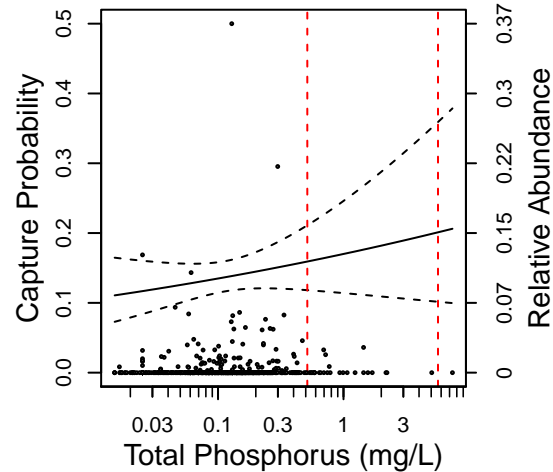
*Leptophlebiidae*



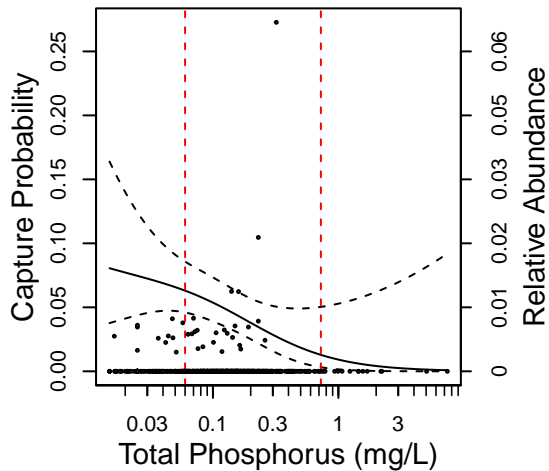
*Leuctridae*



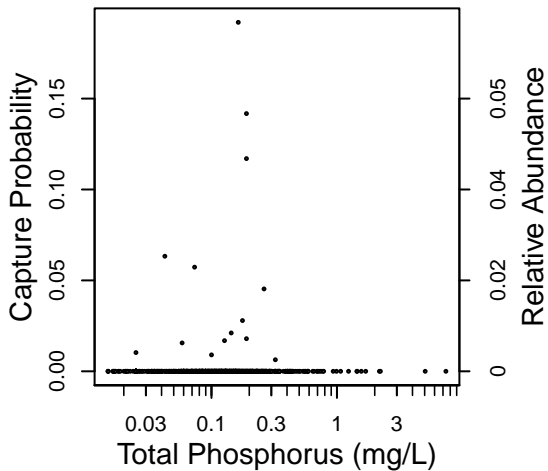
*Libellulidae*



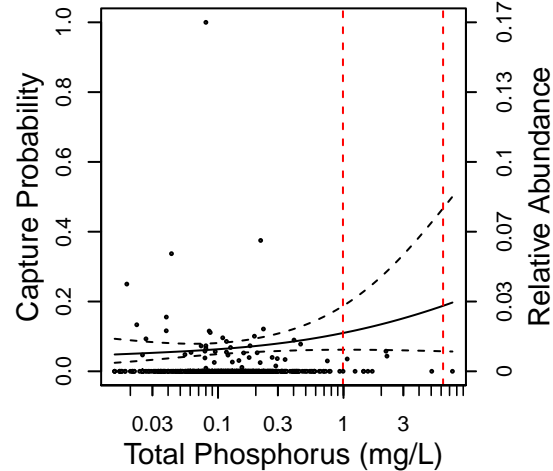
*Limnephilidae*



*Lumbricidae*

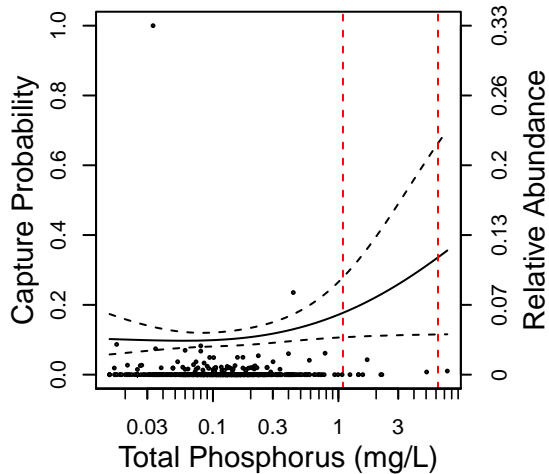


*Lumbriculidae*

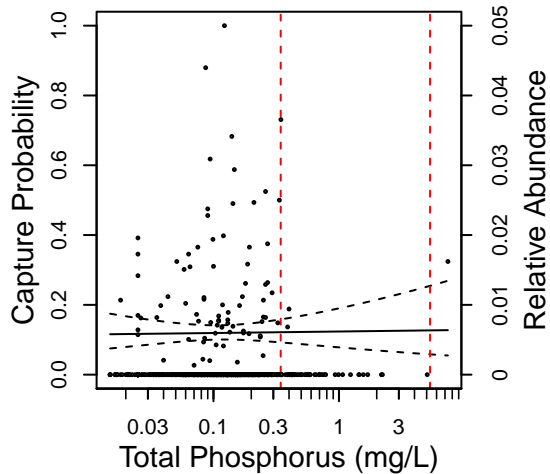


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

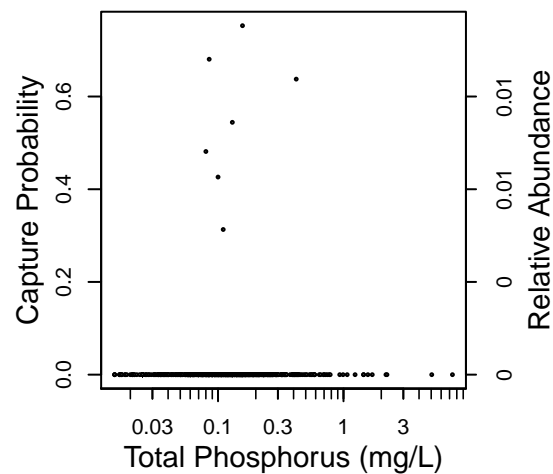
*Lymnaeidae*



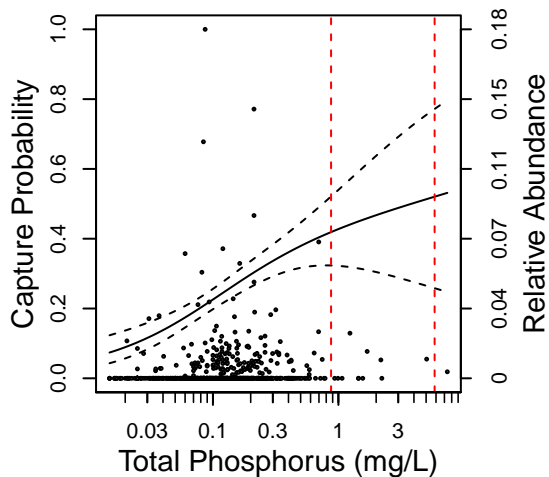
*Mesoveliidae*



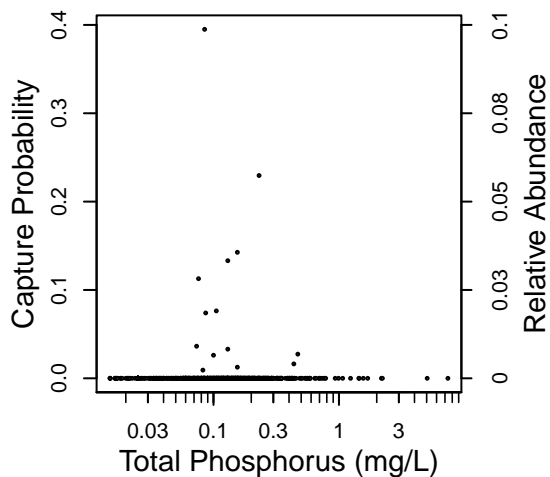
*Muscidae*



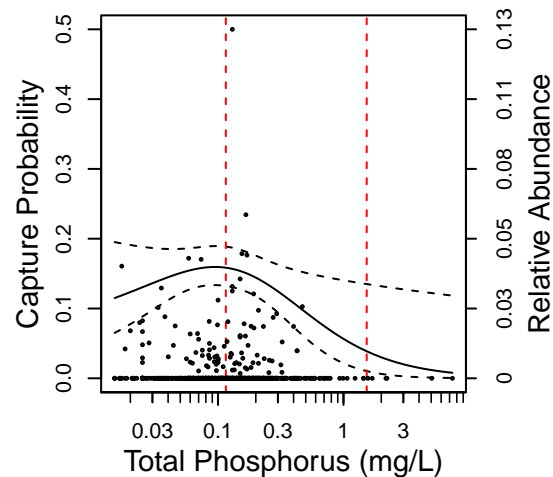
*Naididae*



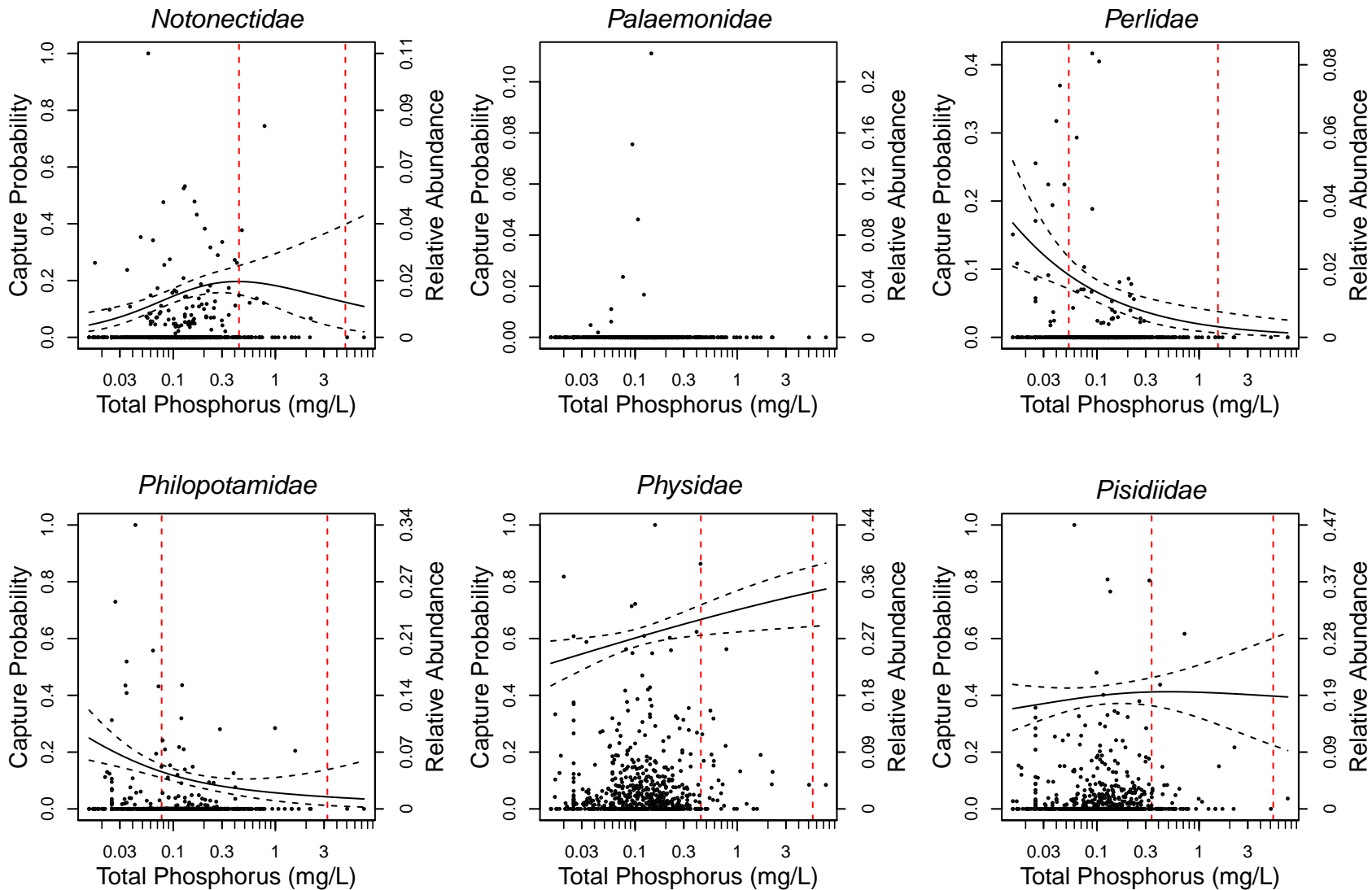
*Naucoridae*



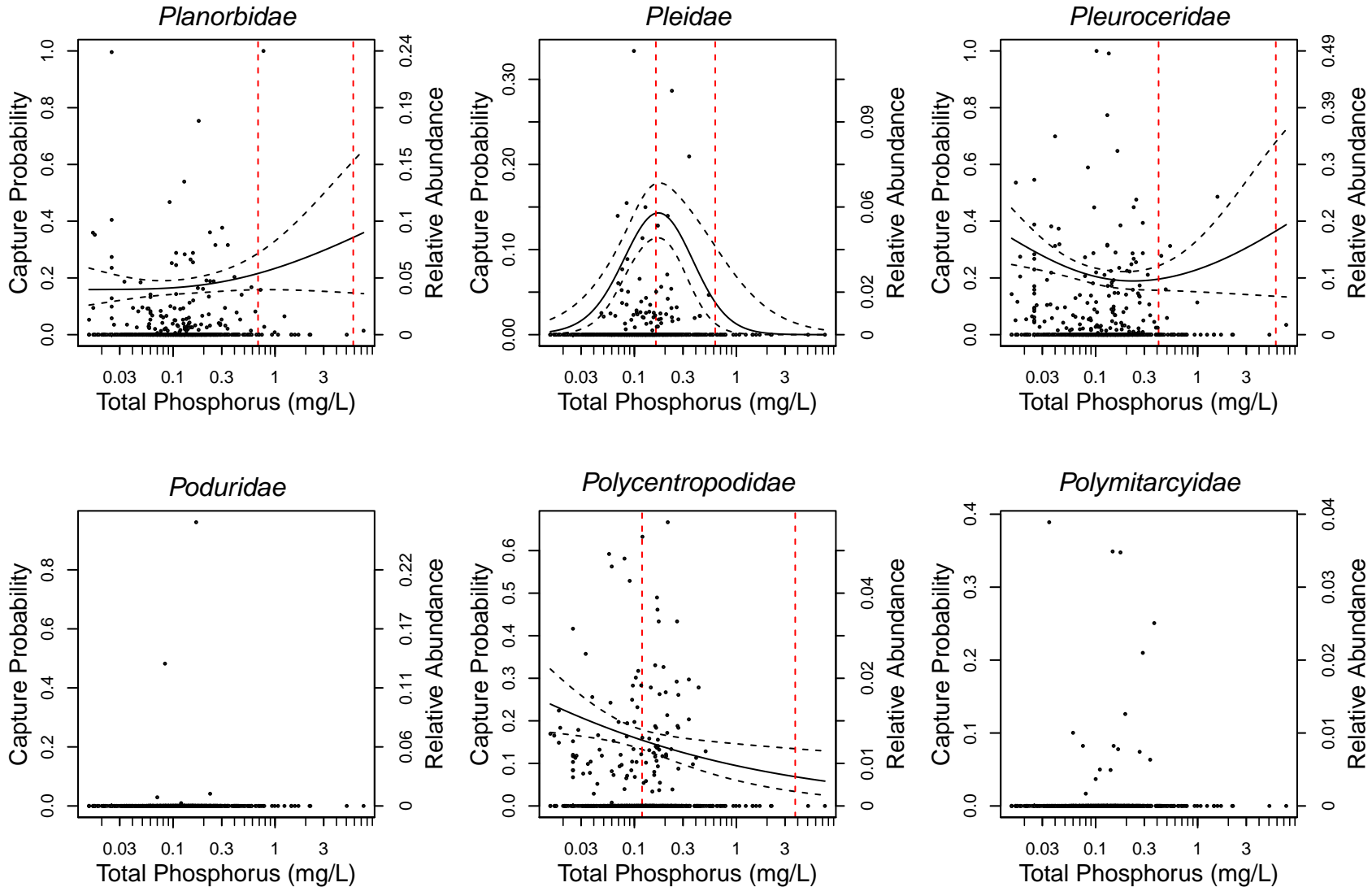
*Nepidae*



# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

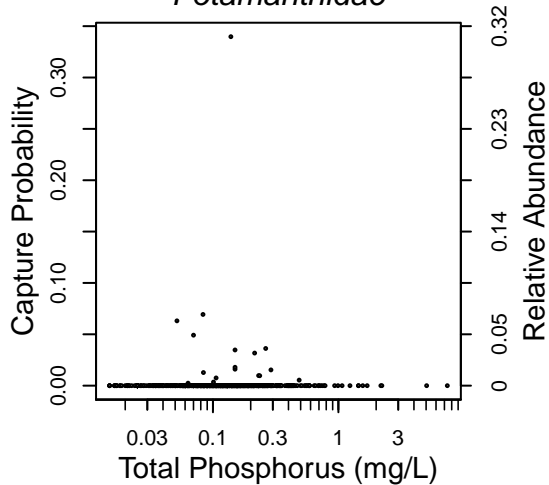


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

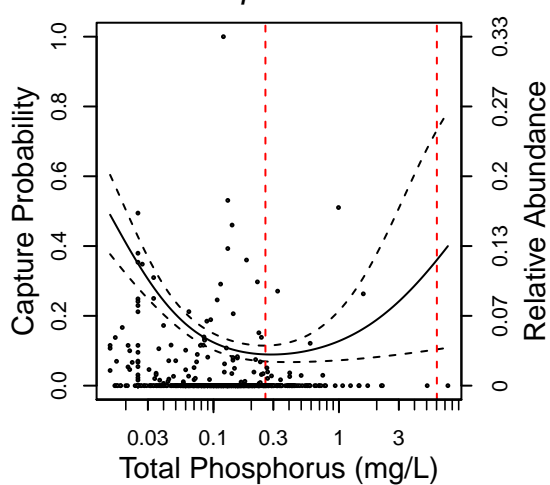


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

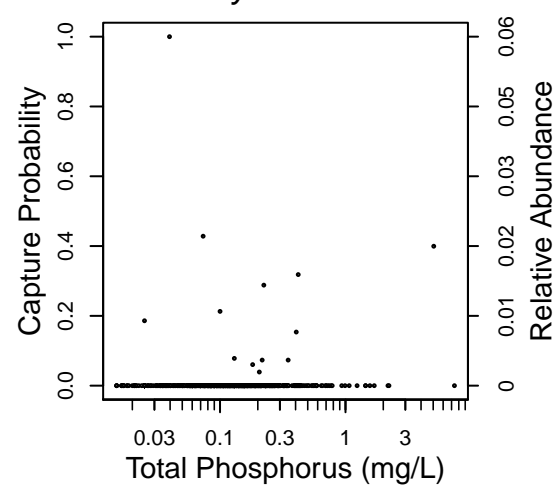
*Potamanthidae*



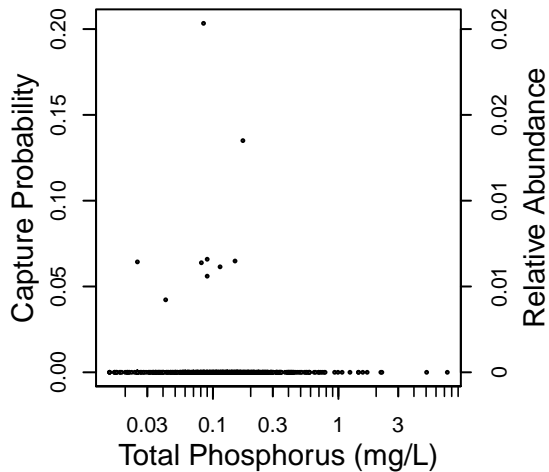
*Psephenidae*



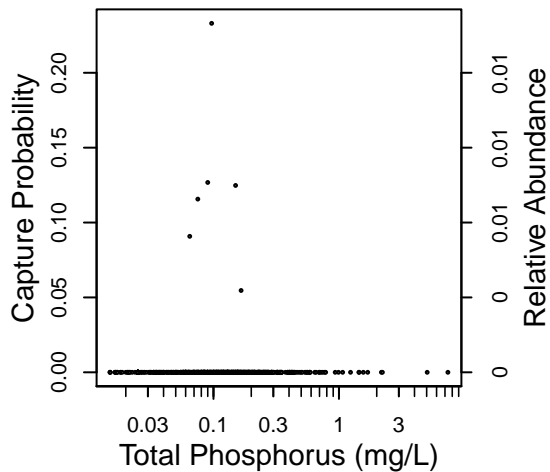
*Psychodidae*



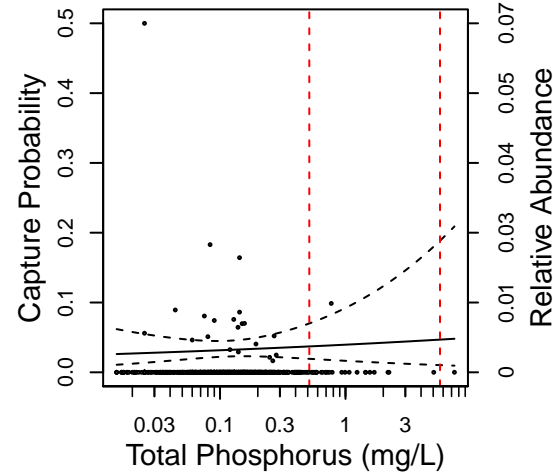
*Psychomyiidae*



*Pteronarcyidae*

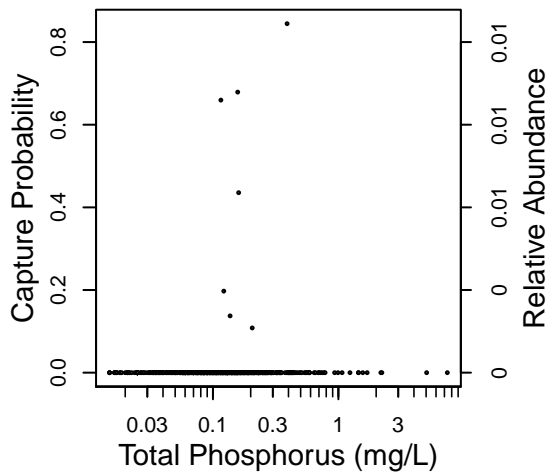


*Pyralidae*

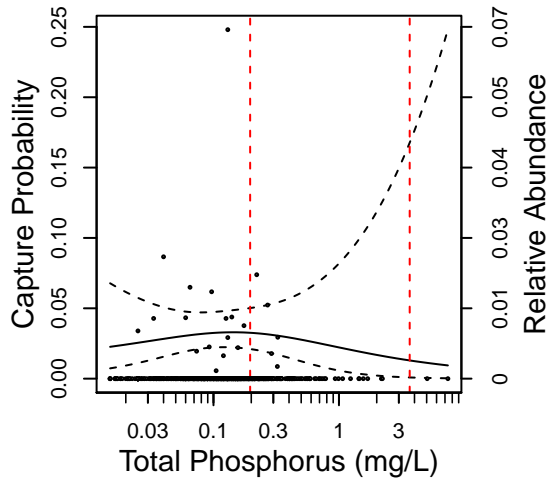


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

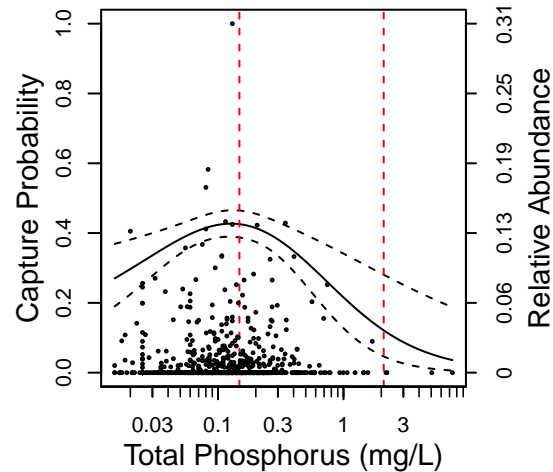
*Saldidae*



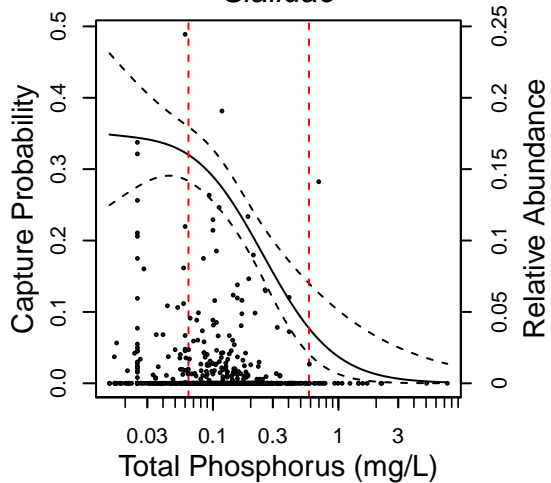
*Sciomyzidae*



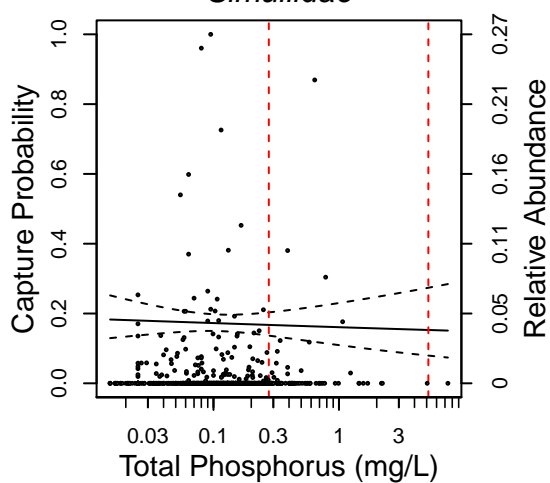
*Scirtidae*



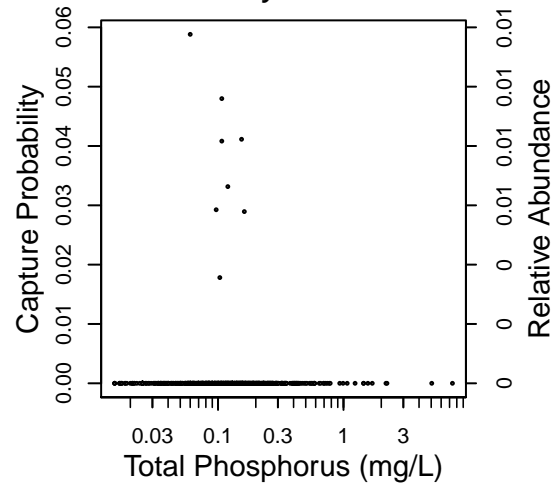
*Sialidae*



*Simuliidae*



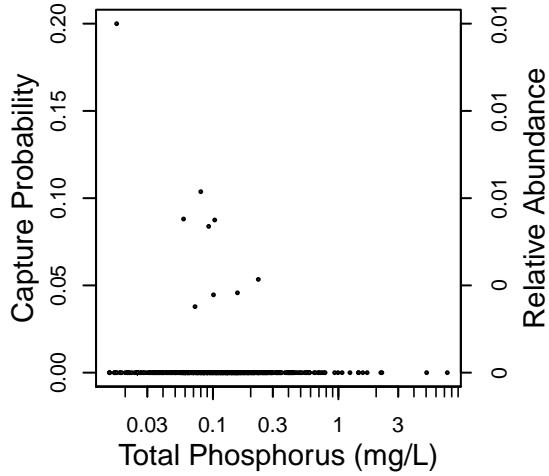
*Sisyridae*



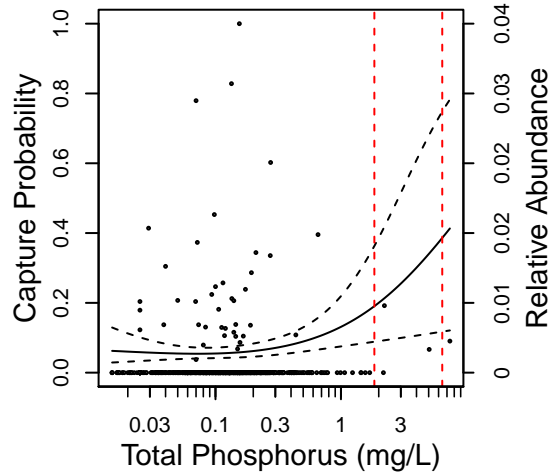


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

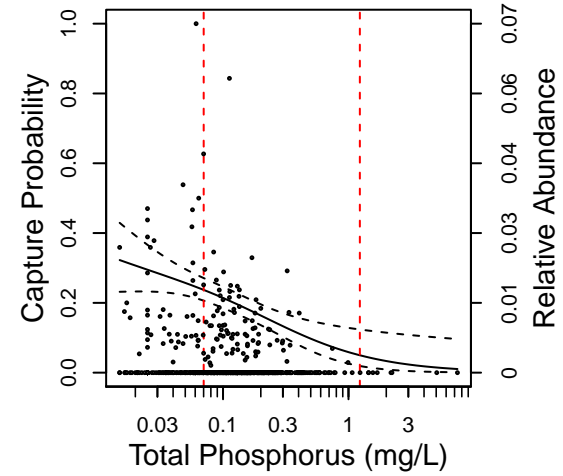
*Sminthuridae*



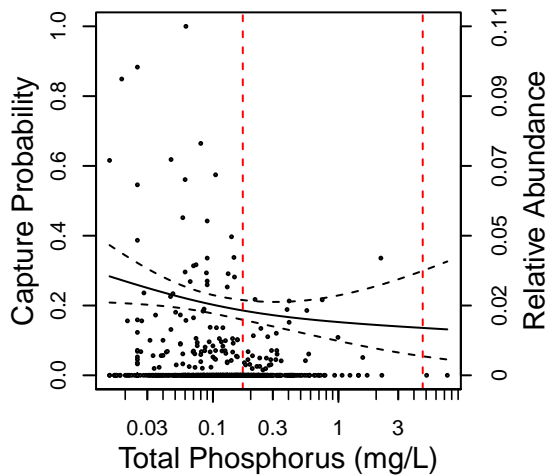
*Stratiomyidae*



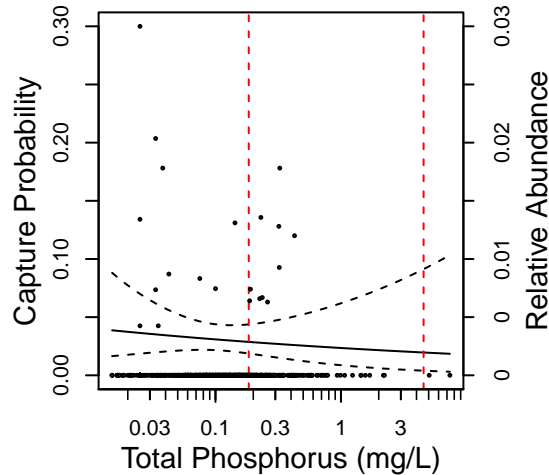
*Tabanidae*



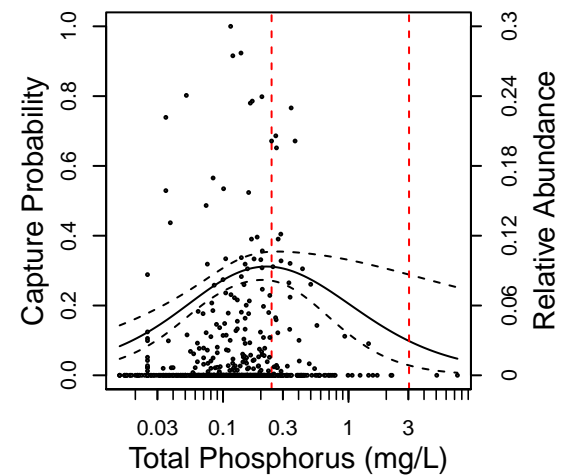
*Tipulidae*



*Trichoptera*

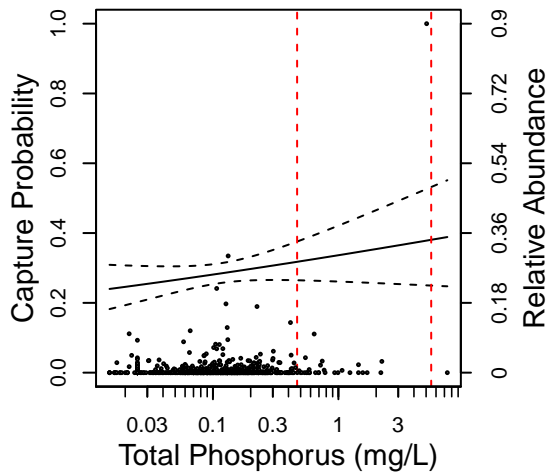


*Tricorythidae*

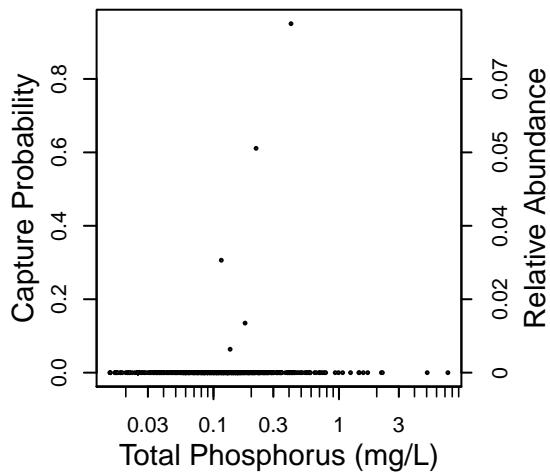


# Capture Probability of Macroinvertebrate Taxon Along TP Gradient

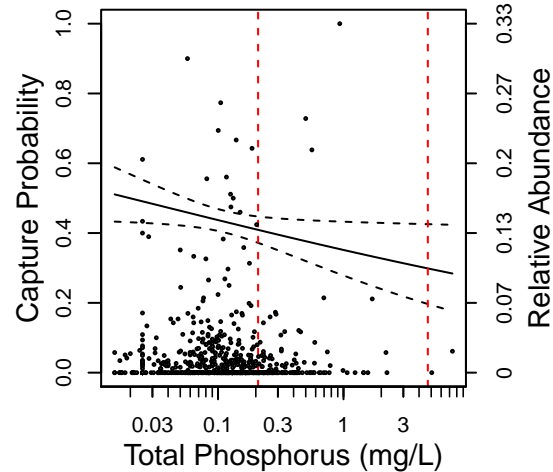
*Tubificidae*



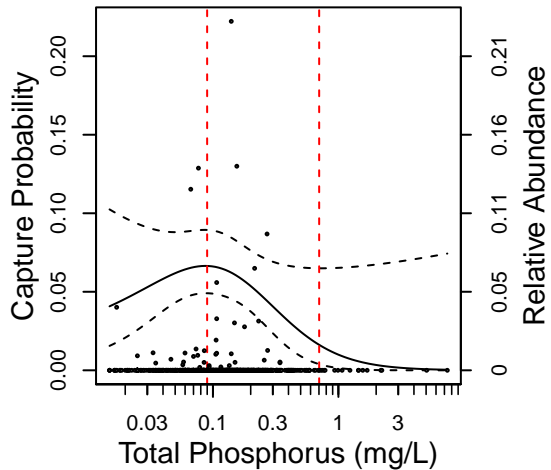
*Valvatidae*



*Veliidae*

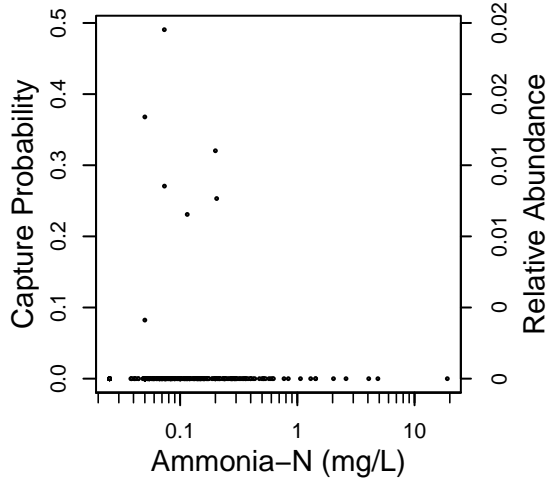


*Viviparidae*

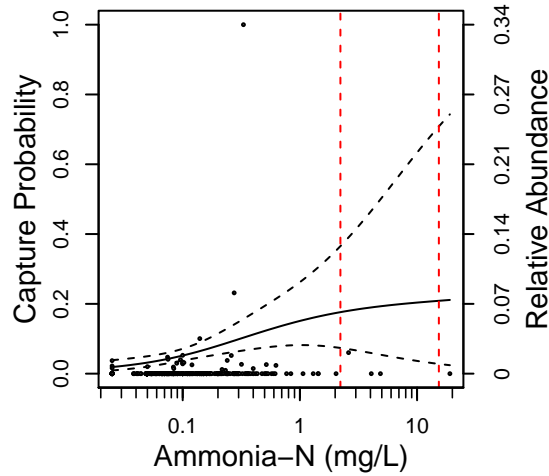


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

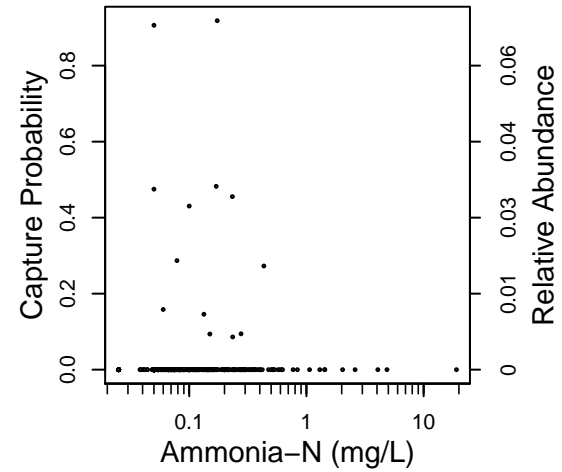
*Acerpenna pygmaea*



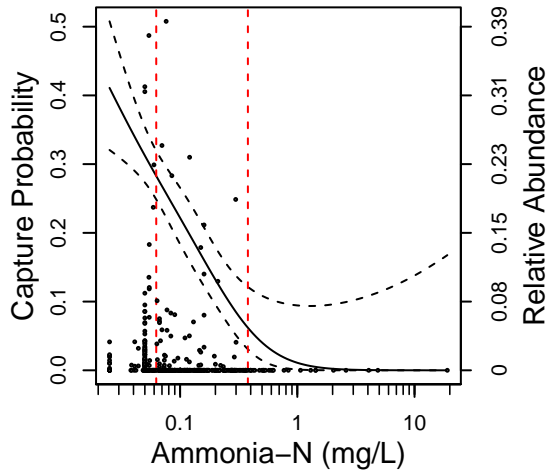
*Aeshna umbrosa*



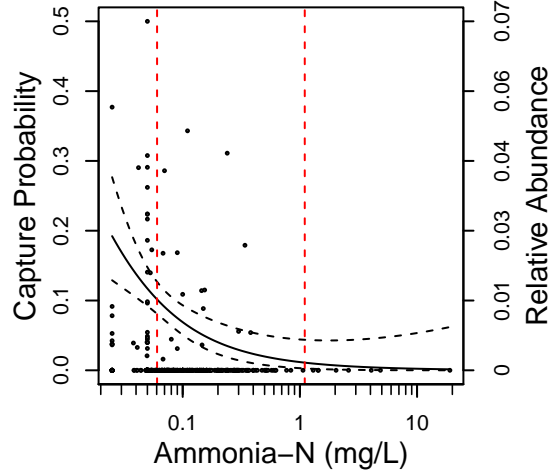
*Anax junius*



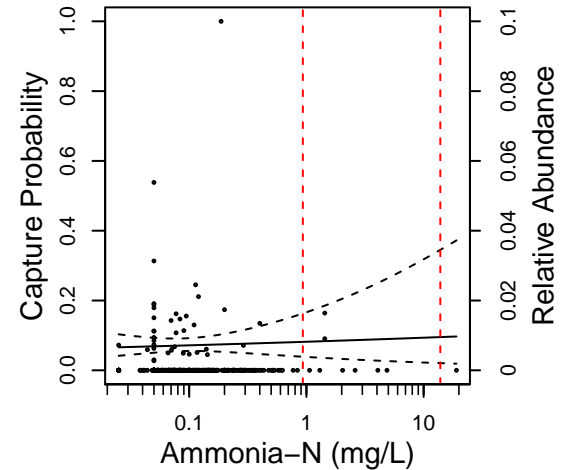
*Ancyronyx variegatus*



*Argia apicalis*

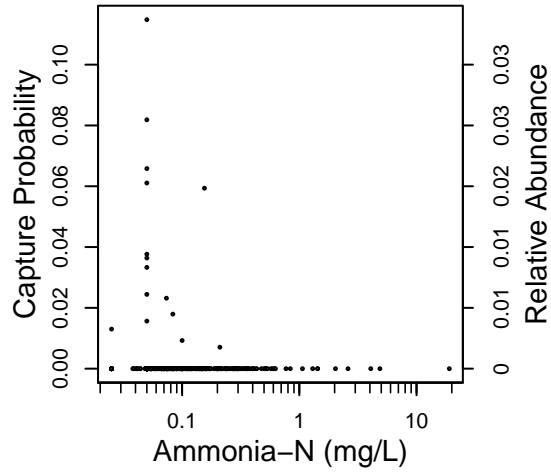


*Argia fumipennis violacea*

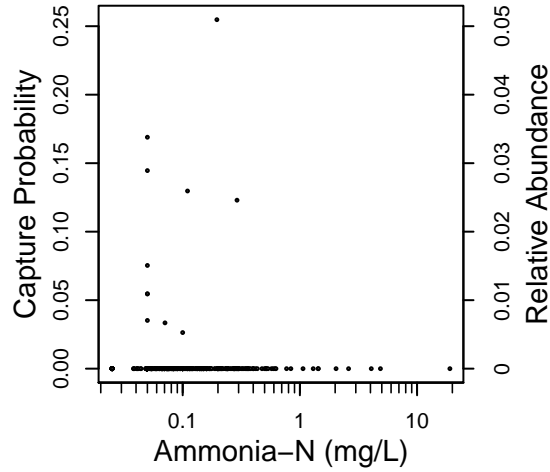


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

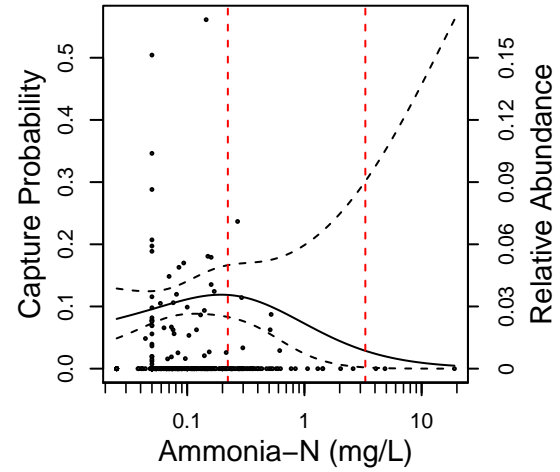
*Argia moesta*



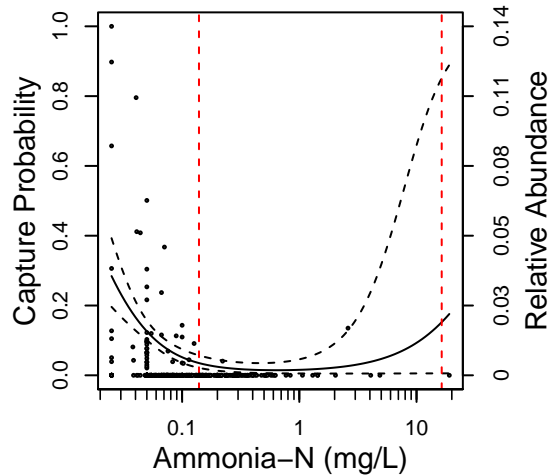
*Argia sedula*



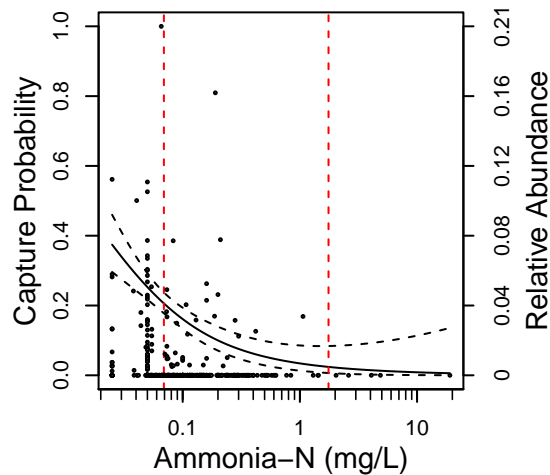
*Argia tibialis*



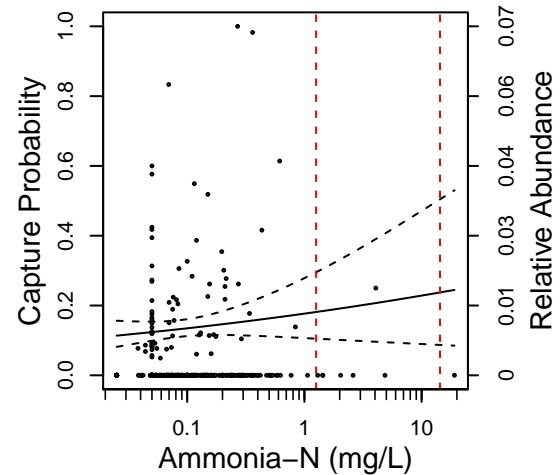
*Baetis flavistriga*



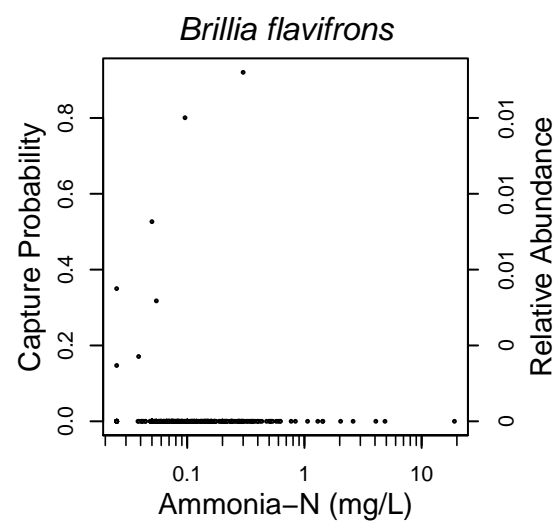
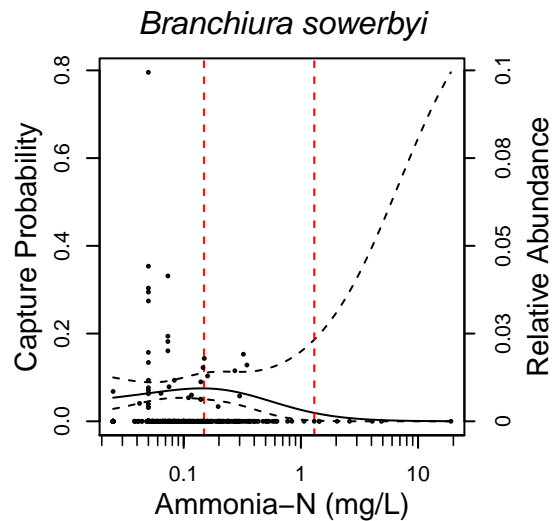
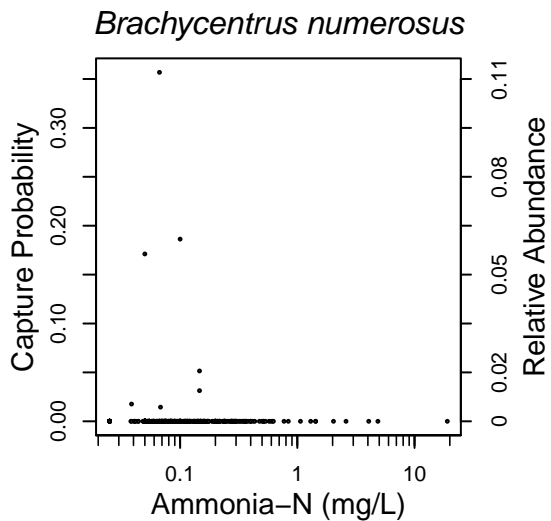
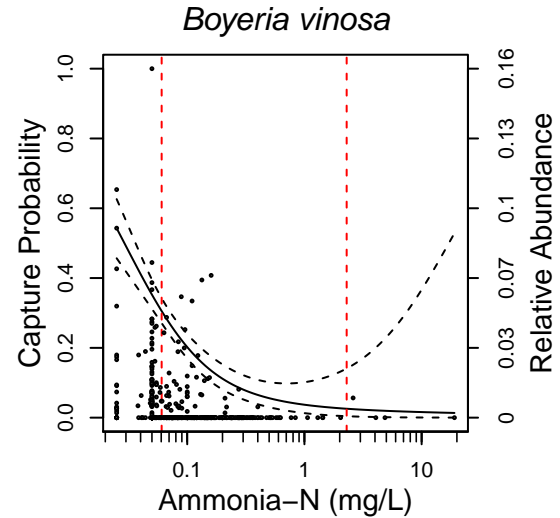
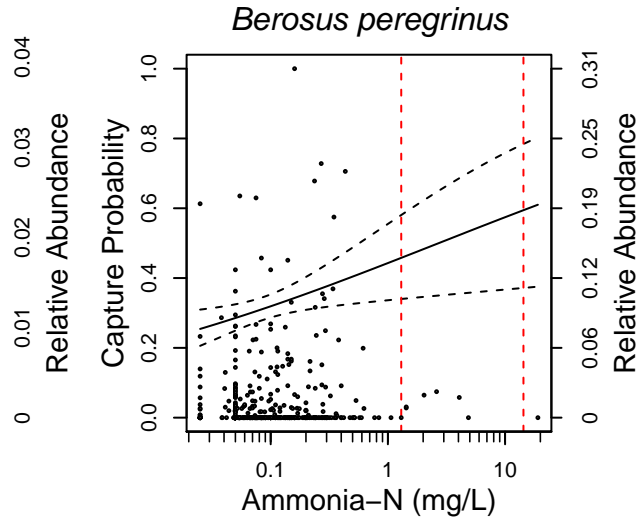
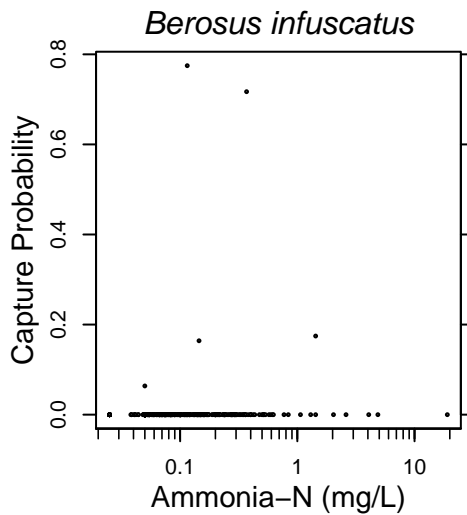
*Baetis intercalaris*



*Basiaeschna janata*

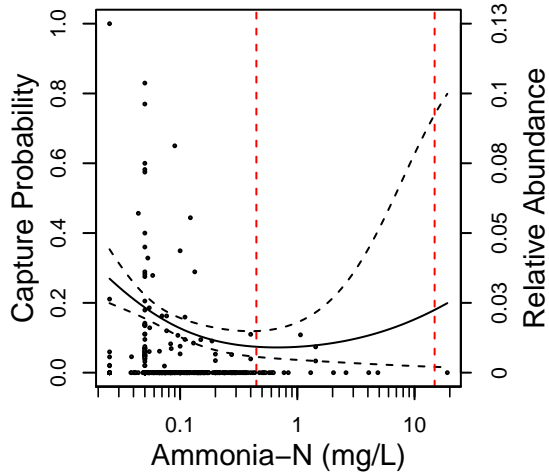


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

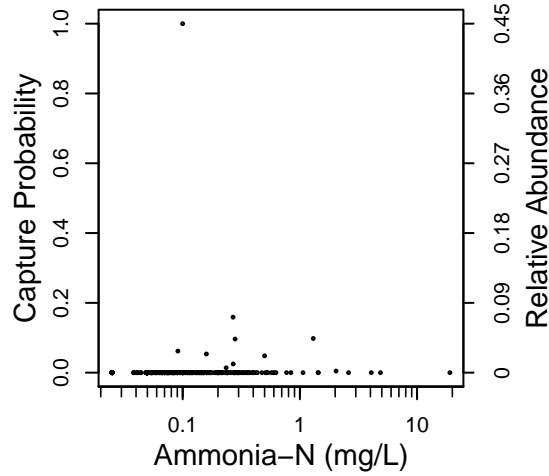


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

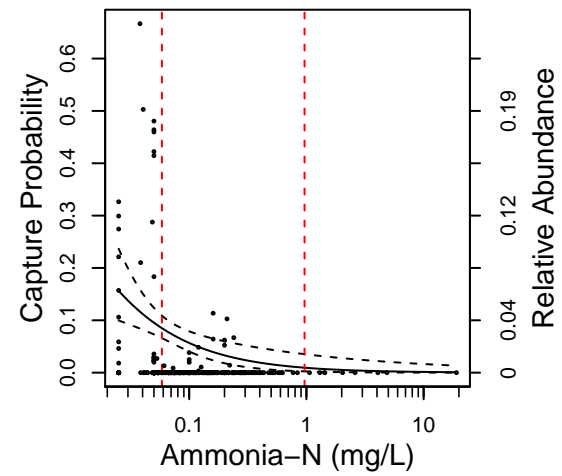
*Calopteryx maculata*



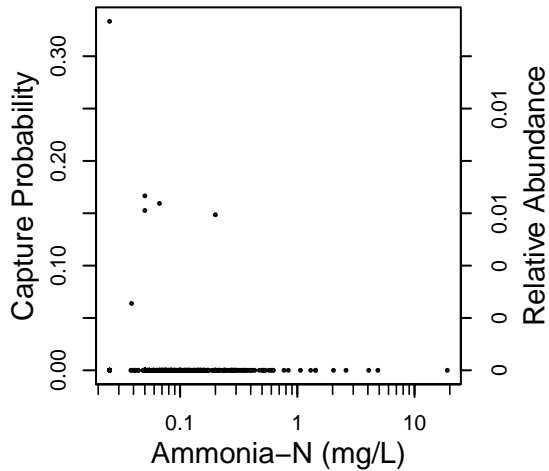
*Cambarus nebrascensis*



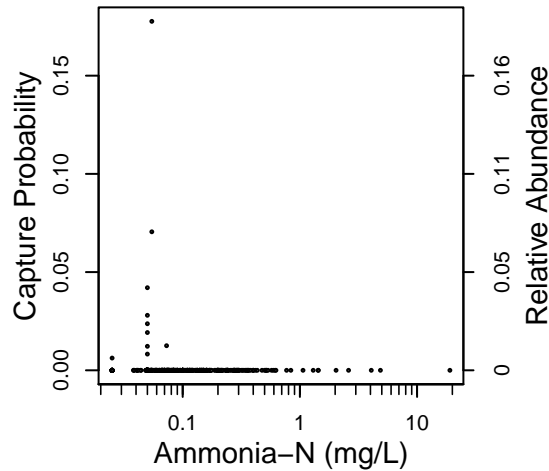
*Ceratopsyche checkerboard*



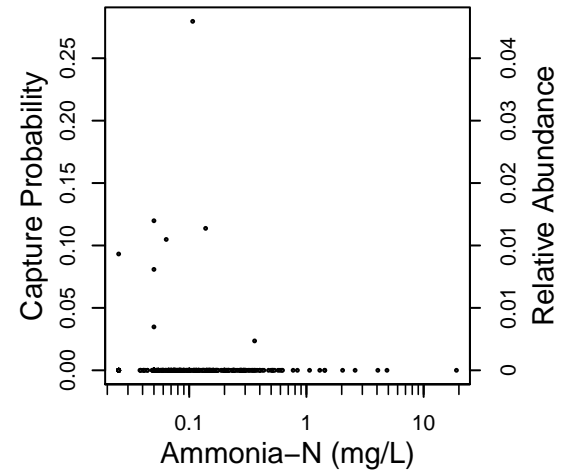
*Ceratopsyche slossonae*



*Ceratopsyche sparna*

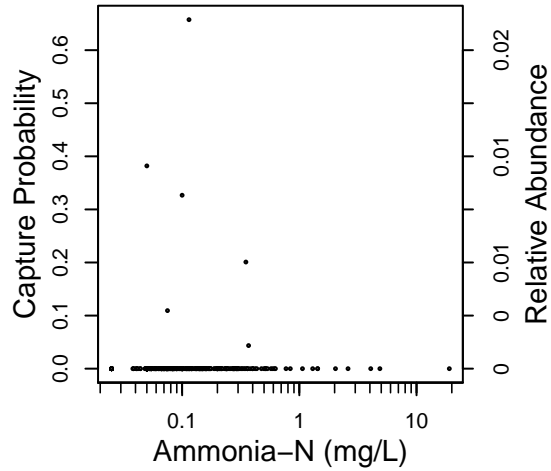


*Chauliodes pectinicornis*

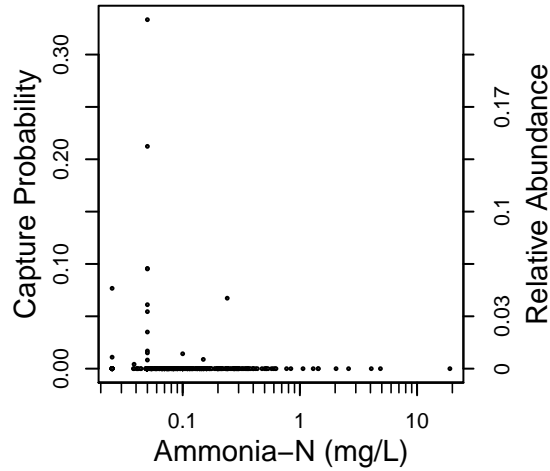


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

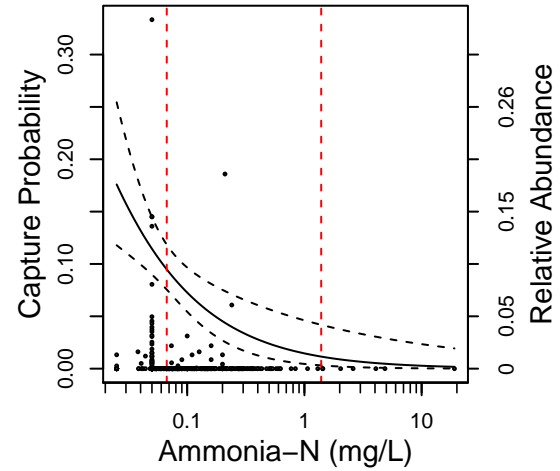
*Chauliodes rastricornis*



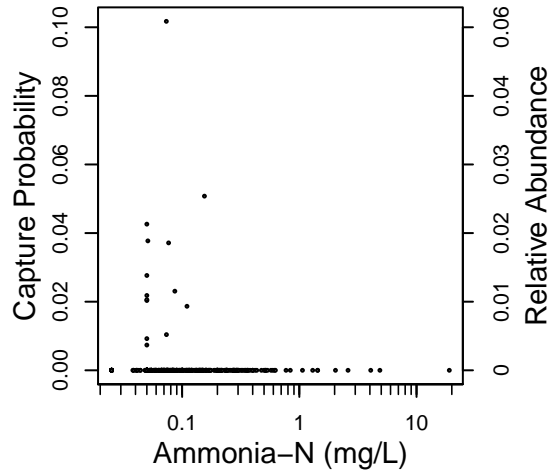
*Chimarra aterrima*



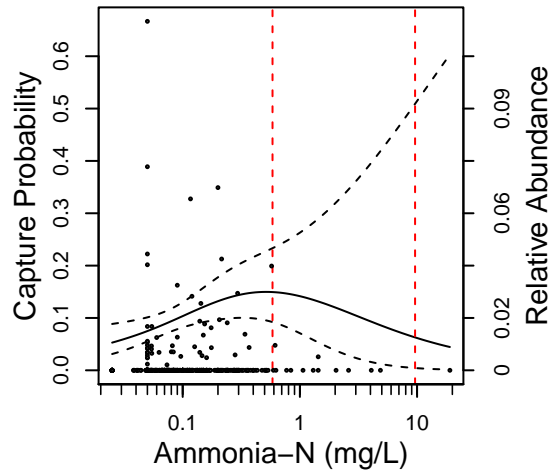
*Chimarra obscura*



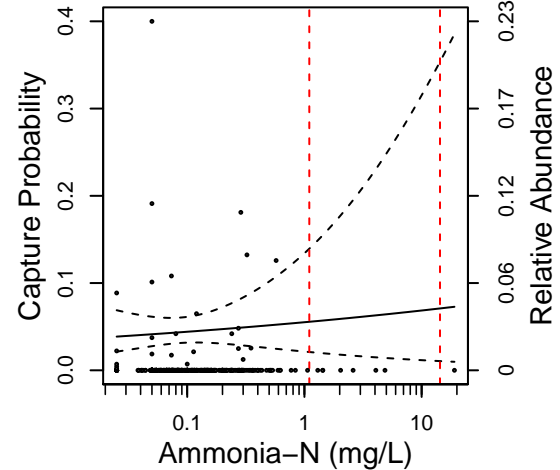
*Choroterpes basalis*



*Clinotanypus pinguis*

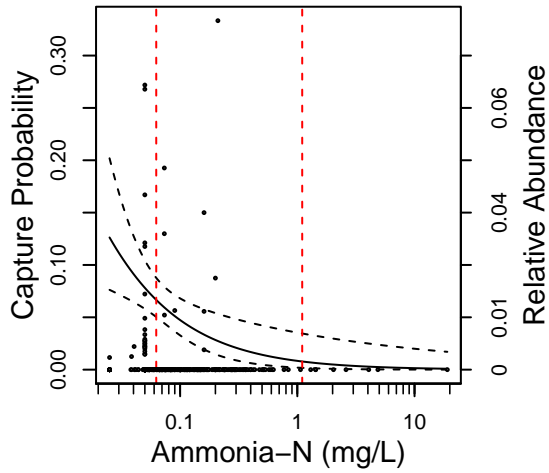


*Coptotomus loticus*

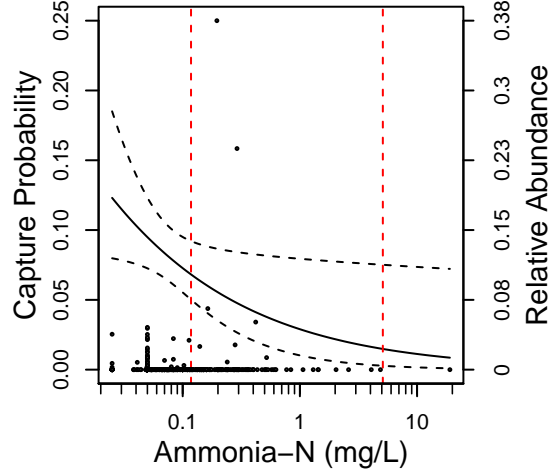


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

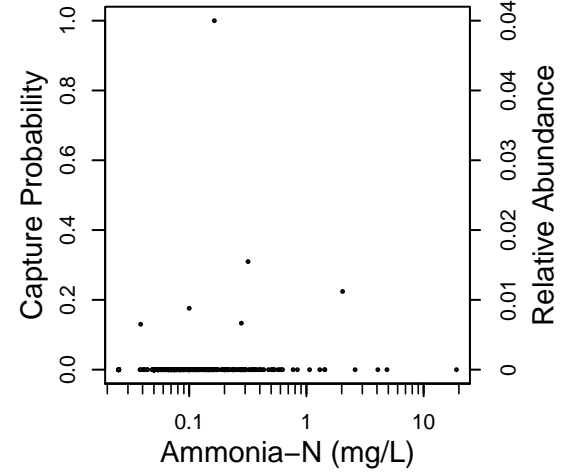
*Corydalus cornutus*



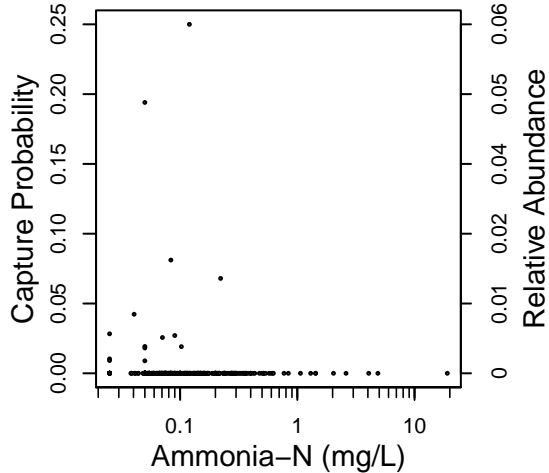
*Cricotopus (cricotopus)*



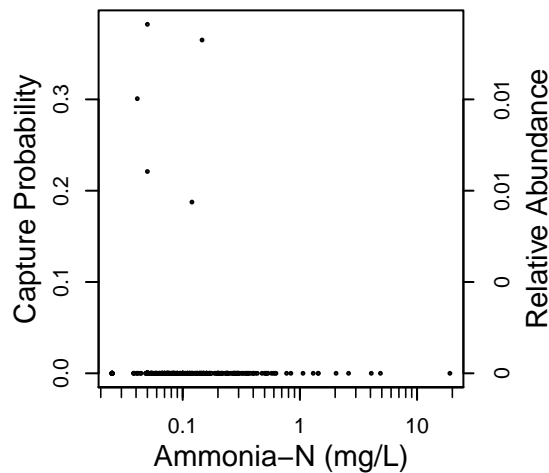
*Cricotopus sylvestris* group



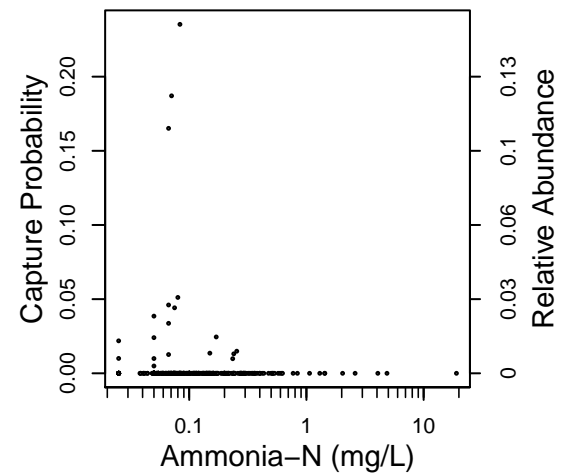
*Cricotopus trifascia*



*Dreissena polymorpha*



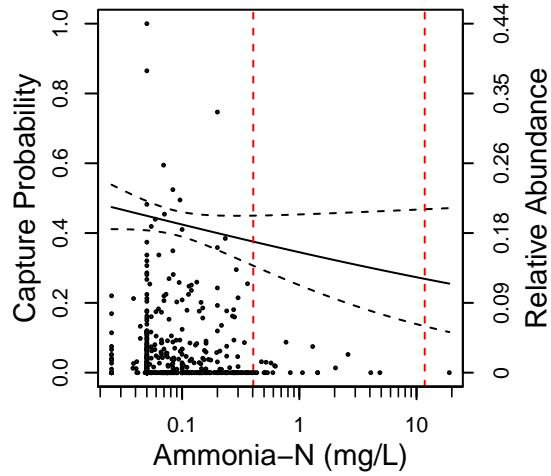
*Dubiraphia bivittata*



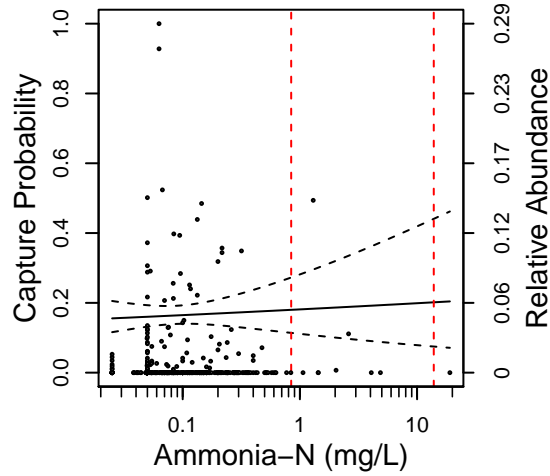


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

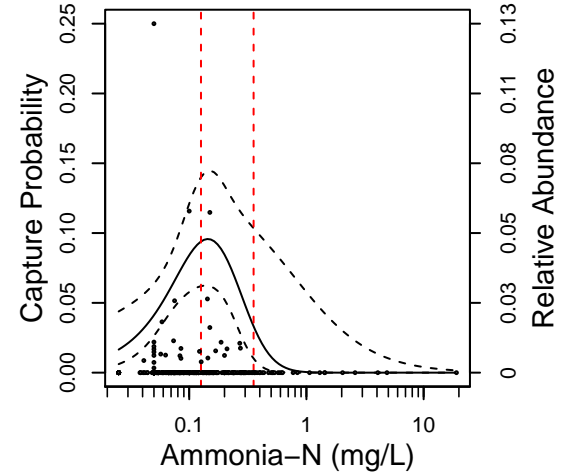
*Dubiraphia minima* group



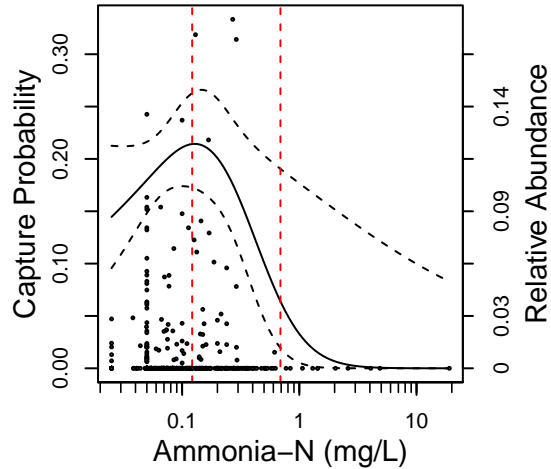
*Dubiraphia quadrinotata*



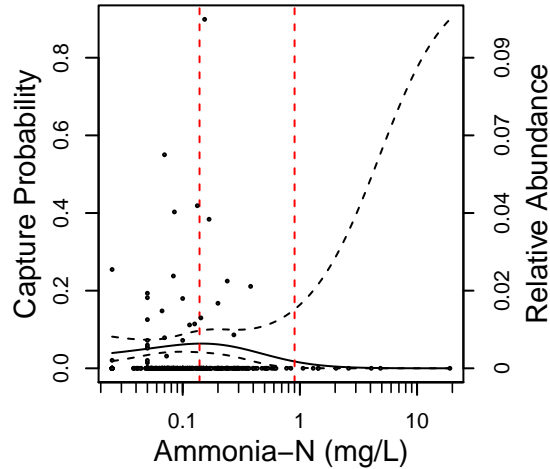
*Enallagma basidens*



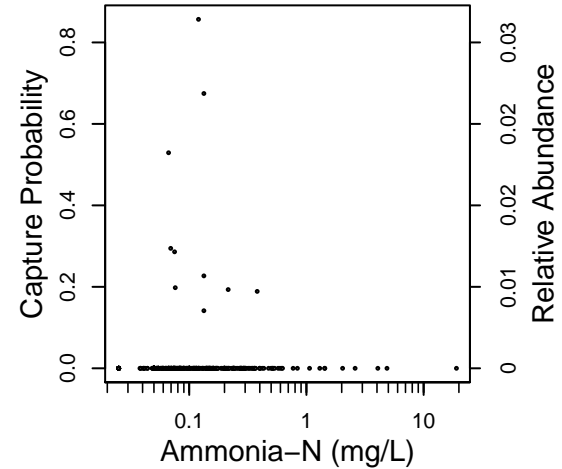
*Enallagma divagans*



*Enallagma exsulans*

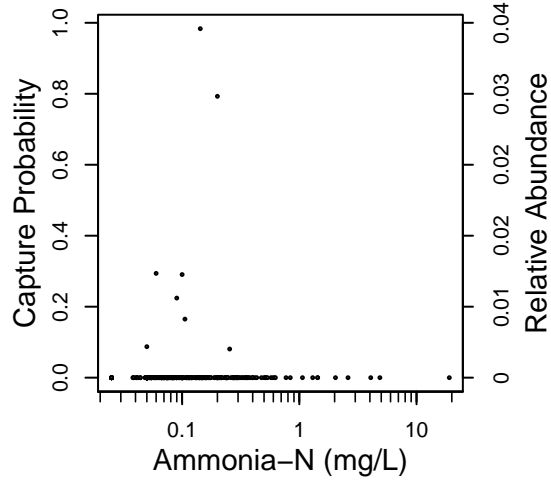


*Enallagma signatum*

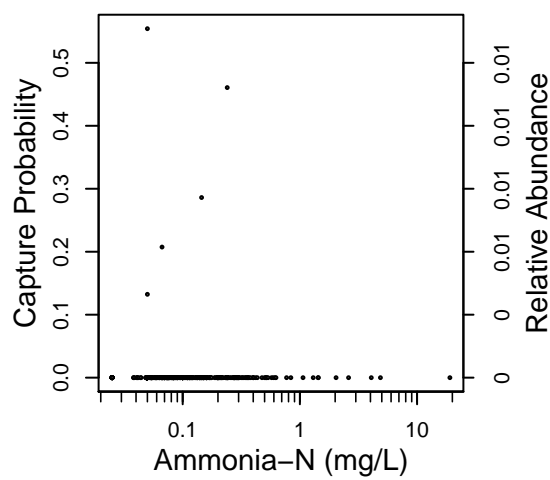


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

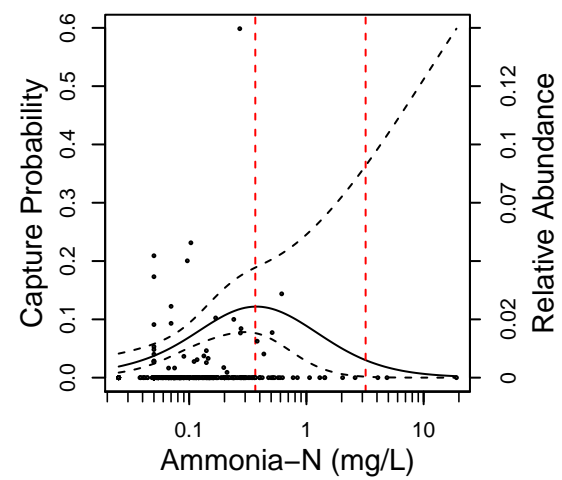
*Enochrus ochraceus*



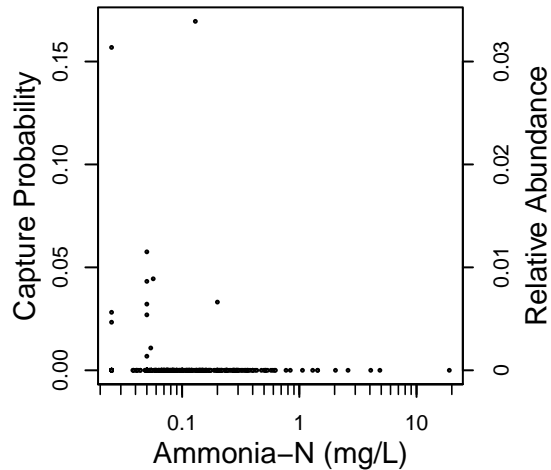
*Enochrus pygmaeus*



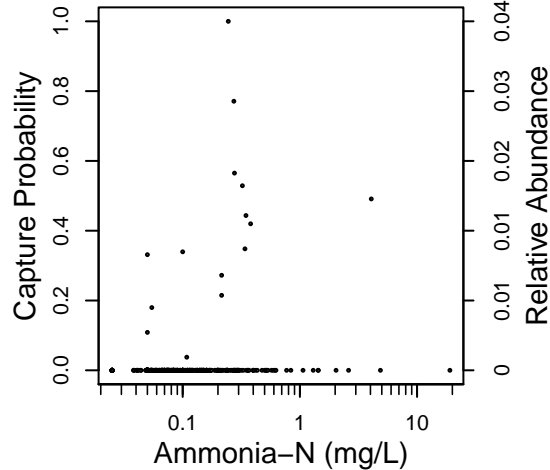
*Epitheca princeps*



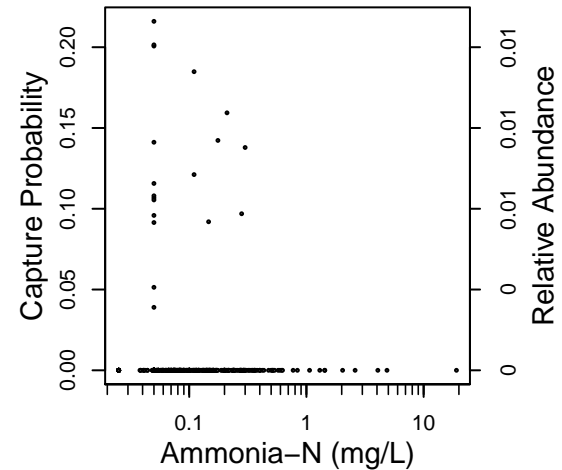
*Erpetogomphus designatus*



*Erythemis simplicicollis*

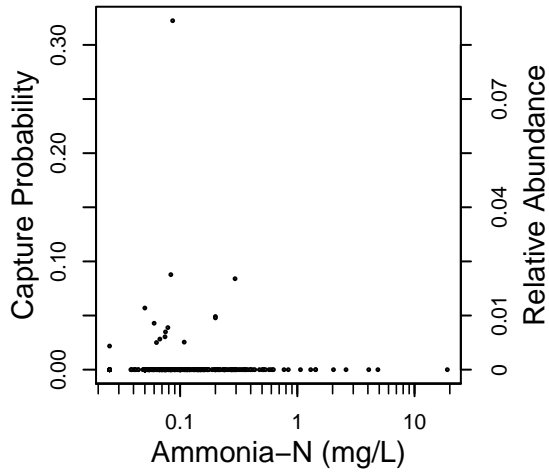


*Hagenius brevistylus*

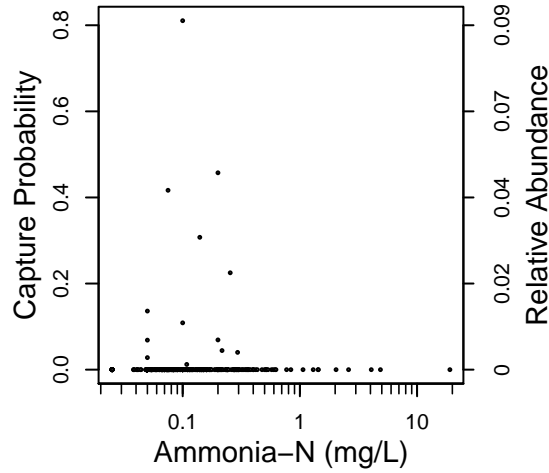


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

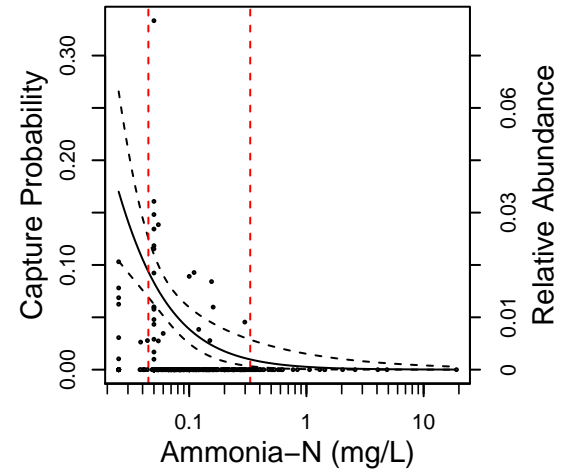
*Haliplus borealis*



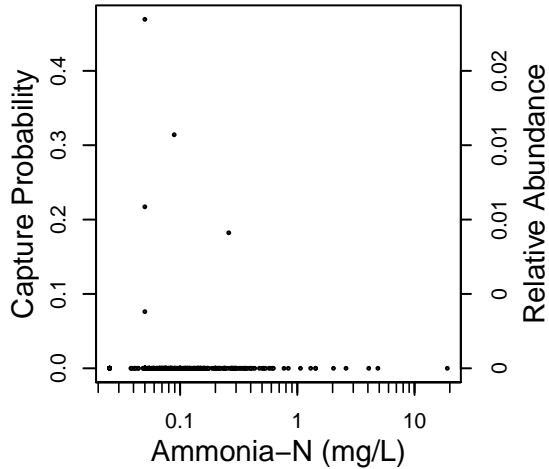
*Haliplus immaculicollis*



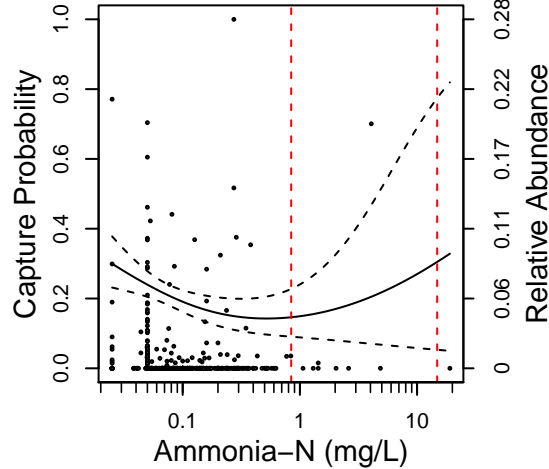
*Helichus basalis*



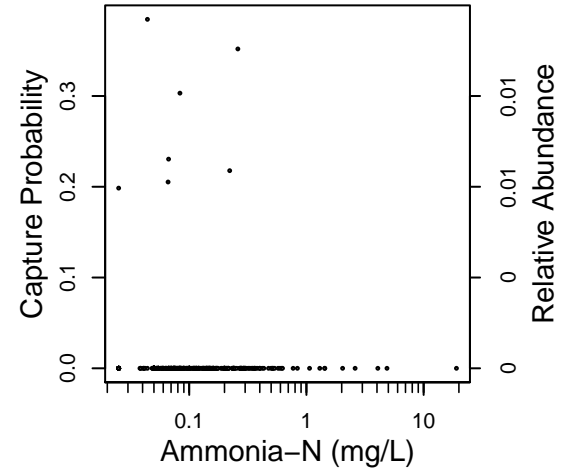
*Helichus fastigiatus*



*Helichus lithophilus*

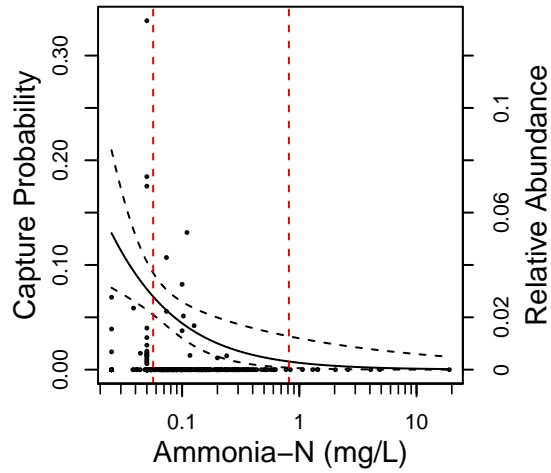


*Helichus striatus*

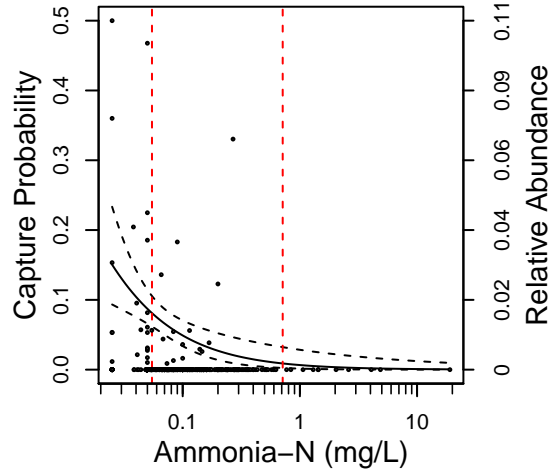


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

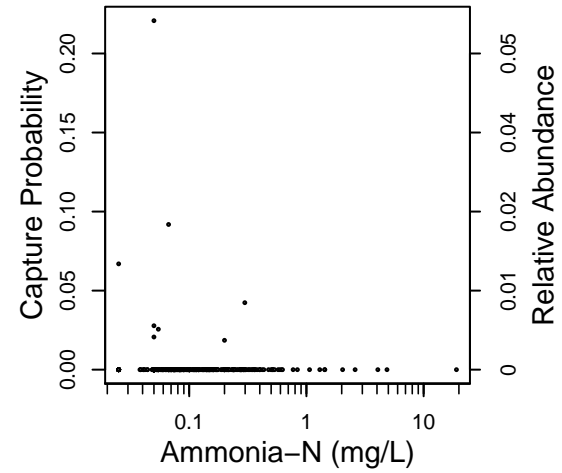
*Helicopsyche borealis*



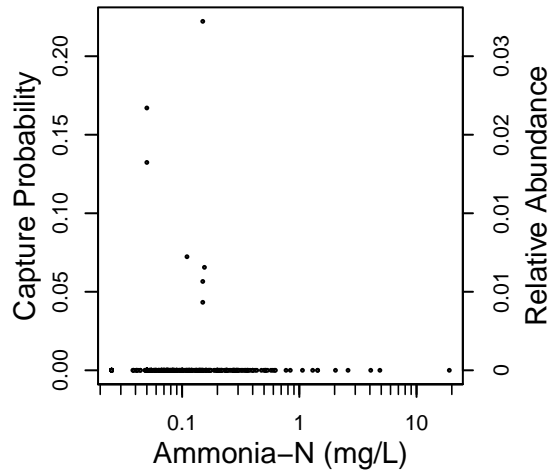
*Hetaerina americana*



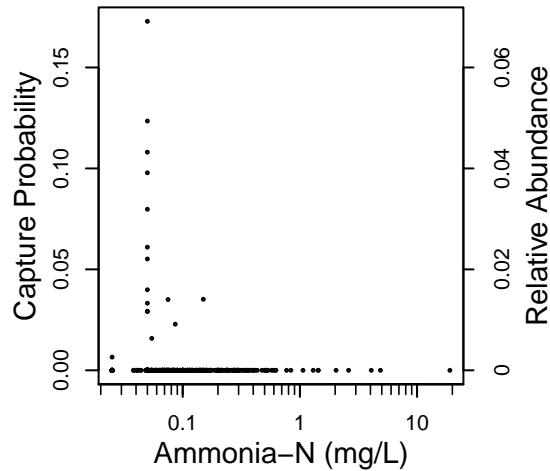
*Hetaerina titia*



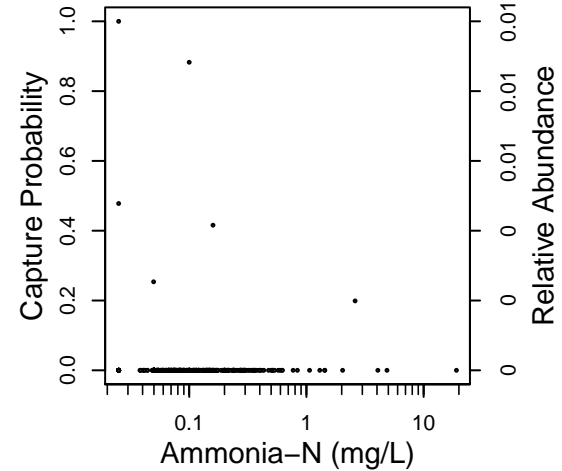
*Heterosternuta ohionis*



*Heterosternuta pulcher*

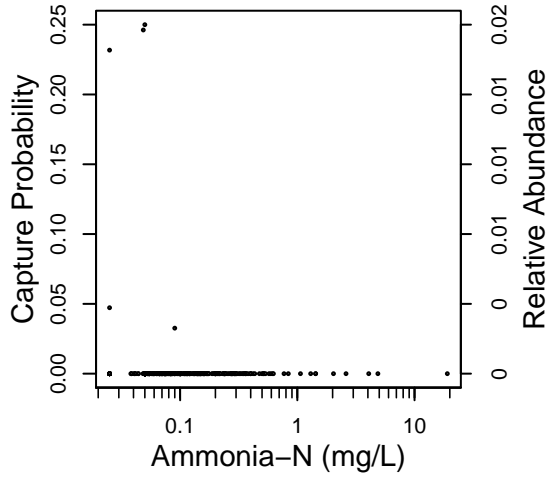


*Heterosternuta wickhami*

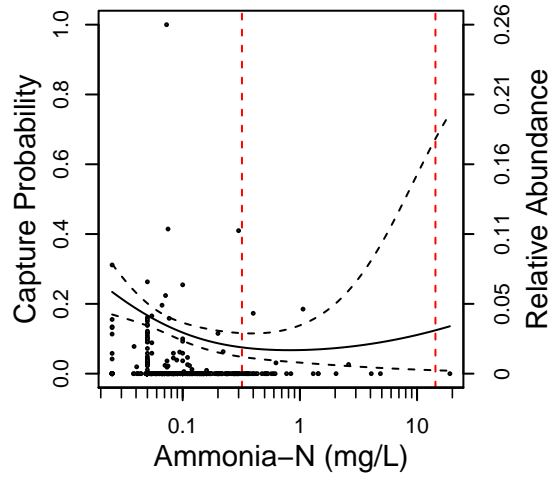


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

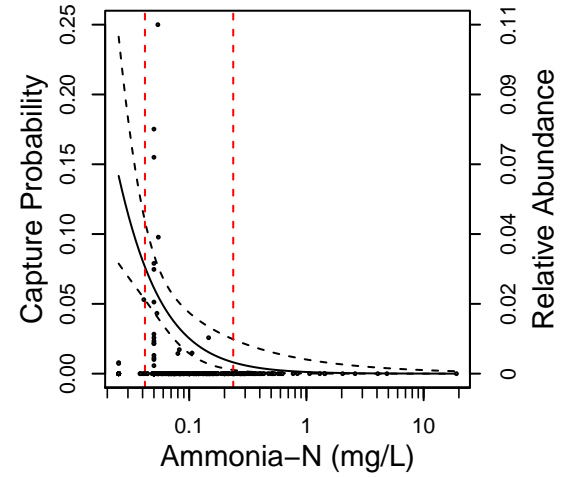
*Hydropsyche aerata*



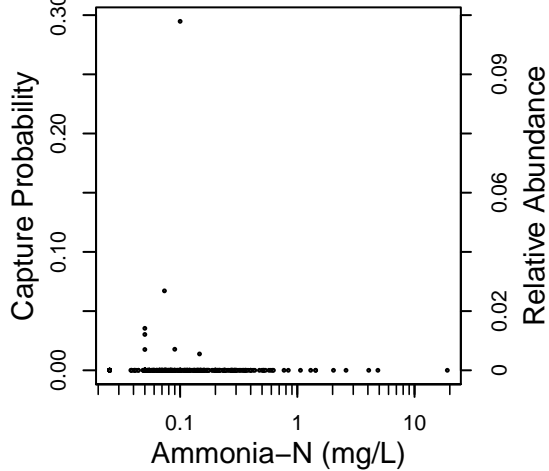
*Hydropsyche betteni* group



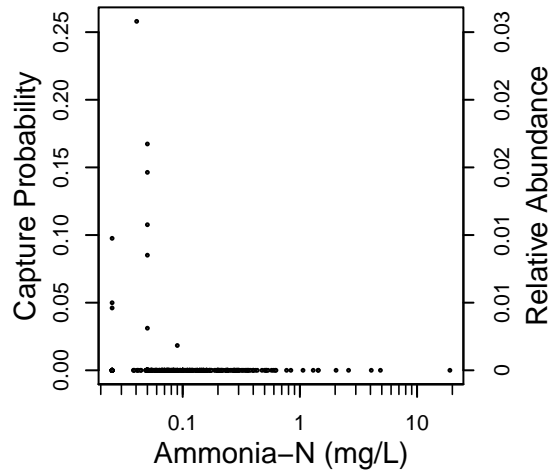
*Hydropsyche bidens*



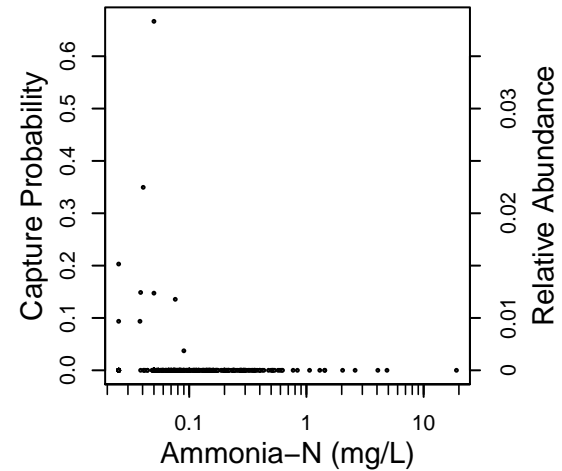
*Hydropsyche demora*



*Hydropsyche dicantha*

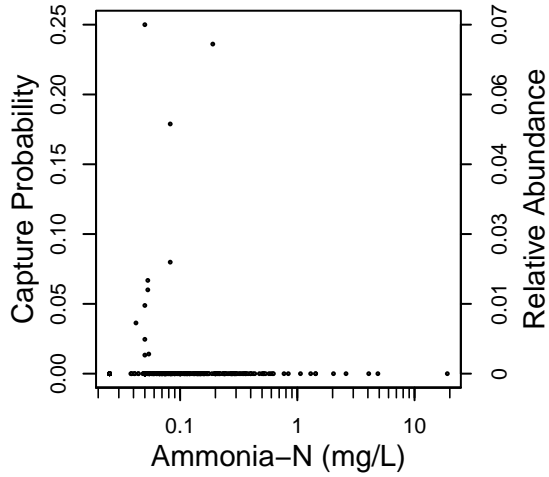


*Hydropsyche frisoni*

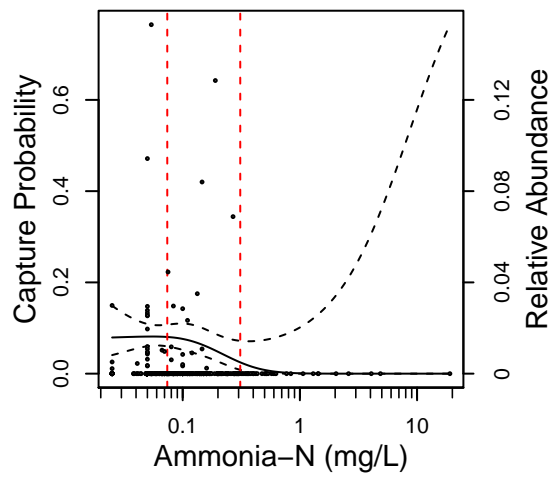


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

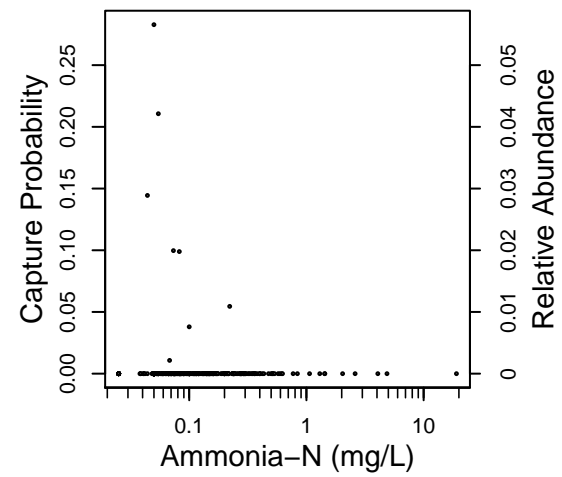
*Hydropsyche orris*



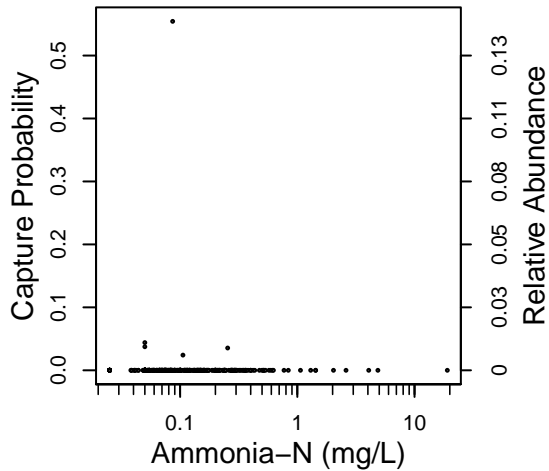
*Hydropsyche simulans*



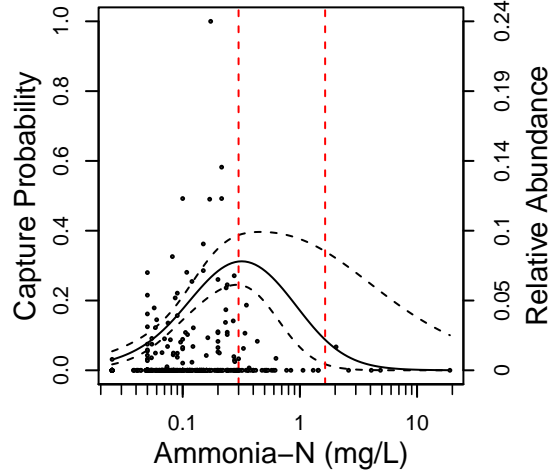
*Hydropsyche venularis*



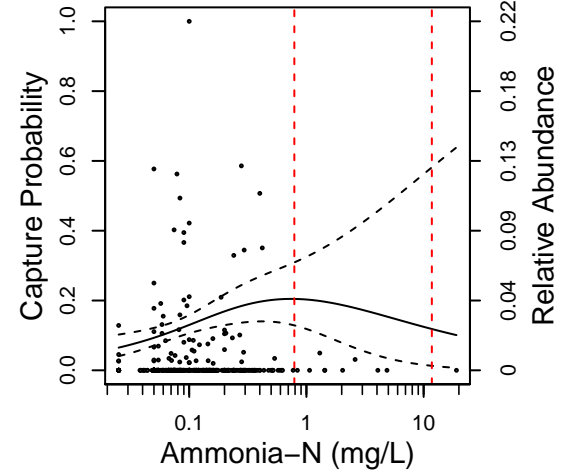
*Hydrovatus pustulatus*



*Ischnura posita*

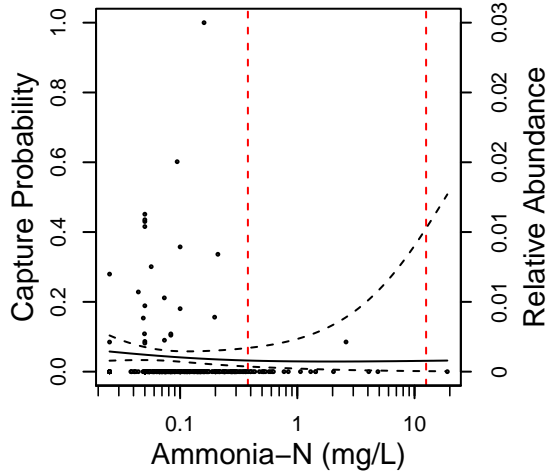


*Ischnura verticalis*

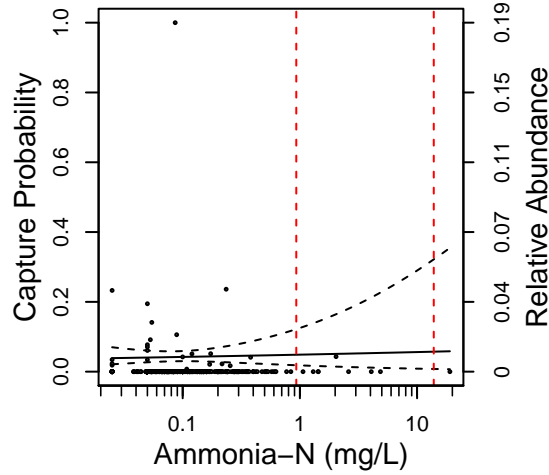


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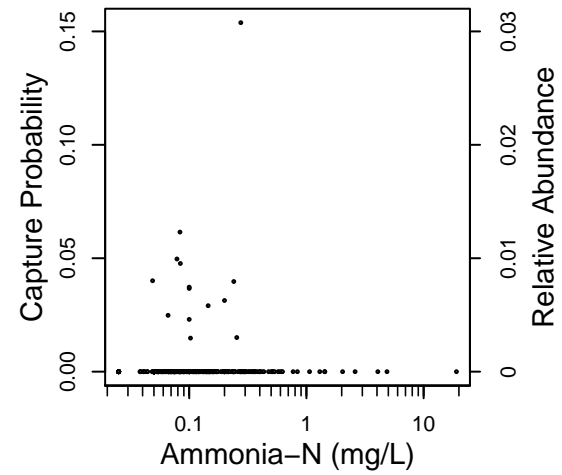
*Labrundinia pilosella*



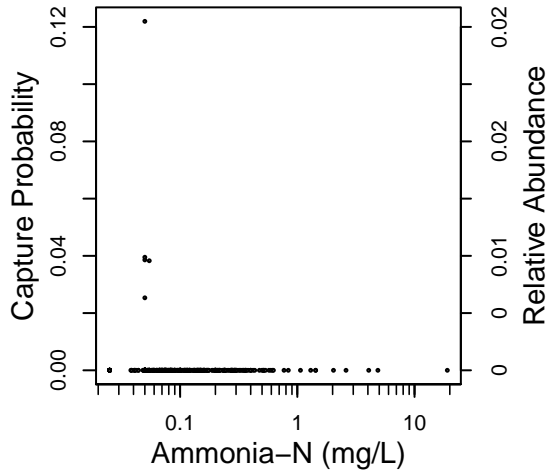
*Laccophilus maculosus*



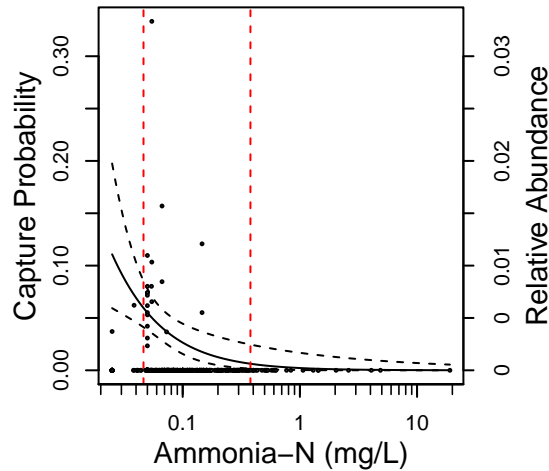
*Liodessus affinis complex*



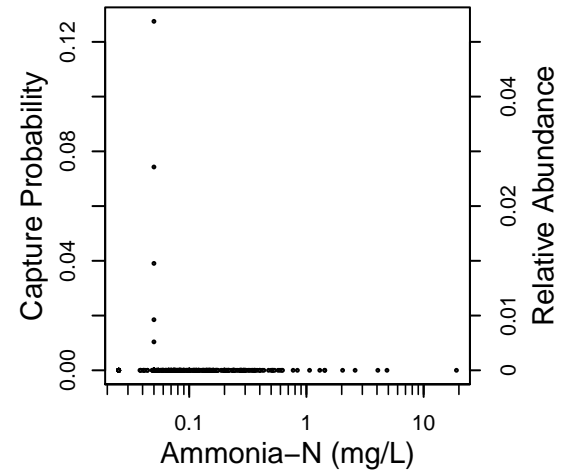
*Lype diversa*



*Maccaffertium exiguum*

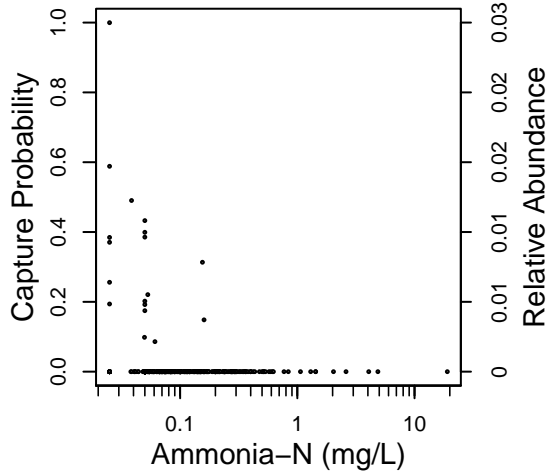


*Maccaffertium luteum*

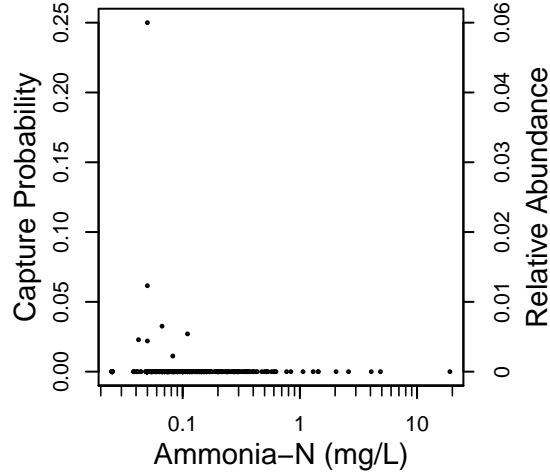


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

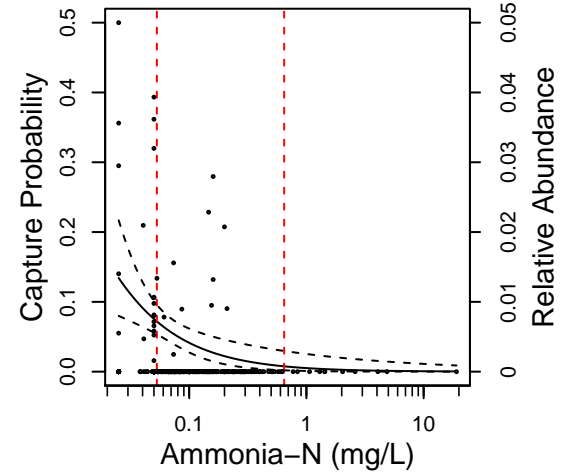
*Maccaffertium mediopunctatum*



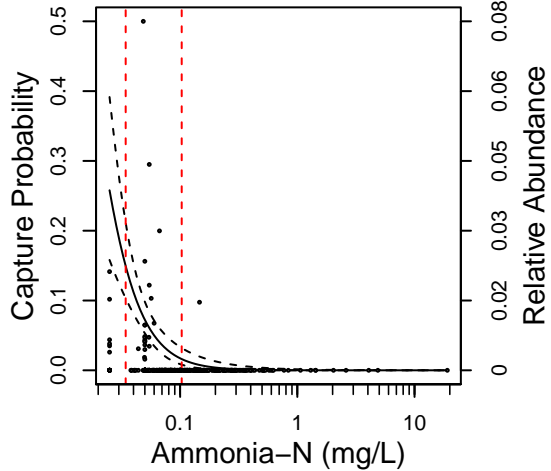
*Maccaffertium mexicanum integrum*



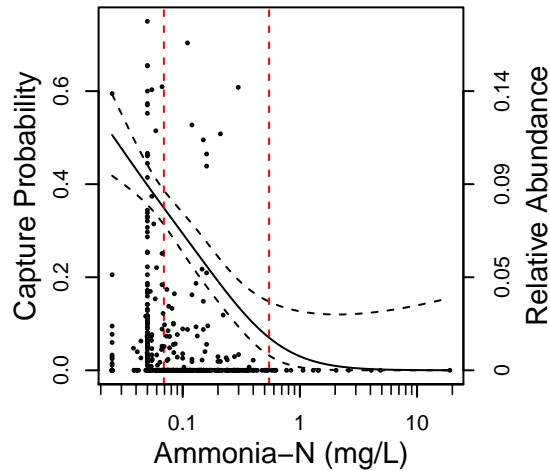
*Maccaffertium pulchellum*



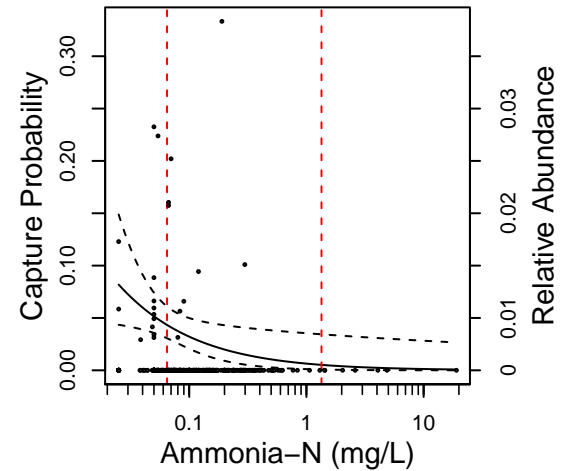
*Maccaffertium terminatum*



*Macronychus glabratus*



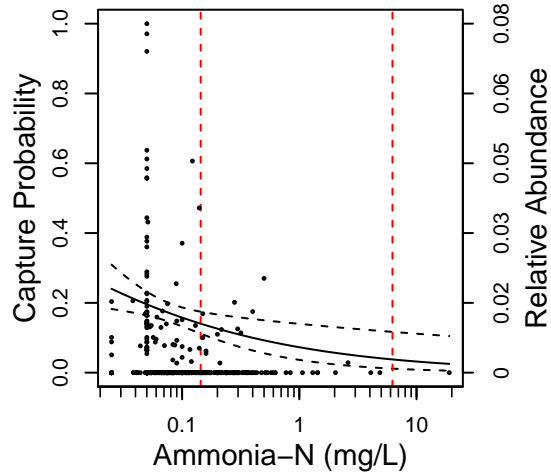
*Metrobates hesperius*



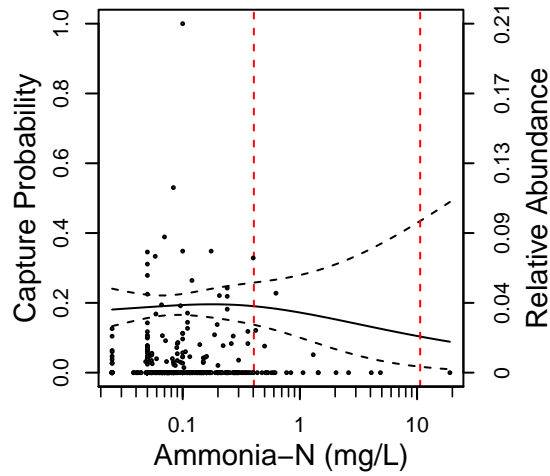


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

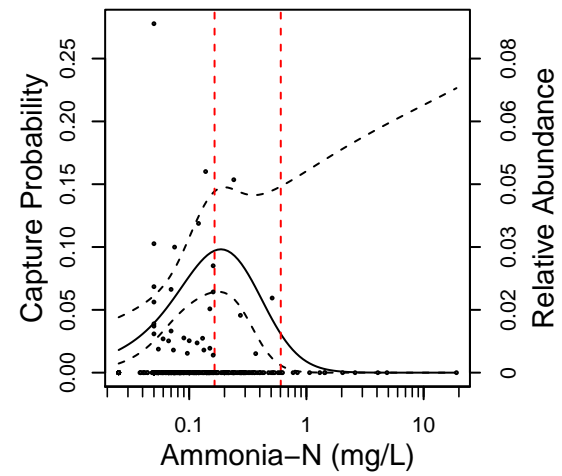
*Microtendipes pedellus* group



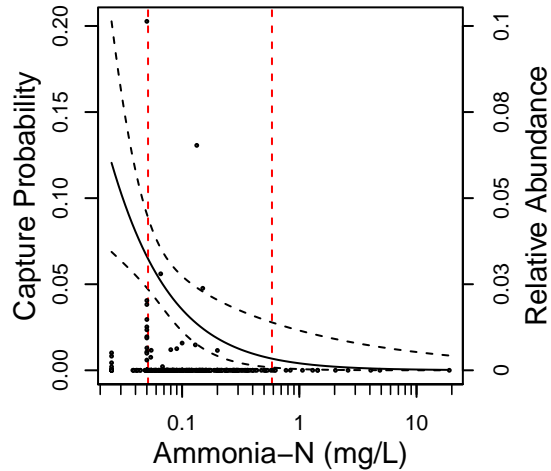
*Microvelia americana*



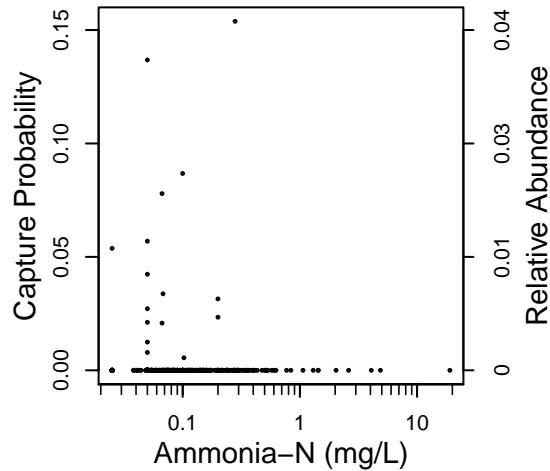
*Nasiaeschna pentacantha*



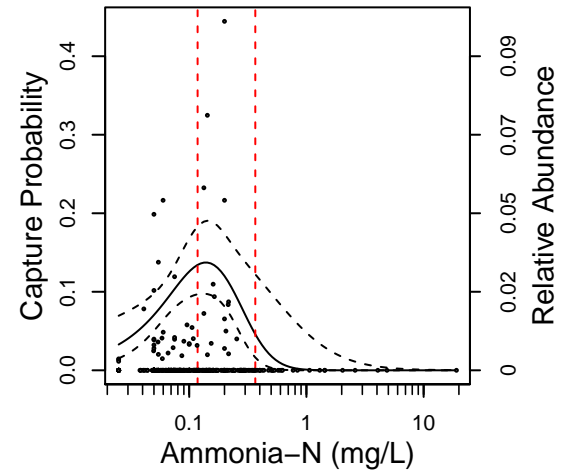
*Nectopsyche candida/exquisita*



*Nectopsyche diarina*

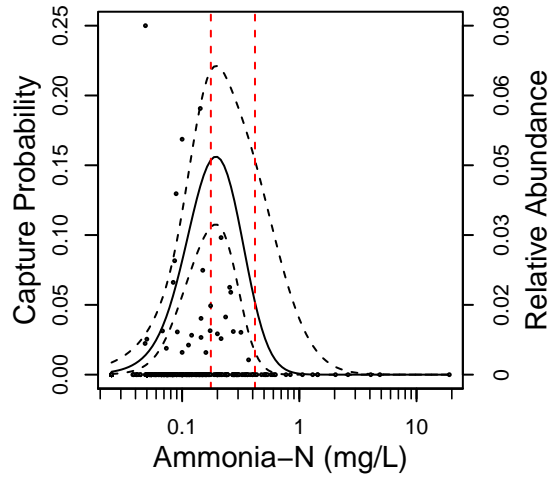


*Neoplea striola*

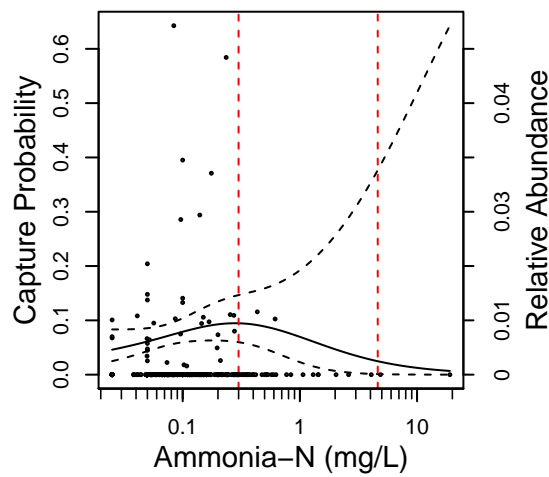


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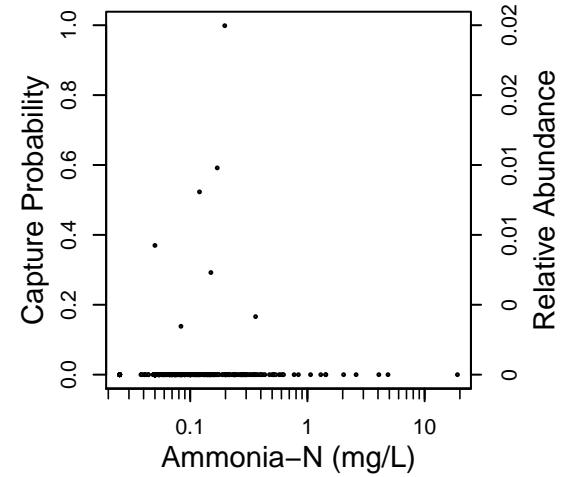
*Neoporus clypealis*



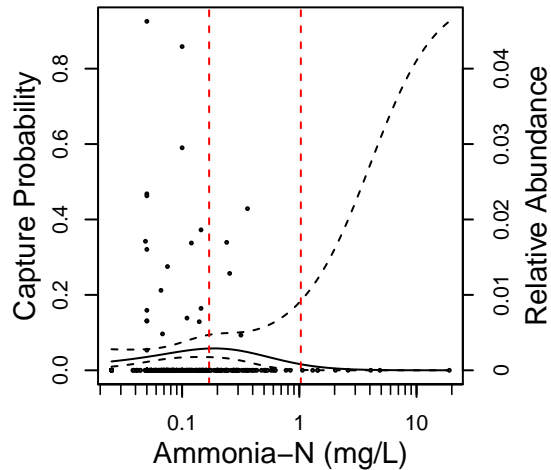
*Neoporus dimidiatus*



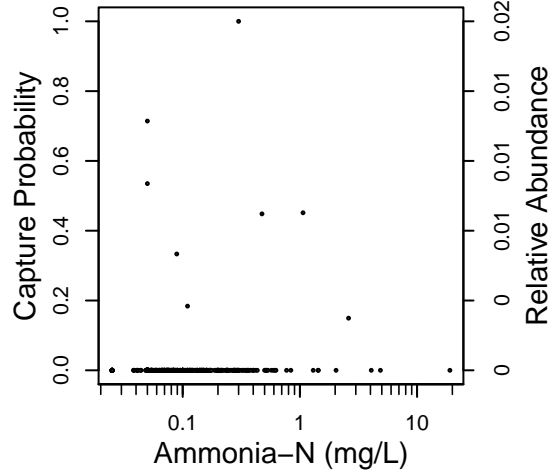
*Neoporus striatopunctatus*



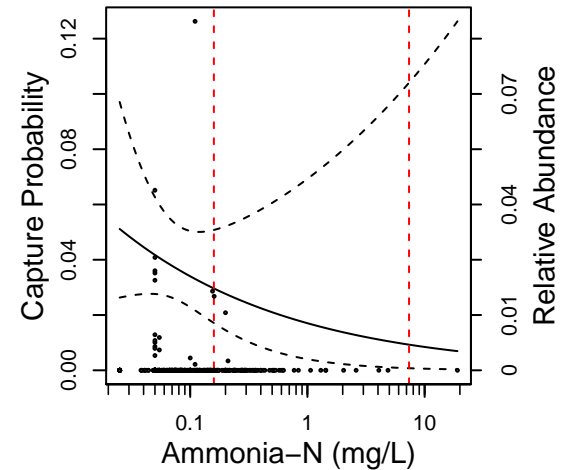
*Neoporus tennetum*



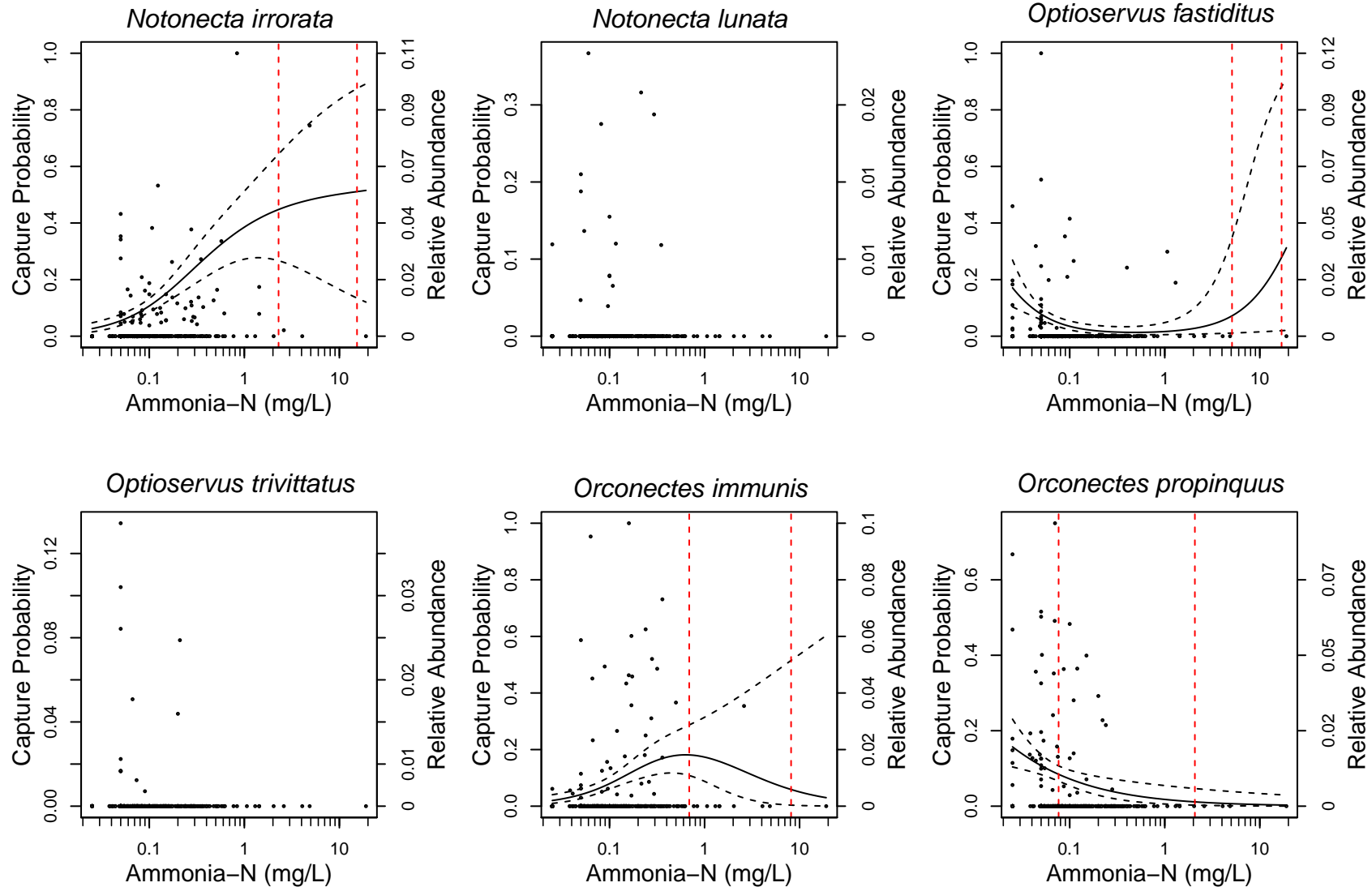
*Nepa apiculata*



*Nigronia serricornis*

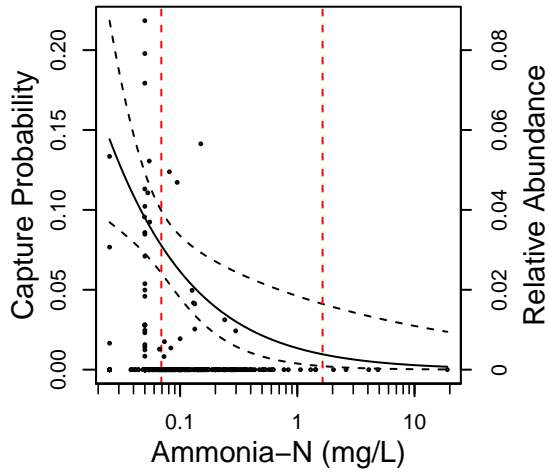


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

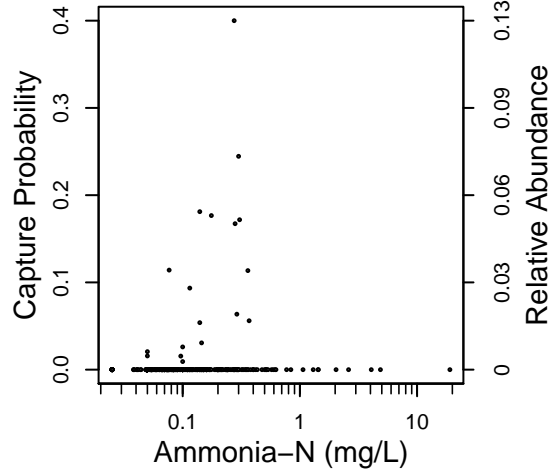


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

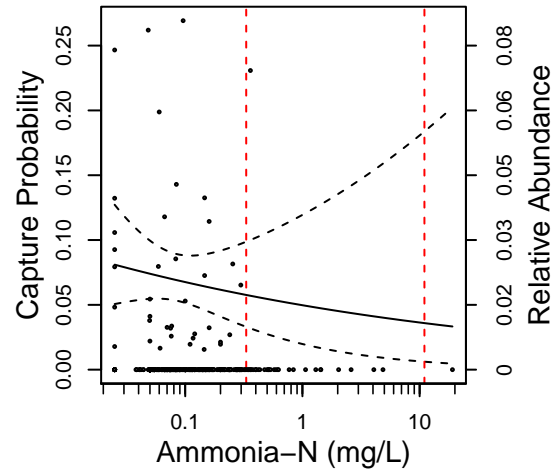
*Orconectes rusticus*



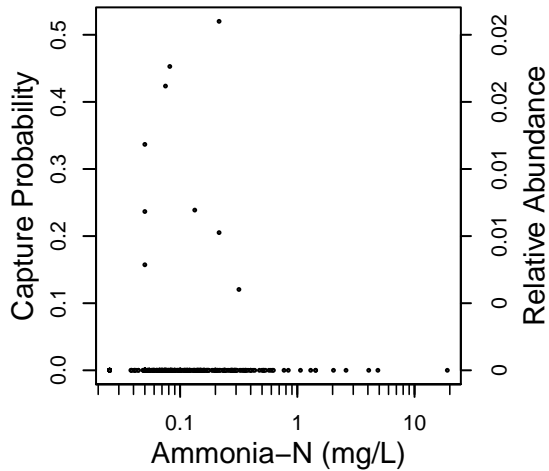
*Orconectes sloanii*



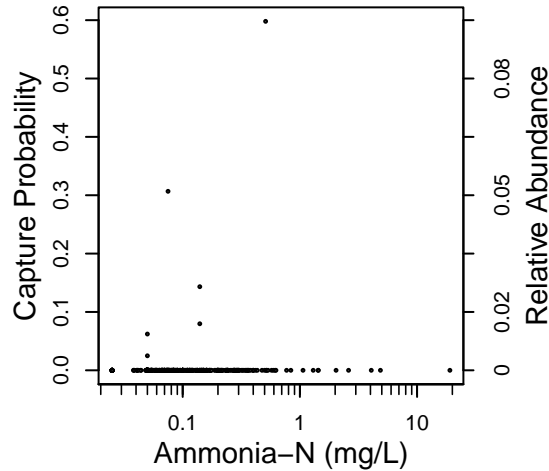
*Orconectes virilis*



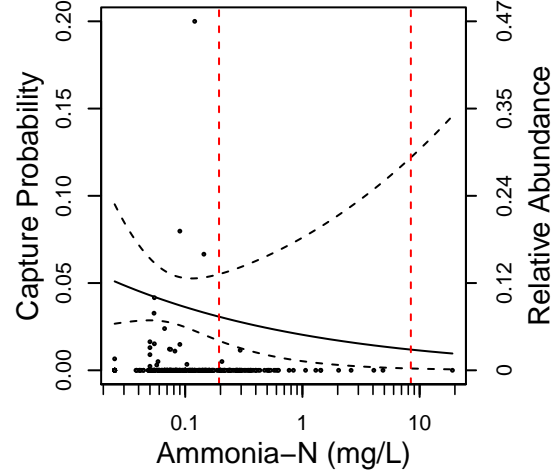
*Pachydiplax longipennis*



*Palaemonetes kadiakensis*

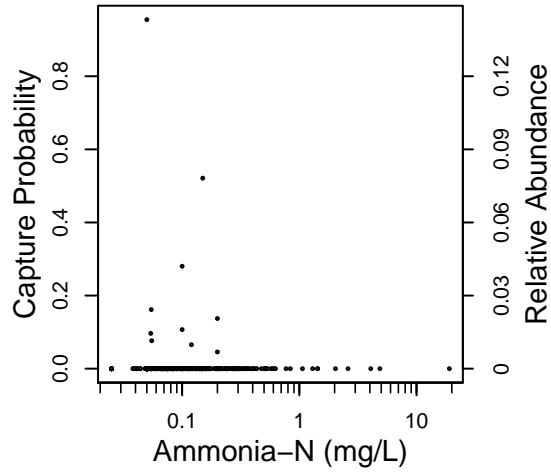


*Palmarcorixa buenoi*

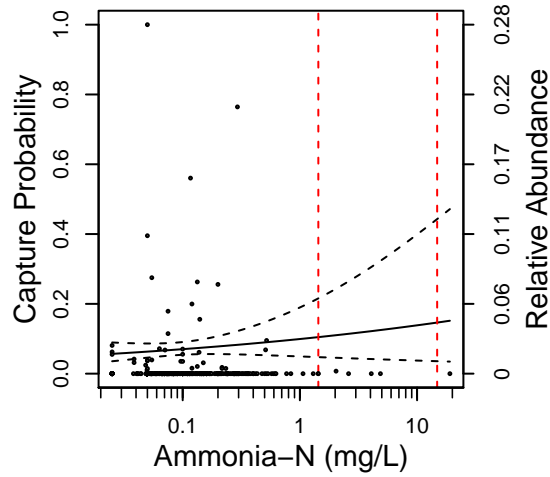


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

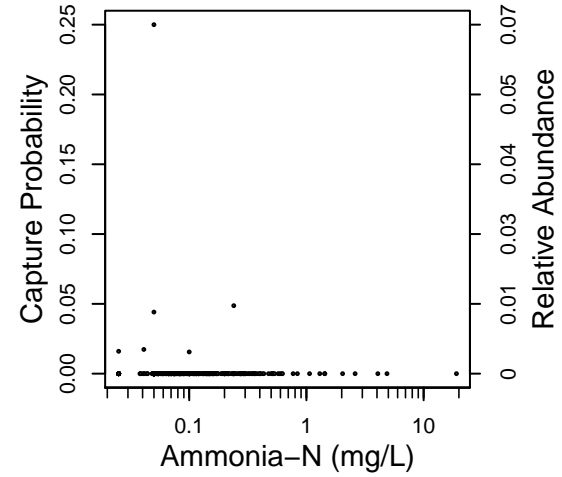
*Palmacorixa gillettei*



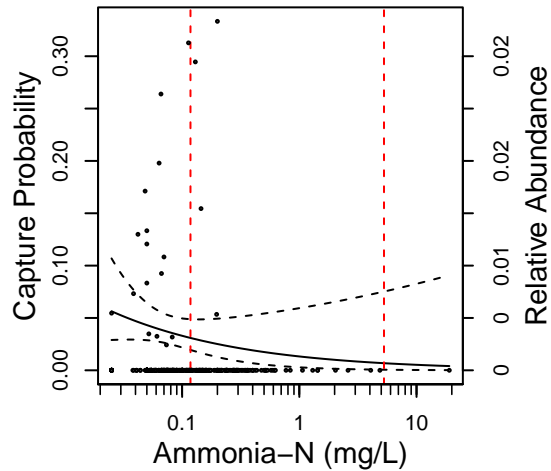
*Palmacorixa nana*



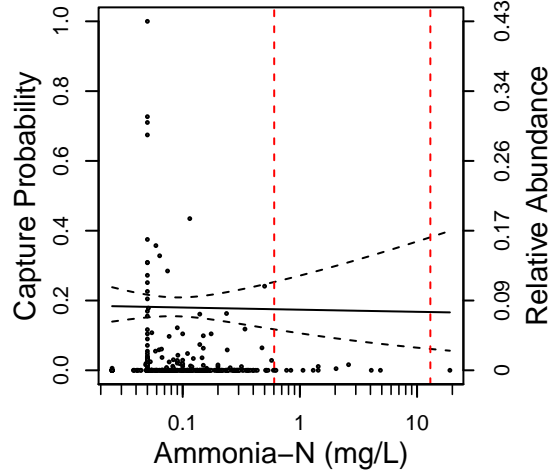
*Paragordius varius*



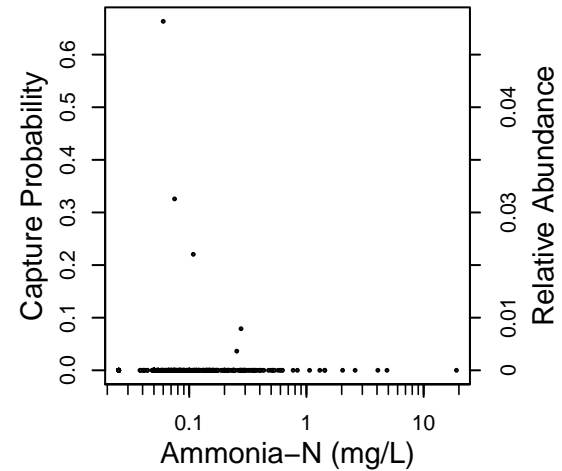
*Paralauterborniella nigrohalterale*



*Paratendipes albimanus*

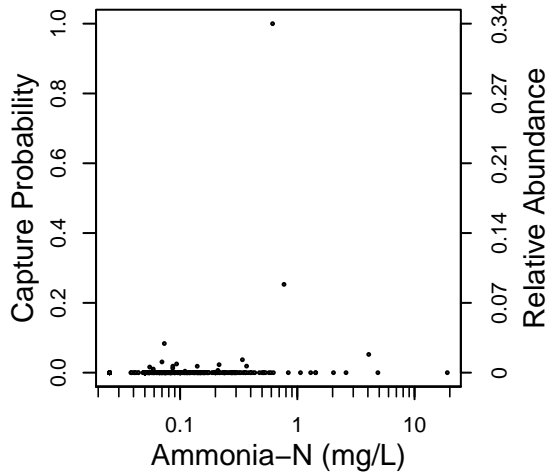


*Pelocoris femoratus*

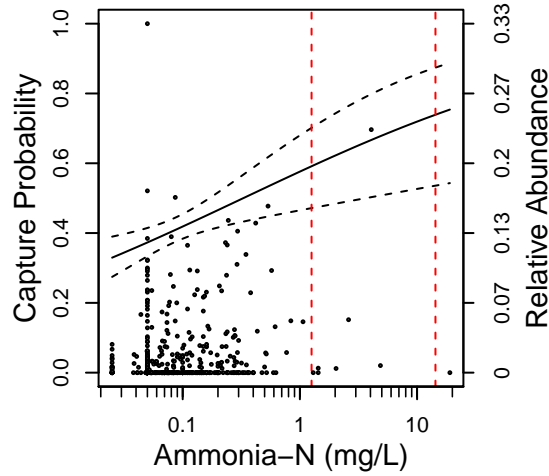


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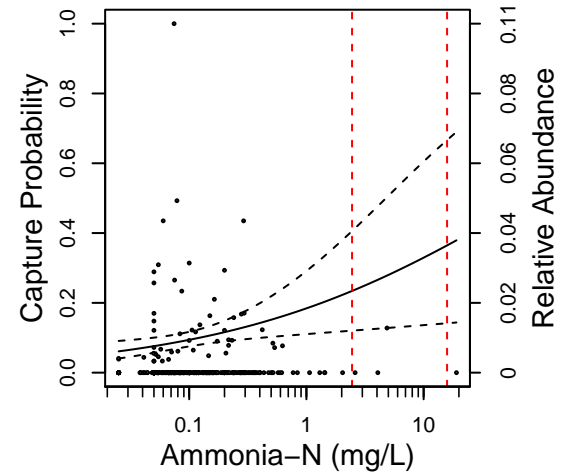
*Peltodytes dunavani*



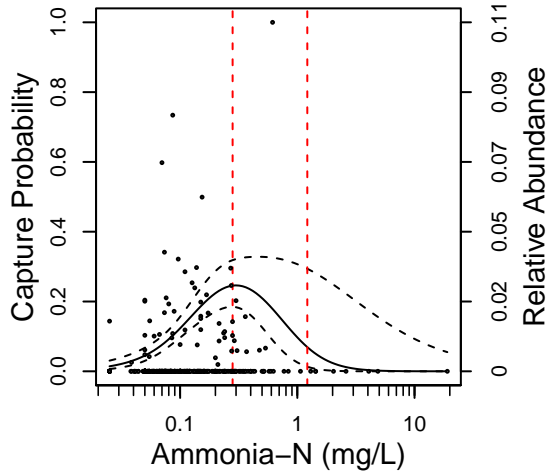
*Peltodytes duodecimpunctatus*



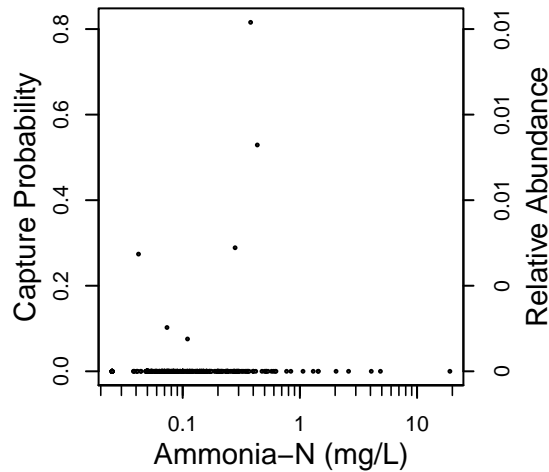
*Peltodytes edentulus*



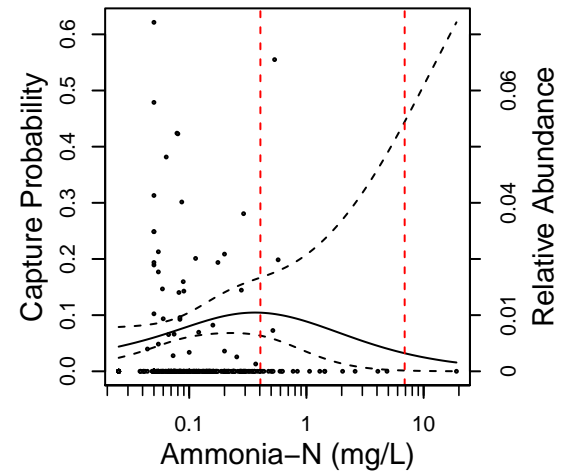
*Peltodytes lengi*



*Peltodytes litoralis*

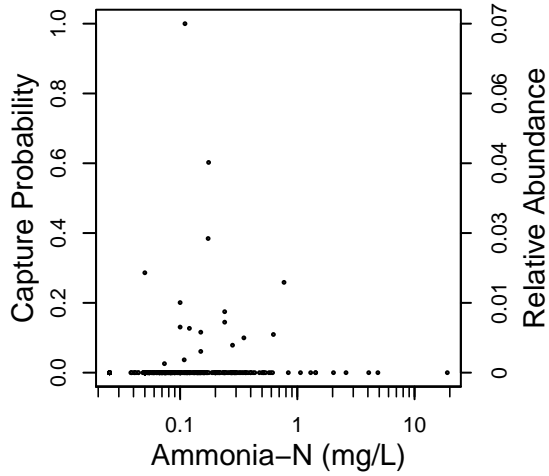


*Peltodytes muticus*

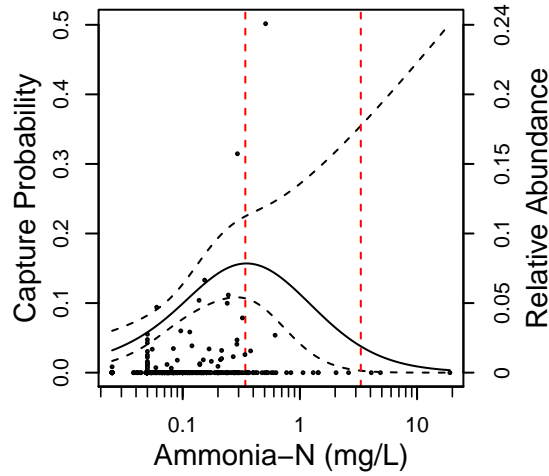


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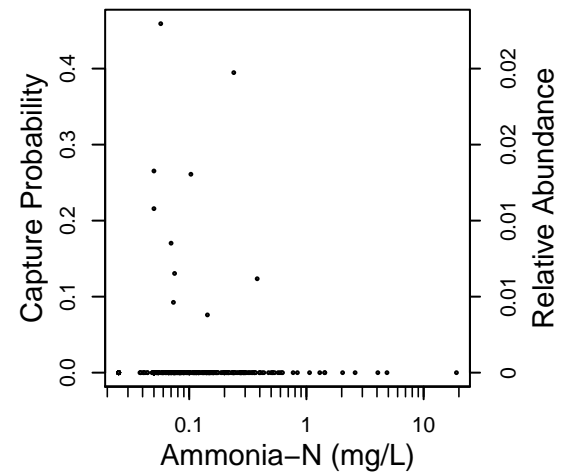
*Peltodytes pedunculatus*



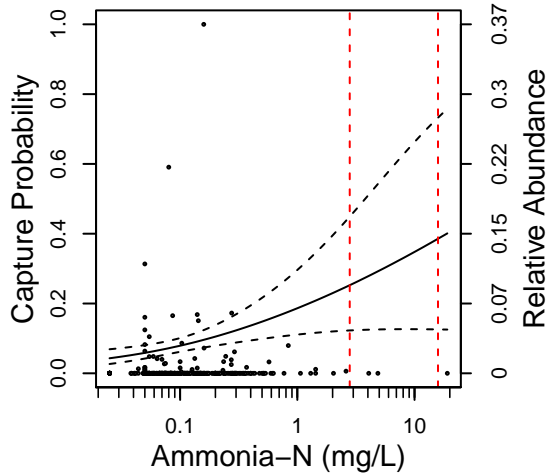
*Peltodytes sexmaculatus*



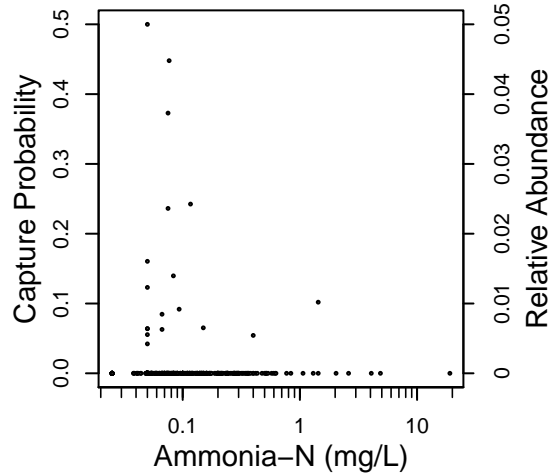
*Perithemis tenera*



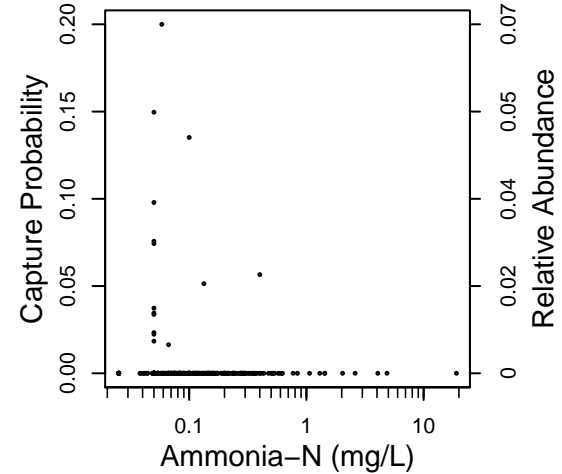
*Plathemis lydia*



*Polypedilum (tripodura)*

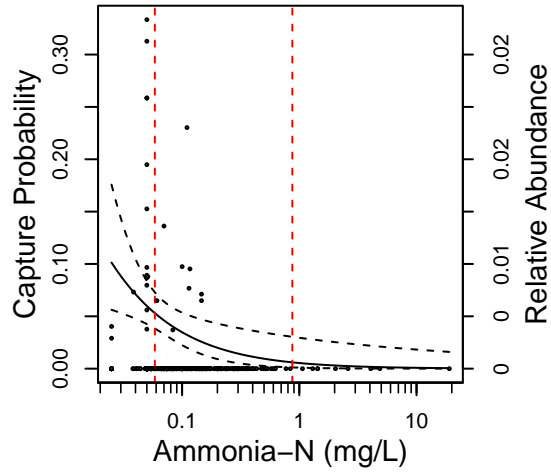


*Polypedilum aviceps*

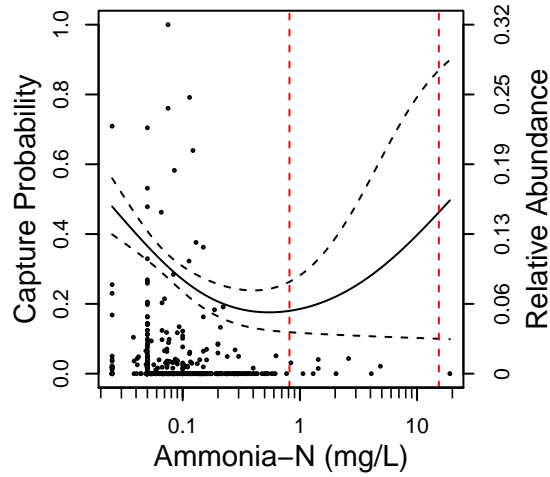


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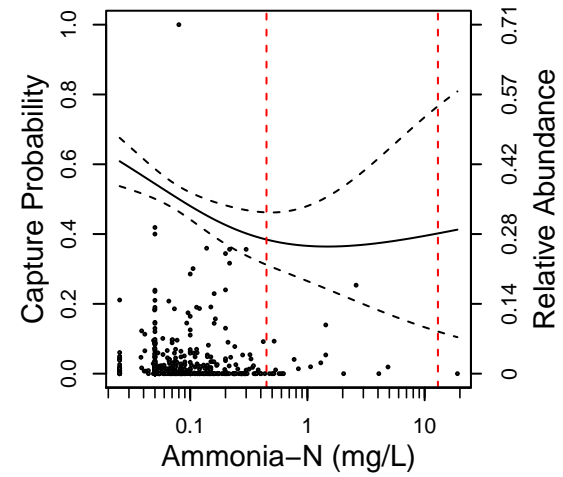
*Polypedilum fallax* group



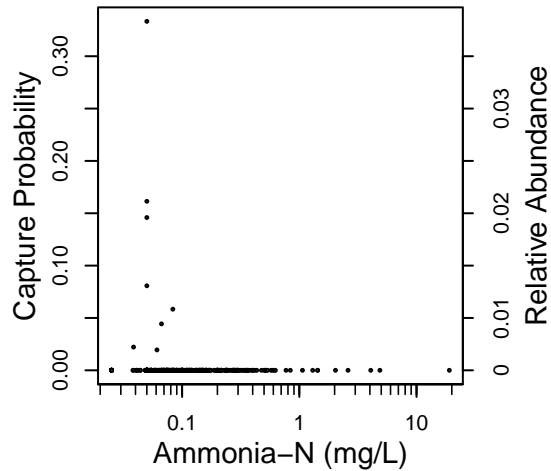
*Polypedilum flavum*



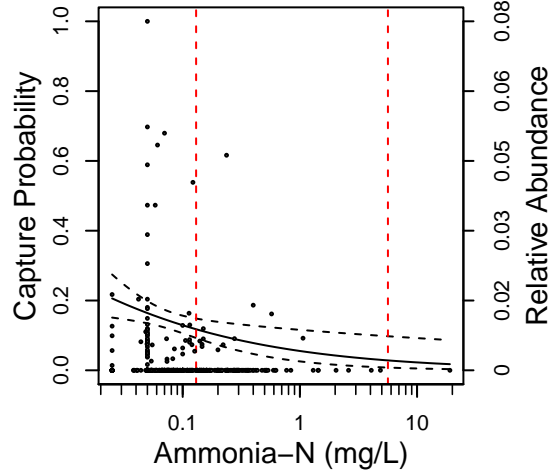
*Polypedilum illinoense* group



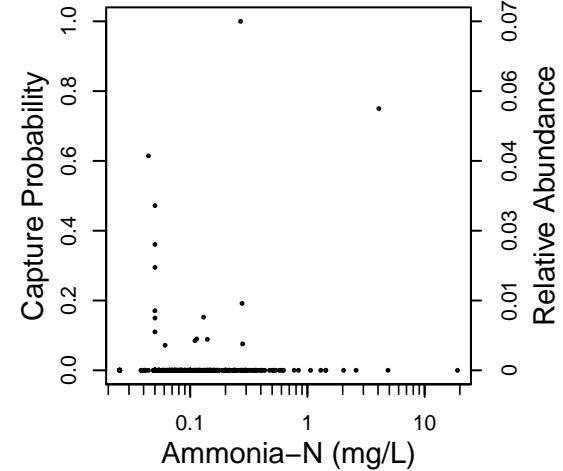
*Polypedilum laetum* group



*Polypedilum scalaenum* group



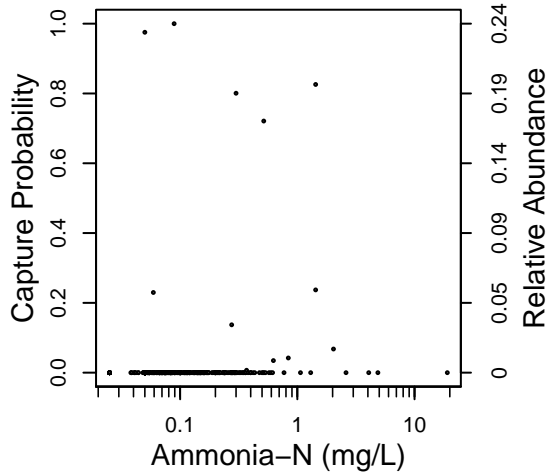
*Progomphus obscurus*



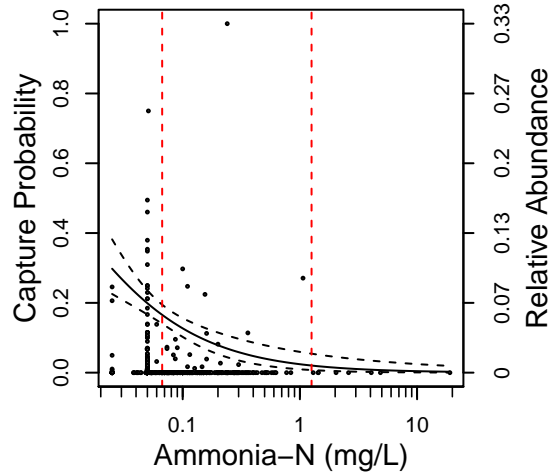


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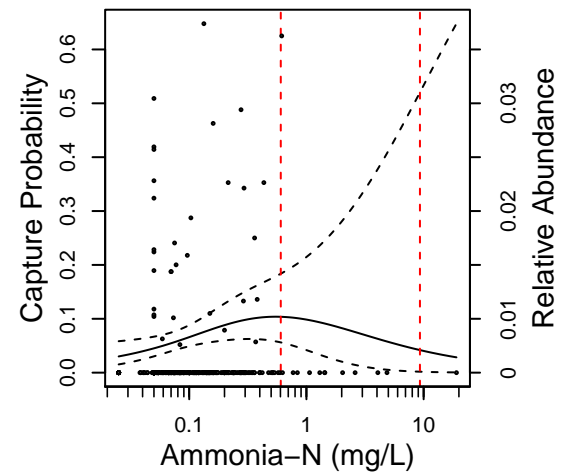
*Psectrotanypus dyari*



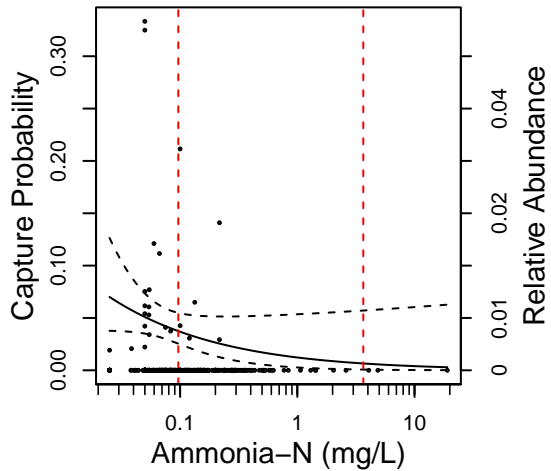
*Psephenus herricki*



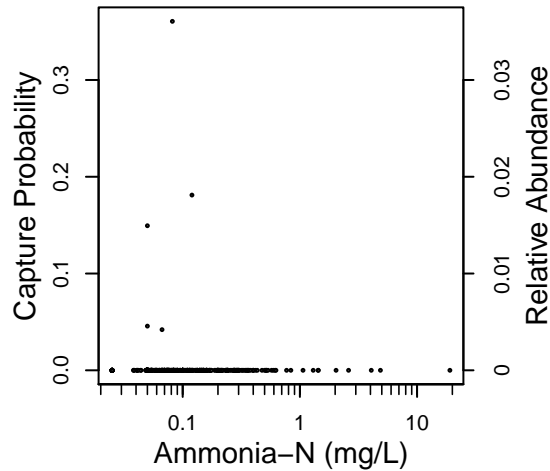
*Ranatra buenoi*



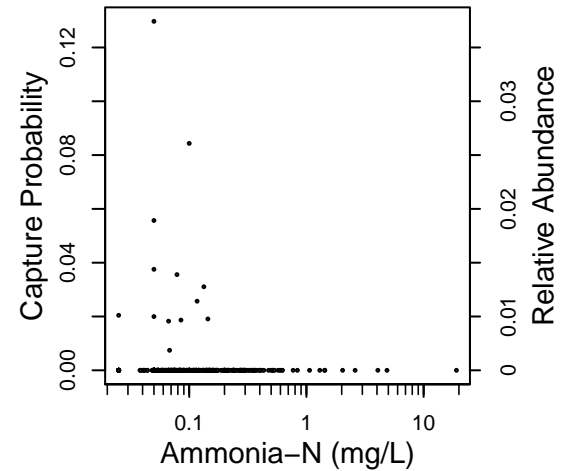
*Ranatra fusca*



*Ranatra kirkaldyi*

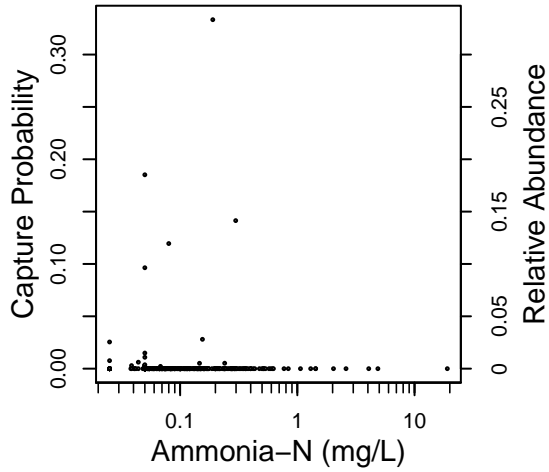


*Ranatra nigra*

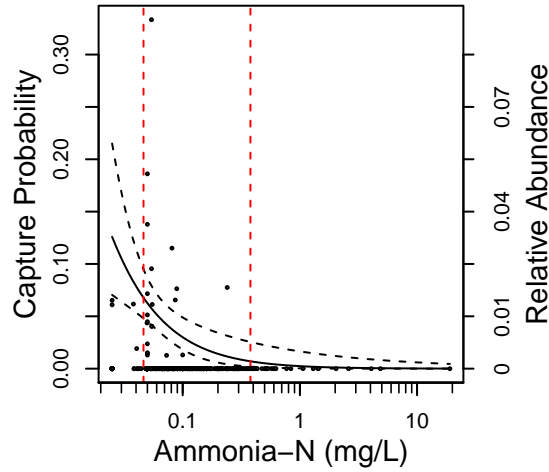


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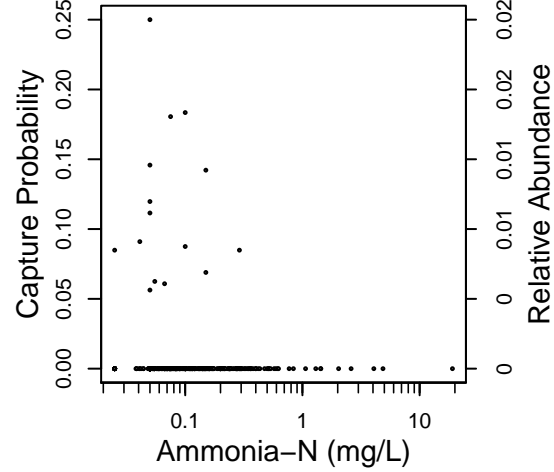
*Rhagovelia obesa*



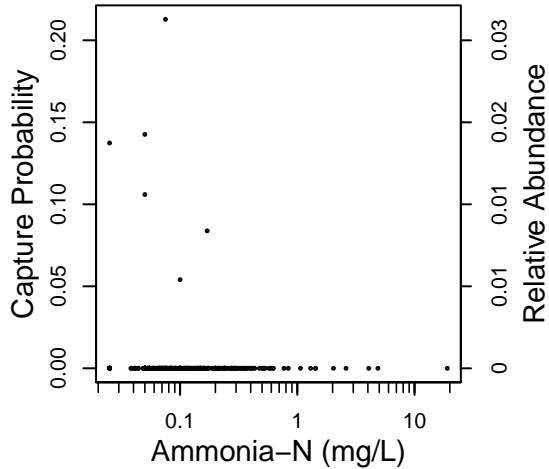
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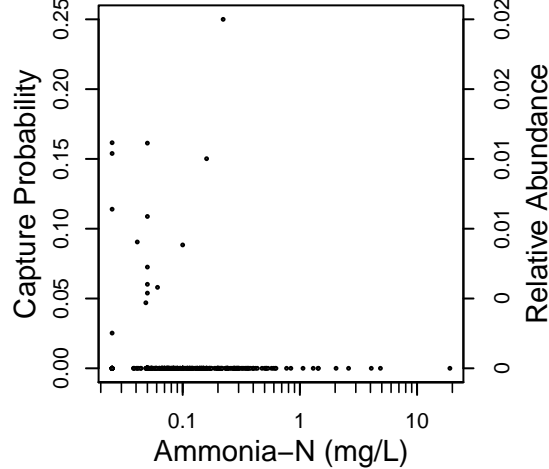
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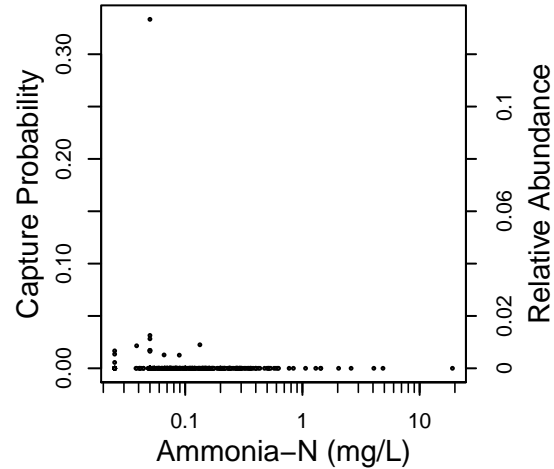
*Rheumatobates tenuipes*



*Saetheria tylus*

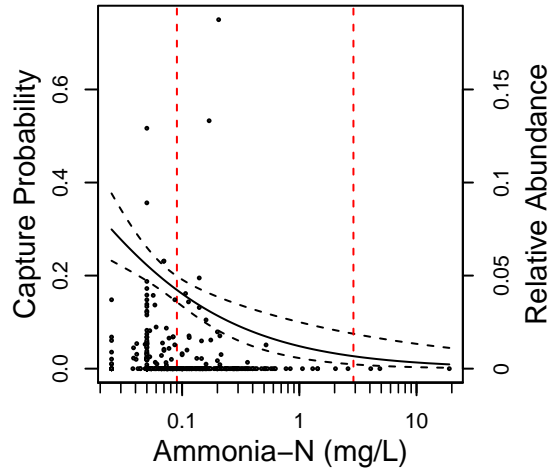


*Sperchopsis tessellata*

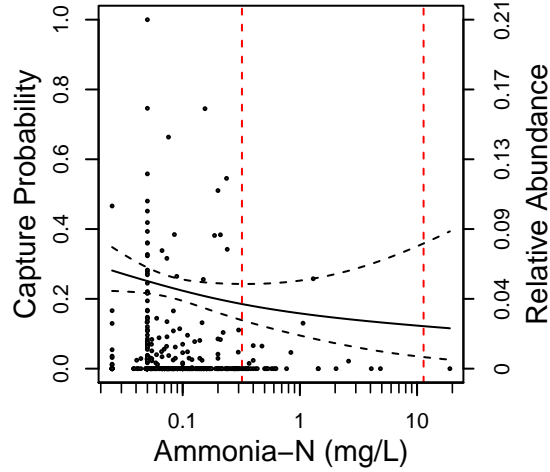


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

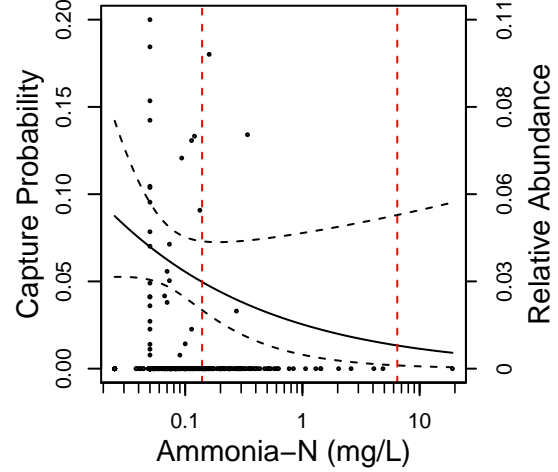
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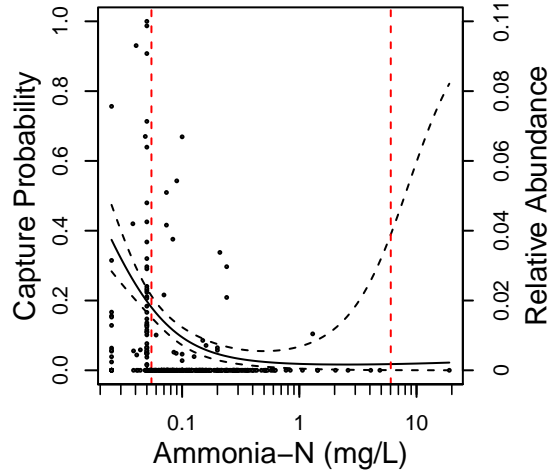
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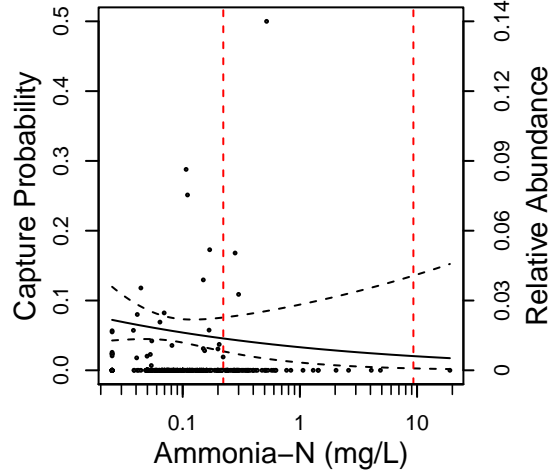
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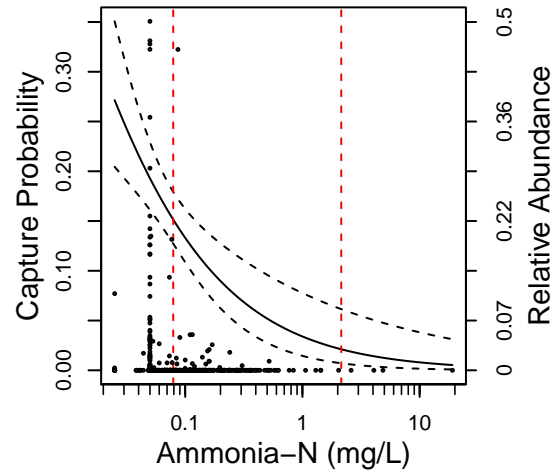
*Stenelmis sexlineata*



*Stenelmis vittipennis*

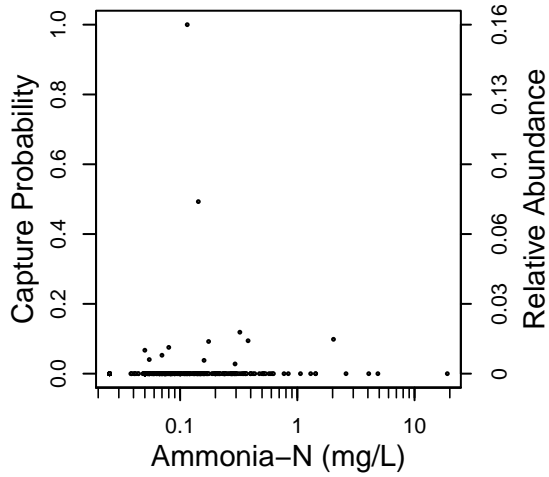


*Stenonema femoratum*

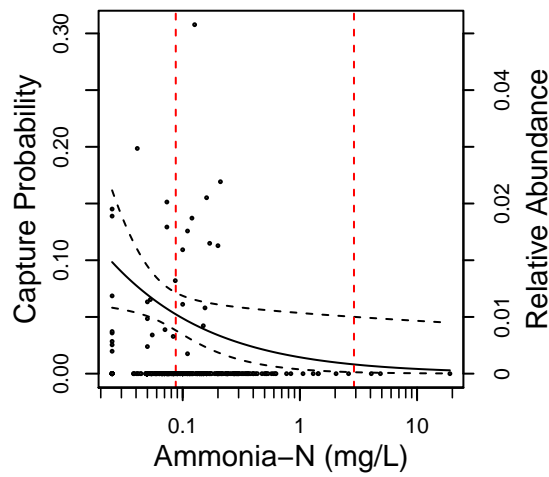


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

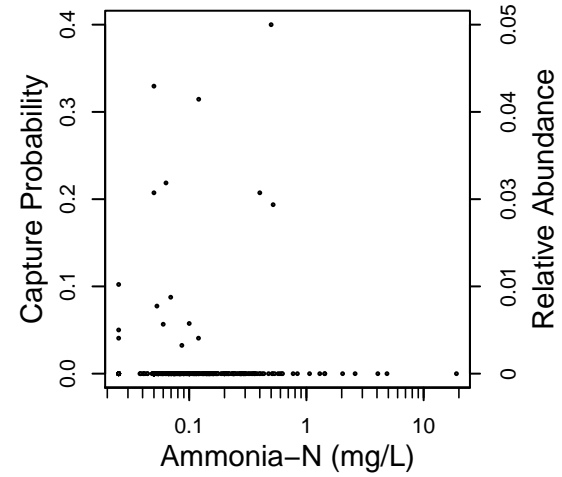
*Tanypus neopunctipennis*



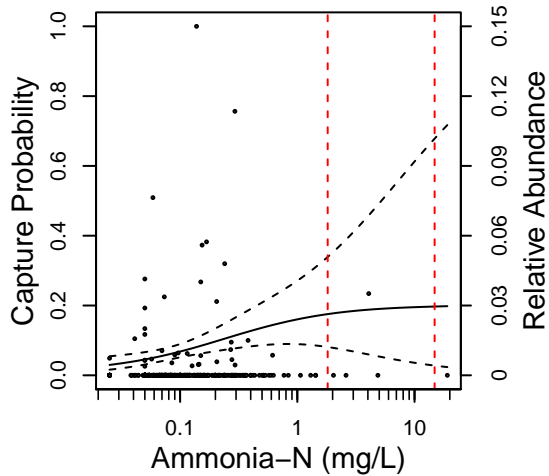
*Trepobates inermis/knighti*



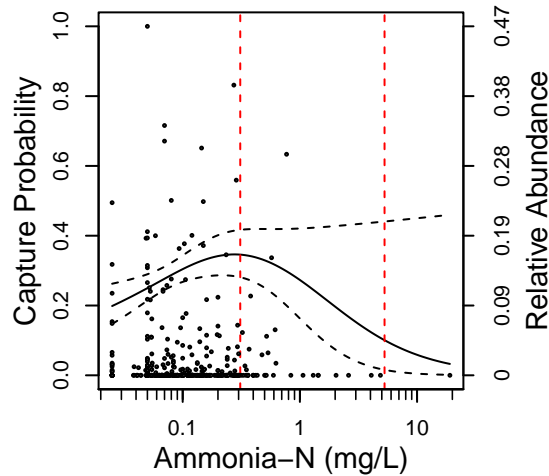
*Trepobates pictus*



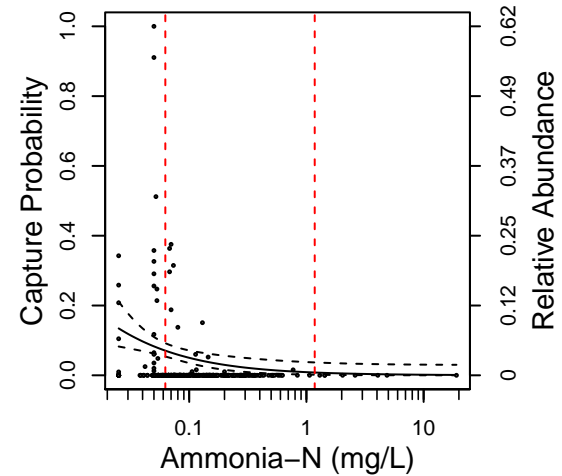
*Trepobates subnitidus*



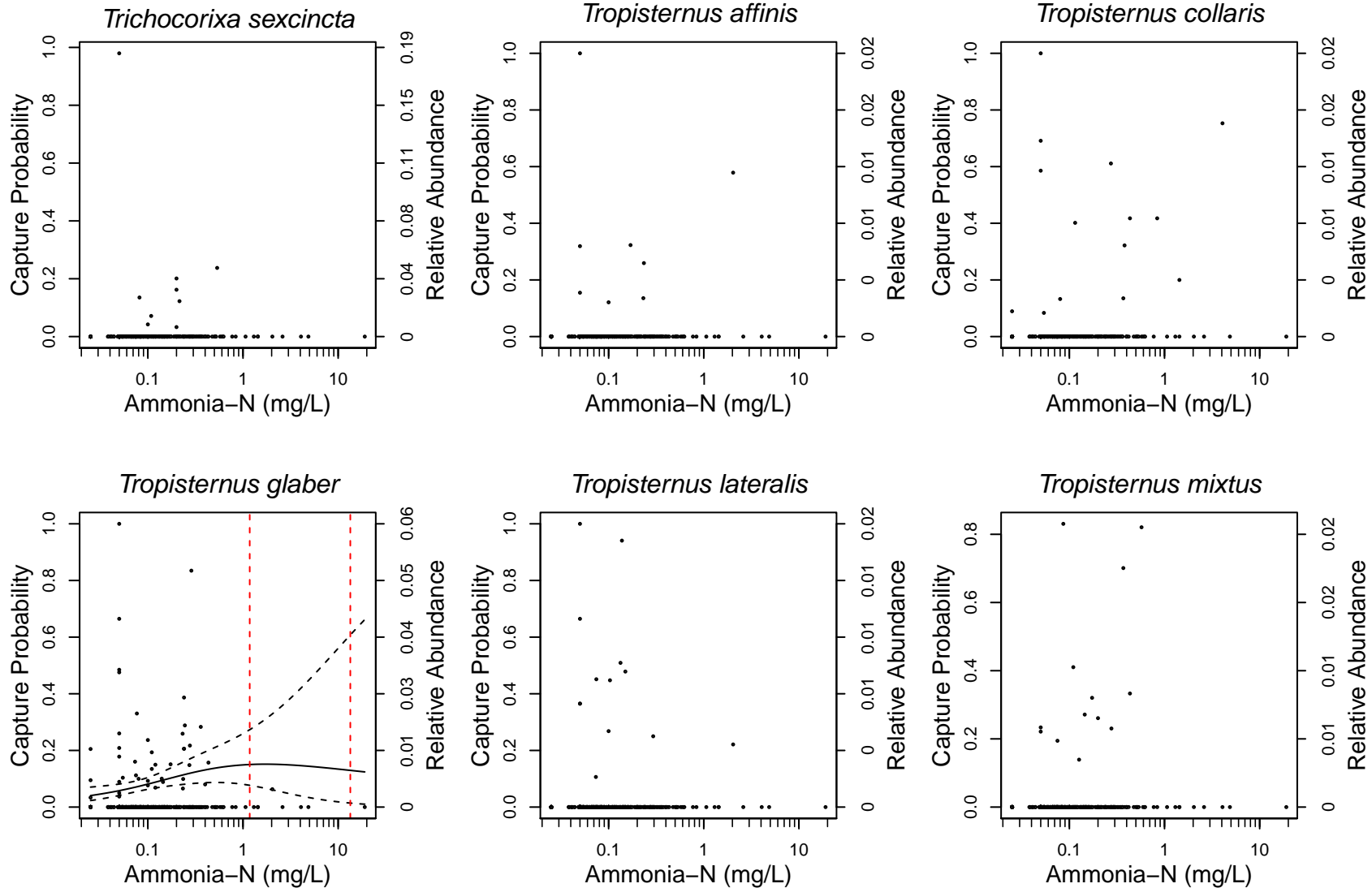
*Trichocorixa calva*



*Trichocorixa kanza*

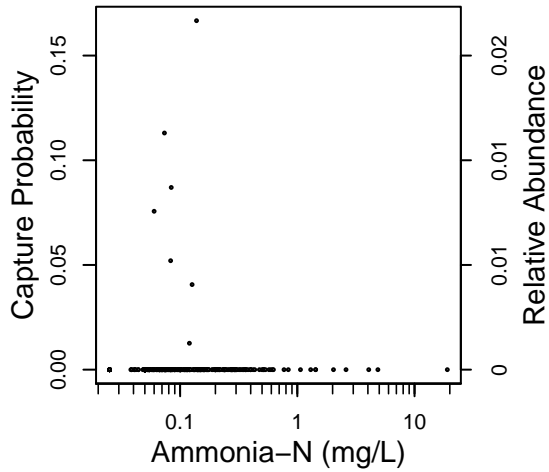


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

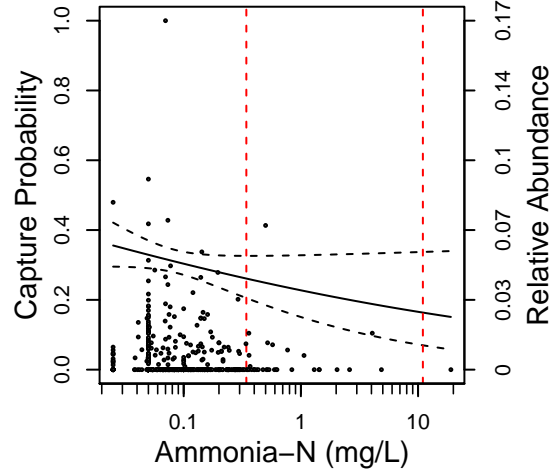


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

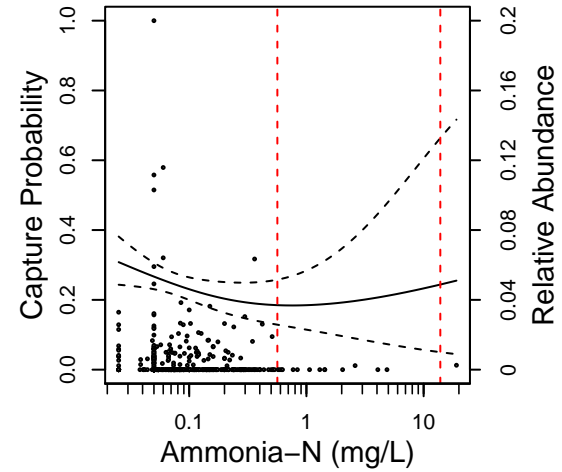
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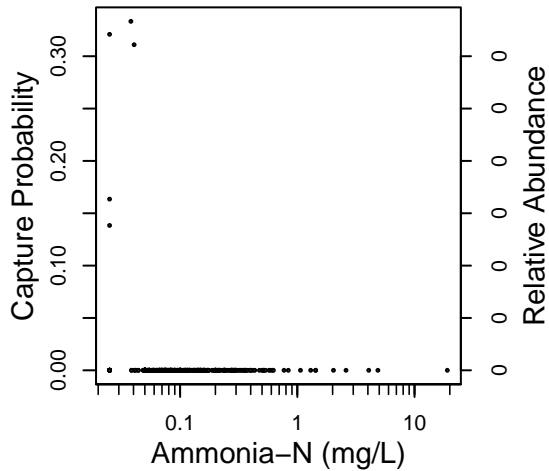
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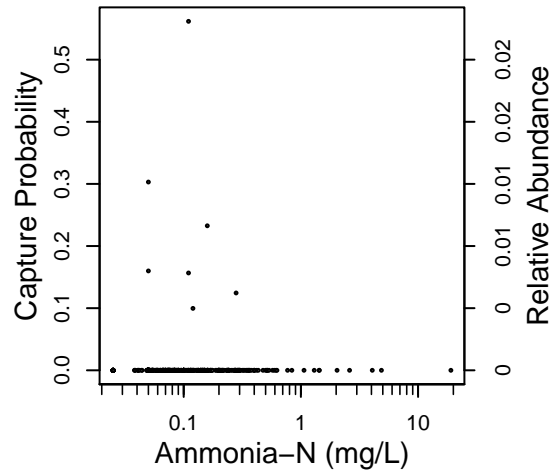
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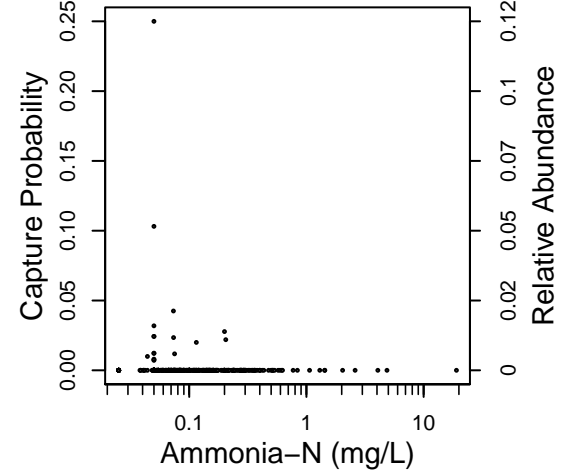
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*Acentria*

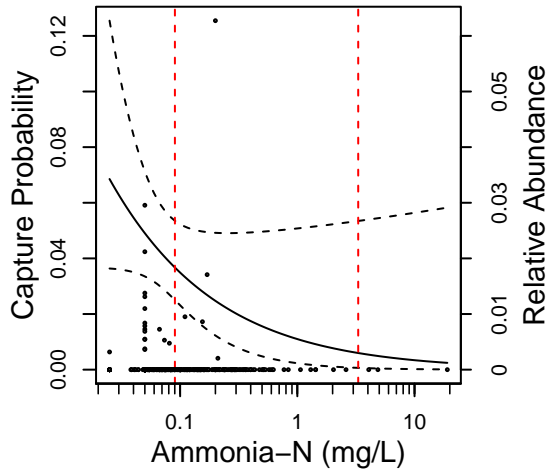


*Acerpenna*

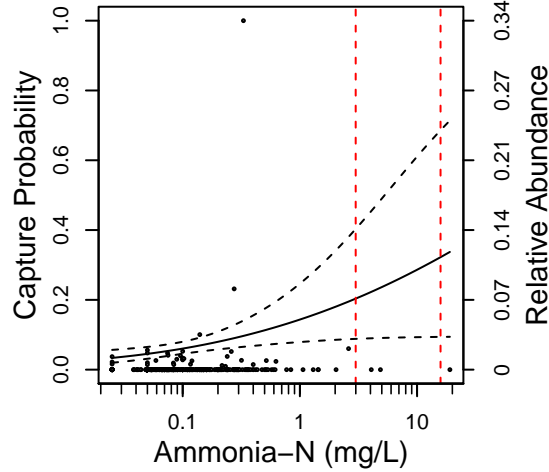


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

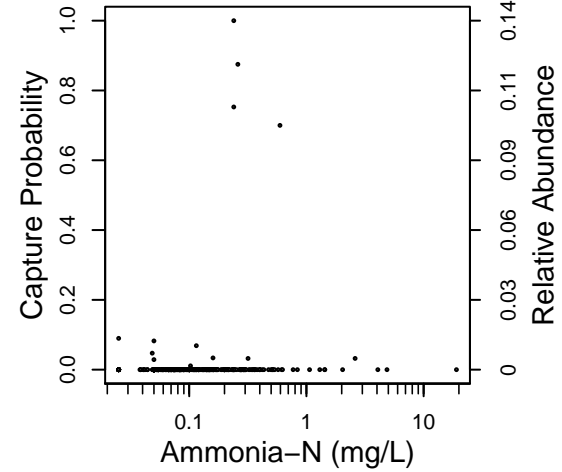
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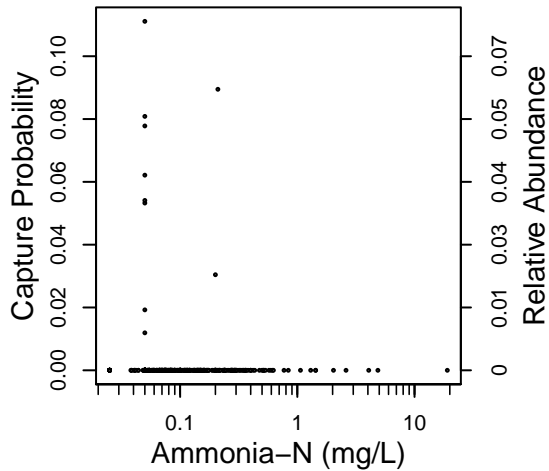
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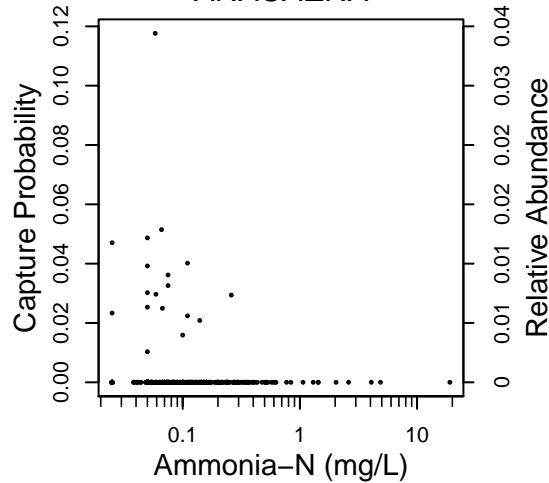
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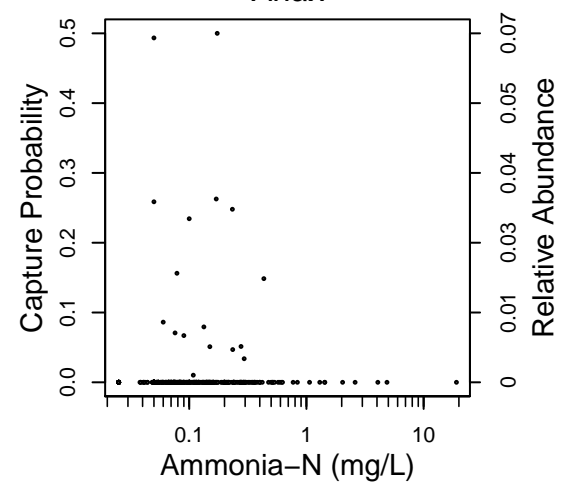
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*ANACAENA*

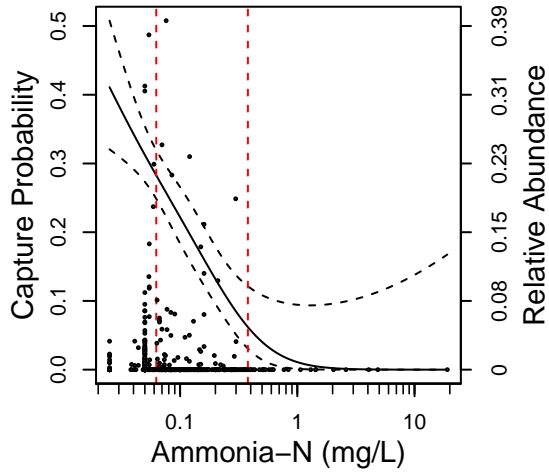


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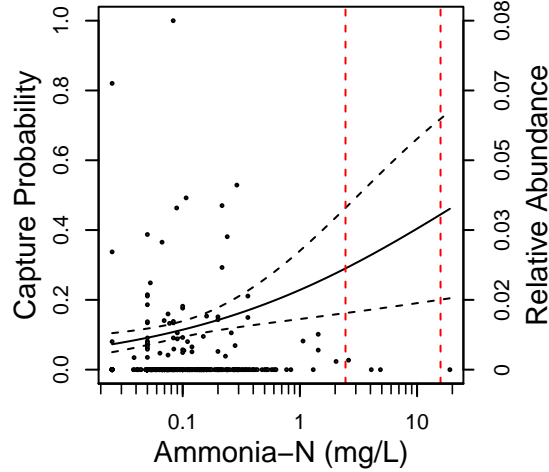


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

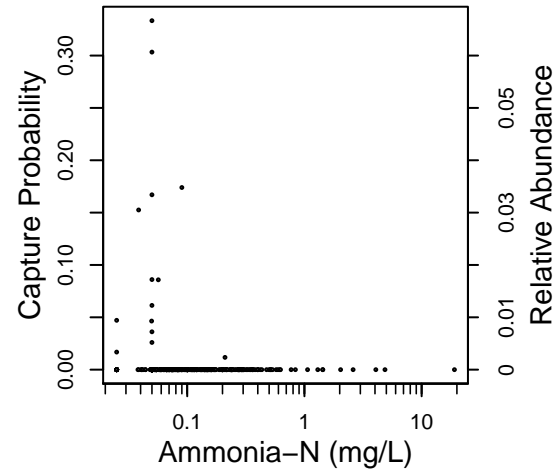
*Ancyronyx*



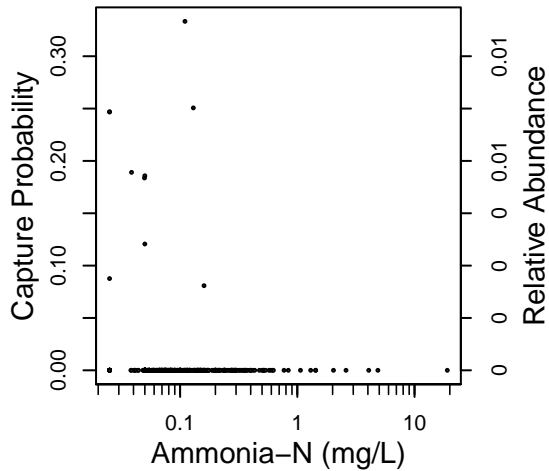
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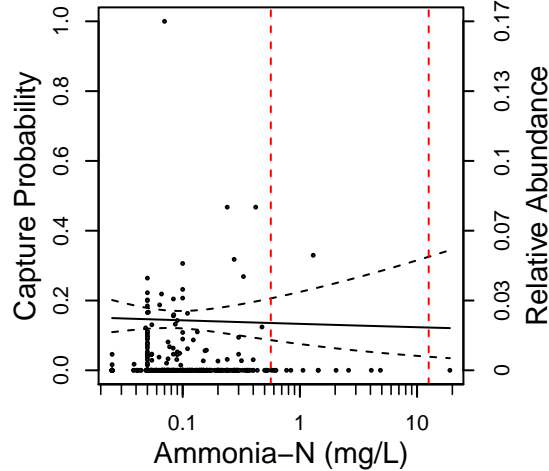
*Anthopotamus*



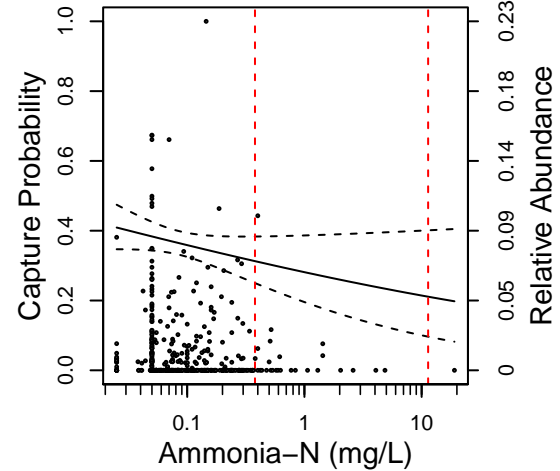
*Antocha*



*Aquarius*



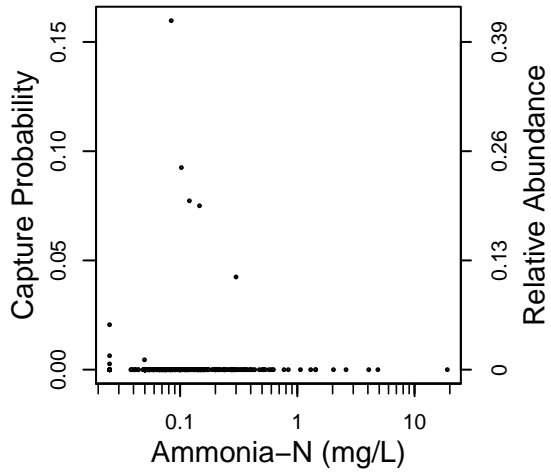
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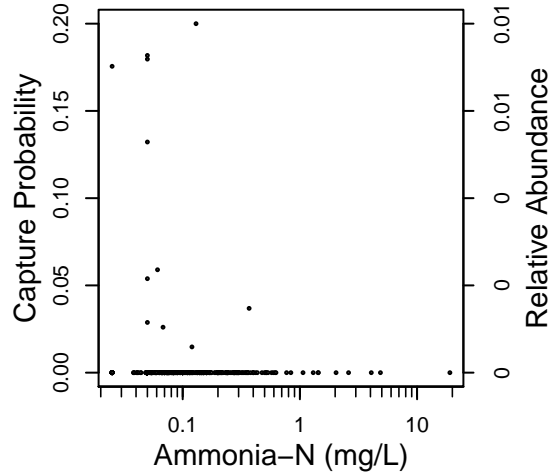


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

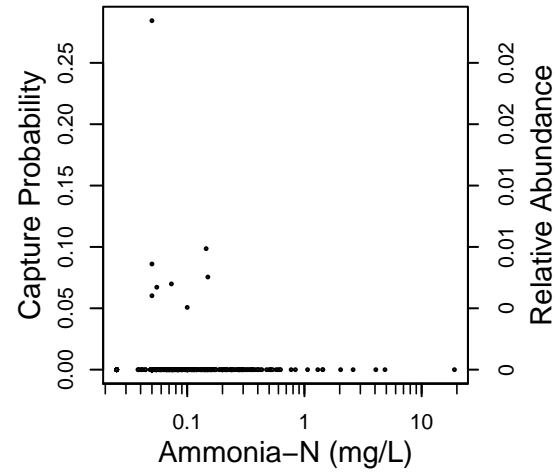
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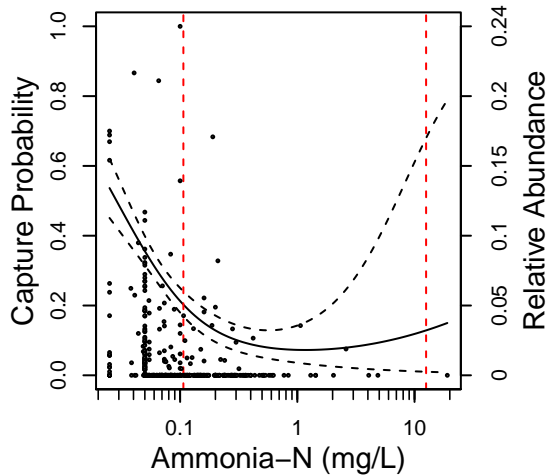
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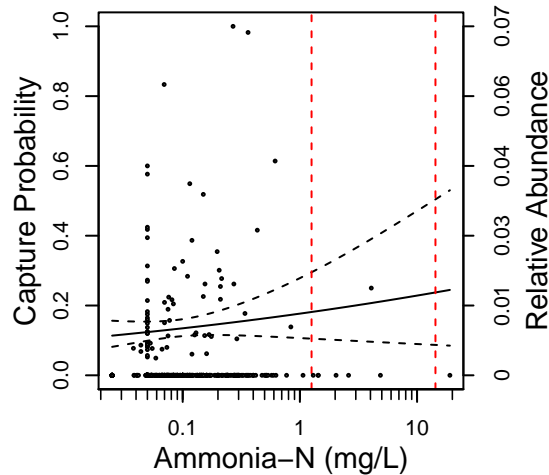
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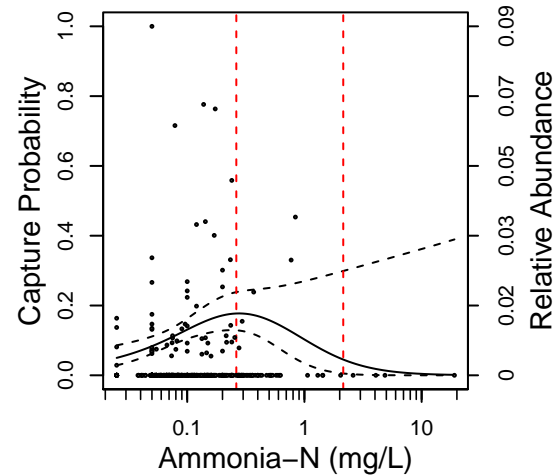
*Baetis*



*Basiaeschna*

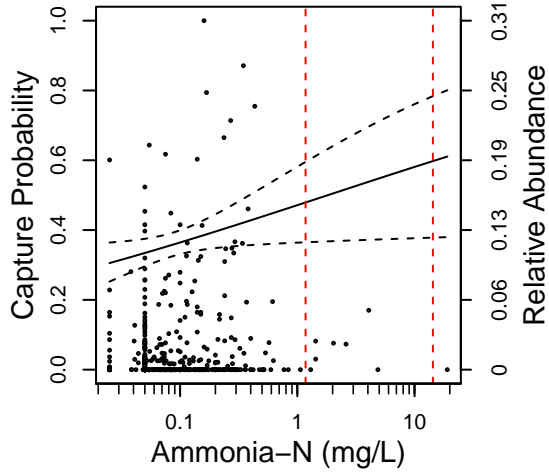


*Belostoma*

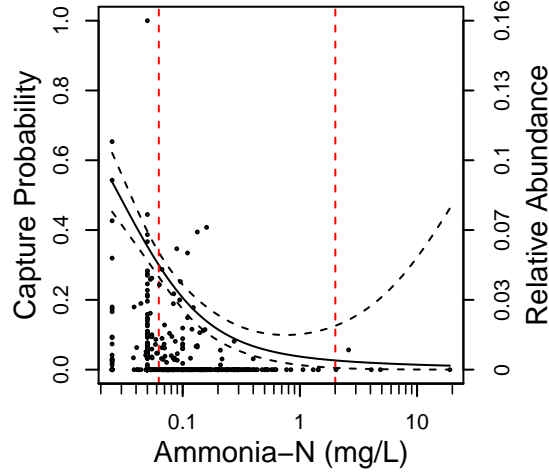


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

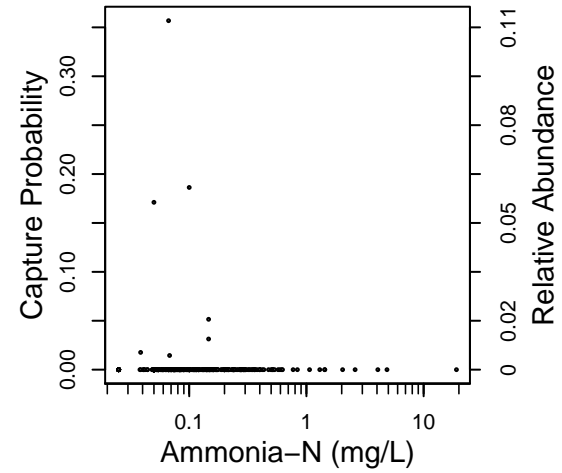
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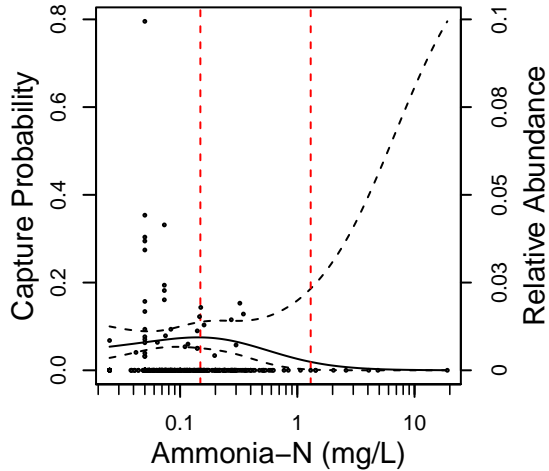
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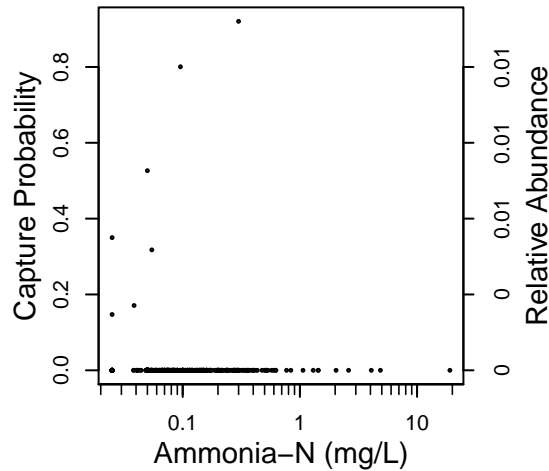
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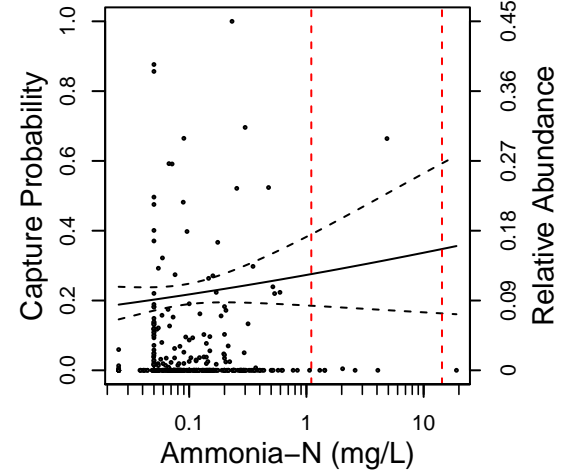
*Branchiura*



*Brillia*

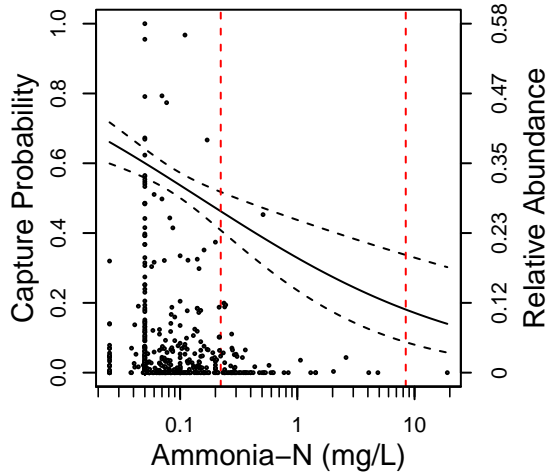


*Caecidotea*

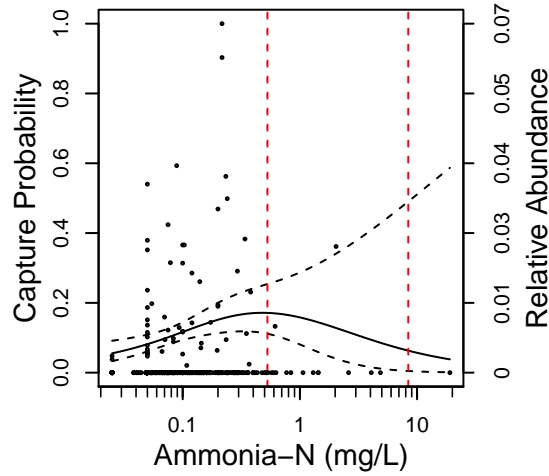


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

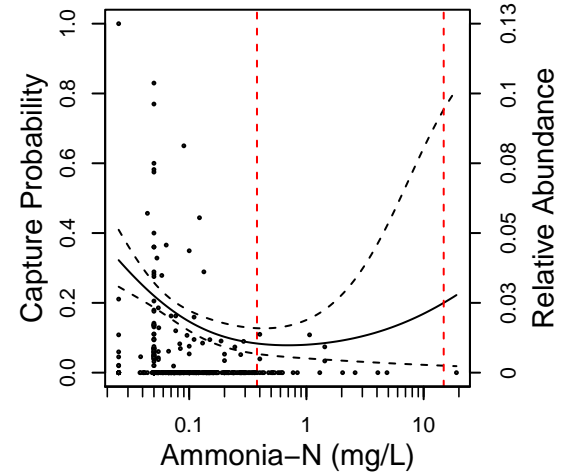
*Caenis*



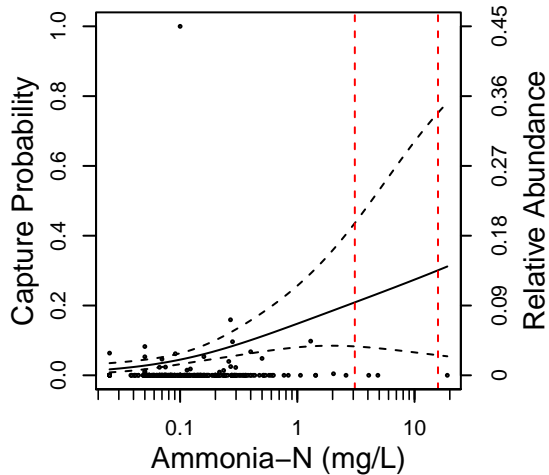
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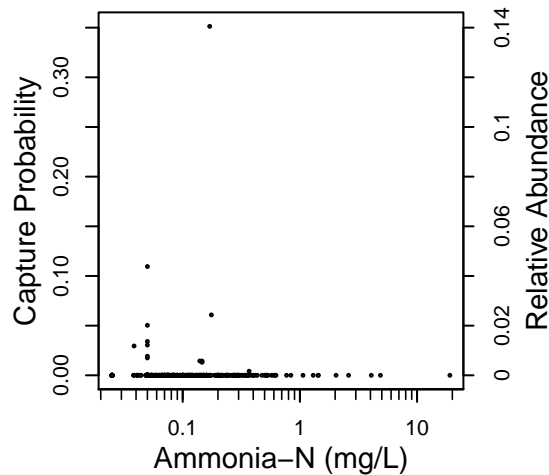
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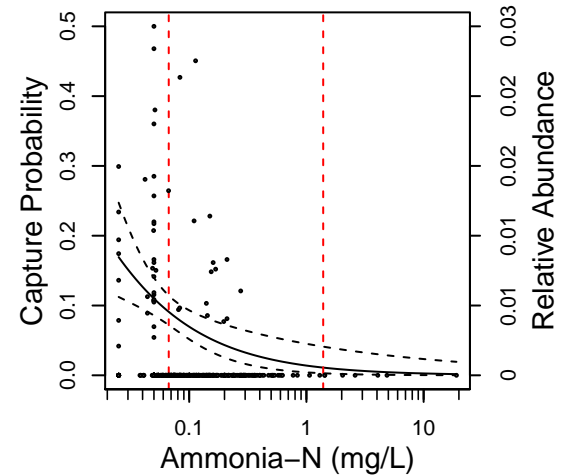
*Cambarus*



*Campeloma*

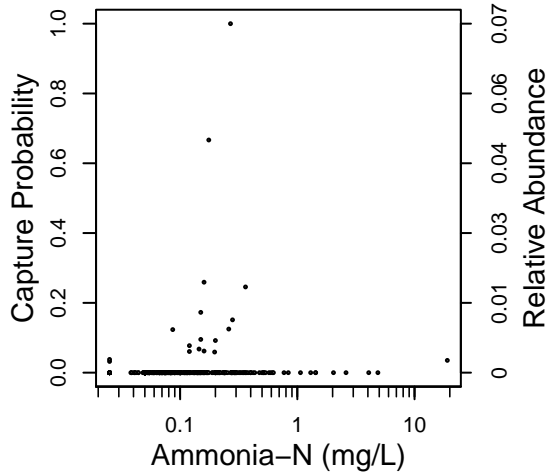


*Centroptilum*

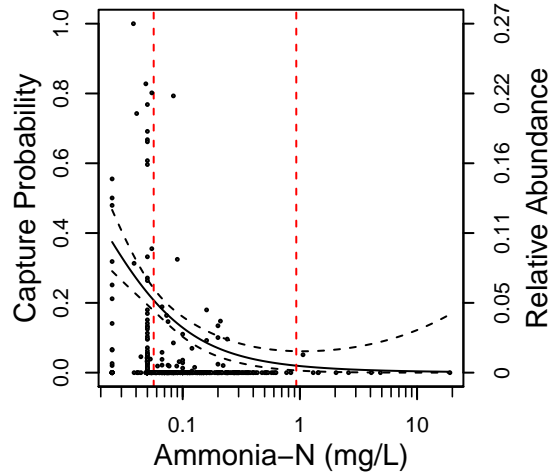


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

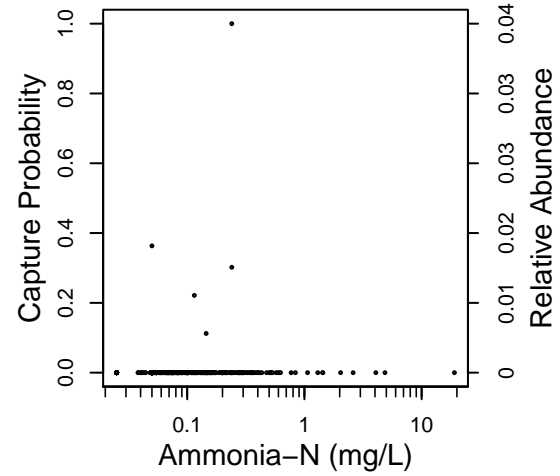
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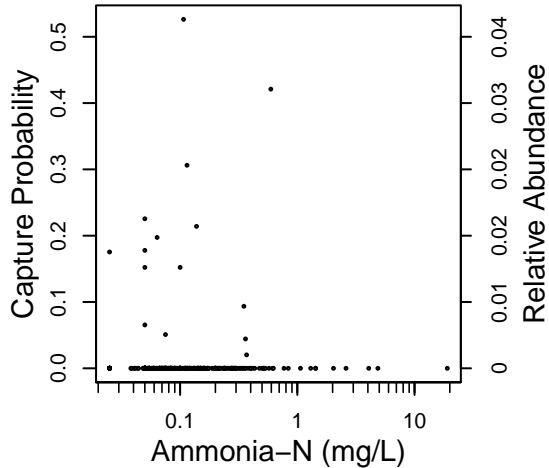
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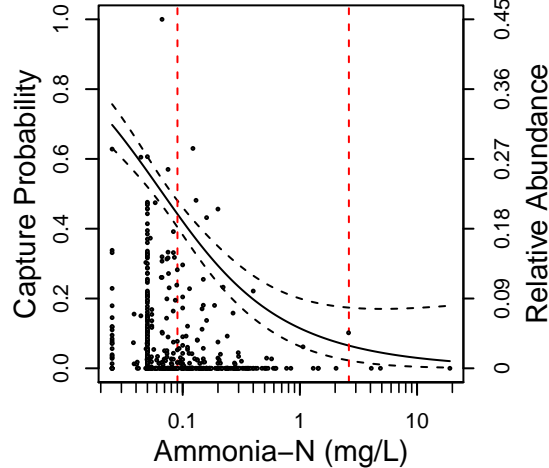
*Chaoborus*



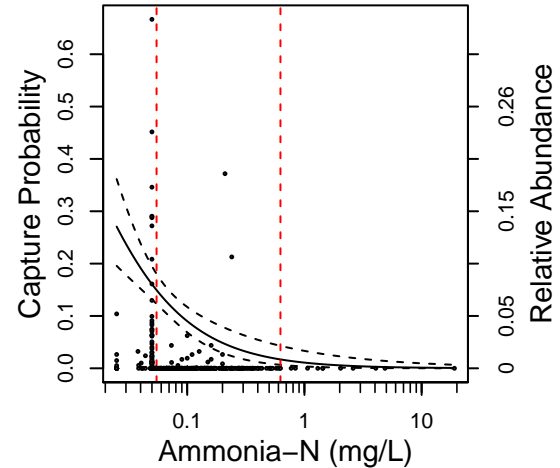
*Chauliodes*



*Cheumatopsyche*

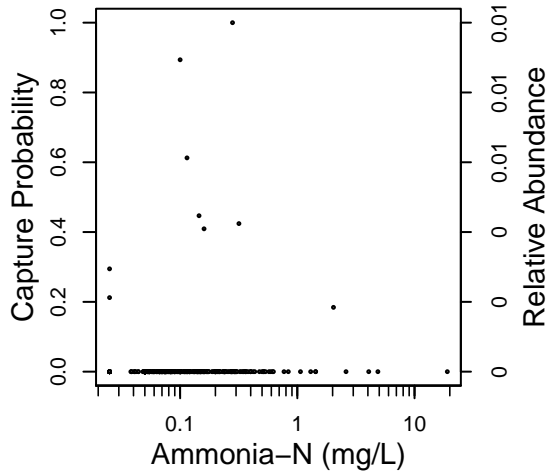


*Chimarra*

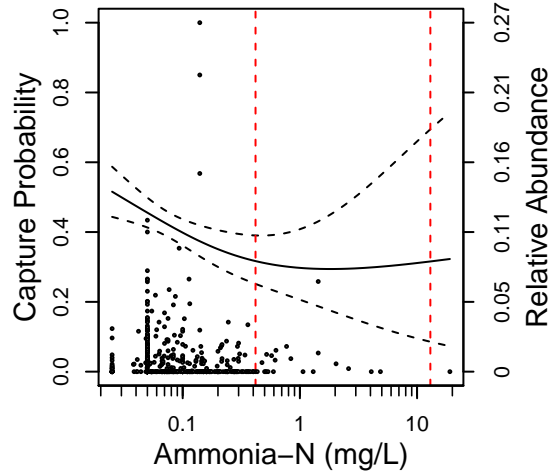


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

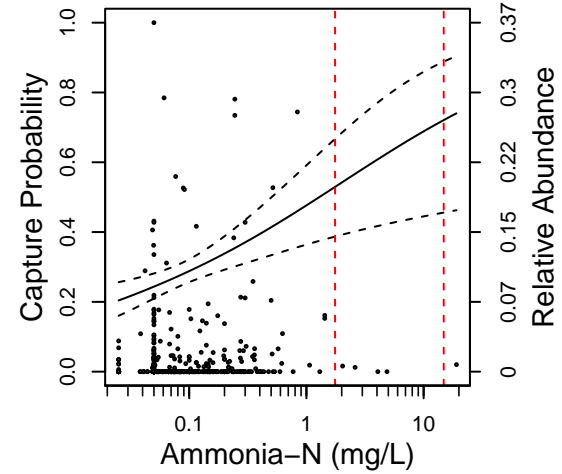
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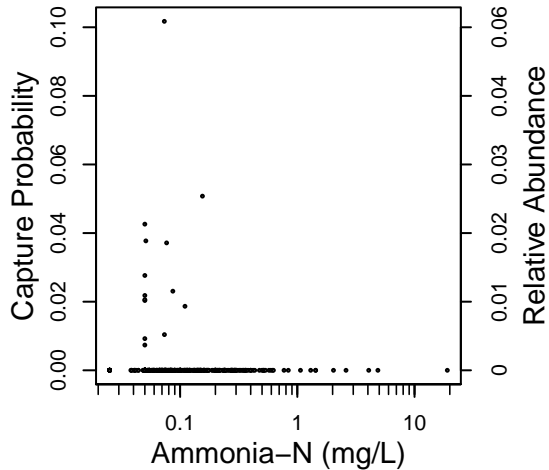
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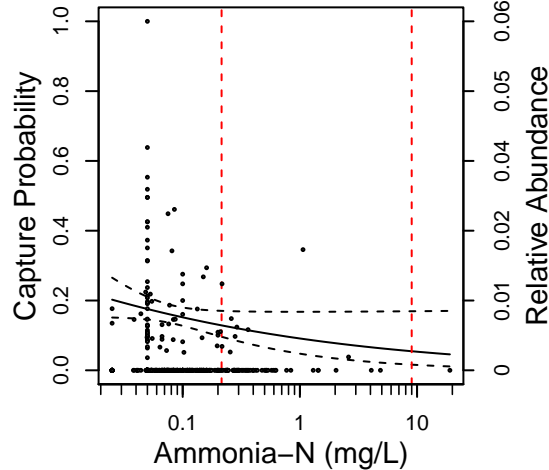
*Chironomus*



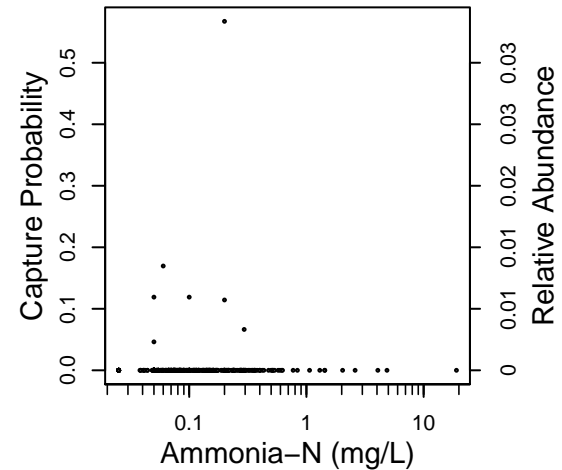
*Choroterpes*



*Chrysops*

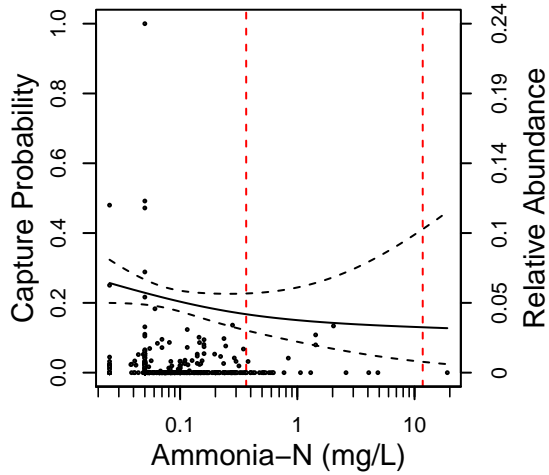


*Cladopelma*

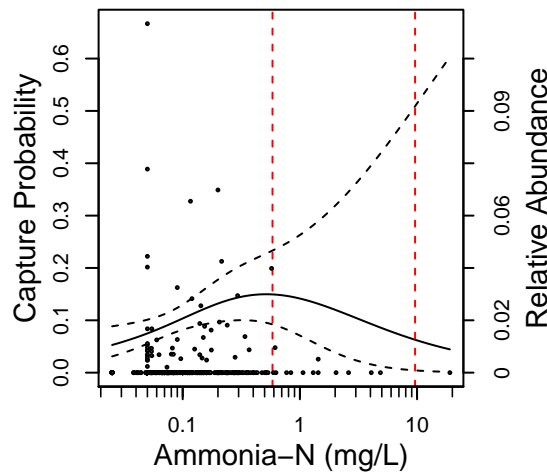


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

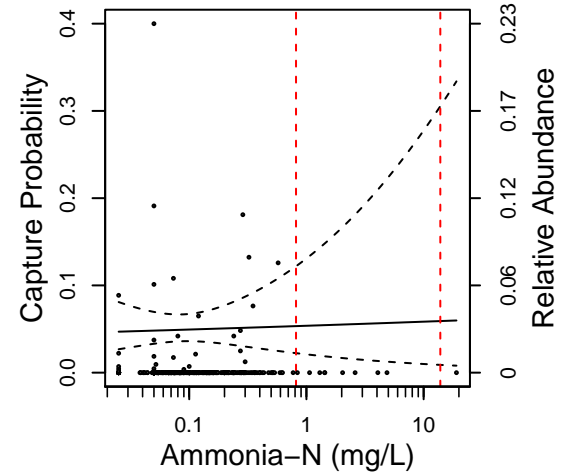
*Cladotanytarsus*



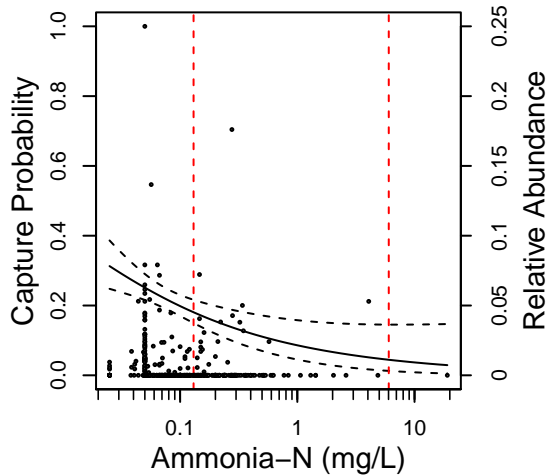
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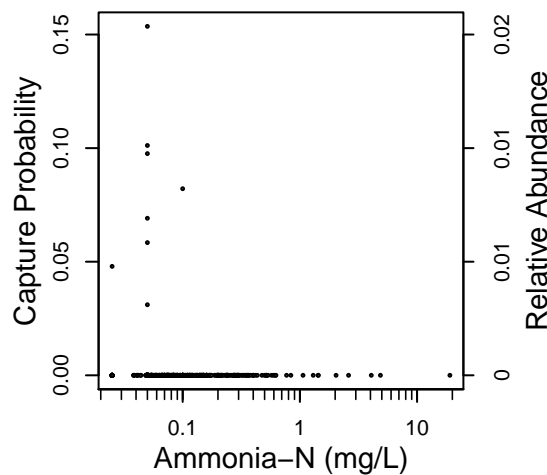
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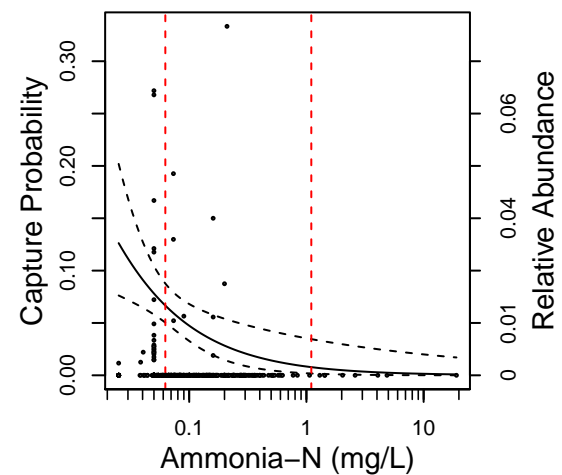
*Corbicula*



*Cordulegaster*

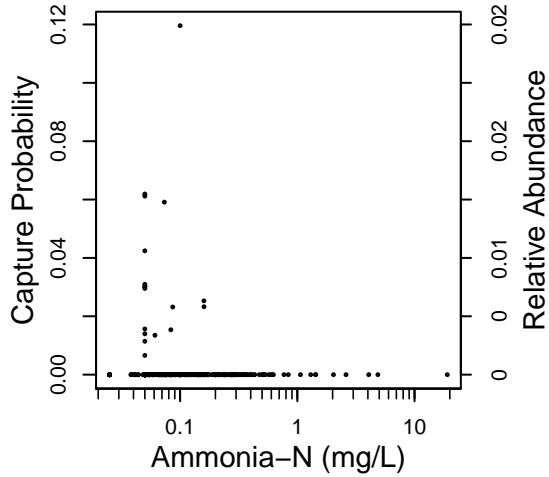


*Corydalus*

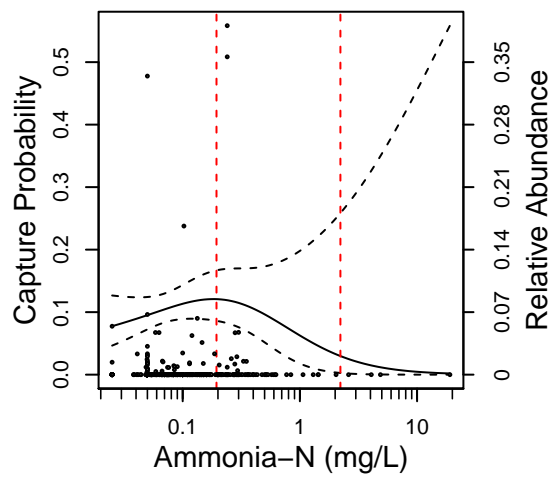


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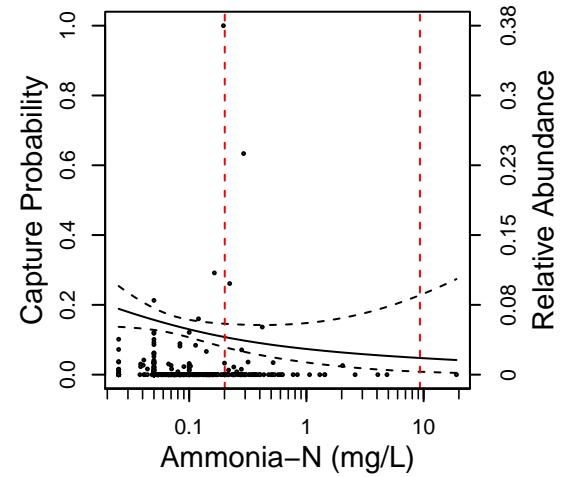
*Corynoneura*



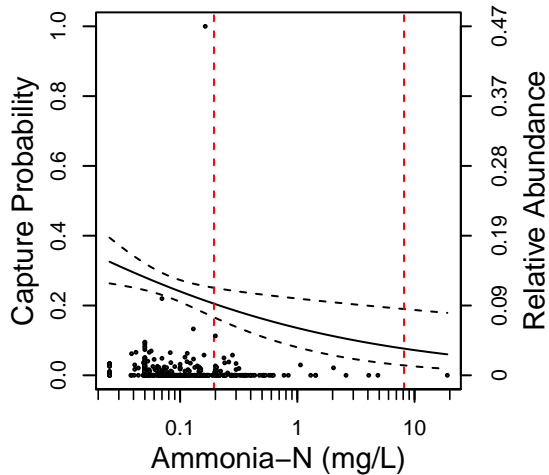
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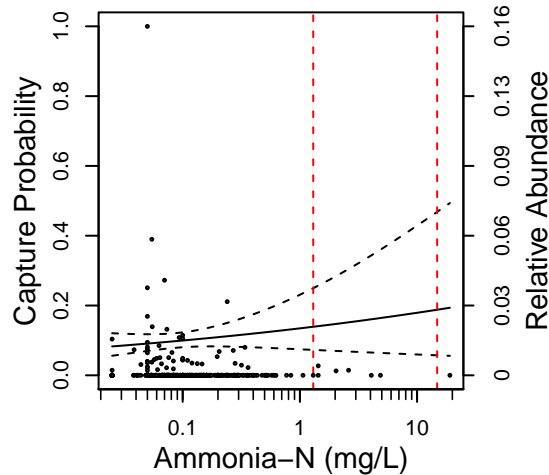
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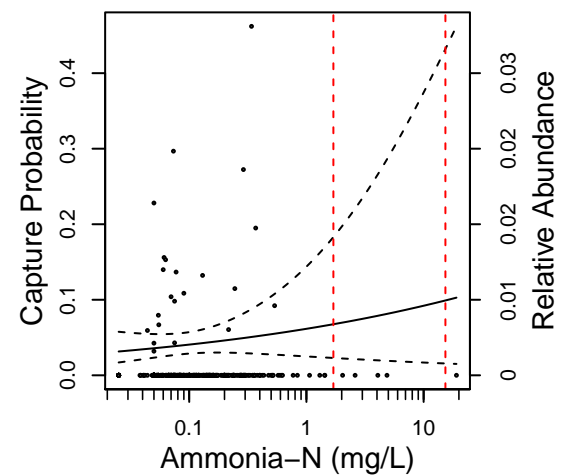
*Cryptochironomus*



*Cryptotendipes*

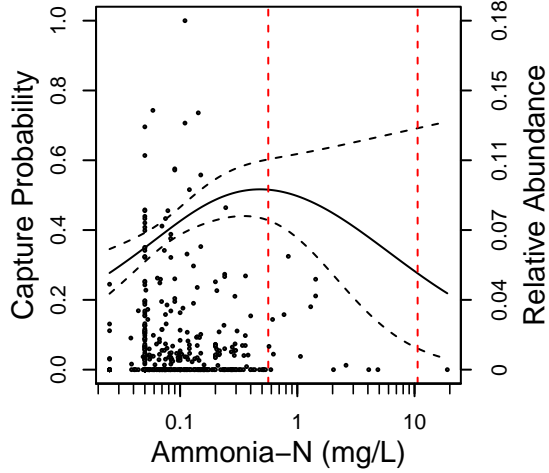


*Culicoides*

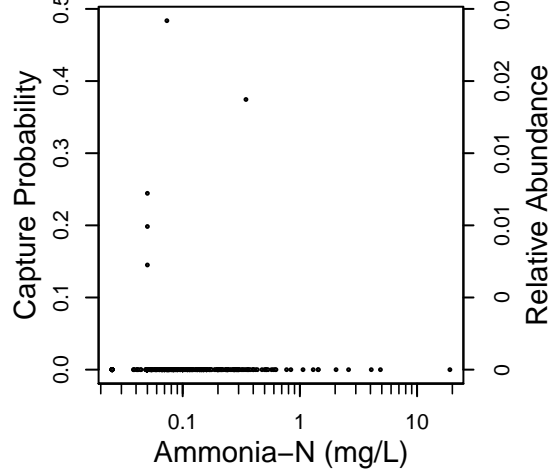


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

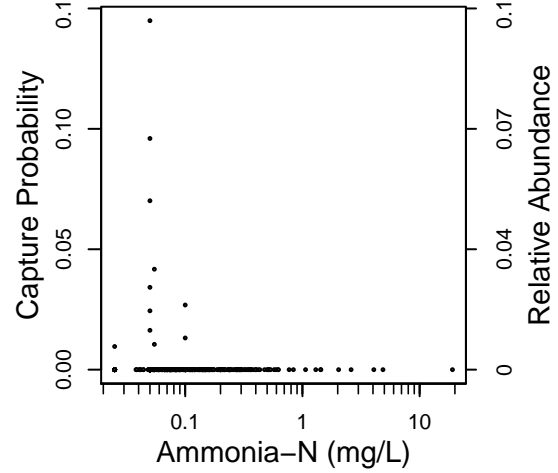
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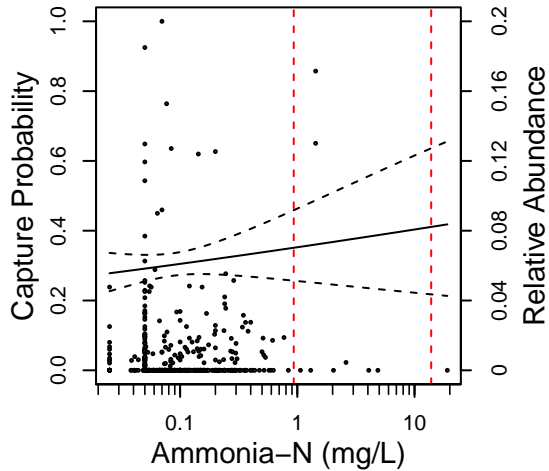
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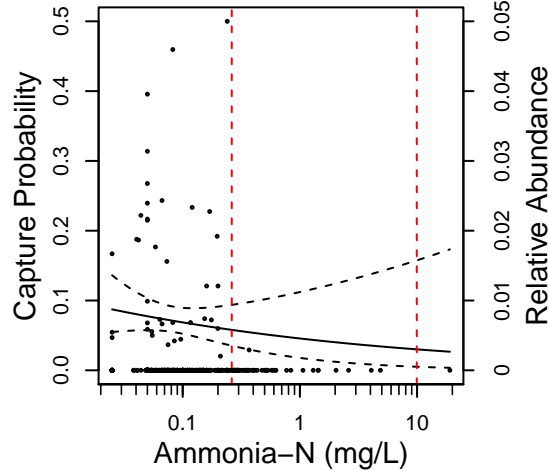
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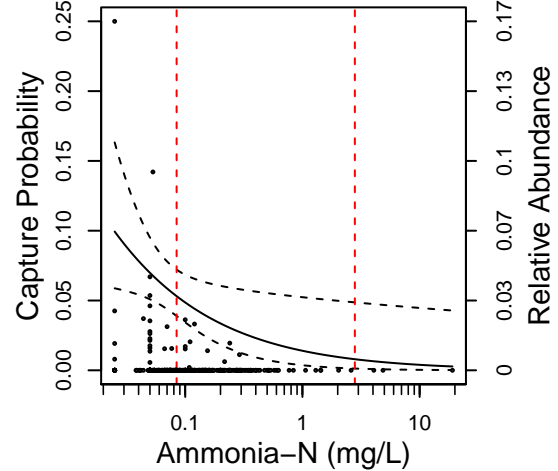
*Dicrotendipes*



*Dineutus*



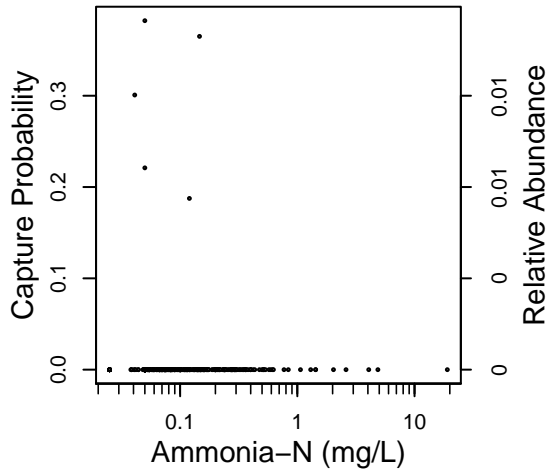
*Dixella*



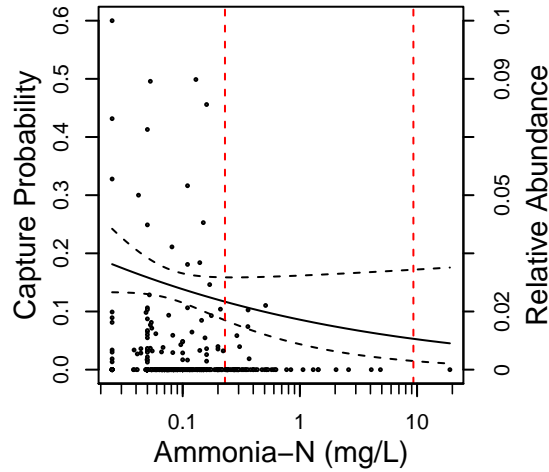


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

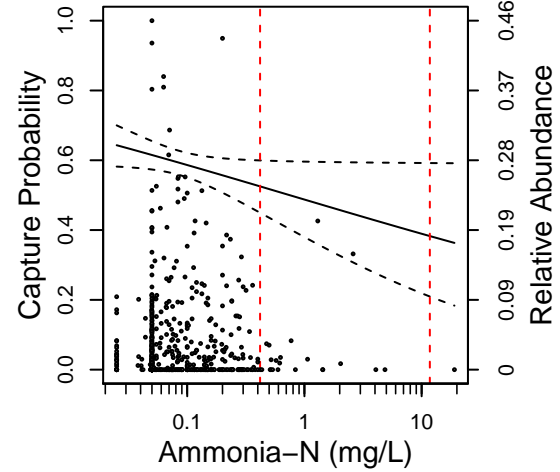
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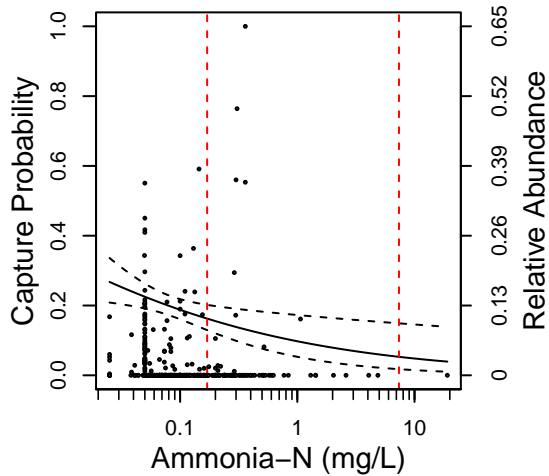
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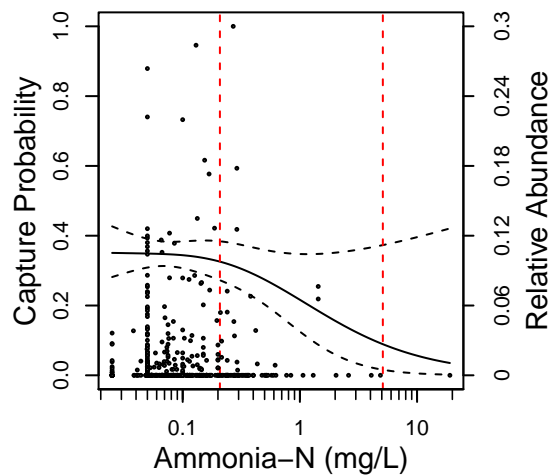
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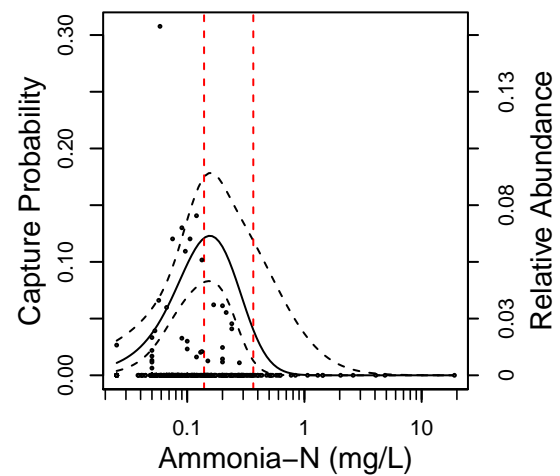
*Elimia*



*Enallagma*

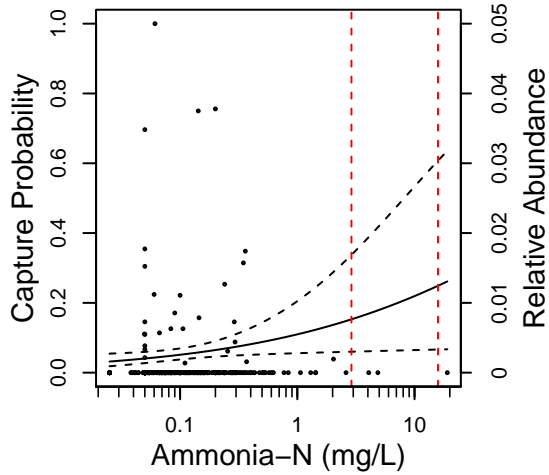


*Endochironomus*

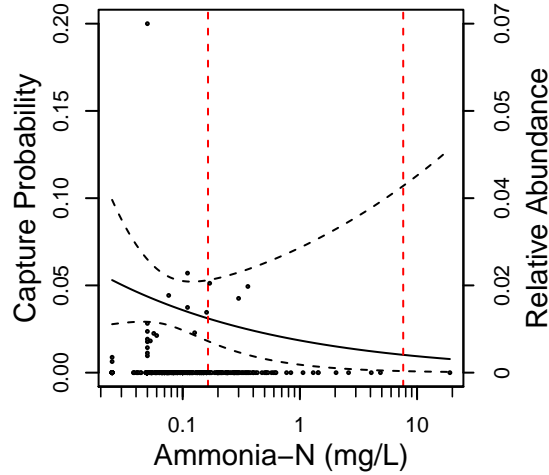


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

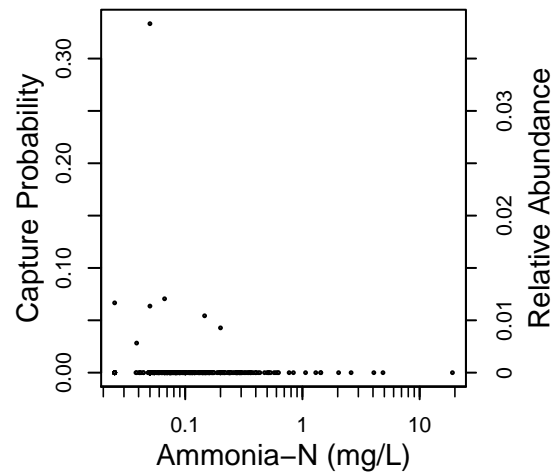
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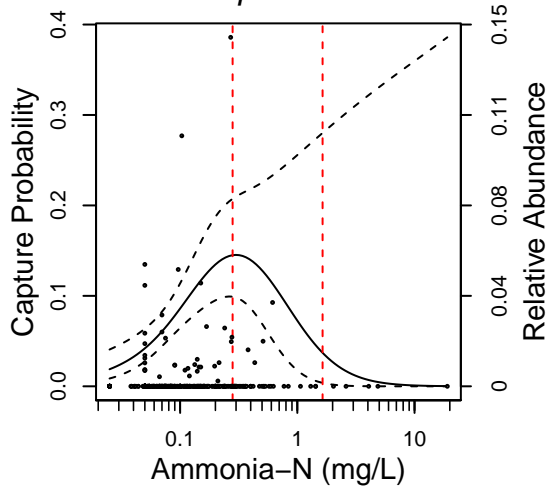
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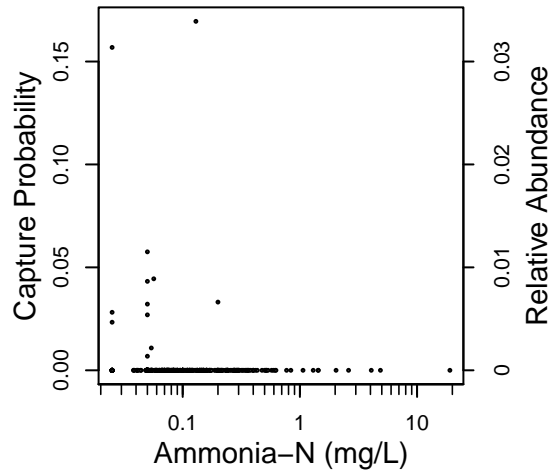
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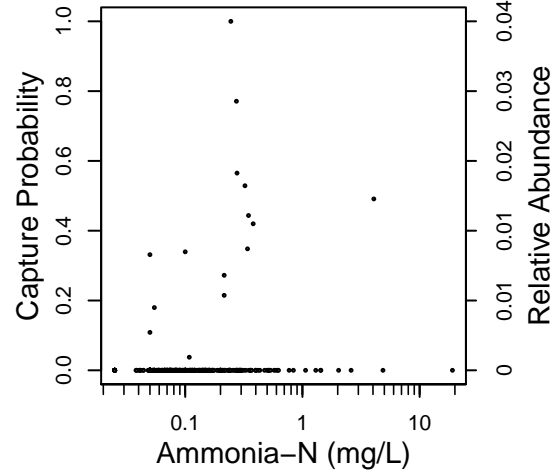
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*Erpetogomphus*

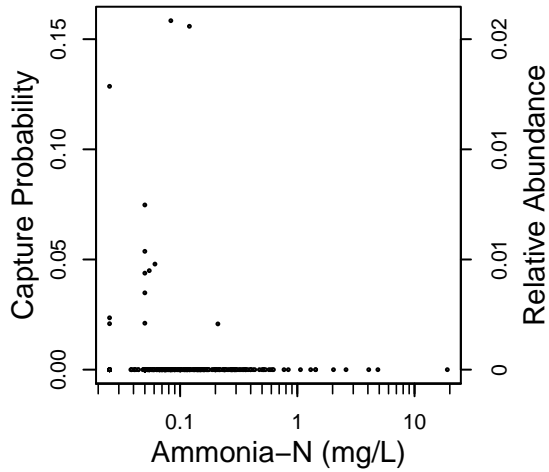


*Erythemis*

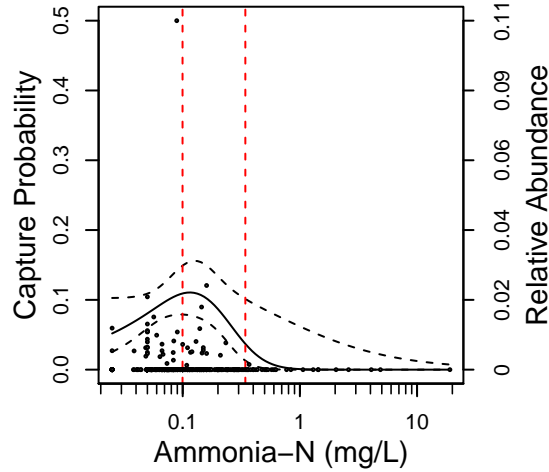


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

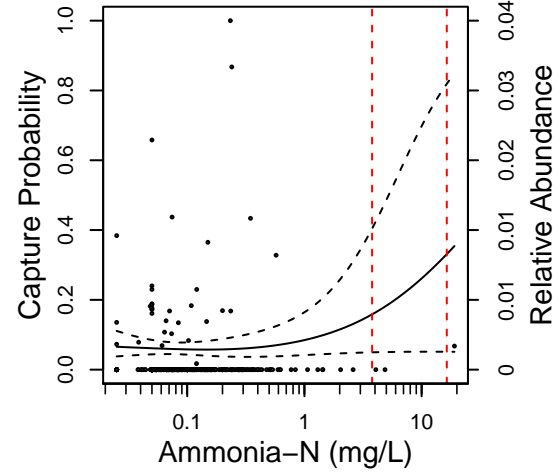
*Eukiefferiella*



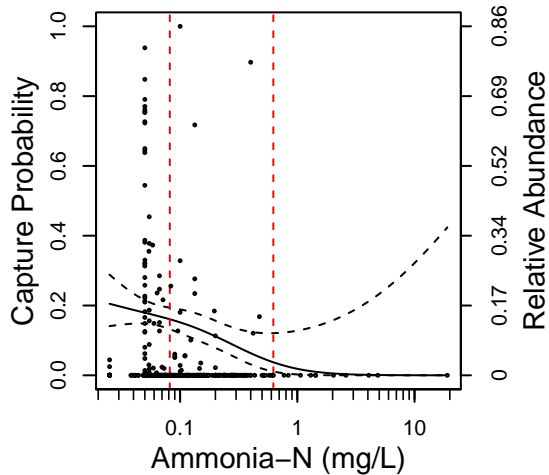
*Ferrissia*



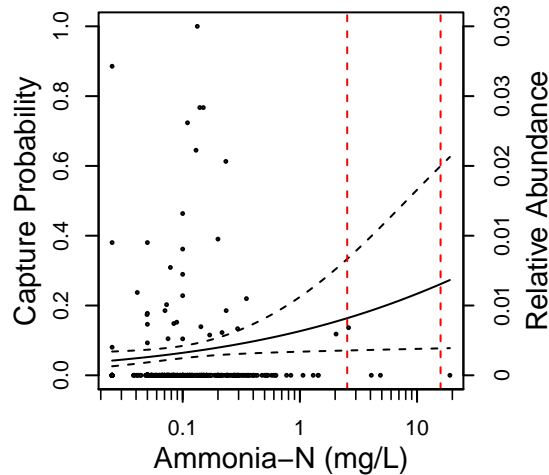
*Fossaria*



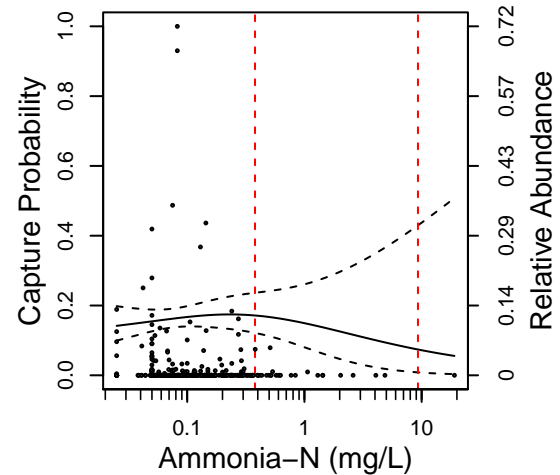
*Gammarus*



*Gerris*

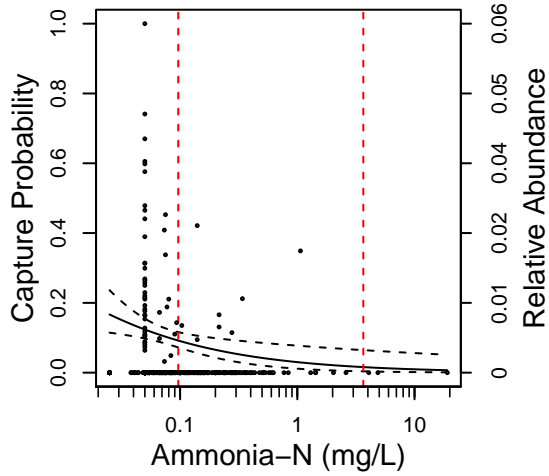


*Glyptotendipes*

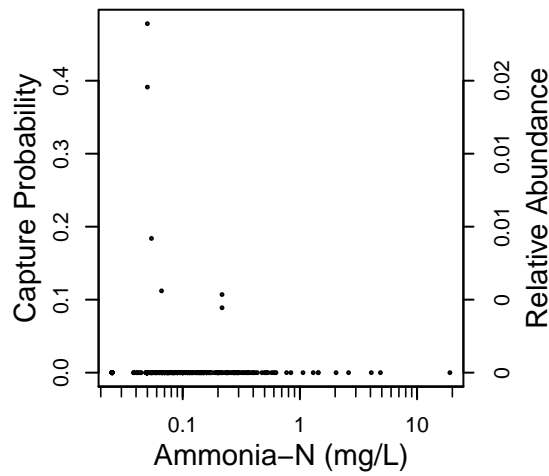


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

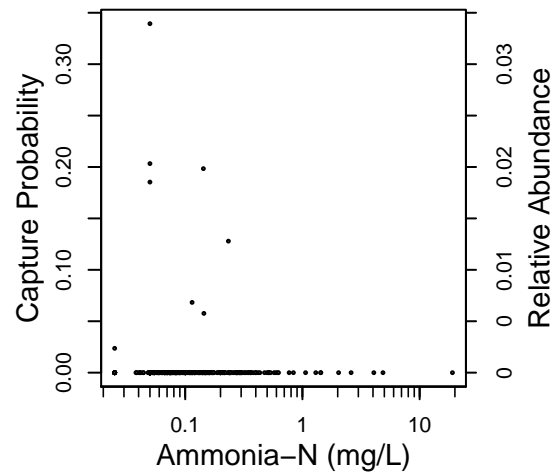
*Gomphus*



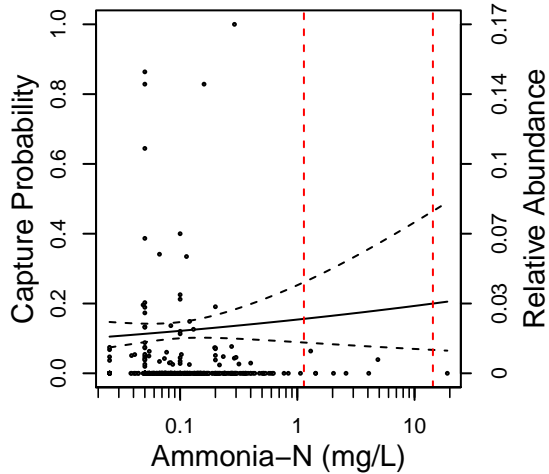
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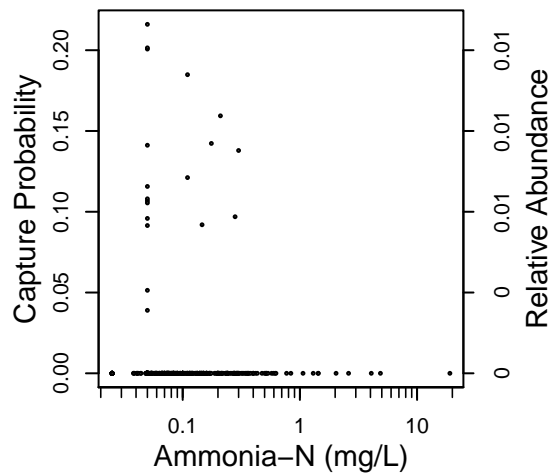
*Gyraulus*



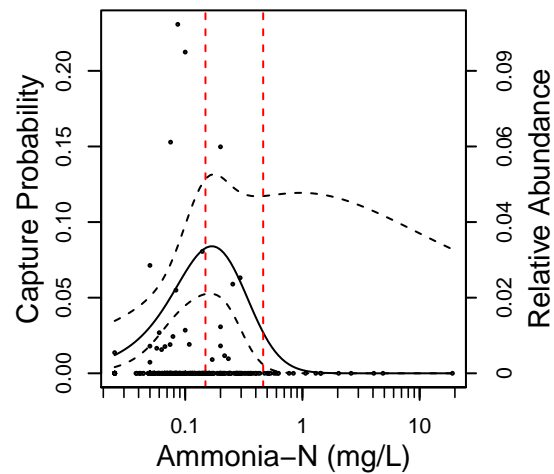
*Gyrinus*



*Hagenius*

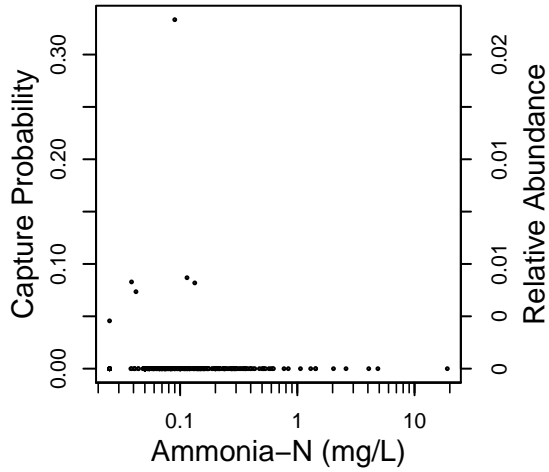


*Halipus*

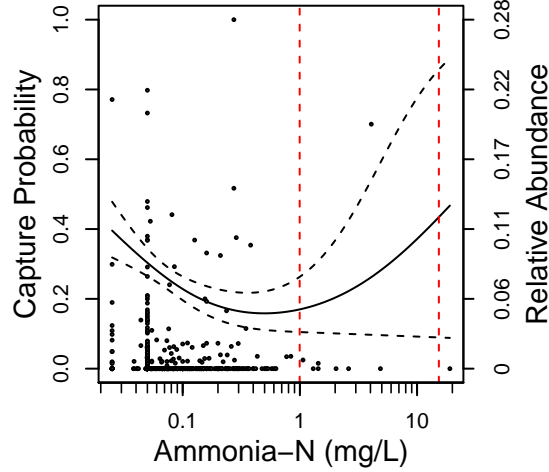


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

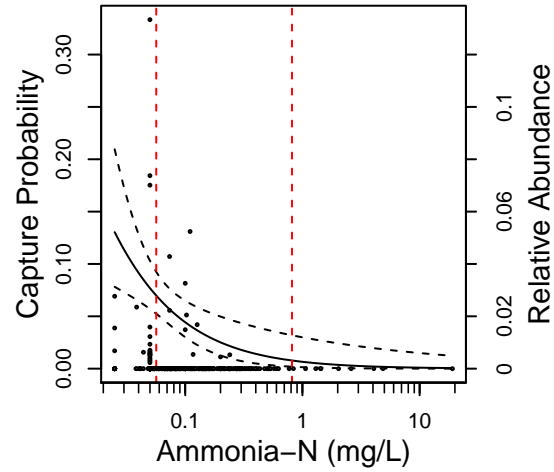
*Harnischia*



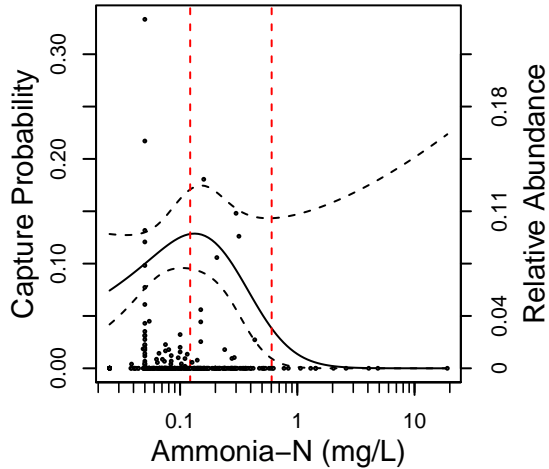
*Helichus*



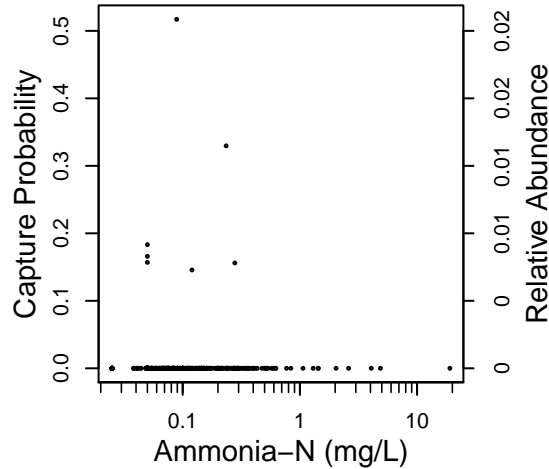
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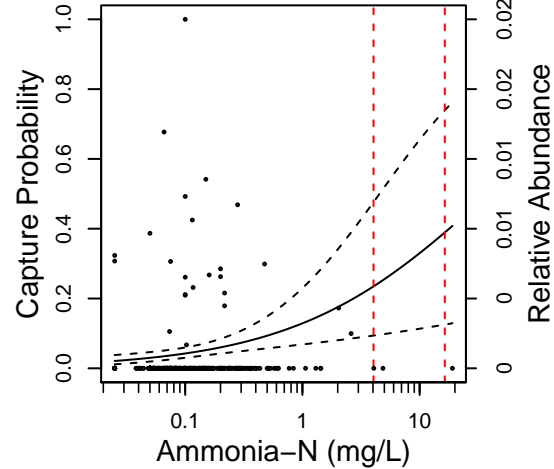
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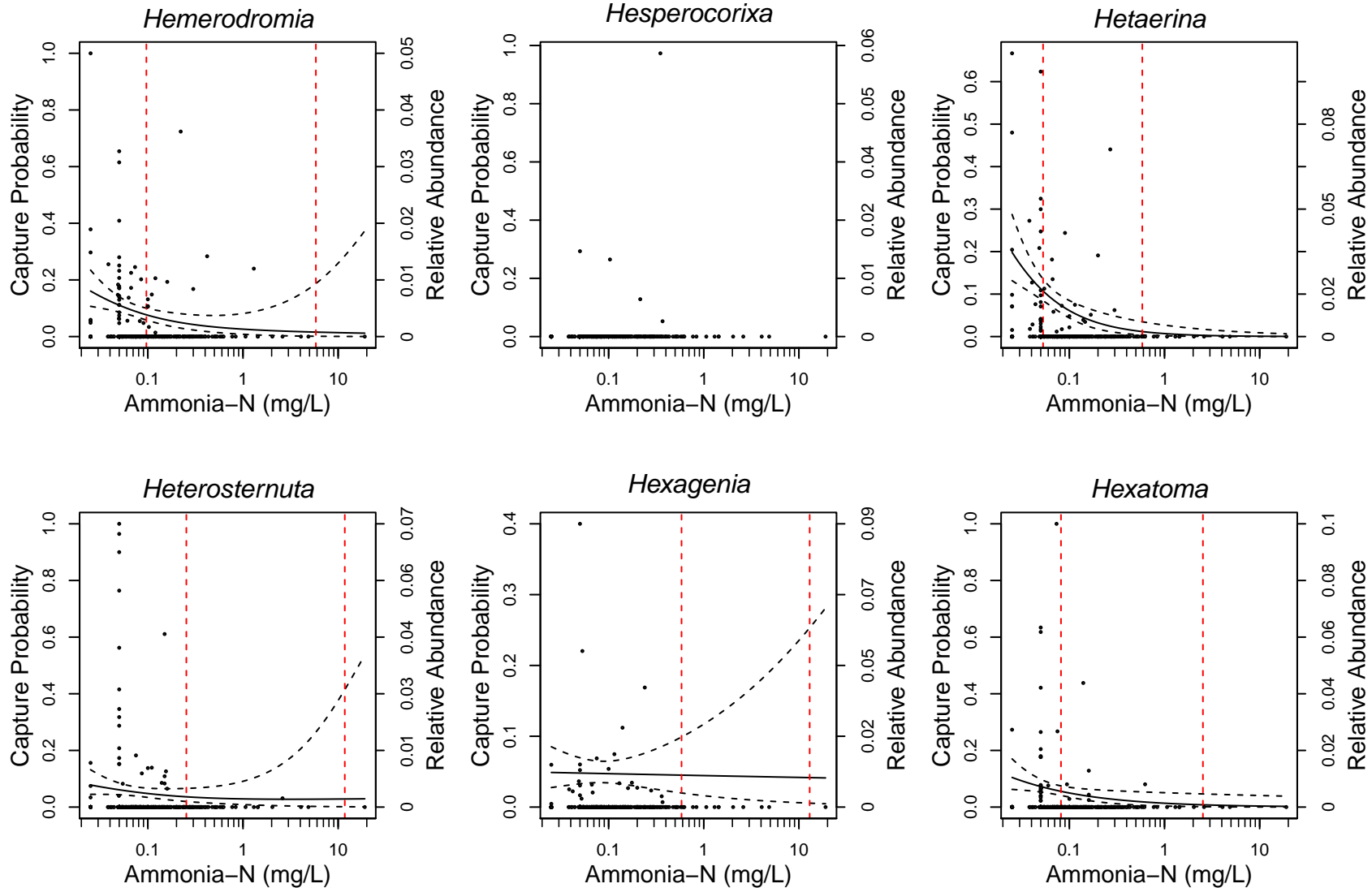
*Helochaers*



*Helophorus*

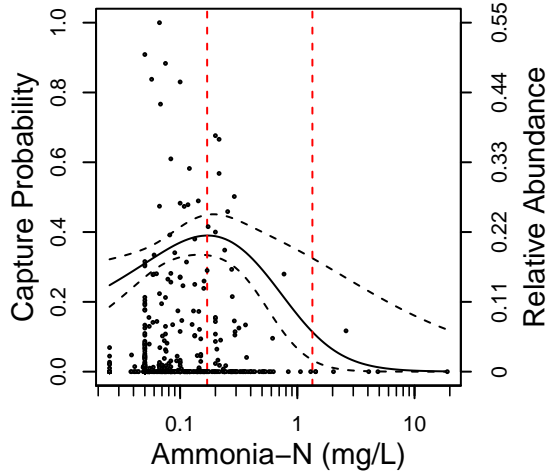


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

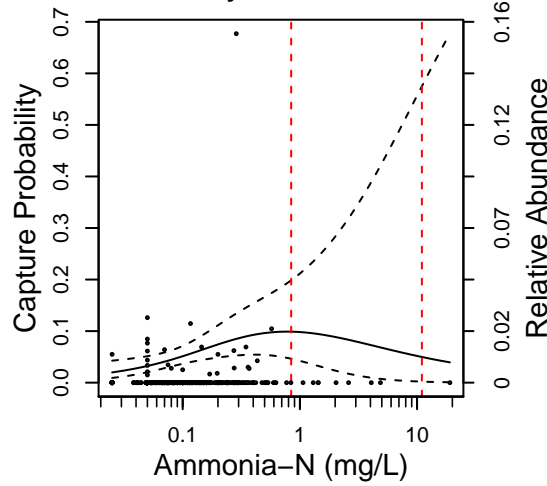


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

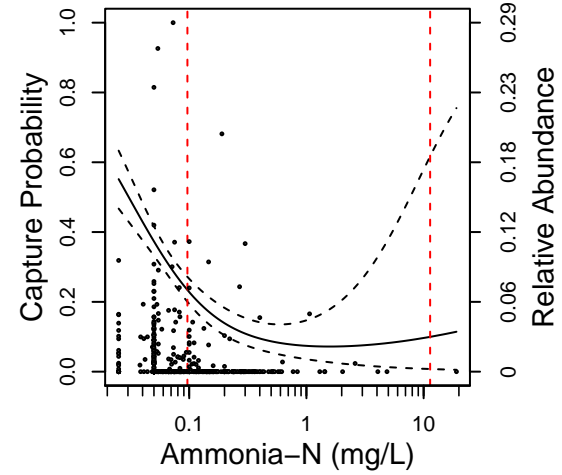
*Hyalella*



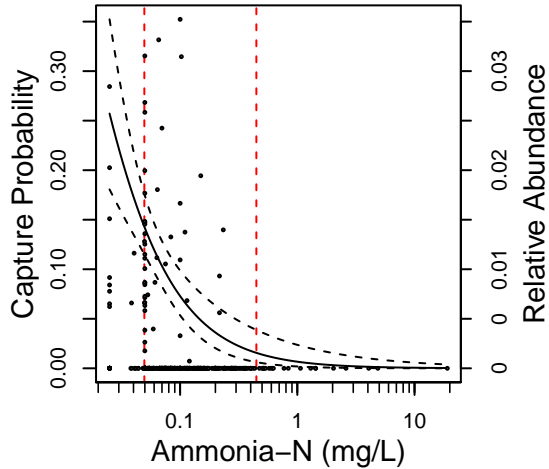
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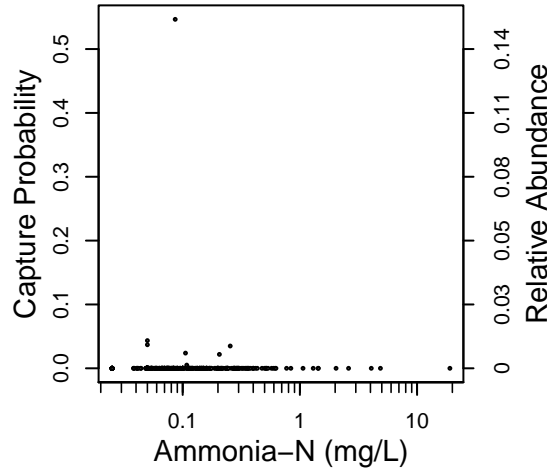
*Hydropsyche*



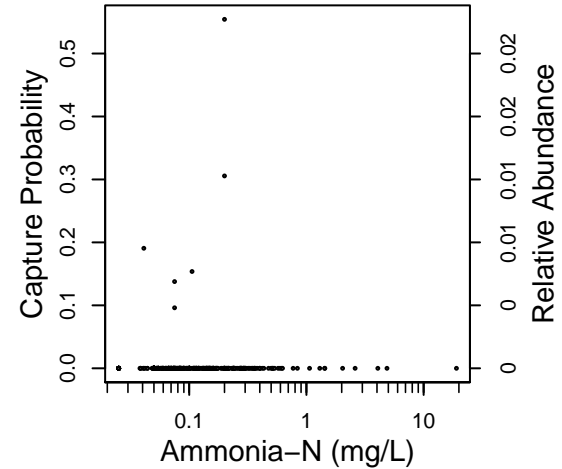
*Hydroptila*



*Hydrovatus*

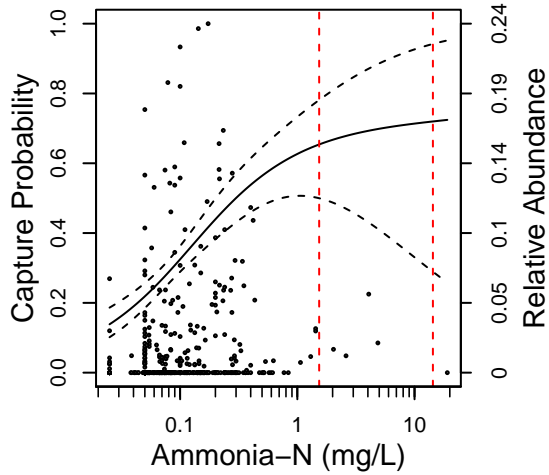


*Hygrotus*

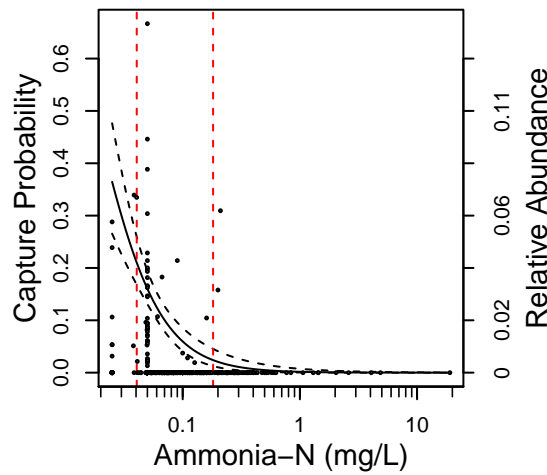


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

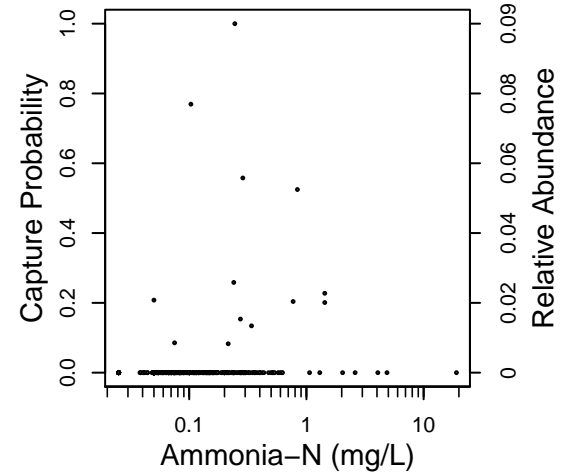
*Ischnura*



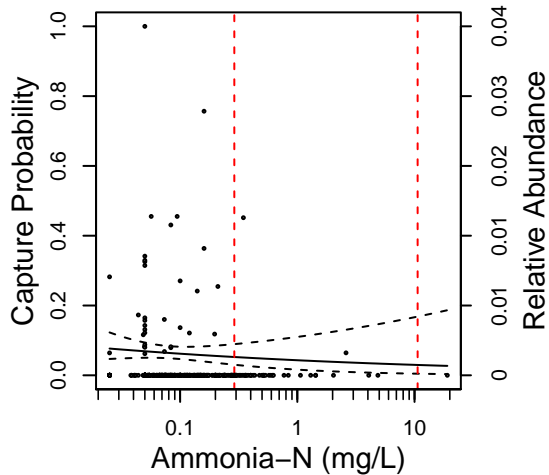
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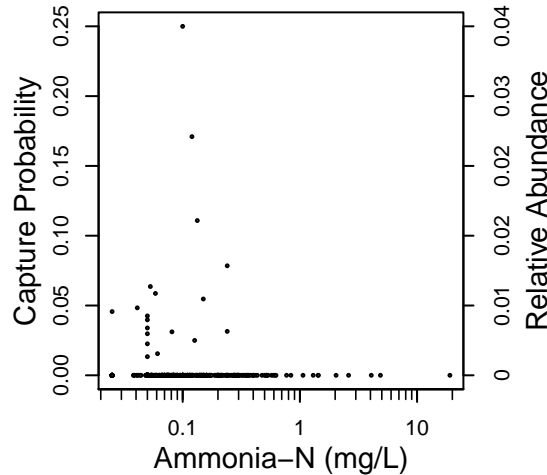
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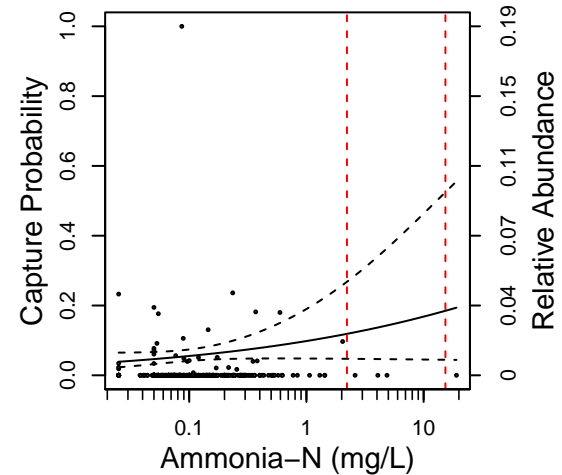
*Labrundinia*



*Laccobius*



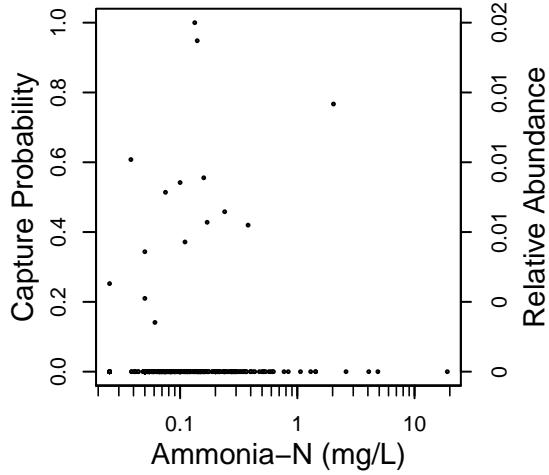
*Laccophilus*



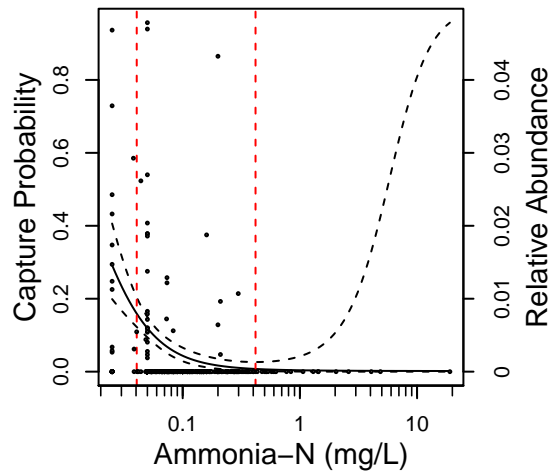


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

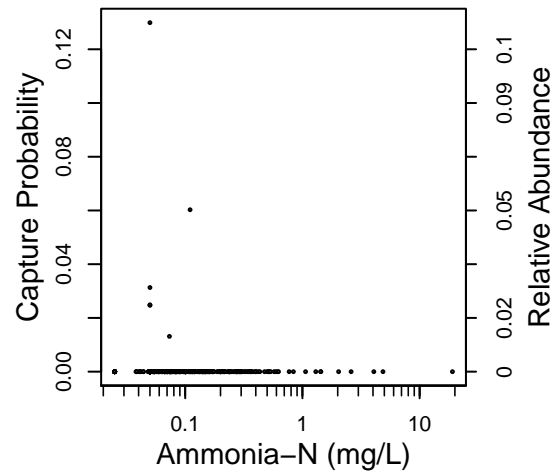
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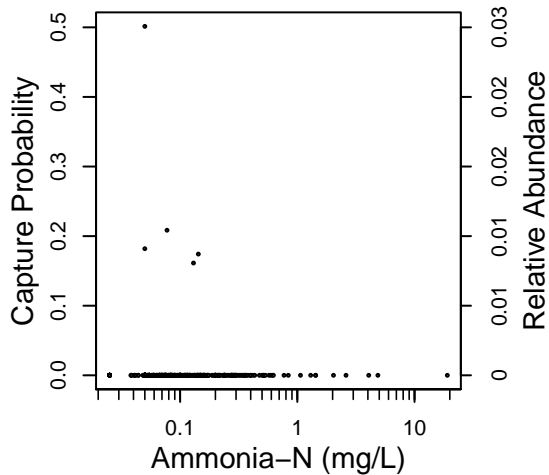
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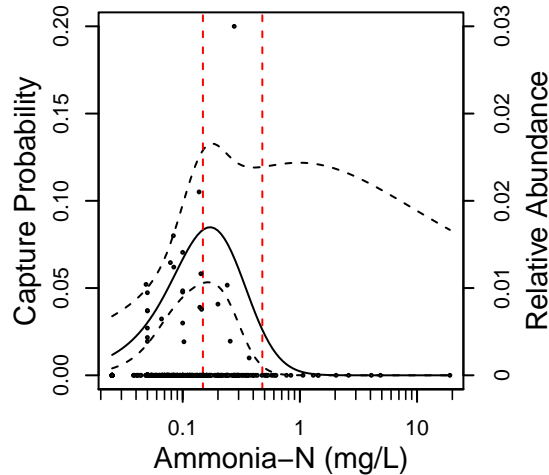
*Leuctra*



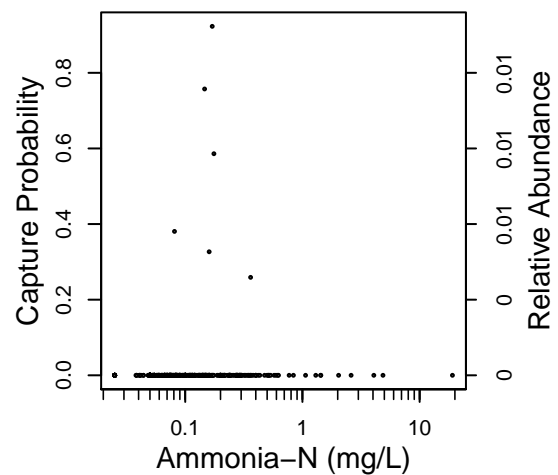
*Limnopus*



*Liodesus*

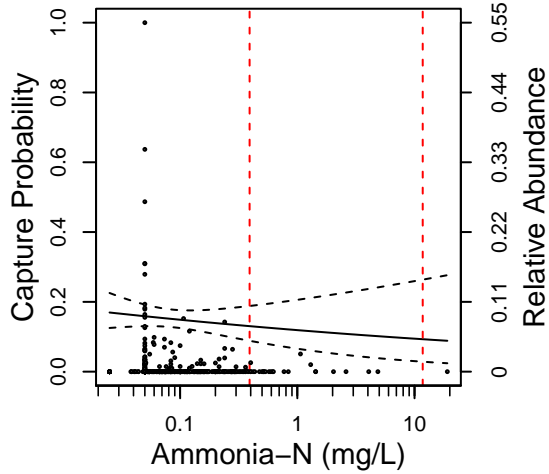


*Lioporeus*

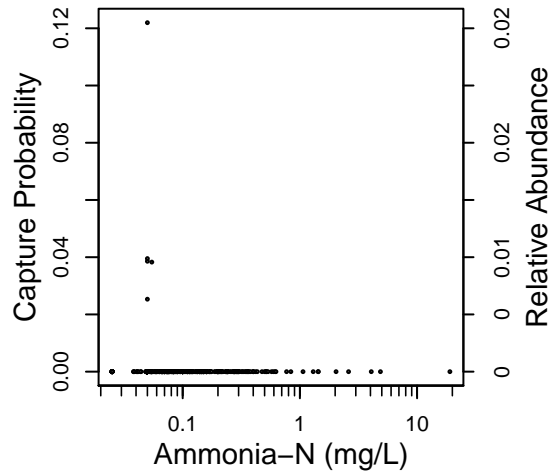


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

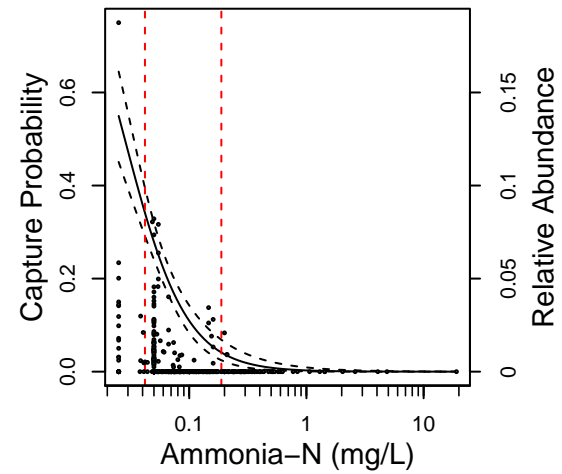
*Lirceus*



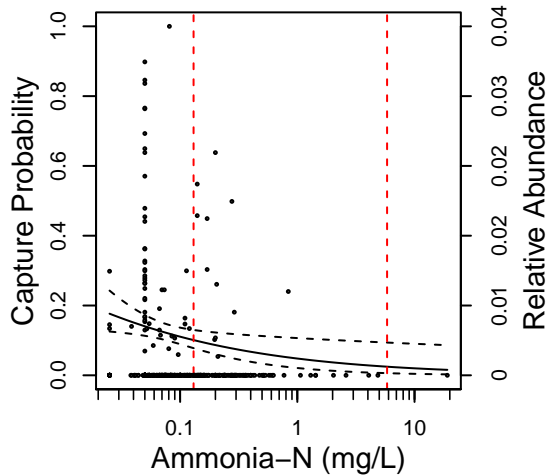
*Lype*



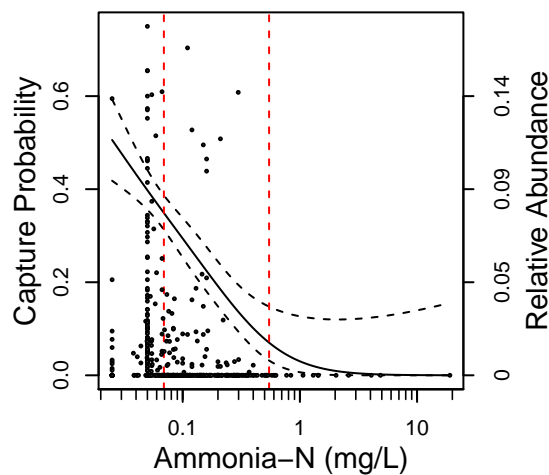
*Maccaffertium*



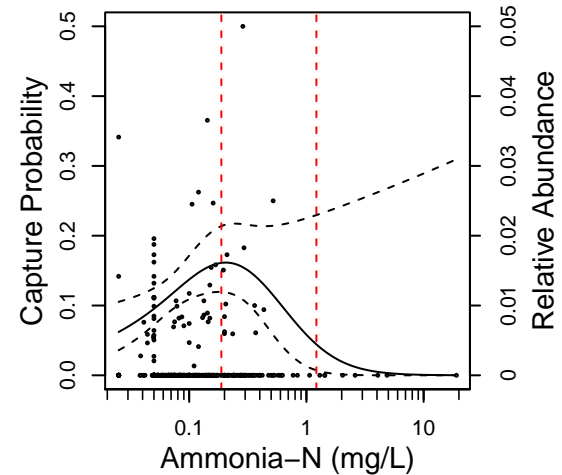
*Macromia*



*Macronychus*

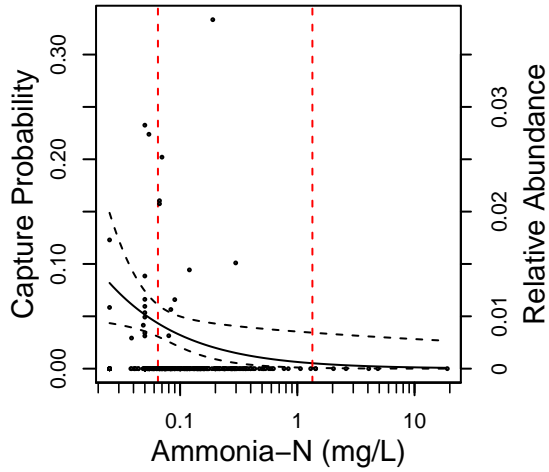


*Mesovelia*

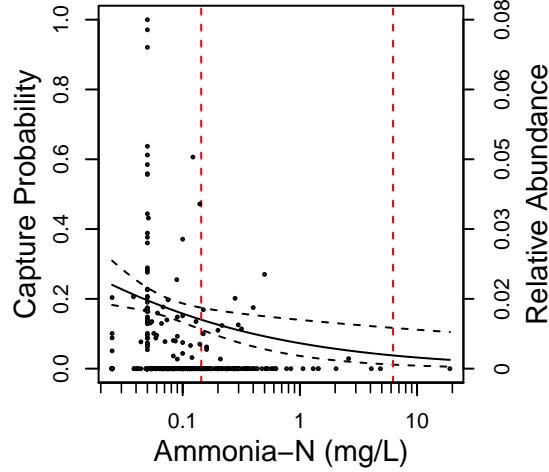


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

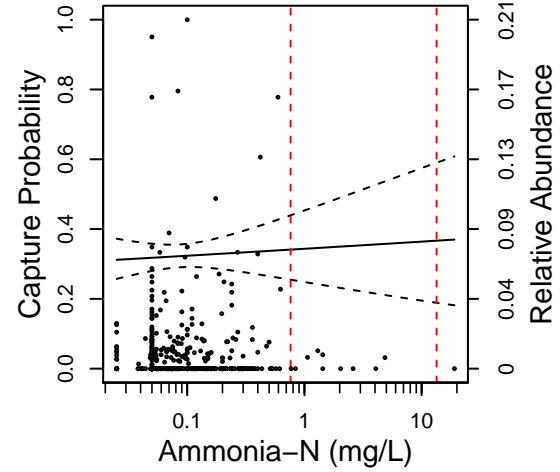
*Metrobates*



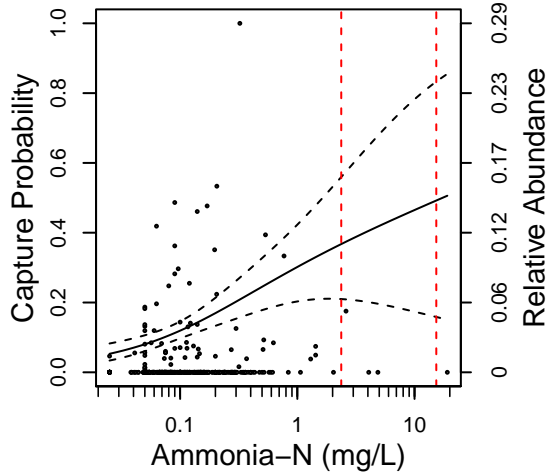
*Microtendipes*



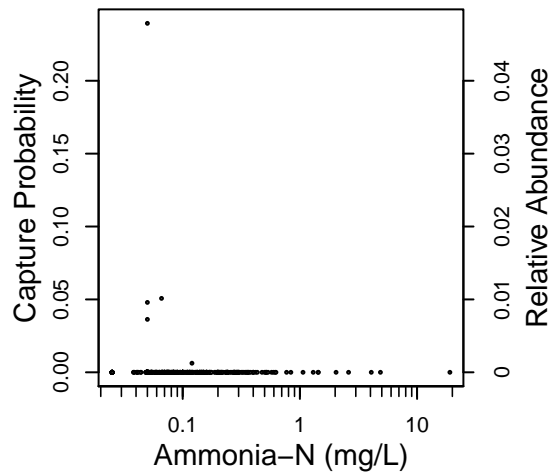
*Microvelia*



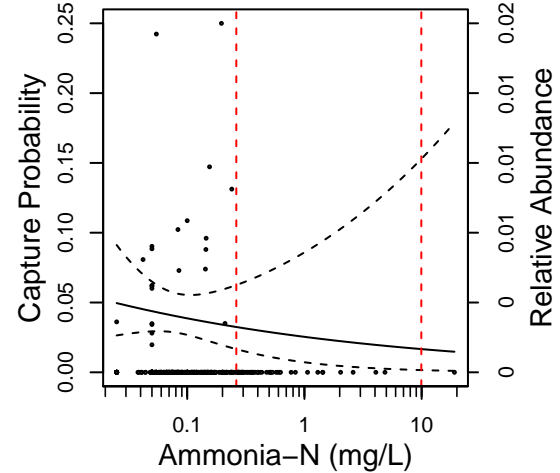
*Musculium*



*Mystacides*

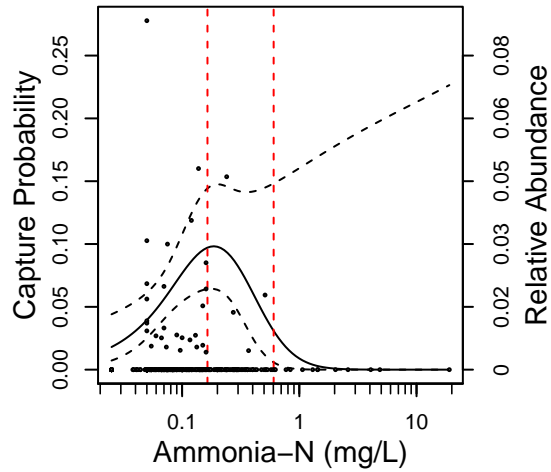


*Nanocladius*

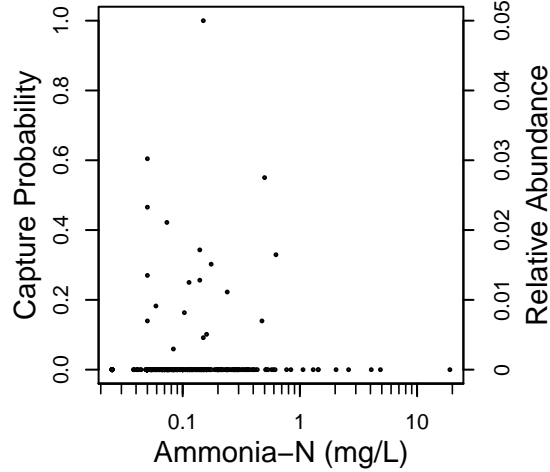


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

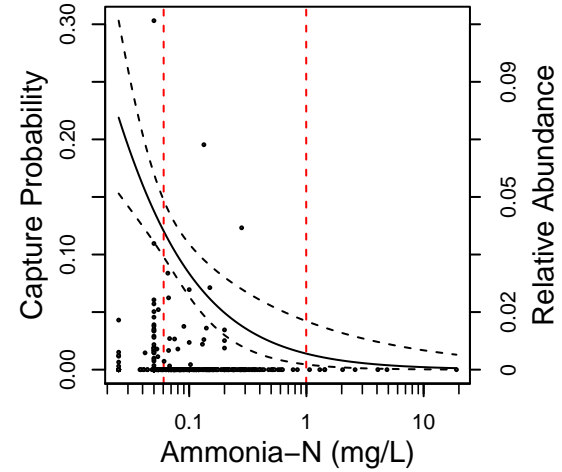
*Nasiaeschna*



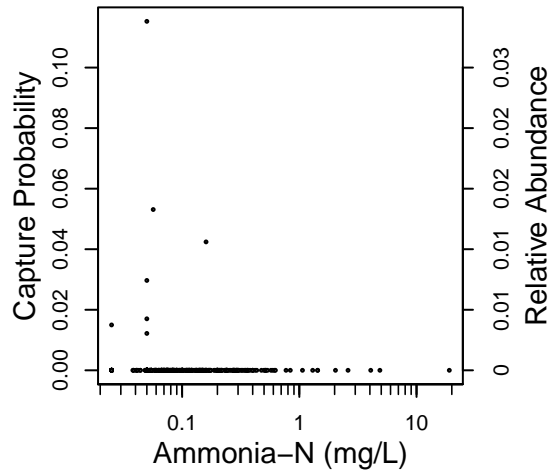
*Natarsia*



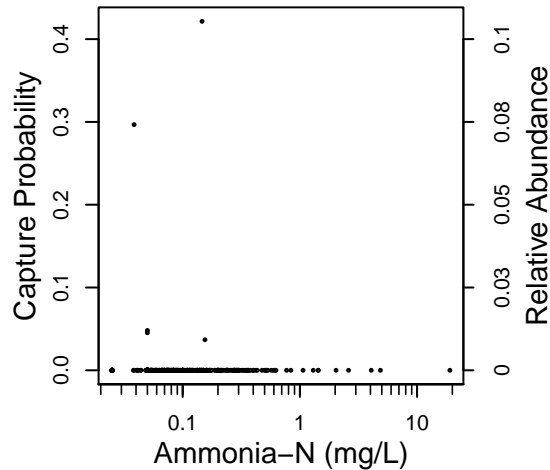
*Nectopsyche*



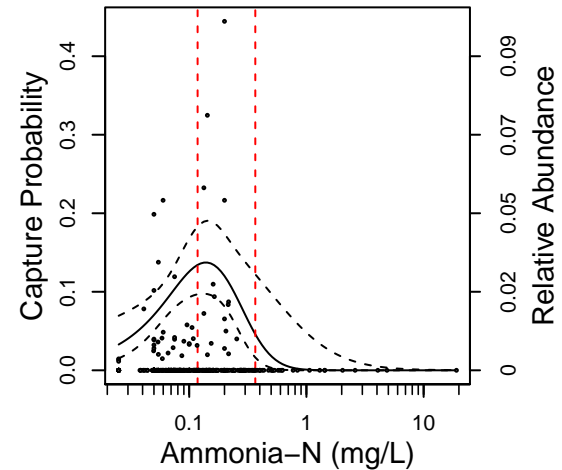
*Neoperla*



*Neophylax*

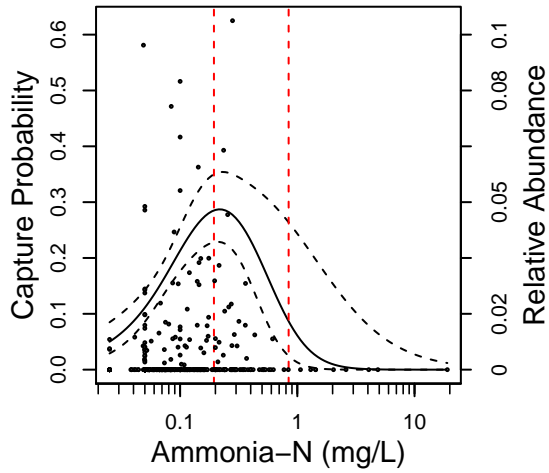


*Neoplea*

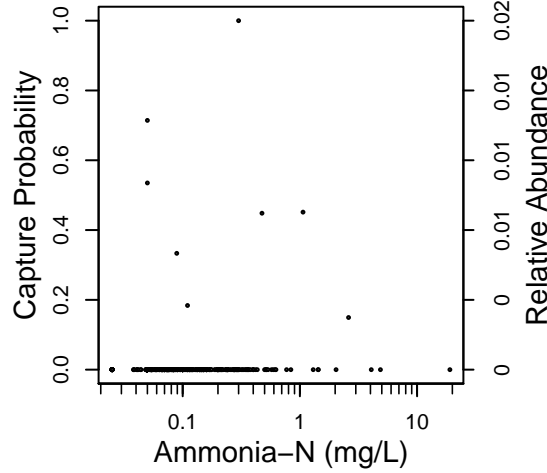


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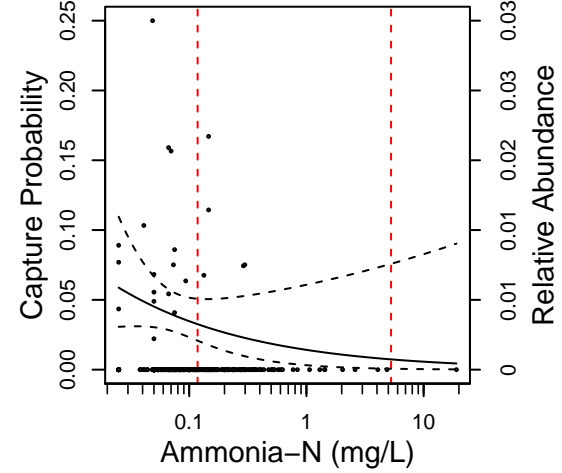
*Neoporus*



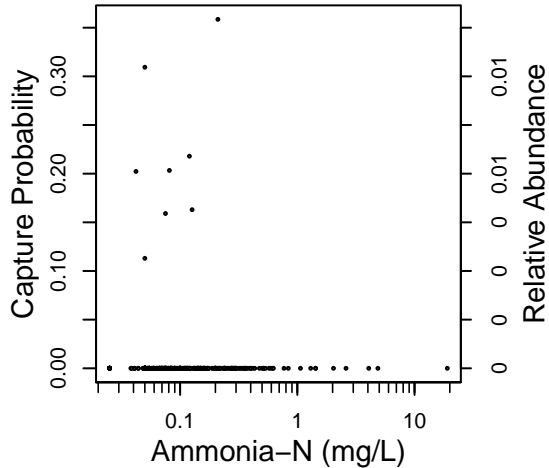
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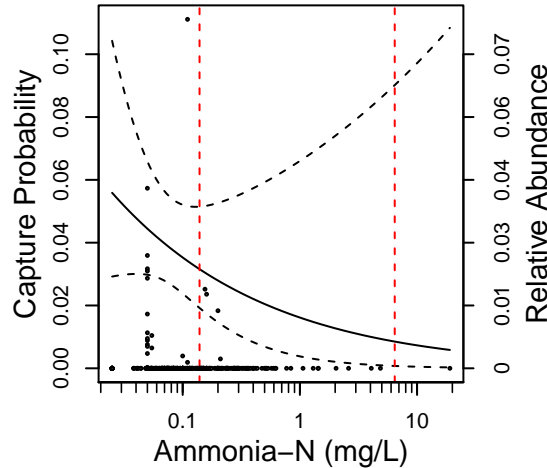
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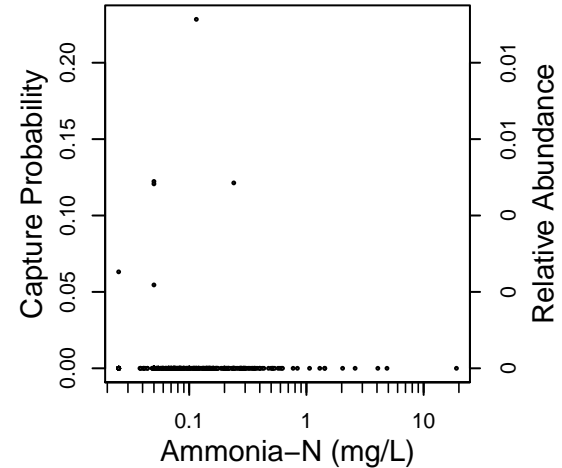
*Neurocordulia*



*Nigronia*

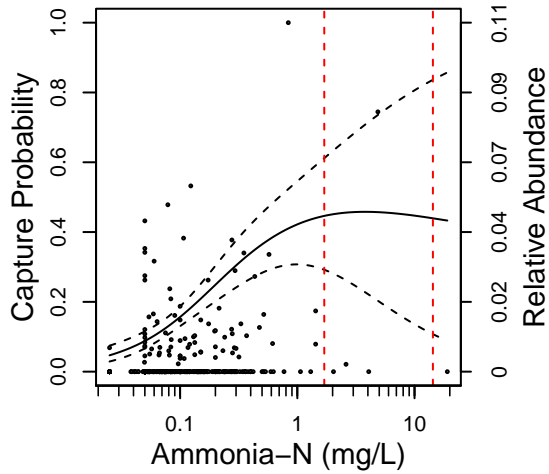


*Nilotanyus*

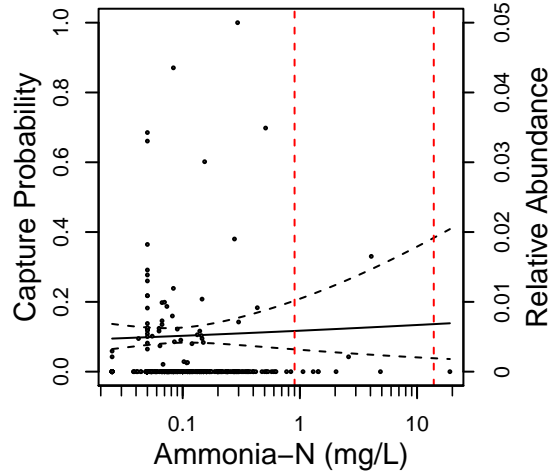


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

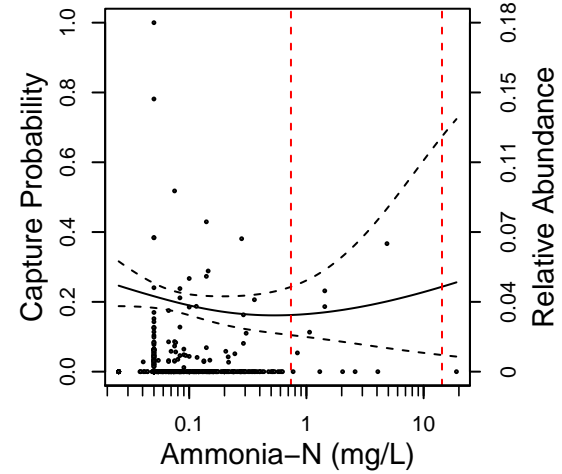
*Notonecta*



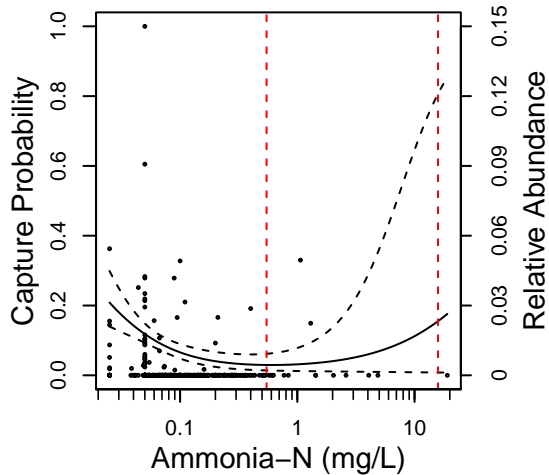
*Oecetis*



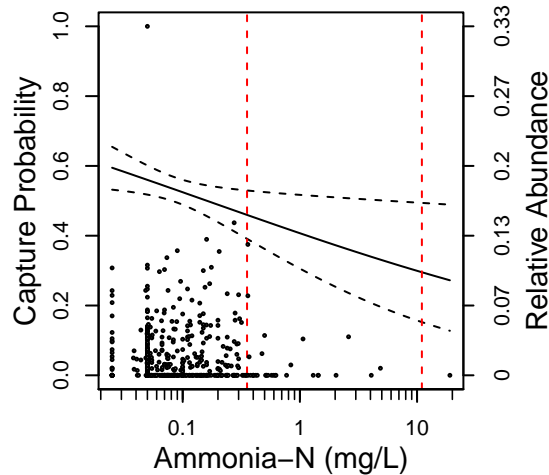
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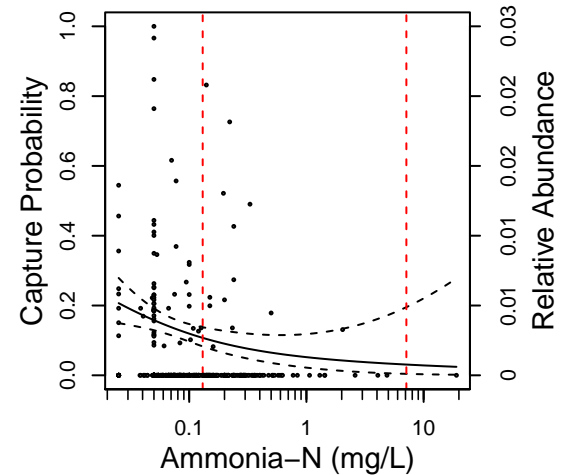
*Optioservus*



*Orconectes*

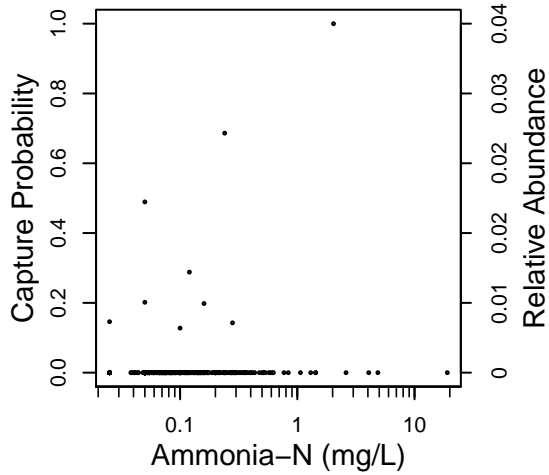


*Orthoclaadiinae*

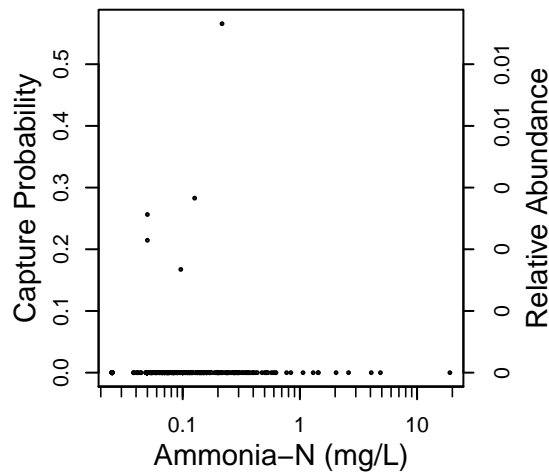


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

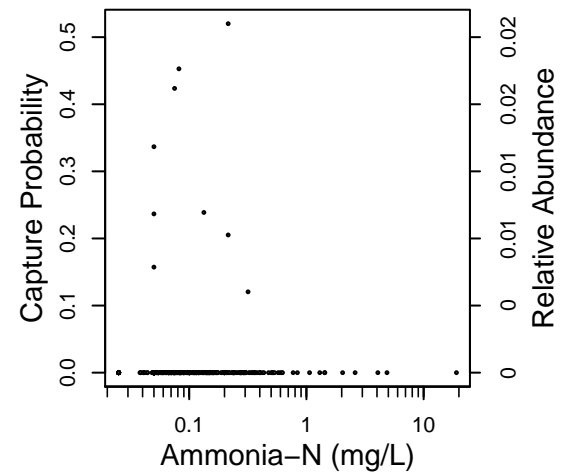
*Orthocladius*



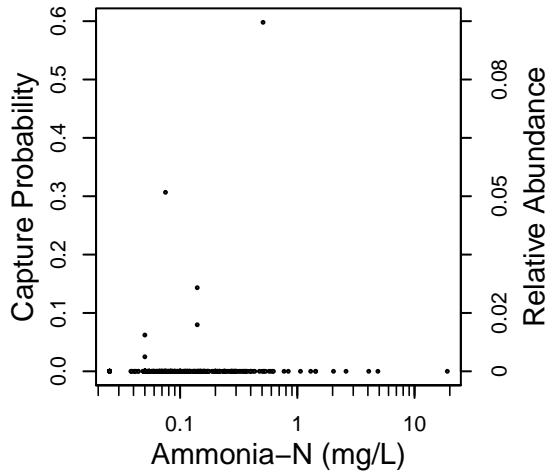
*Oxyethira*



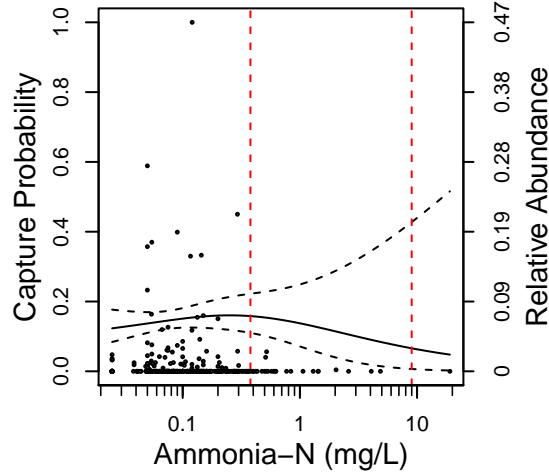
*Pachydiplax*



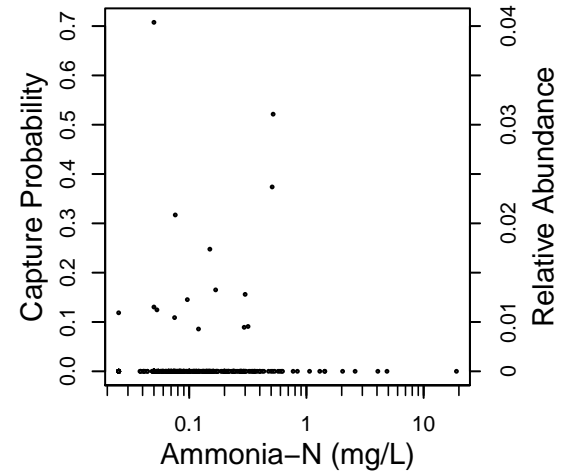
*Palaemonetes*



*Palmarcorixa*

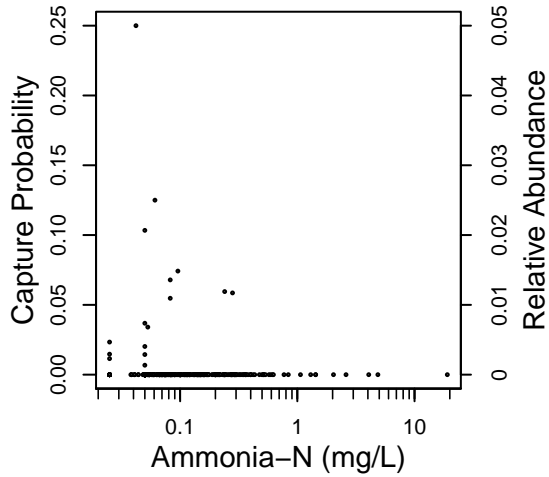


*Parachironomus*

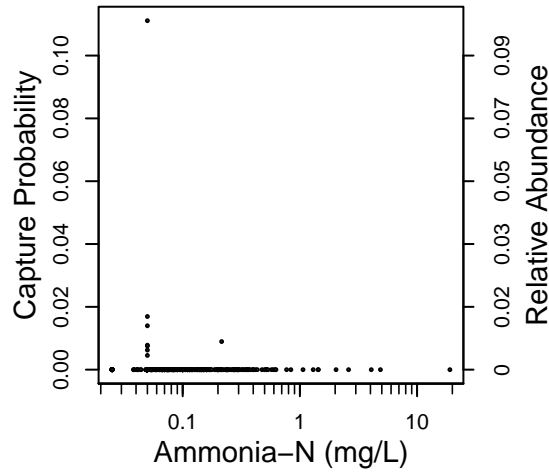


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

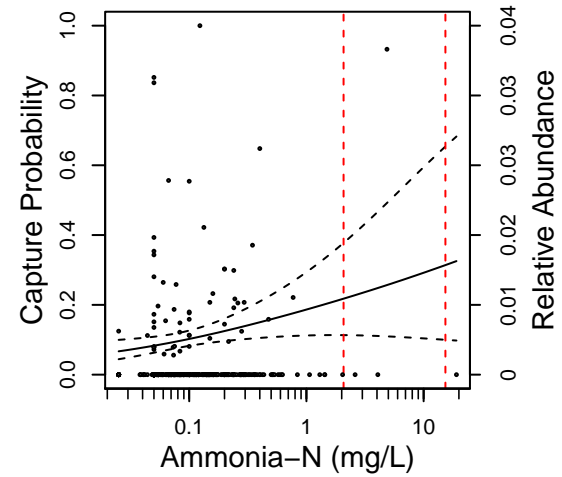
*Paracladopelma*



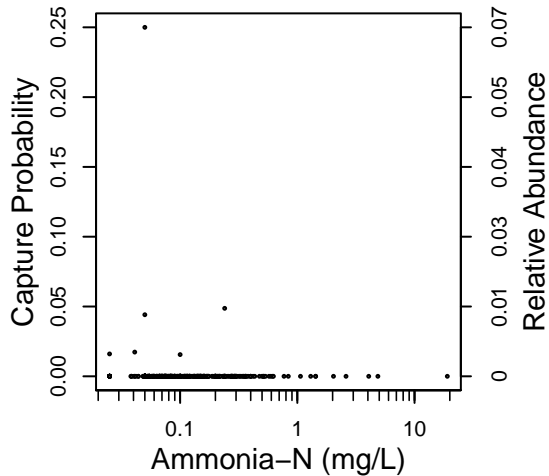
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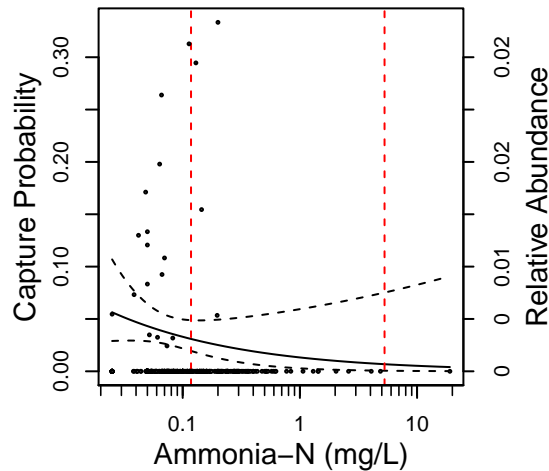
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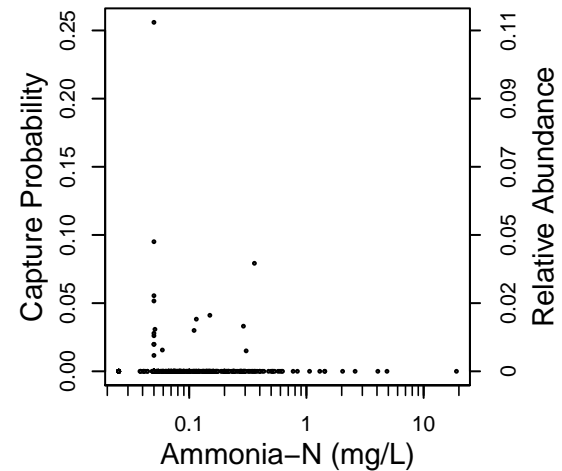
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*Paralauterborniella*



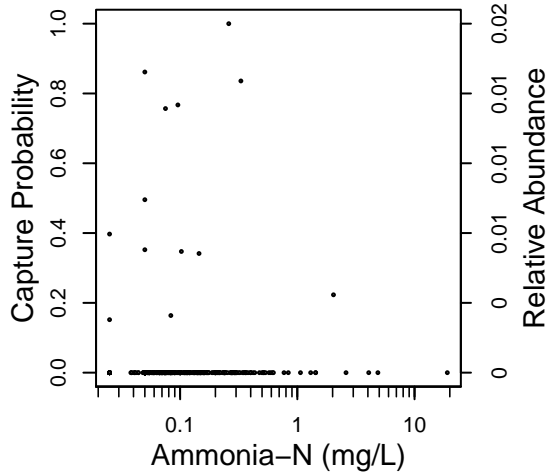
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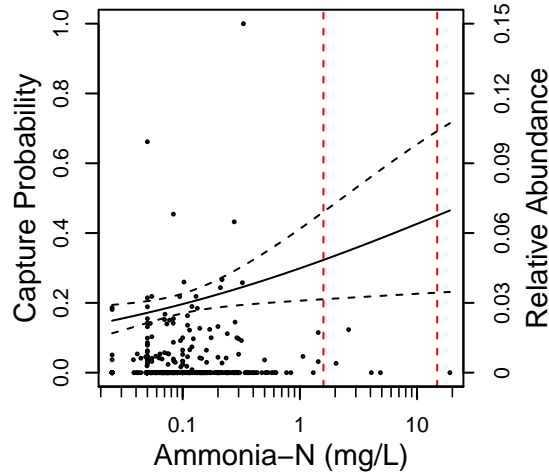


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

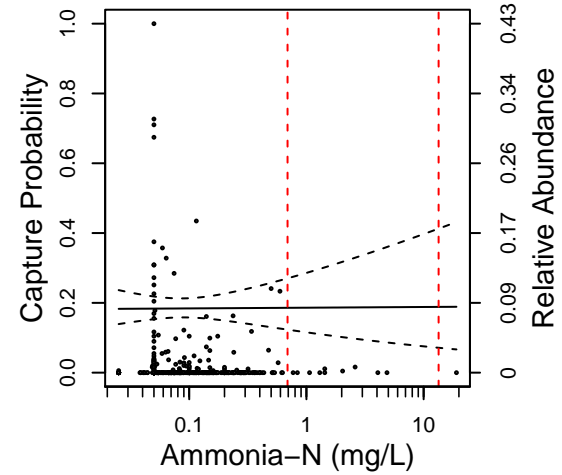
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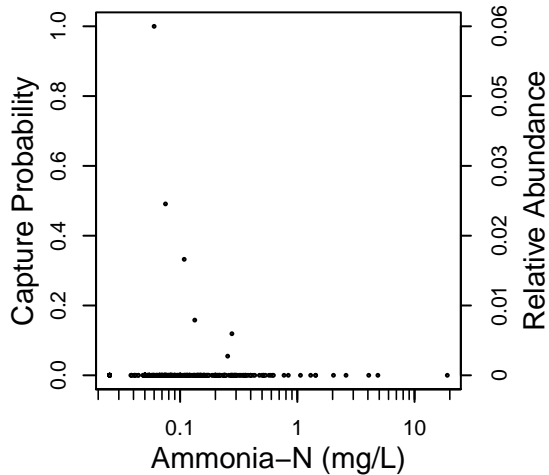
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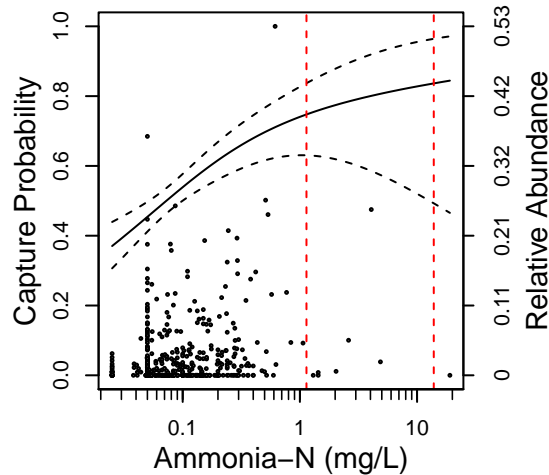
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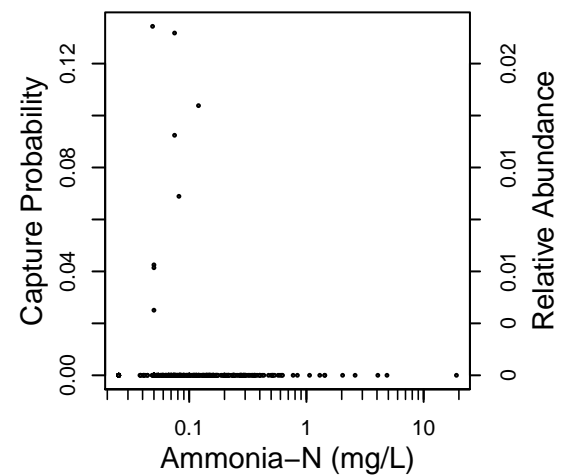
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*Peltodytes*

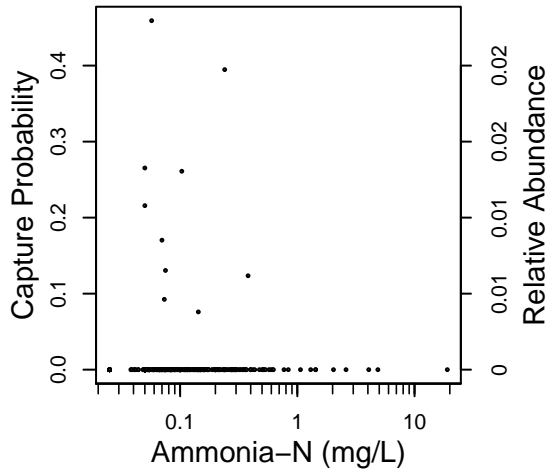


*Pentaneura*

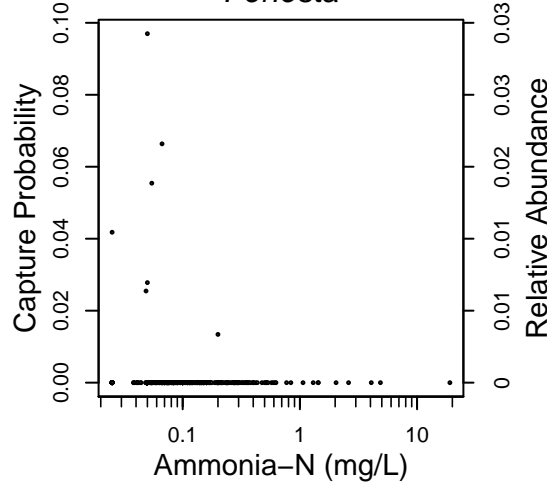


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

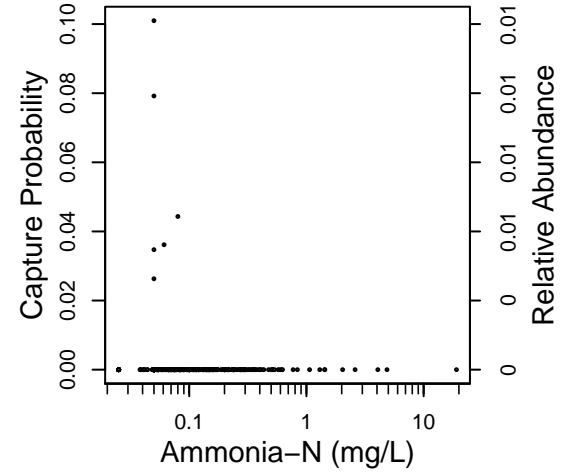
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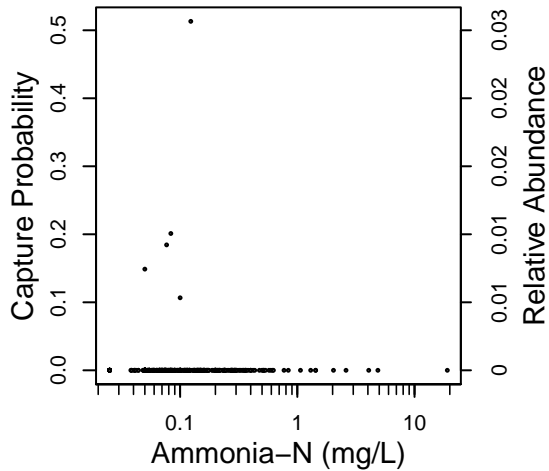
*Perlesta*



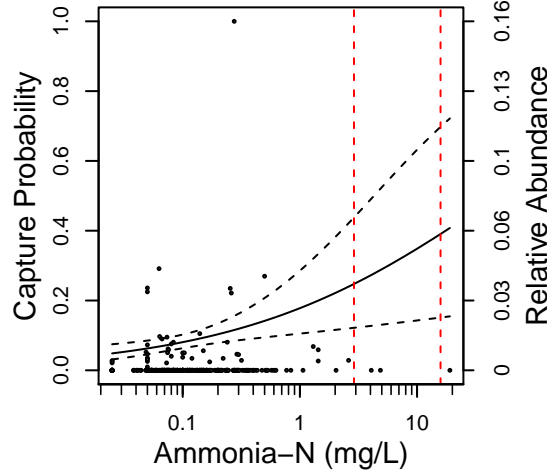
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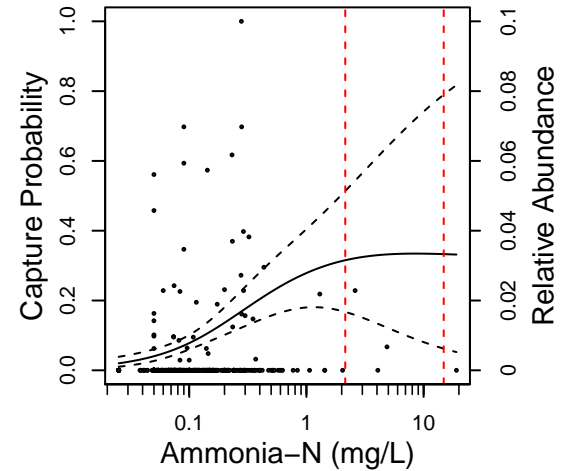
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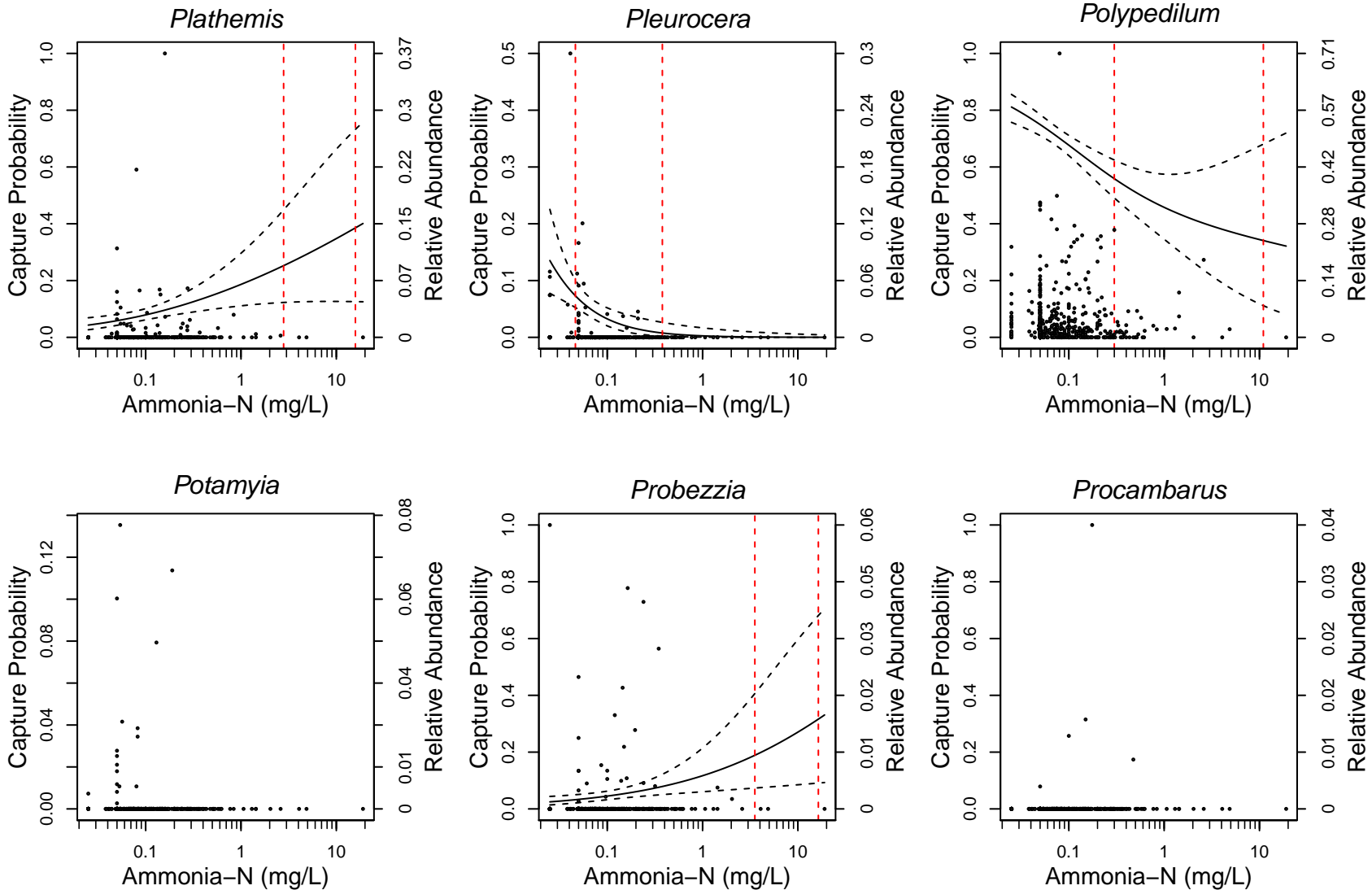
*Pisidium*



*Planorbella*

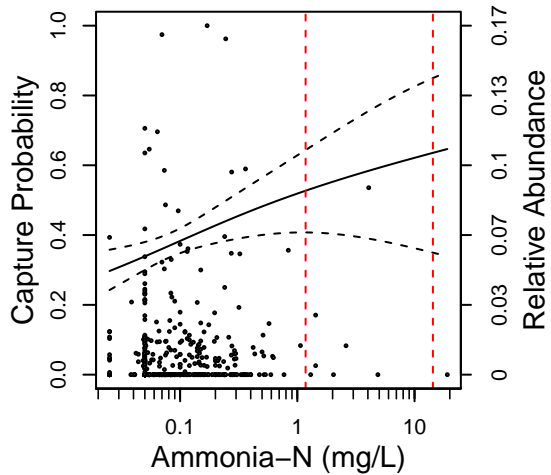


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

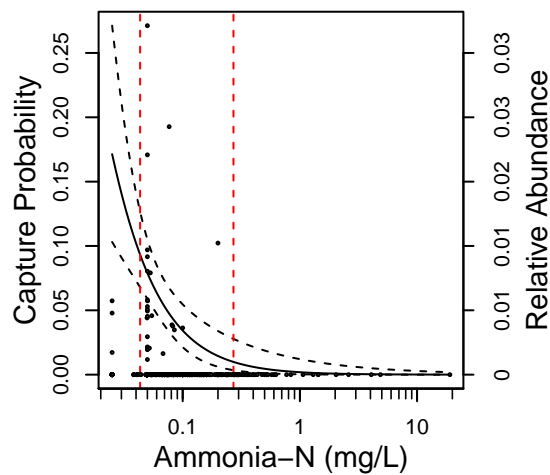


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

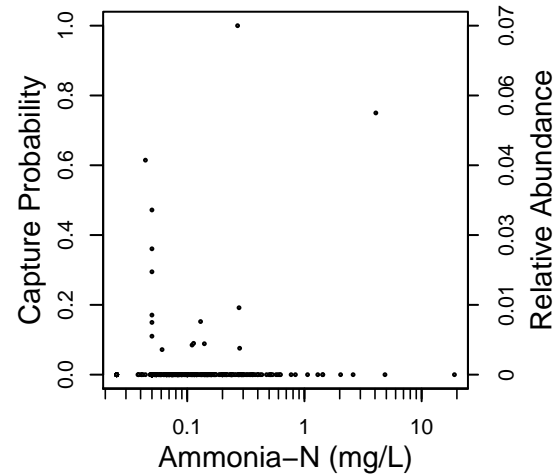
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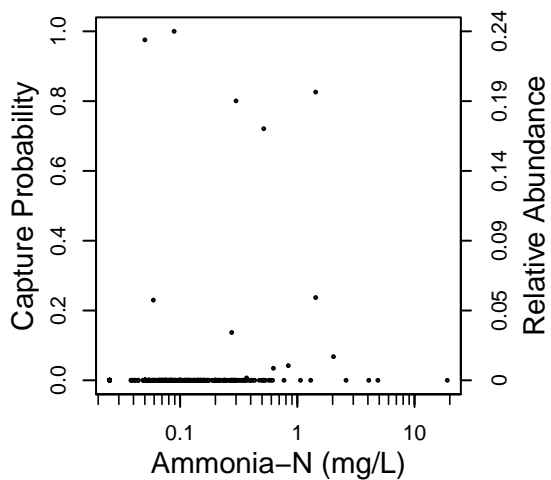
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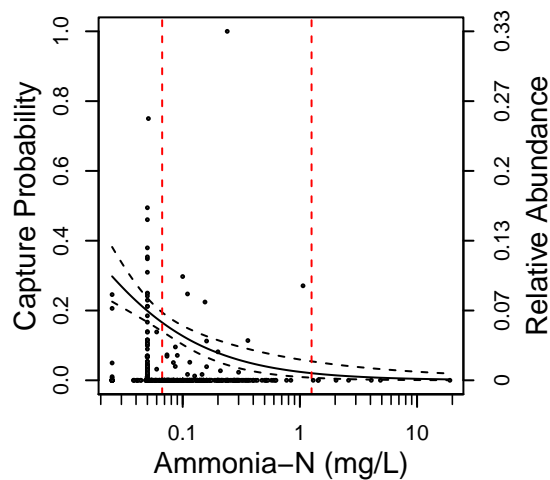
*Progomphus*



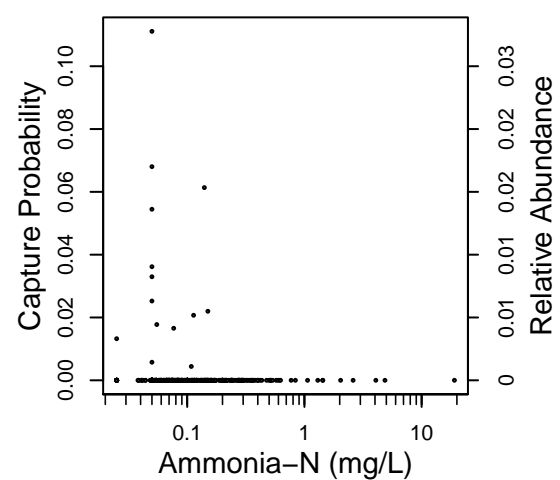
*Psectrotanypus*



*Psephenus*

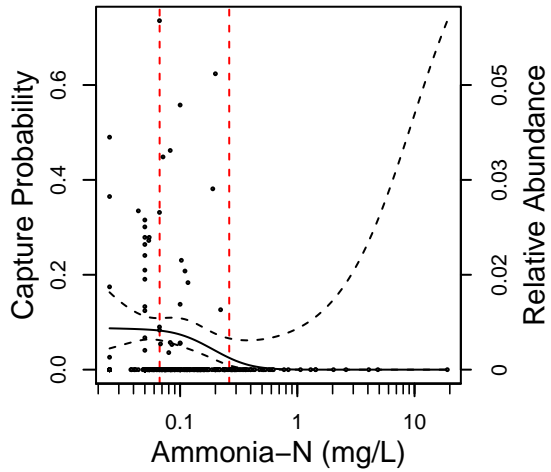


*Pseudochironomus*

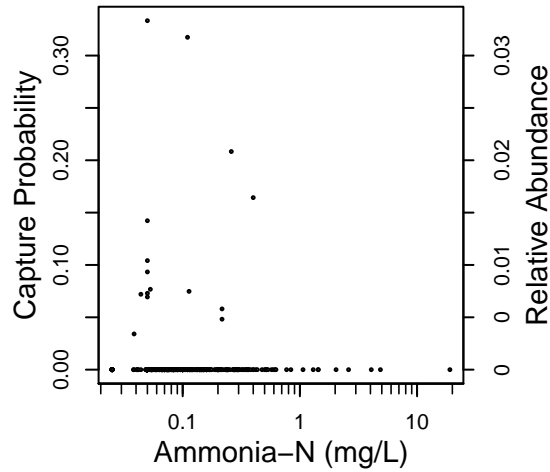


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

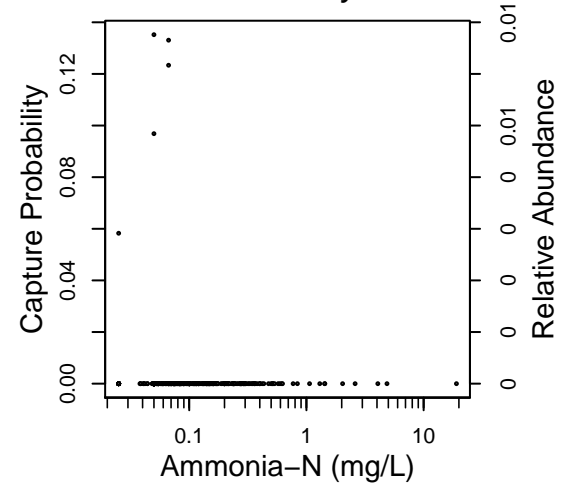
*Pseudocloeon*



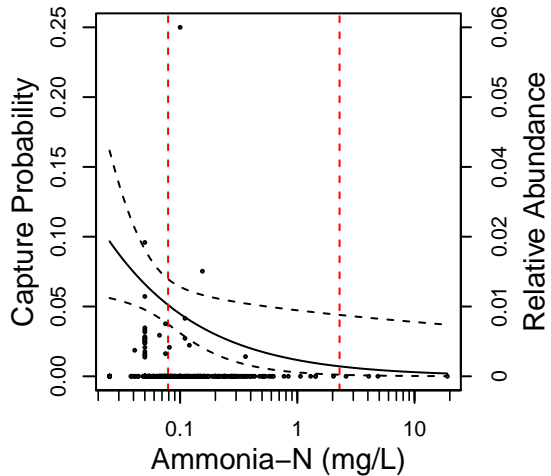
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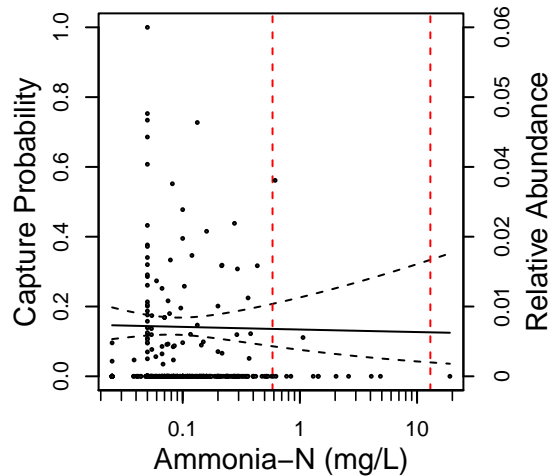
*Pteronarcys*



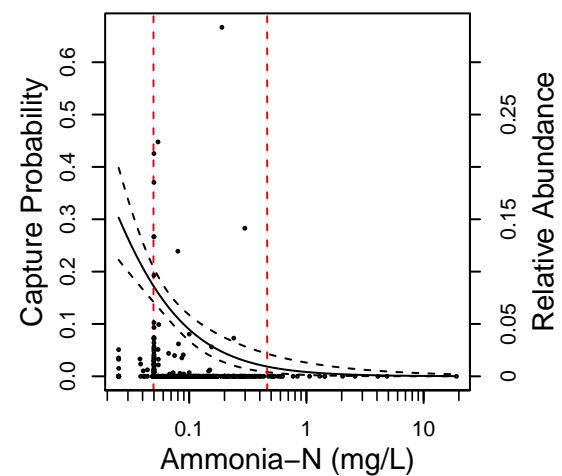
*Pycnopsyche*



*Ranatra*

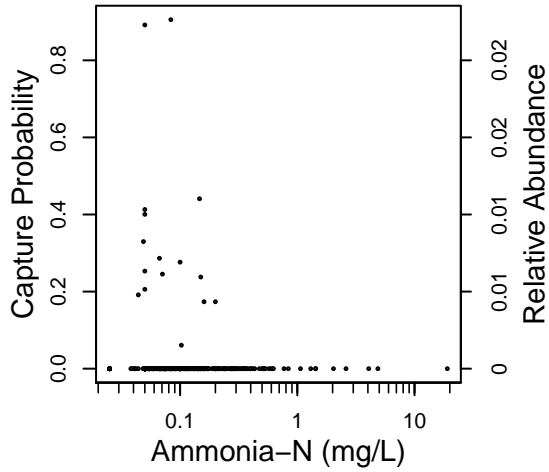


*Rhagovelia*

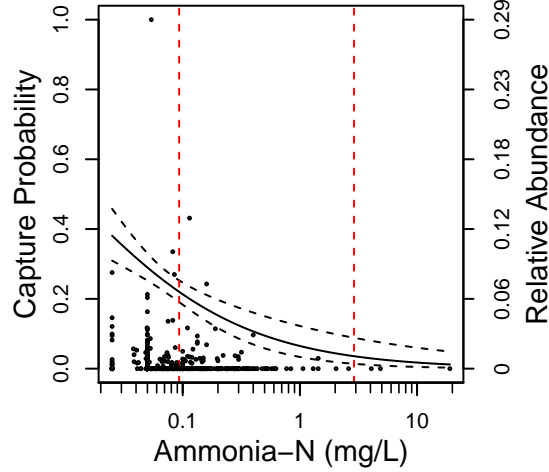


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

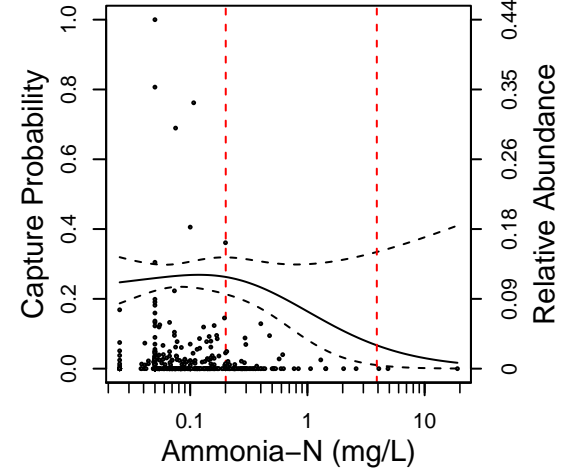
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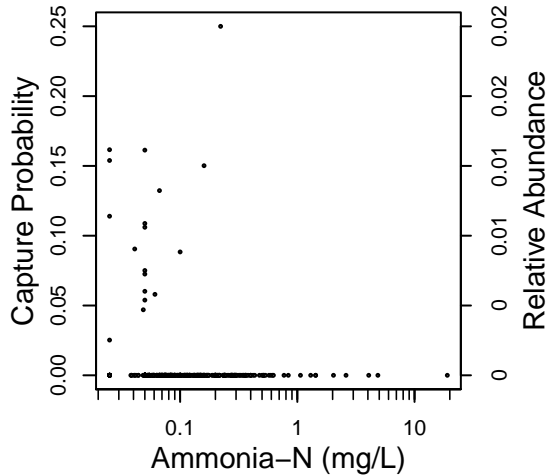
*Rheotanytarsus*



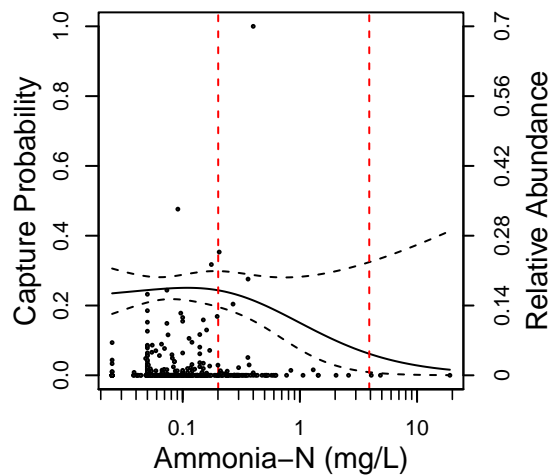
*Rheumatobates*



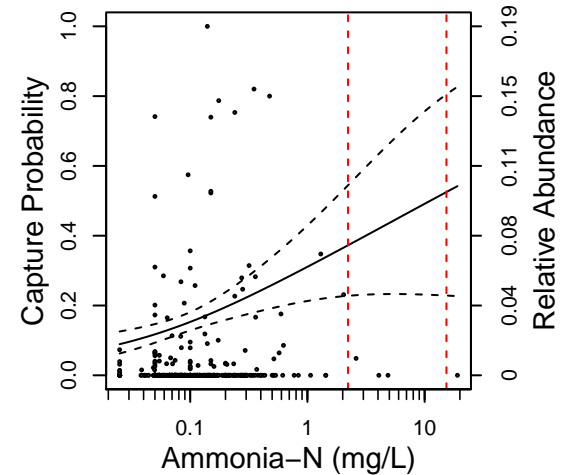
*Saetheria*



*Sialis*

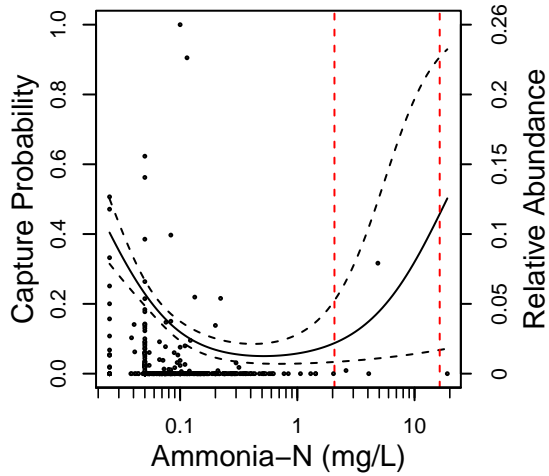


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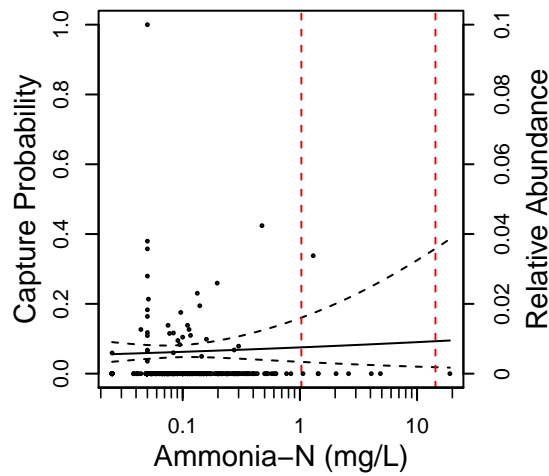


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

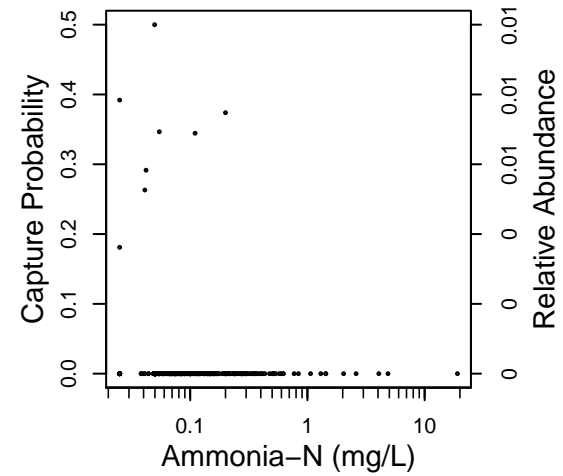
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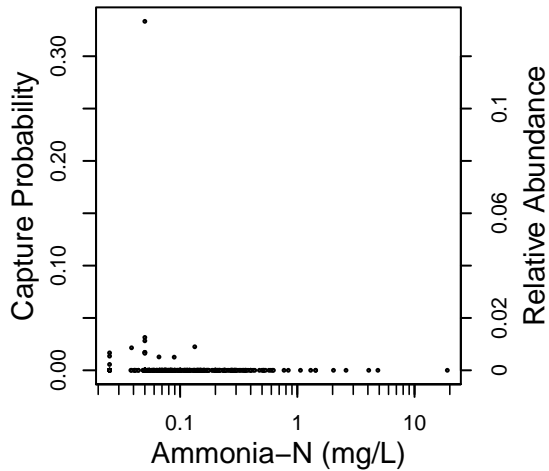
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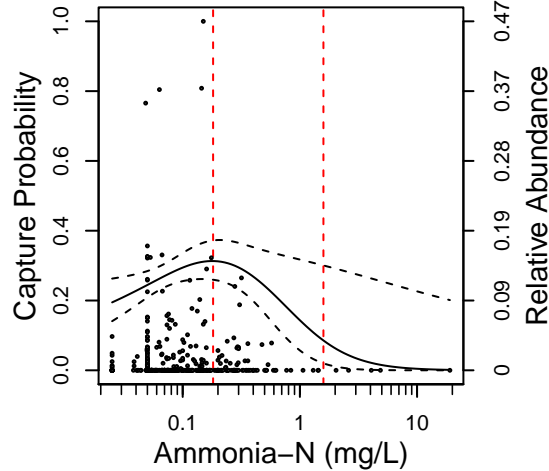
*Sparbarus*



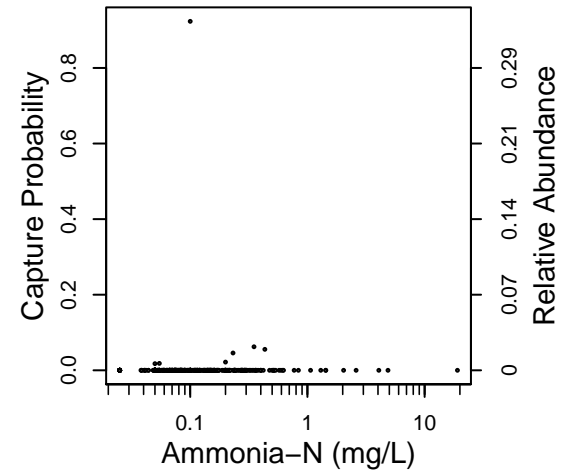
*Sperchopsis*



*Sphaerium*

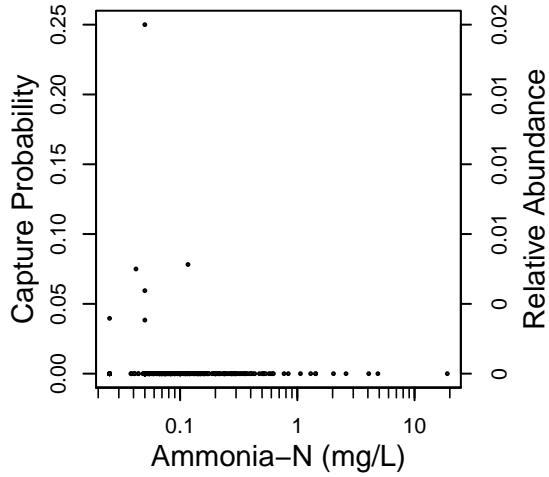


*Stagnicola*

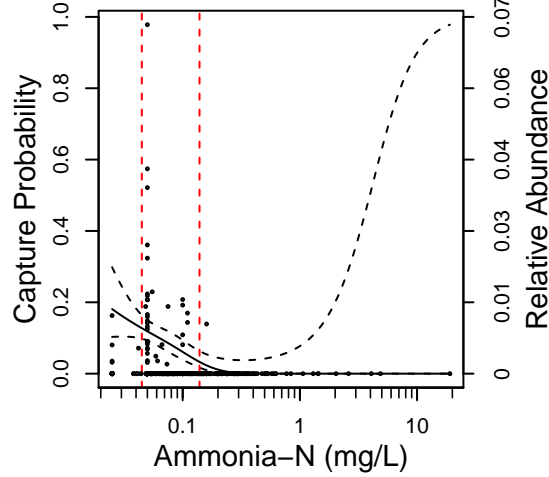


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

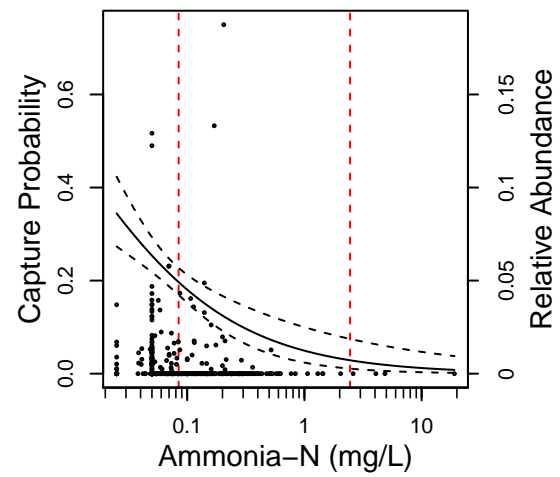
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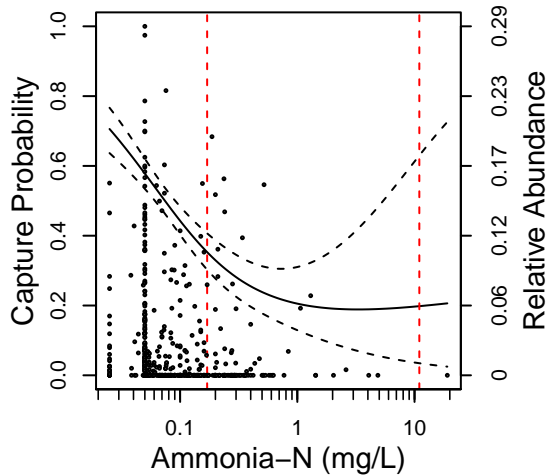
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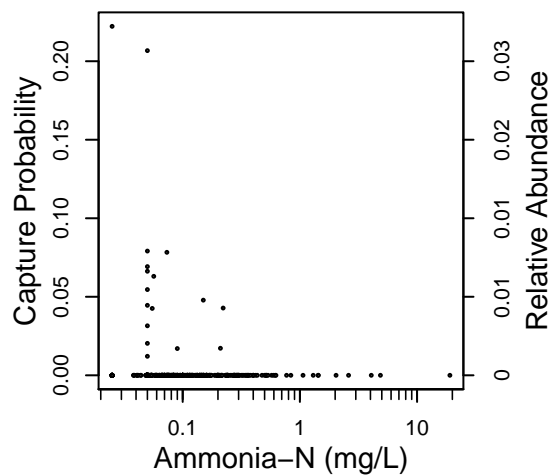
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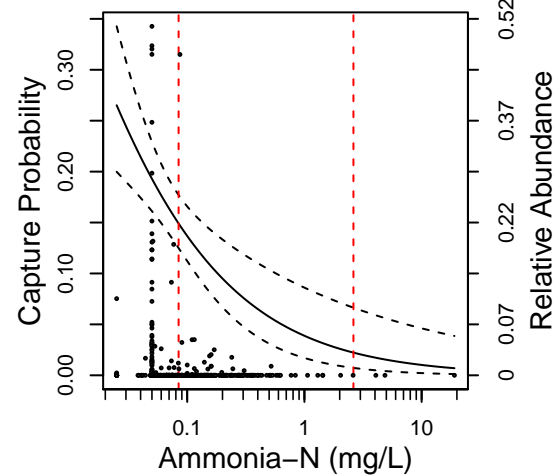
*Stenelmis*



*Stenochironomus*

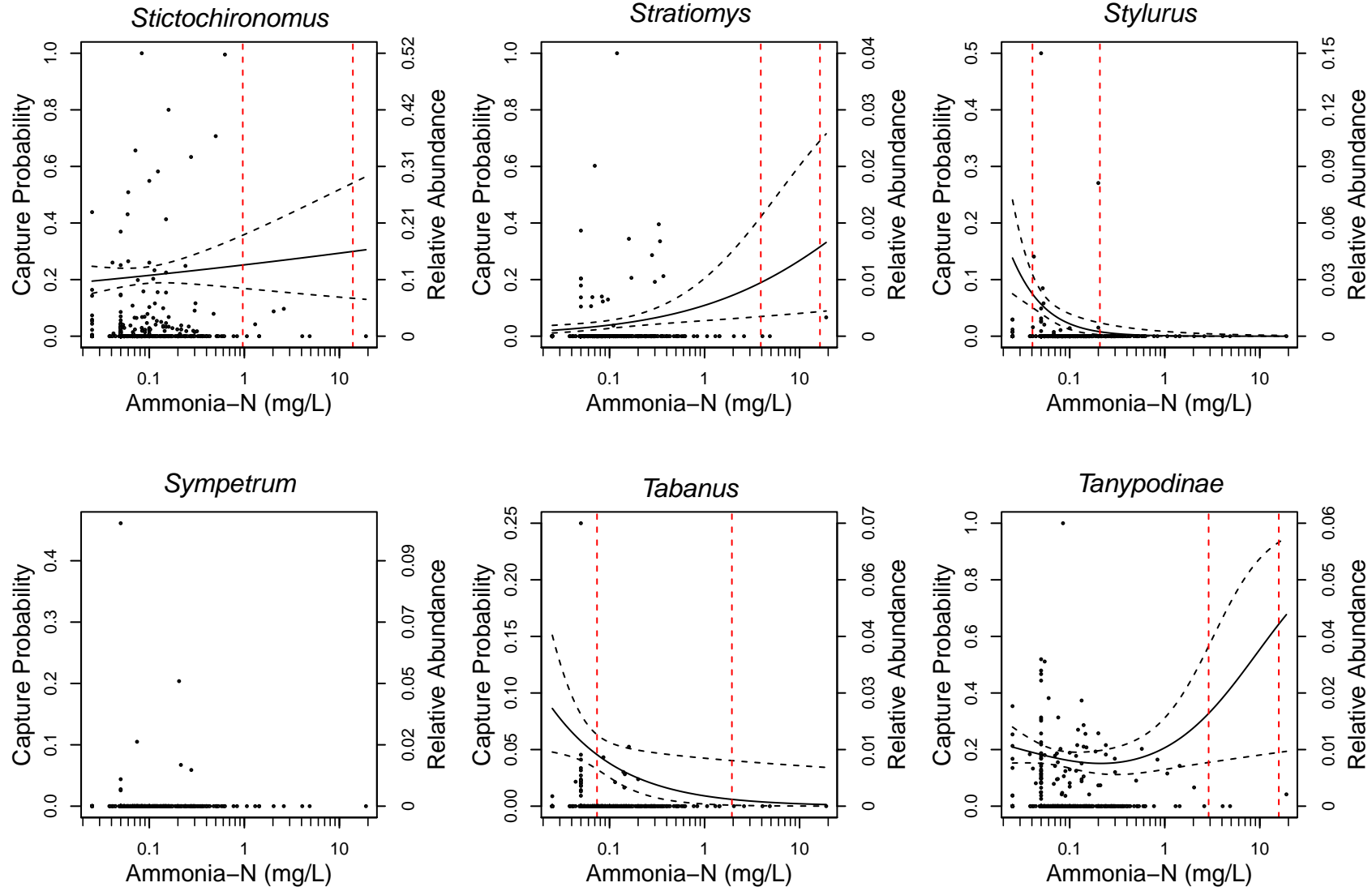


*Stenonema*



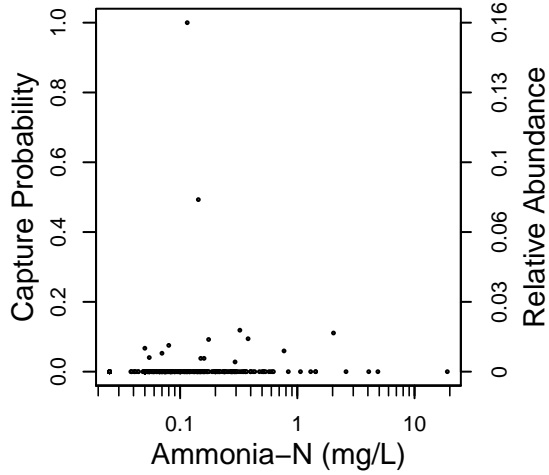


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

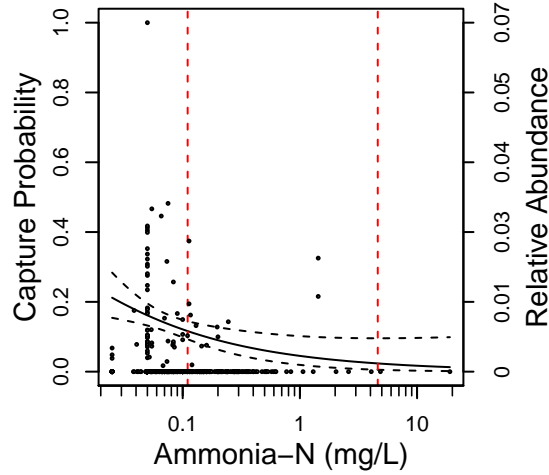


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

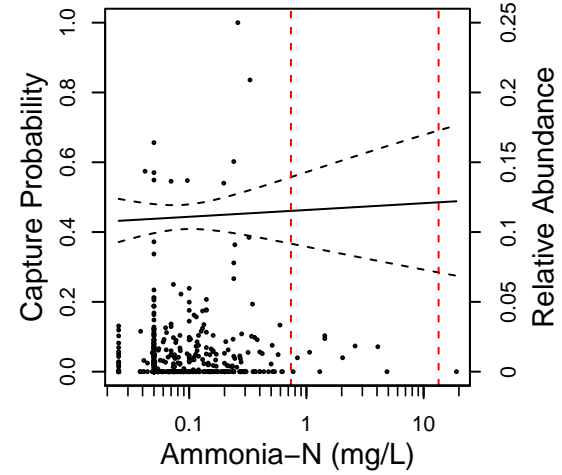
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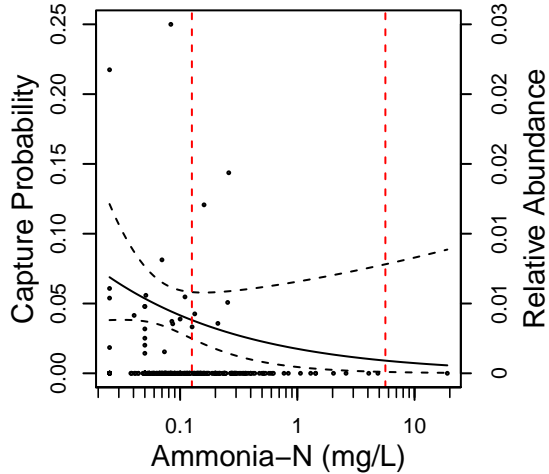
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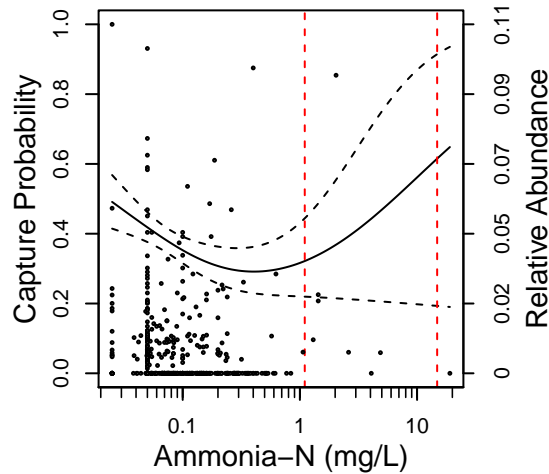
*Tanytarsus*



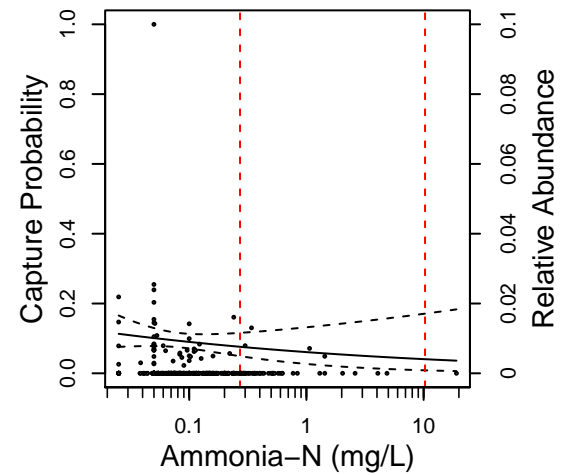
*Thienemanniella*



*Thienemannimyia*

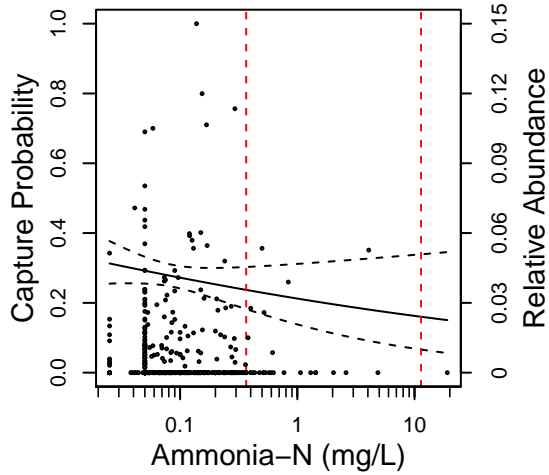


*Tipula*

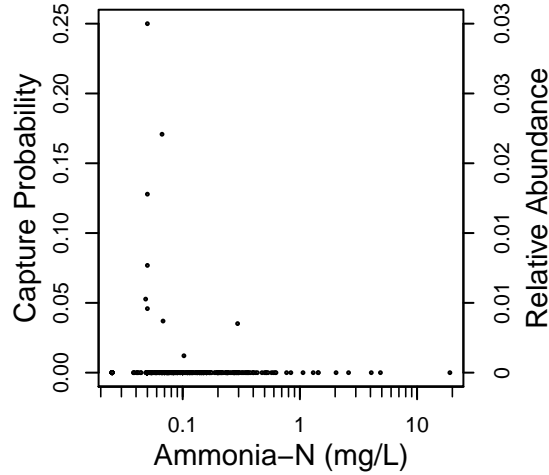


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

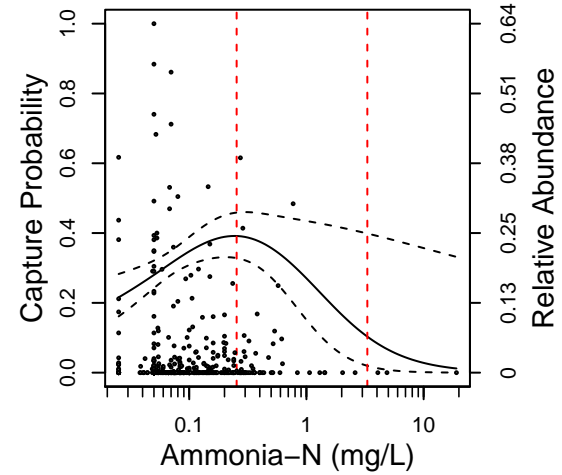
*Trepobates*



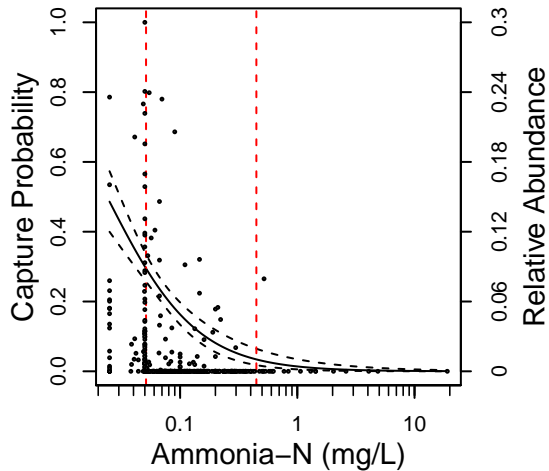
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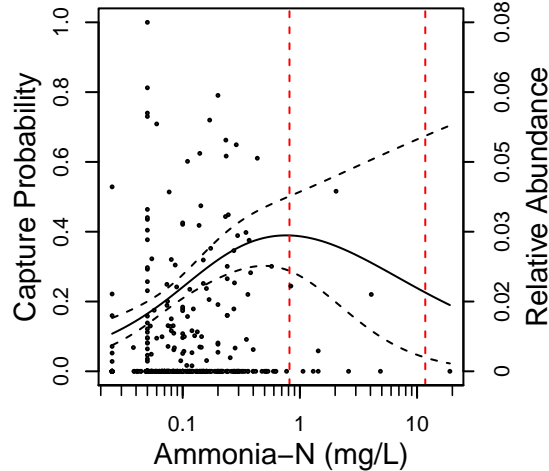
*Trichocorixa*



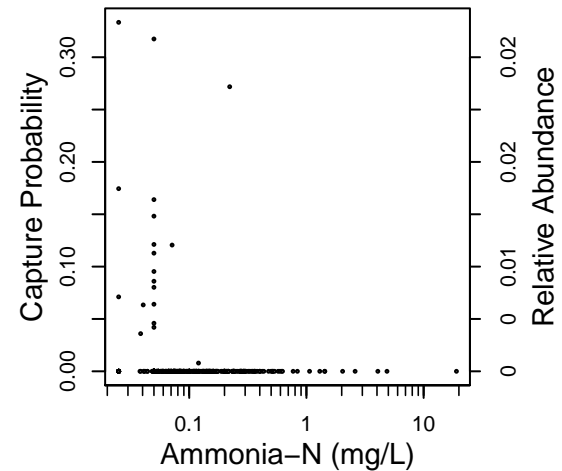
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*Tropisternus*

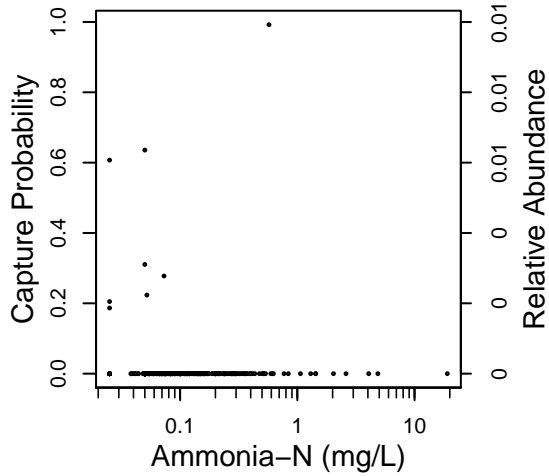


*Tvetenia*

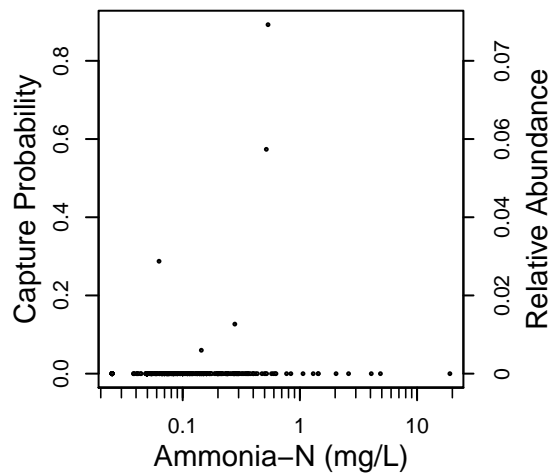


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

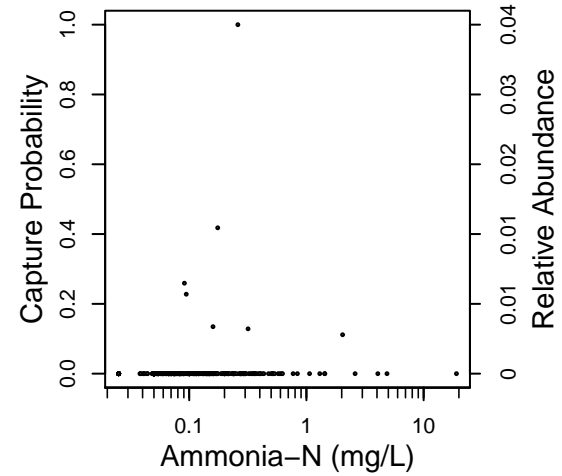
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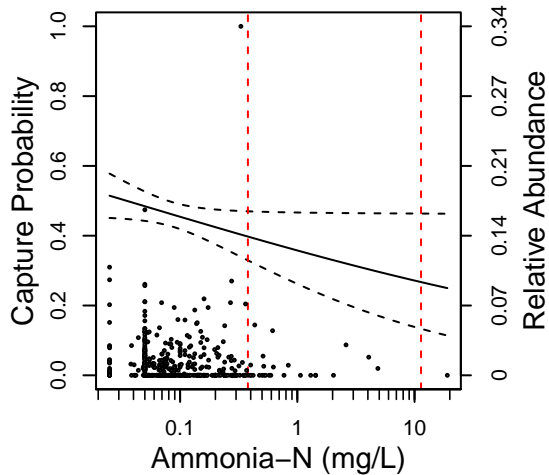
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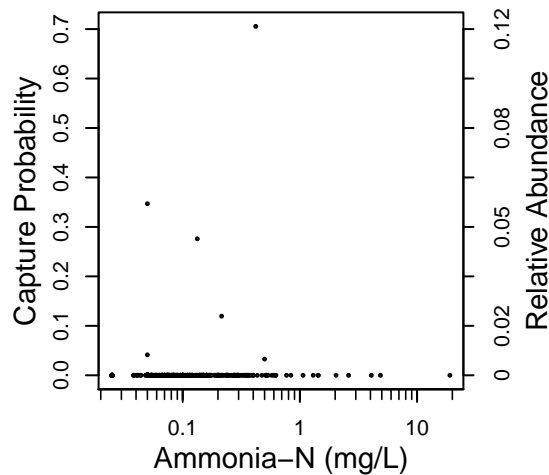
*Zavrelimyia*



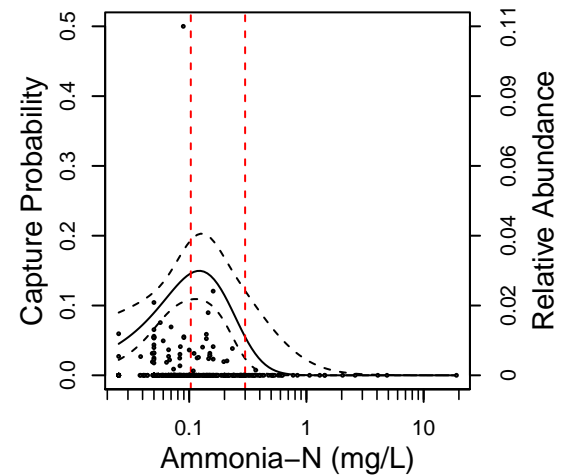
*Aeshnidae*



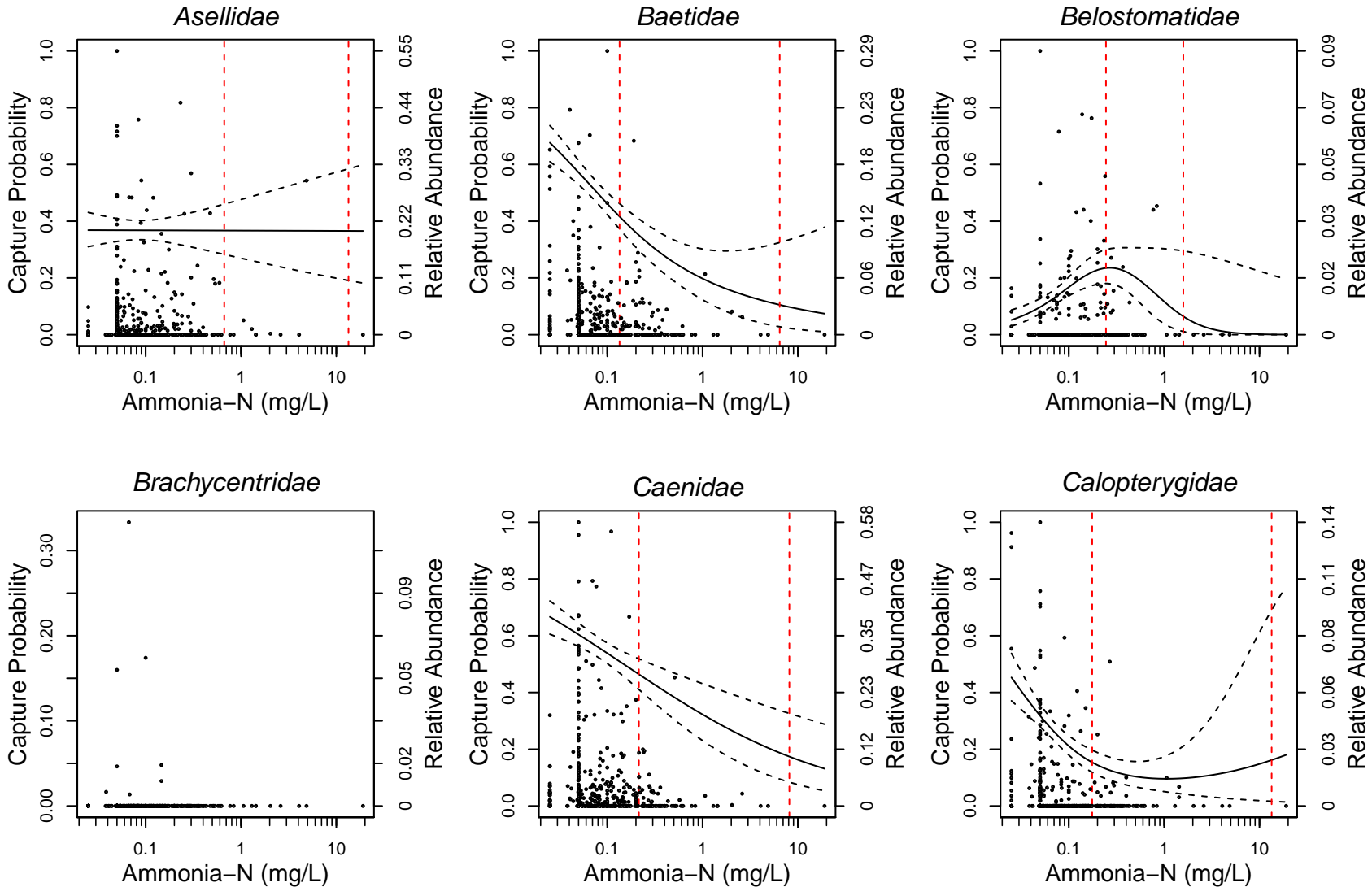
*Amphipoda*



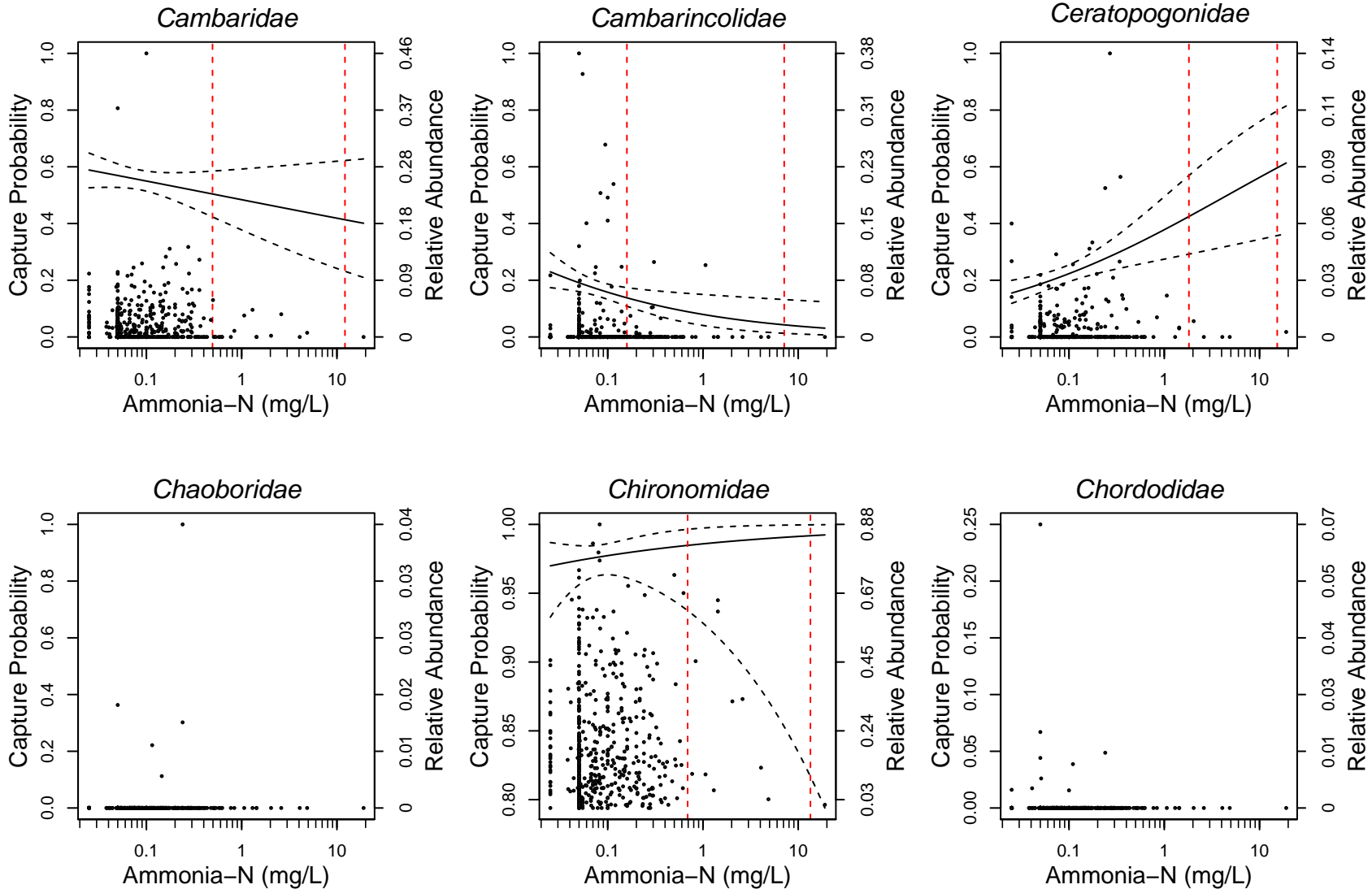
*Ancylidae*



# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

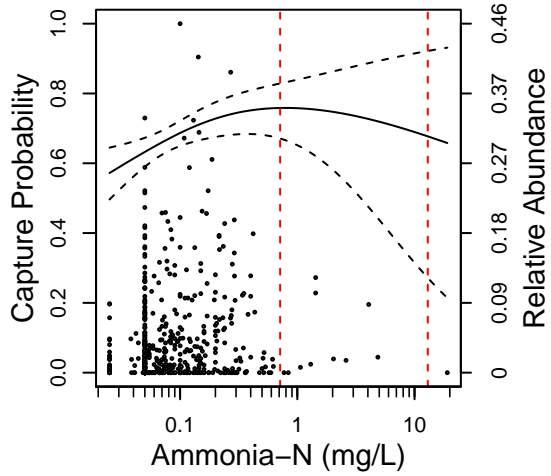


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

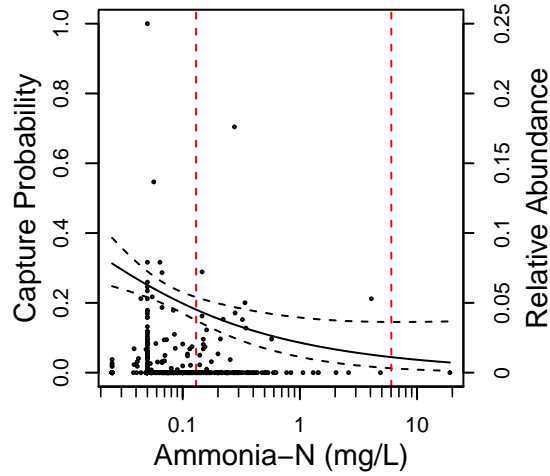


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

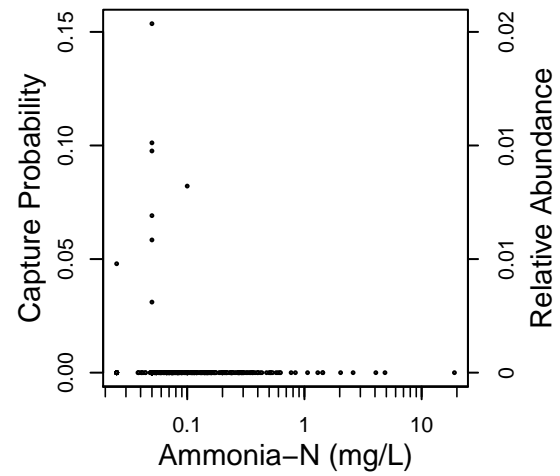
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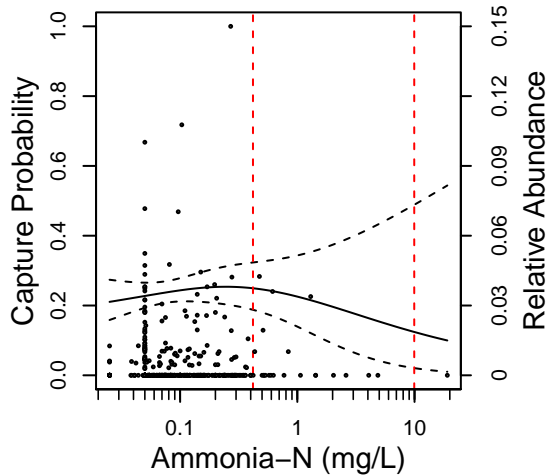
*Corbiculidae*



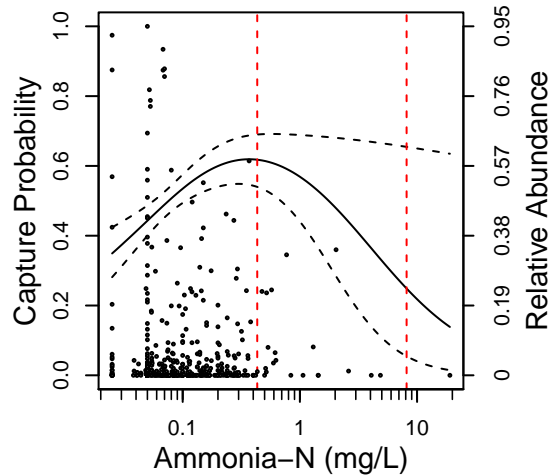
*Cordulegastridae*



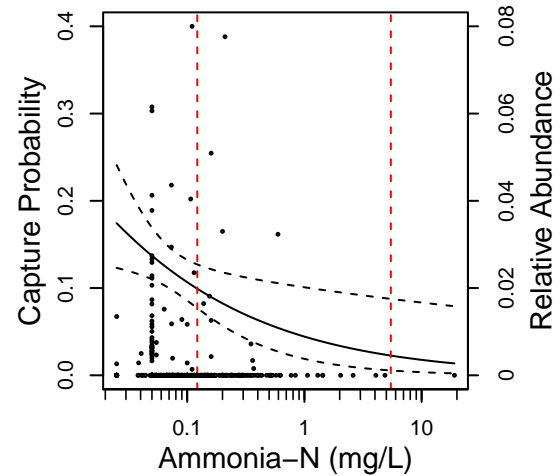
*Corduliidae*



*Corixidae*

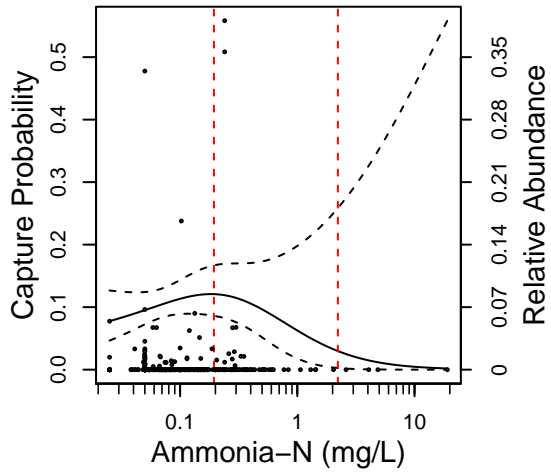


*Corydalidae*

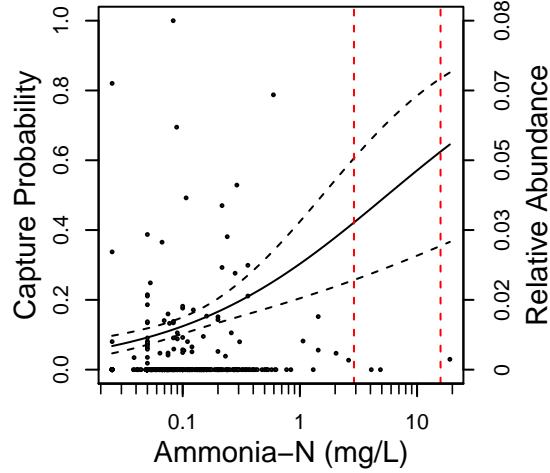


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

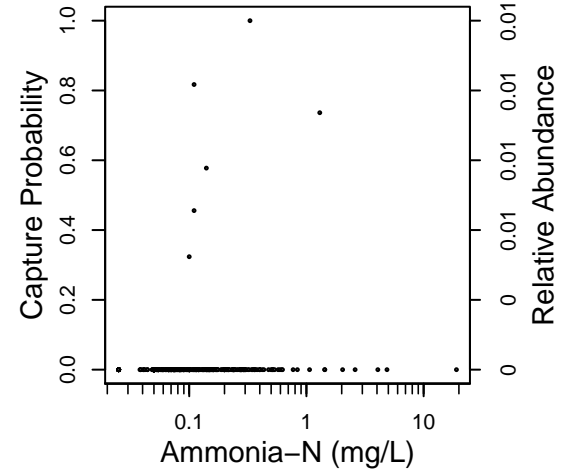
*Crangonyctidae*



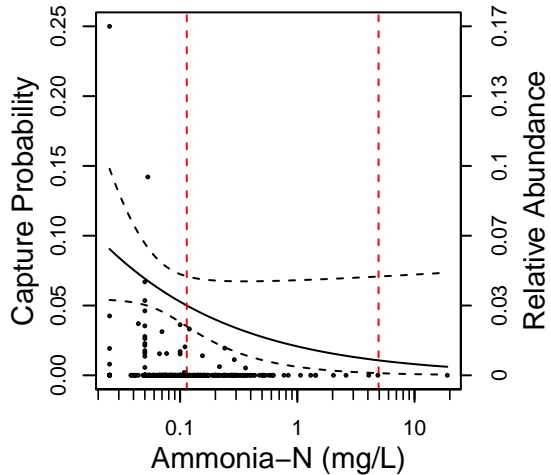
*Culicidae*



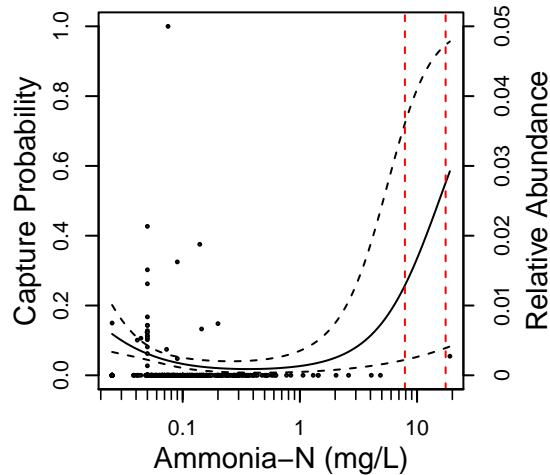
*Curculionidae*



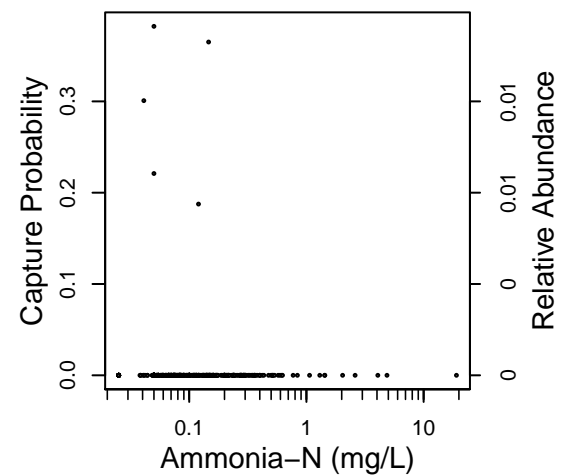
*Dixidae*



*Dorylaimidae*



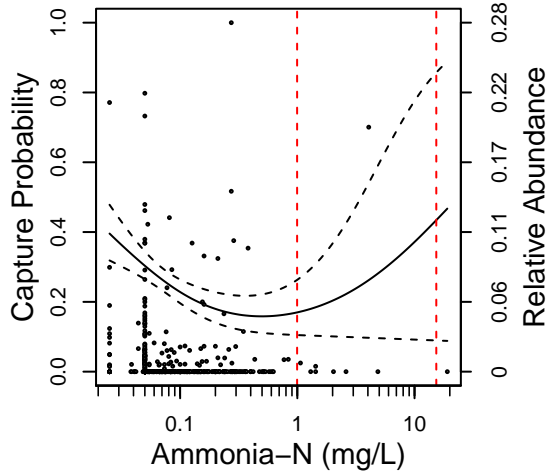
*Dreissenidae*



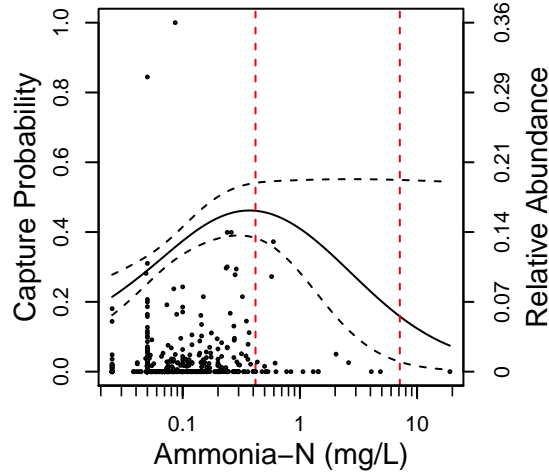


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

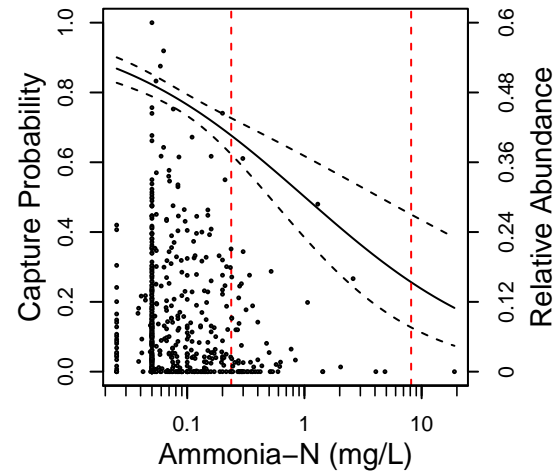
*Dryopidae*



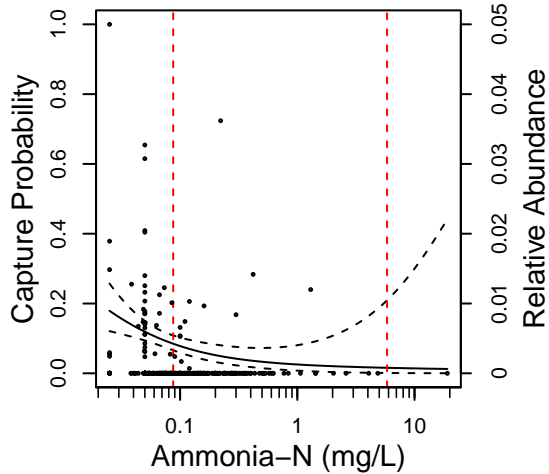
*Dytiscidae*



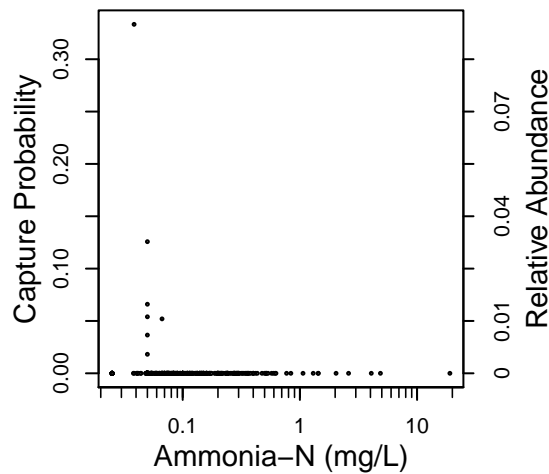
*Elmidae*



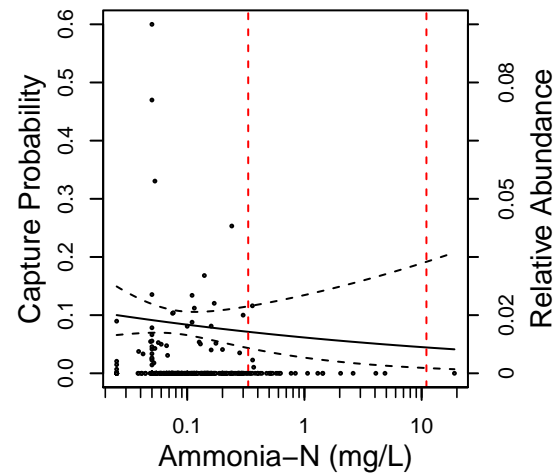
*Empididae*



*EphemereIllidae*

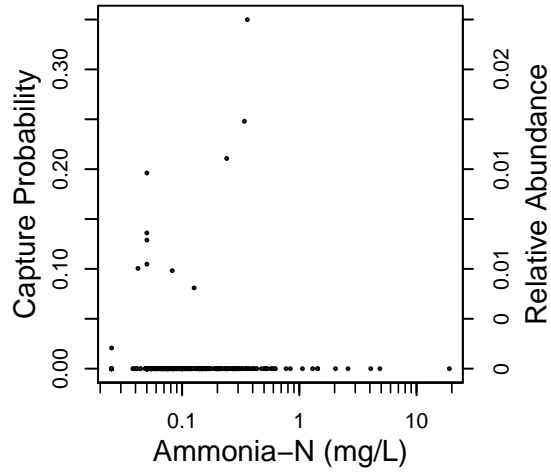


*Ephemeraidae*

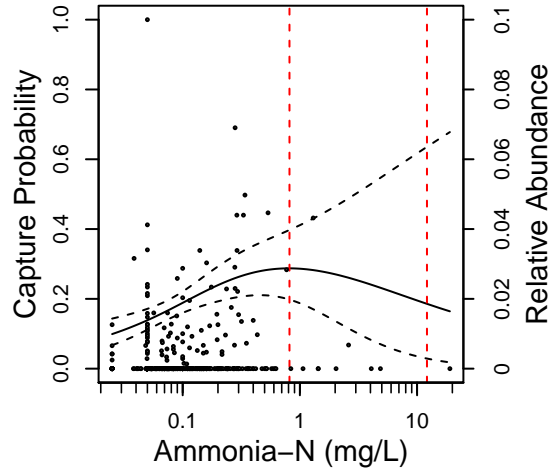


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

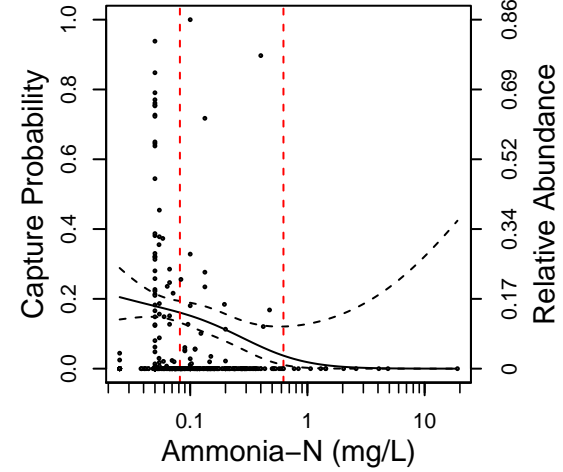
*Ephydriidae*



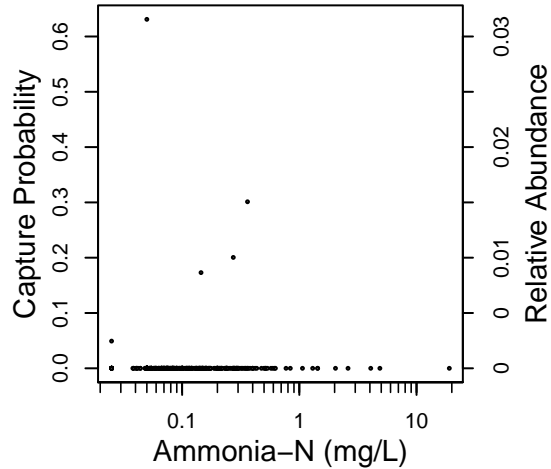
*Erpobdellidae*



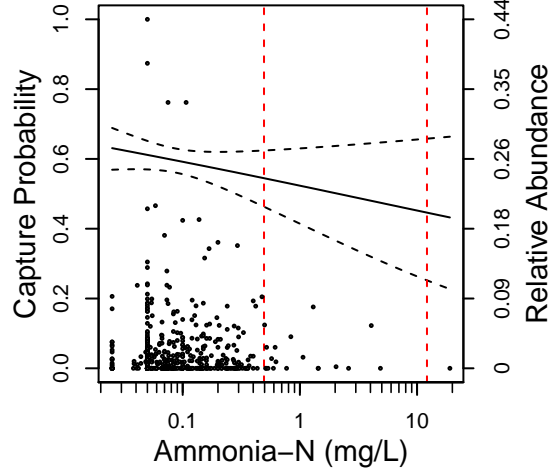
*Gammaridae*



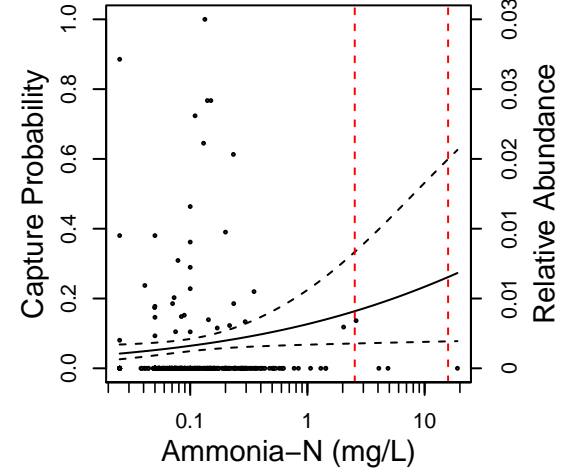
*Gelastocoridae*



*Gerridae*

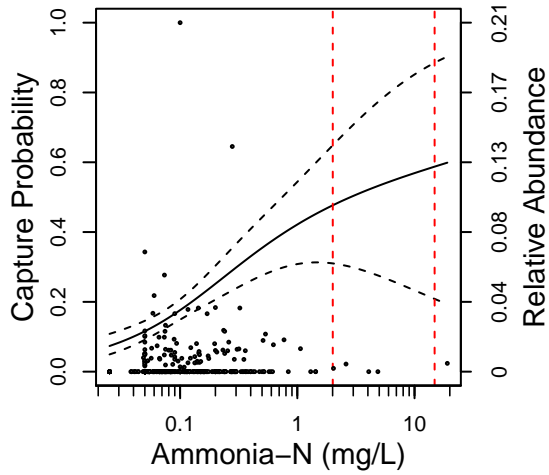


*GERRIDAE*

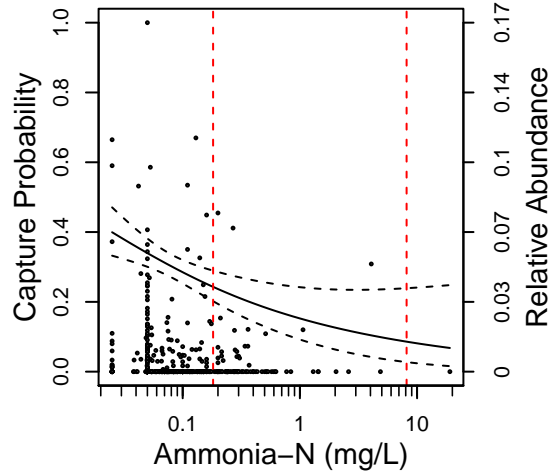


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

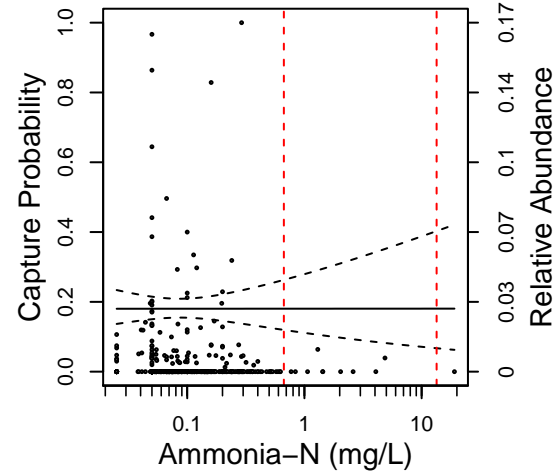
*Glossiphoniidae*



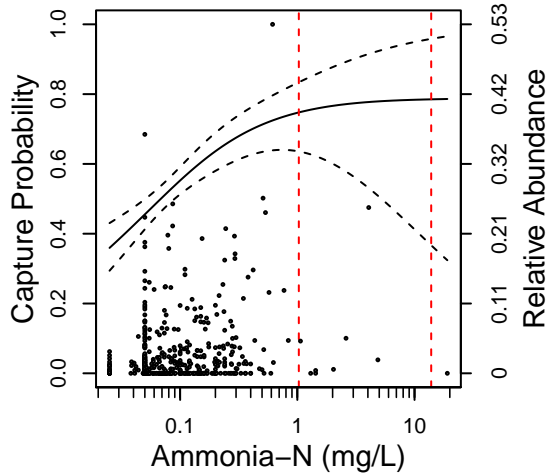
*Gomphidae*



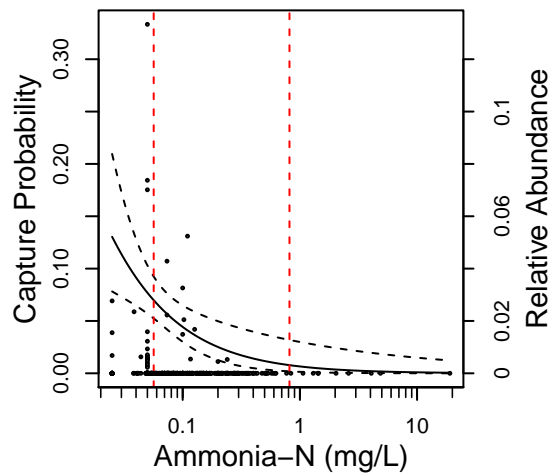
*Gyrinidae*



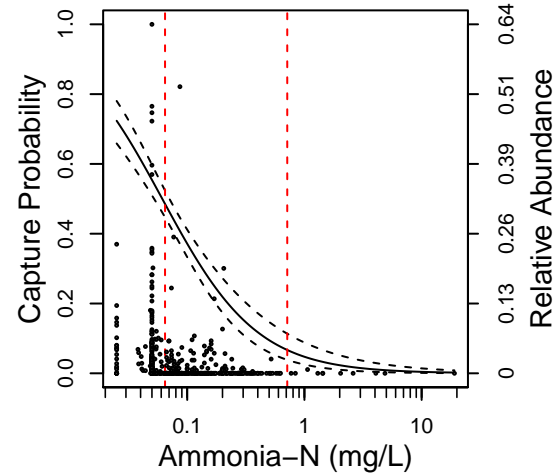
*Haliplidae*



*Helicopsychidae*

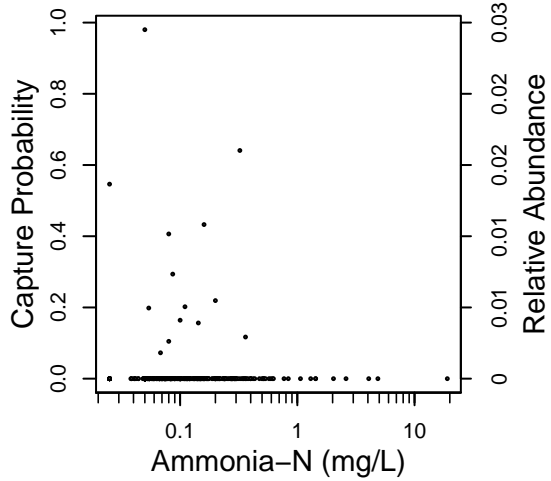


*Heptageniidae*

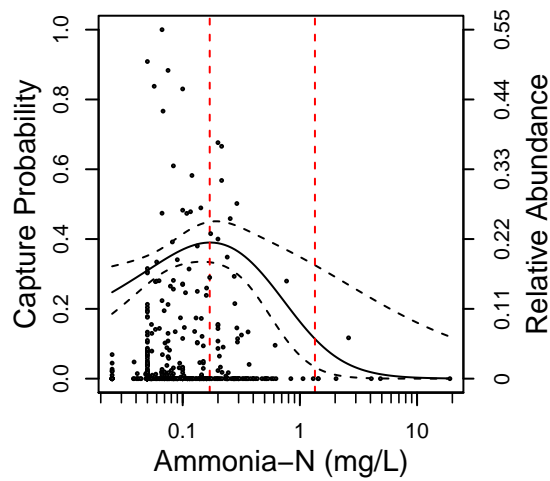


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

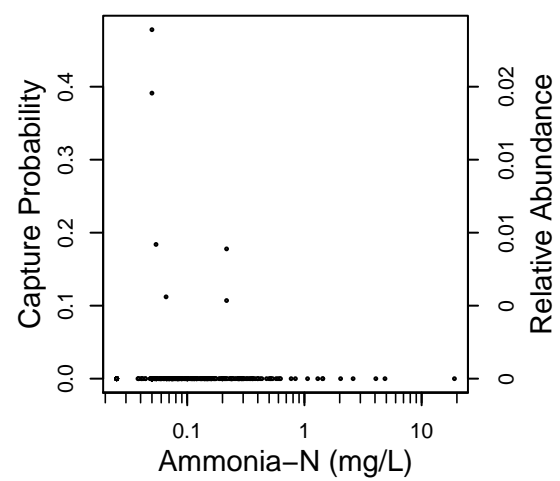
*Heteroceridae*



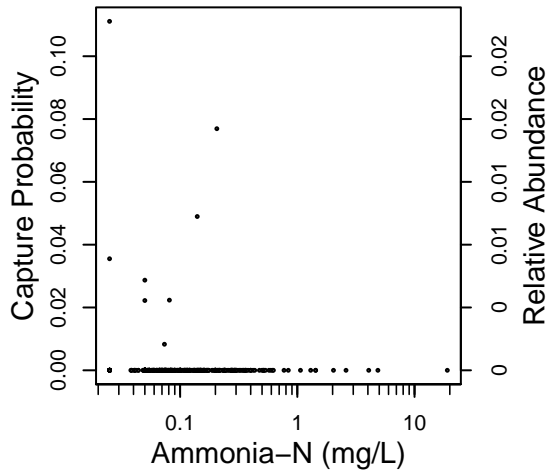
*Hyalellidae*



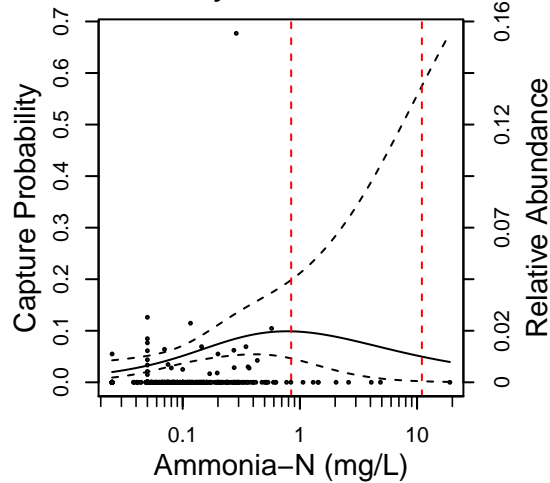
*Hydraenidae*



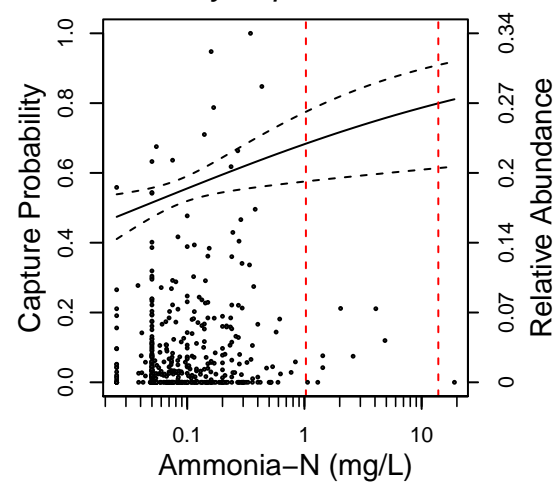
*Hydrobiidae*



*Hydrochidae*

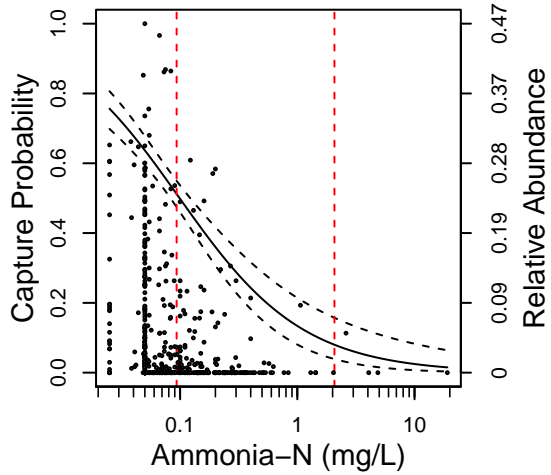


*Hydrophilidae*

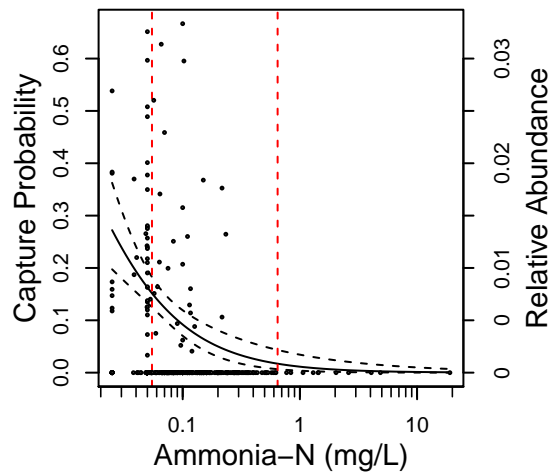


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

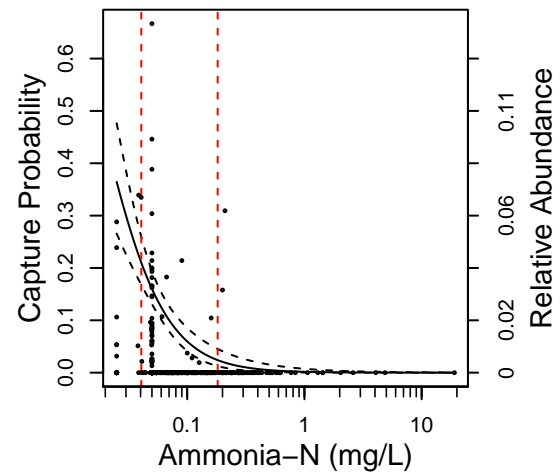
*Hydropsychidae*



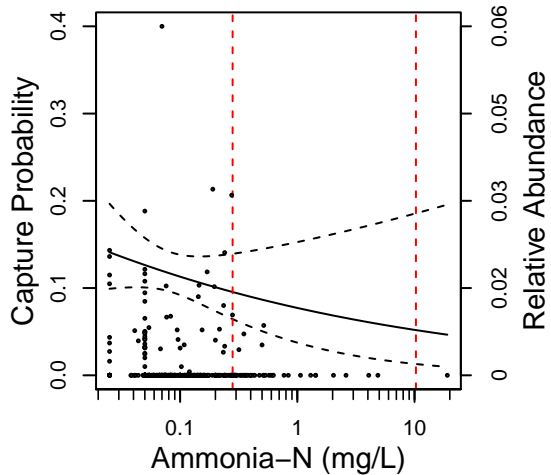
*Hydroptilidae*



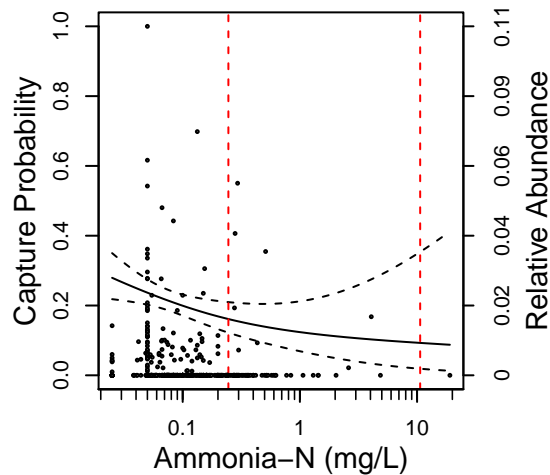
*Isonychiidae*



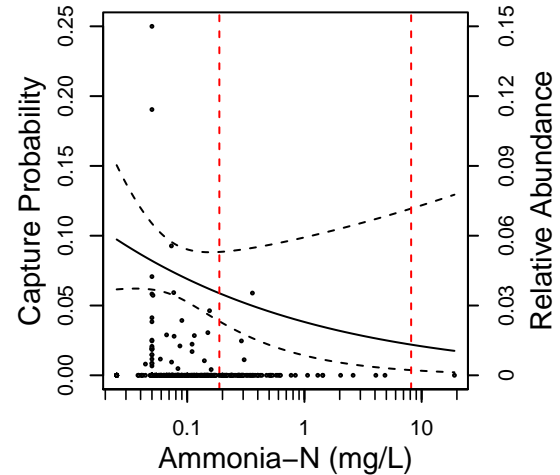
*Isotomidae*



*Leptoceridae*

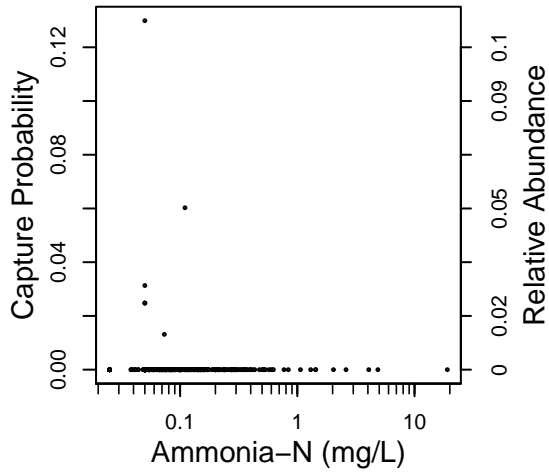


*Leptophlebiidae*

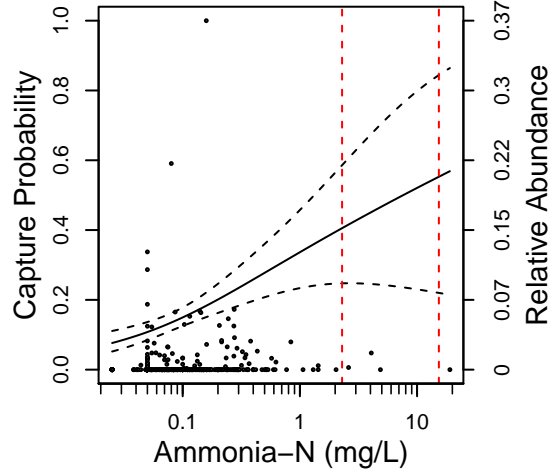


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

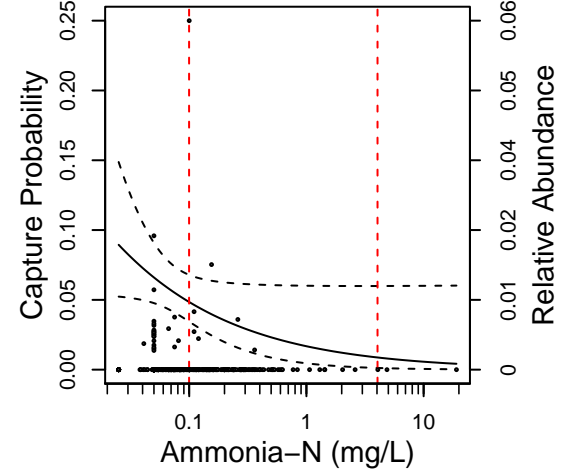
*Leuctridae*



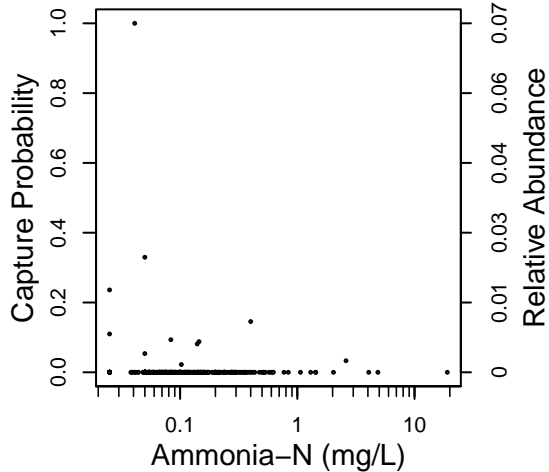
*Libellulidae*



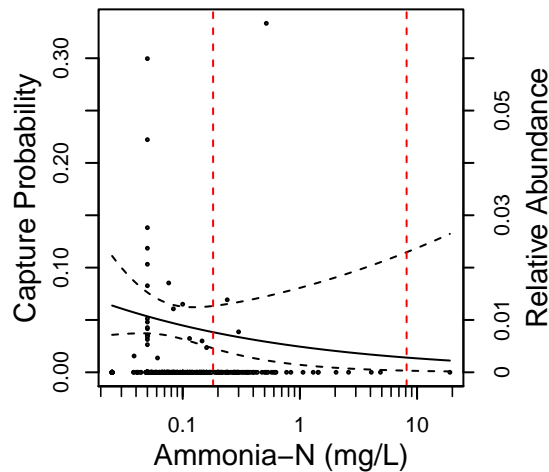
*Limnephilidae*



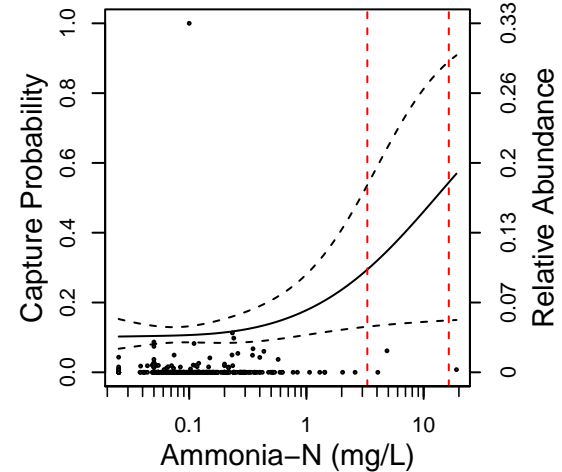
*Lumbricidae*



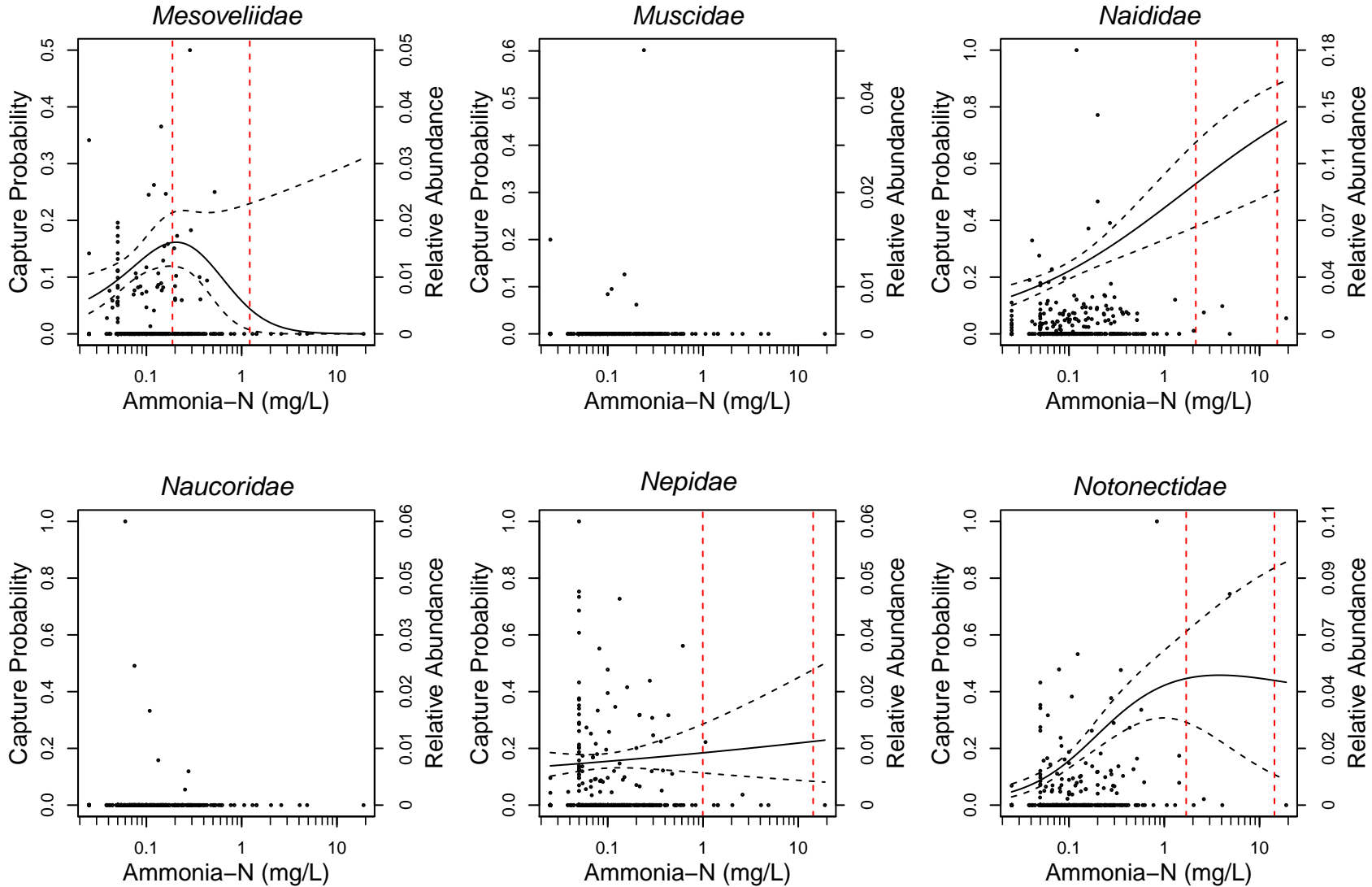
*Lumbriculidae*



*Lymnaeidae*

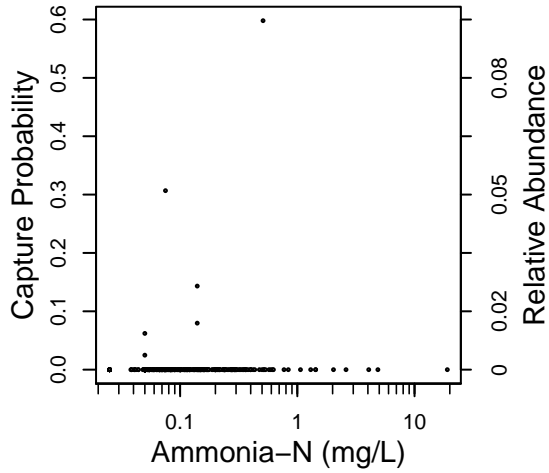


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

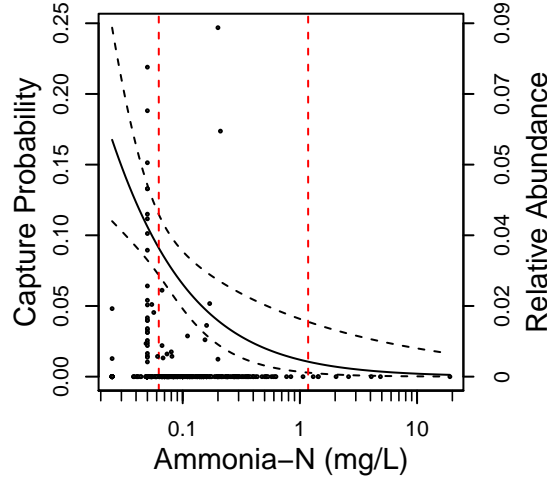


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

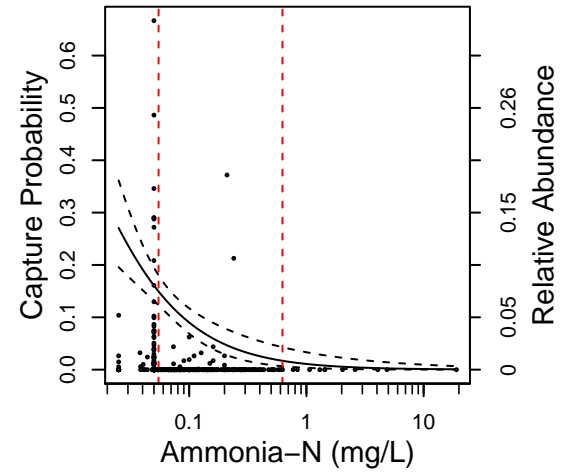
*Palaemonidae*



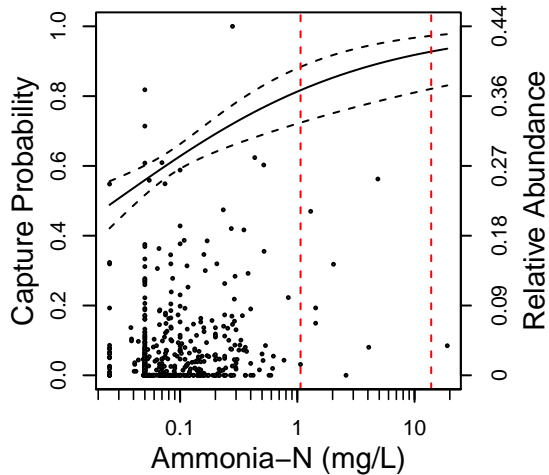
*Perlidae*



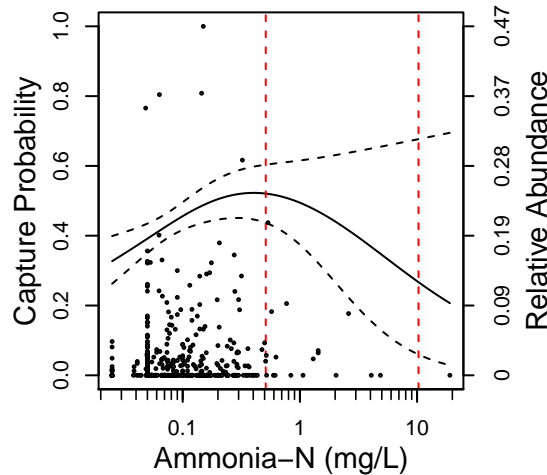
*Philopotamidae*



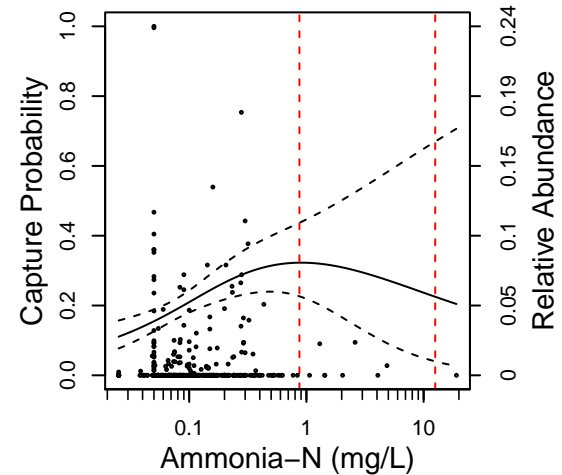
*Physidae*



*Pisidiidae*



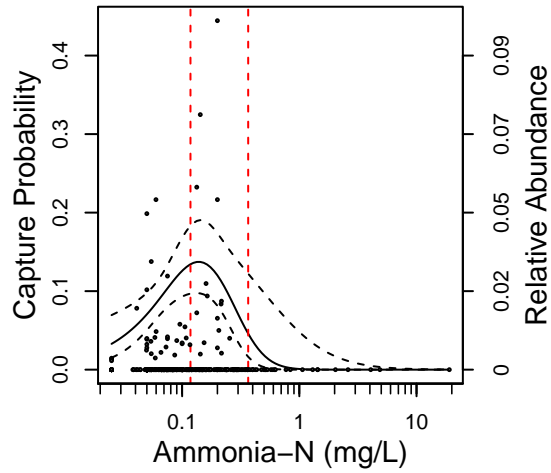
*Planorbidae*



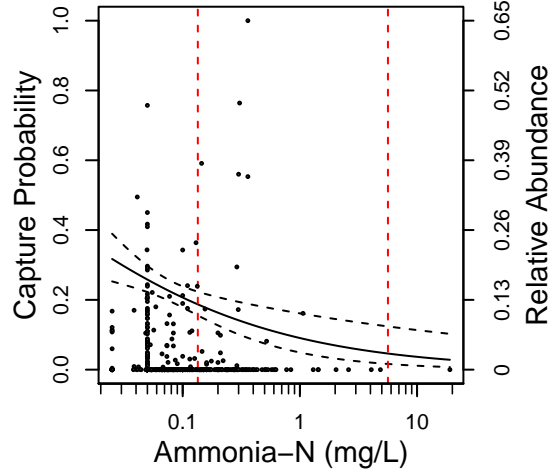


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

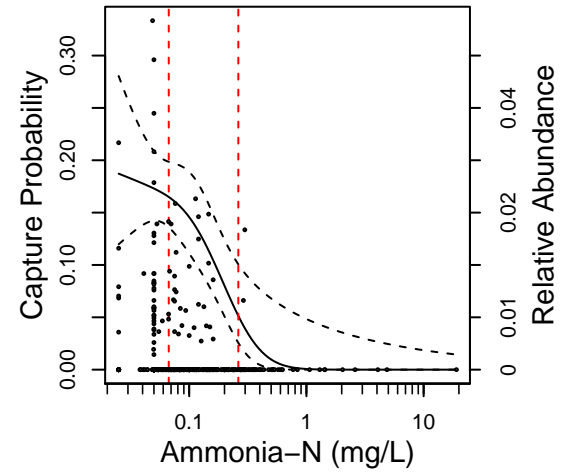
*Pleidae*



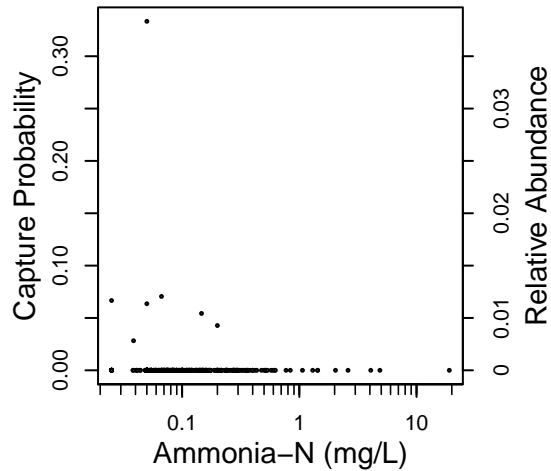
*Pleuroceridae*



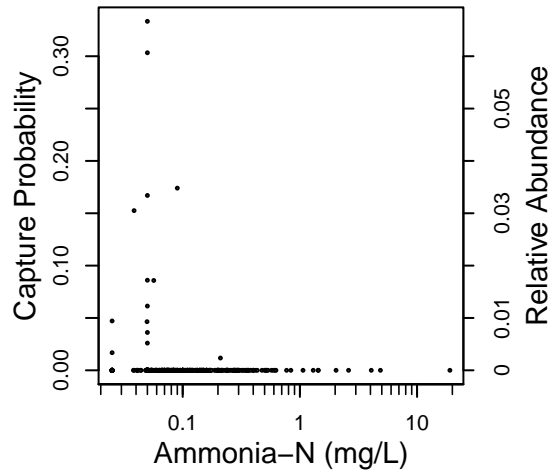
*Polycentropodidae*



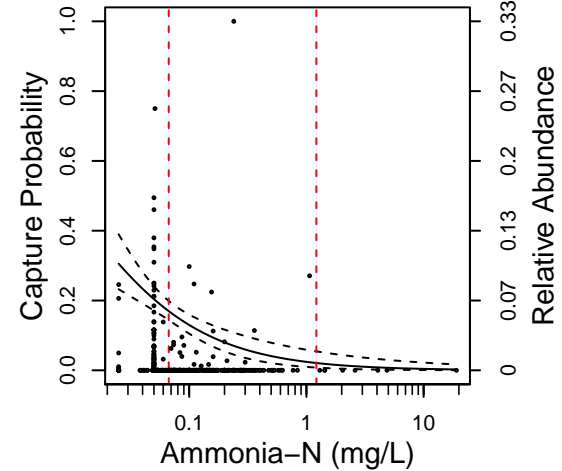
*Polymitarcyidae*



*Potamanthidae*

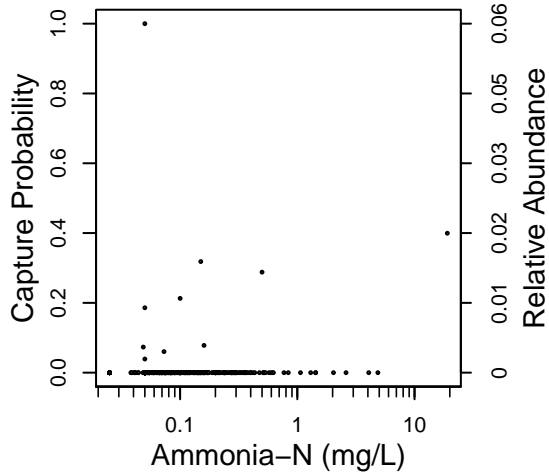


*Psephenidae*

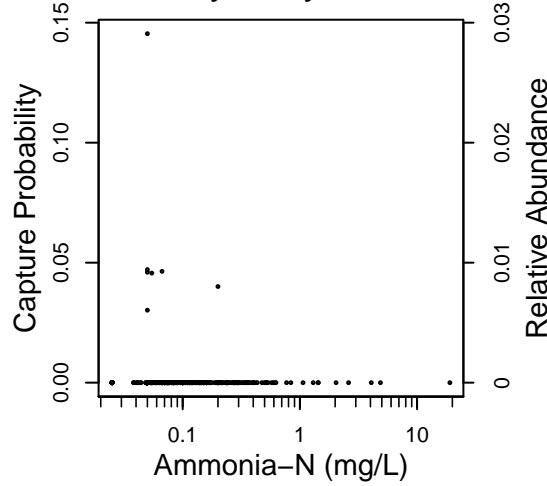


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

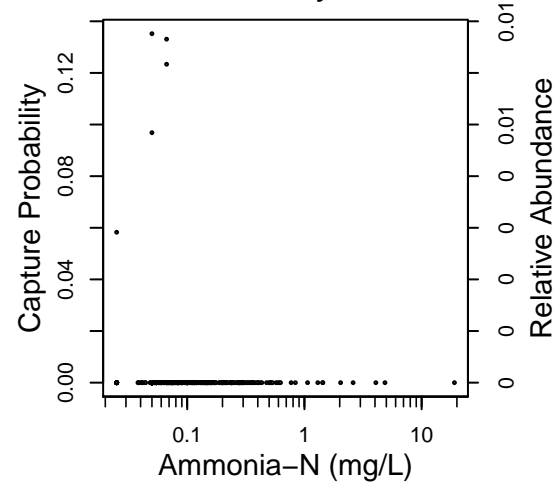
*Psychodidae*



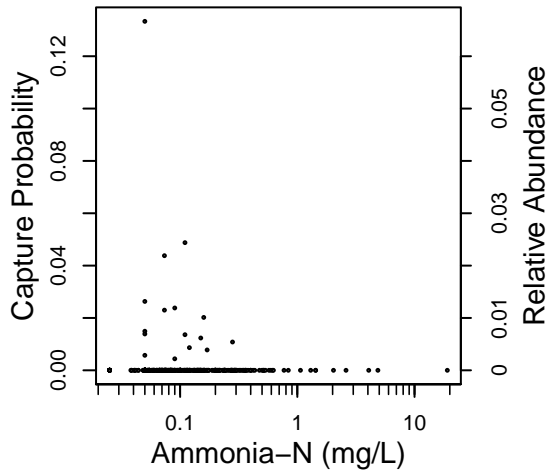
*Psychomyiidae*



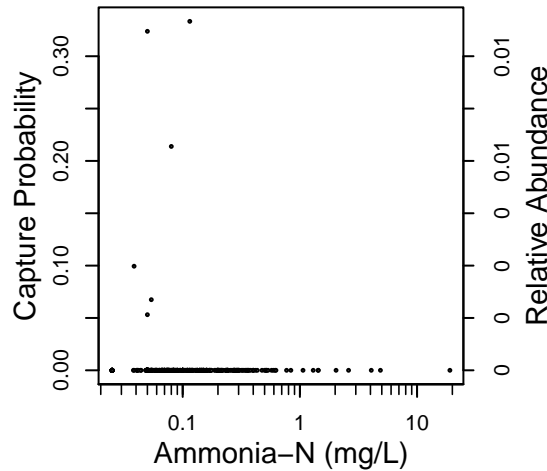
*Pteronarcyidae*



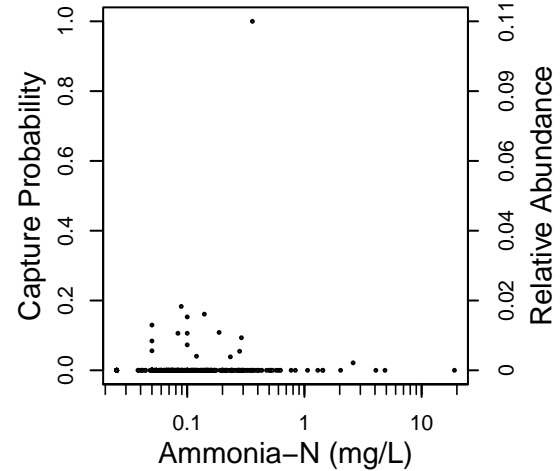
*Pyralidae*



*Saldidae*

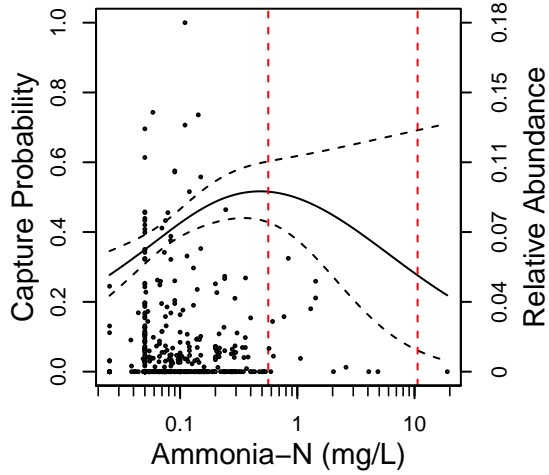


*Sciomyzidae*

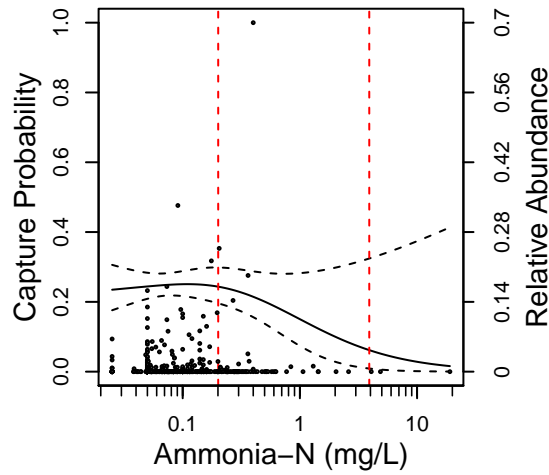


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

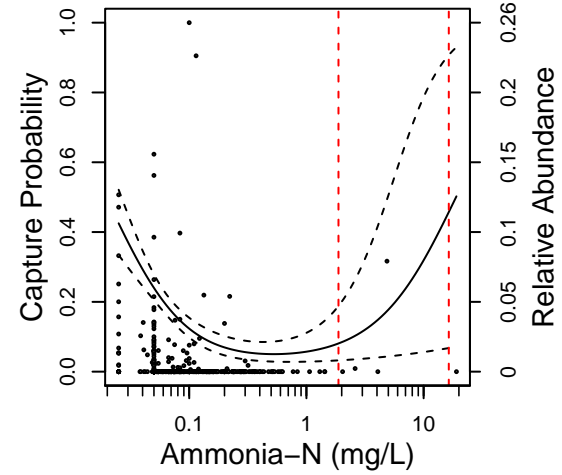
*Scirtidae*



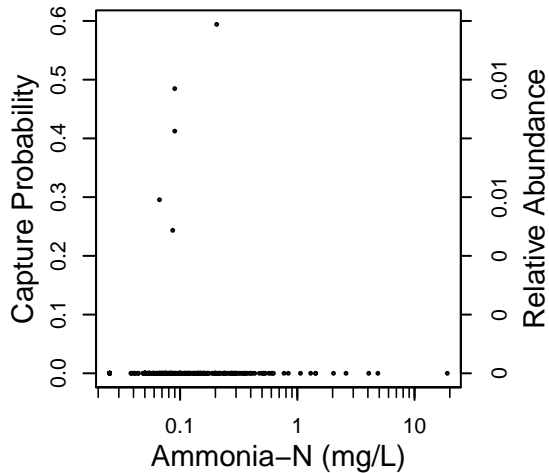
*Sialidae*



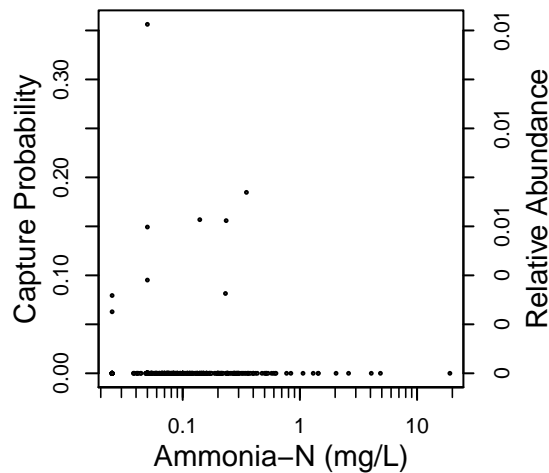
*Simuliidae*



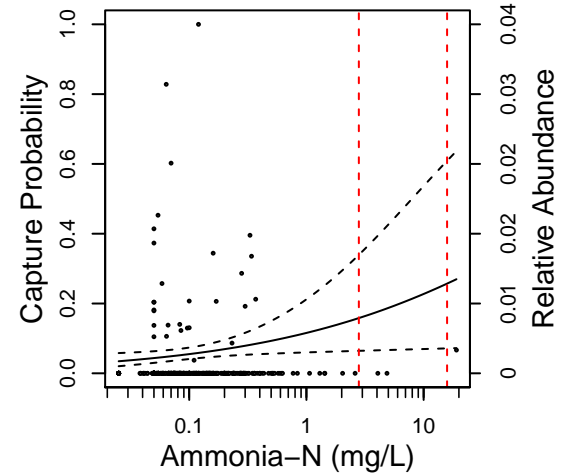
*Sisyridae*



*Sminthuridae*

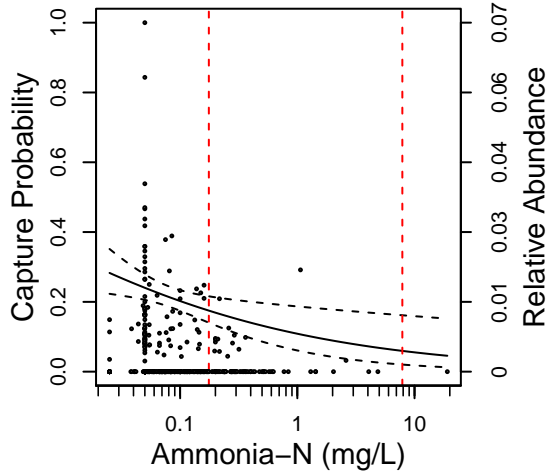


*Stratiomyidae*

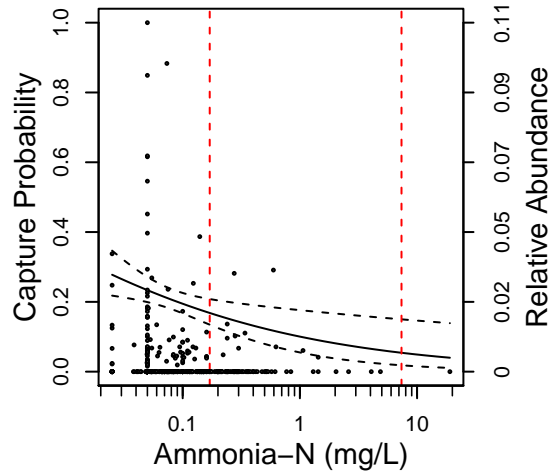


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

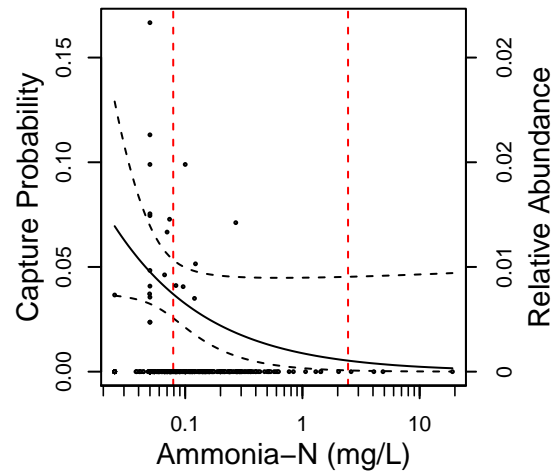
*Tabanidae*



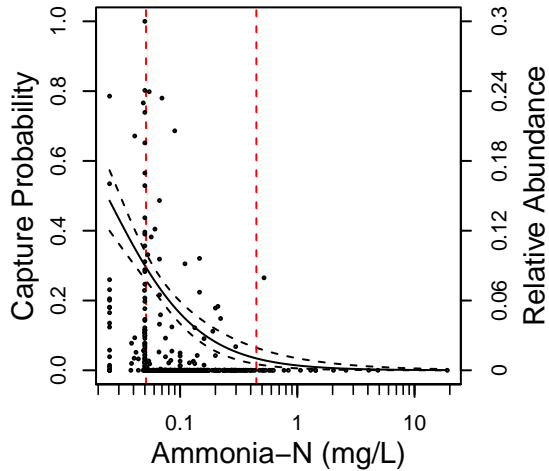
*Tipulidae*



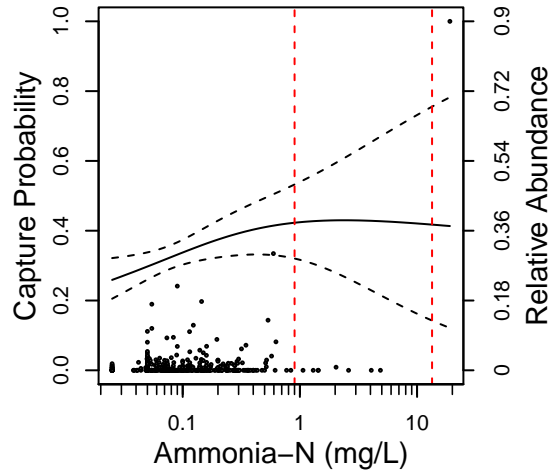
*Trichoptera*



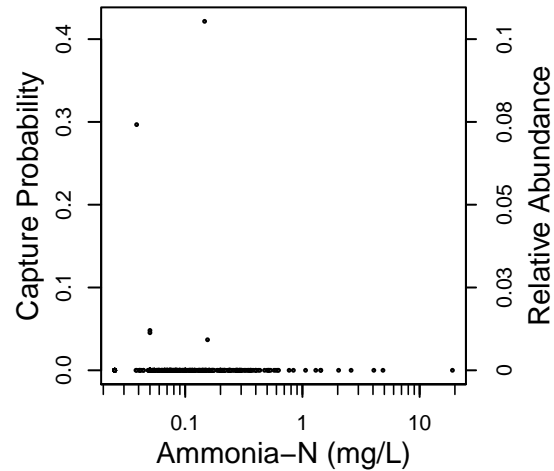
*Tricorythidae*



*Tubificidae*

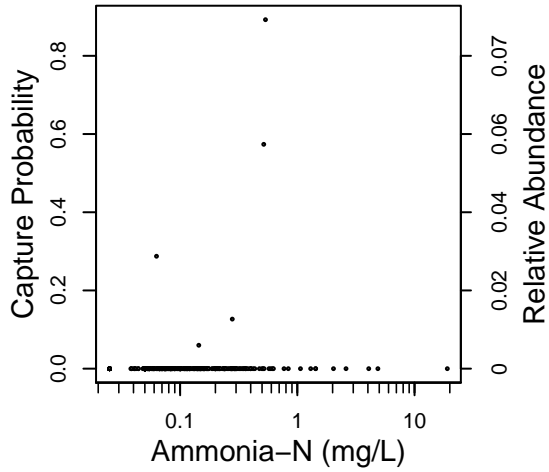


*Uenoidae*

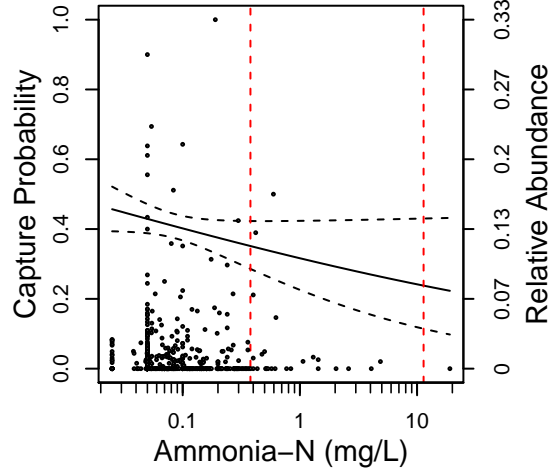


# Capture Probability of Macroinvertebrate Taxon Along Ammonia Gradient

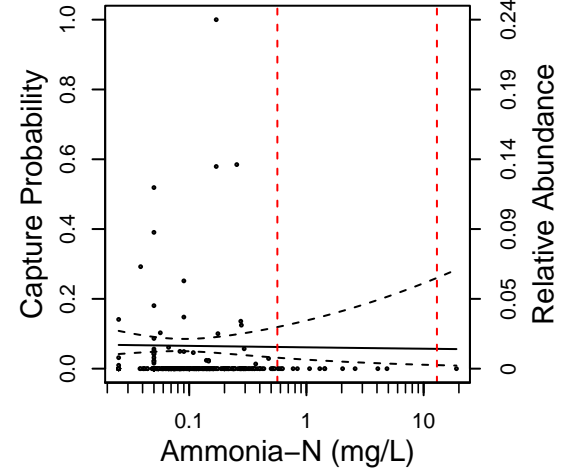
*Valvatidae*



*Veliidae*

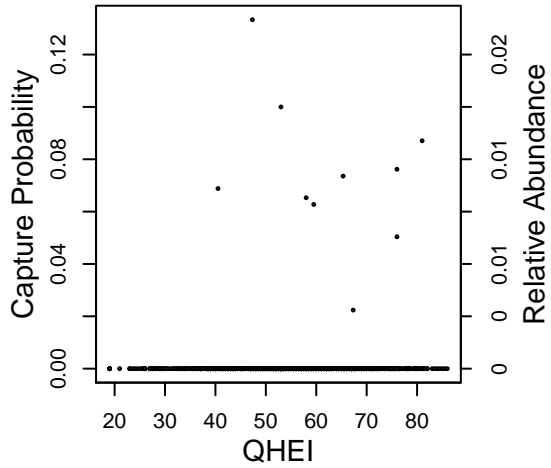


*Viviparidae*

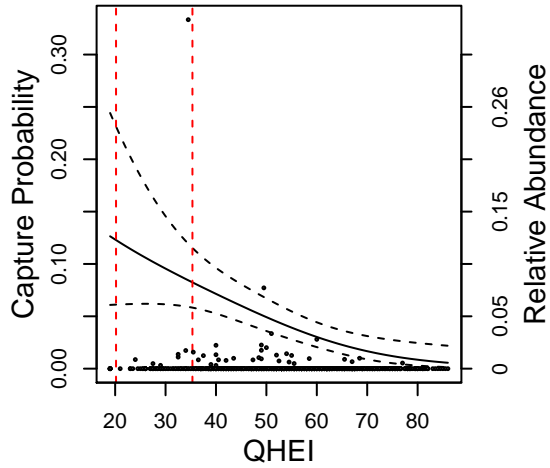


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

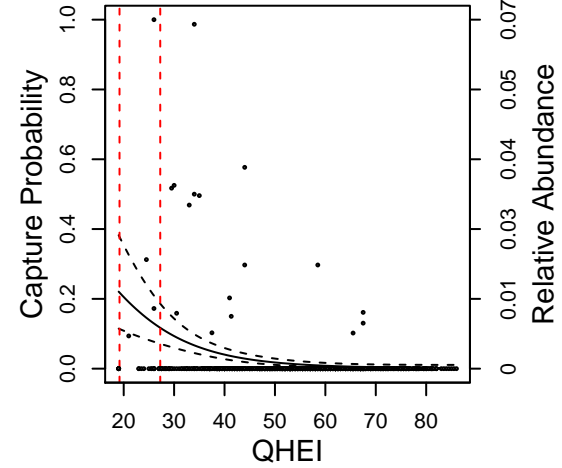
*Acerpenna pygmaea*



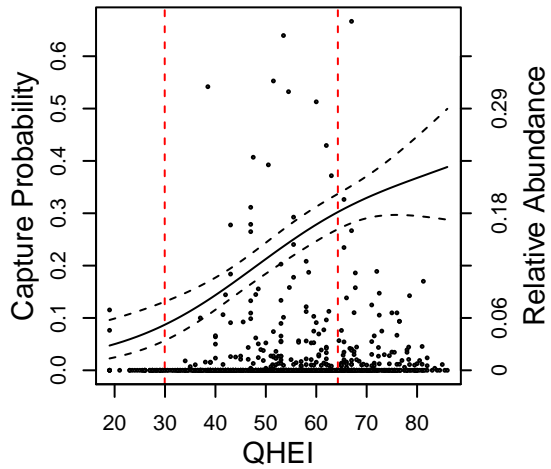
*Aeshna umbrosa*



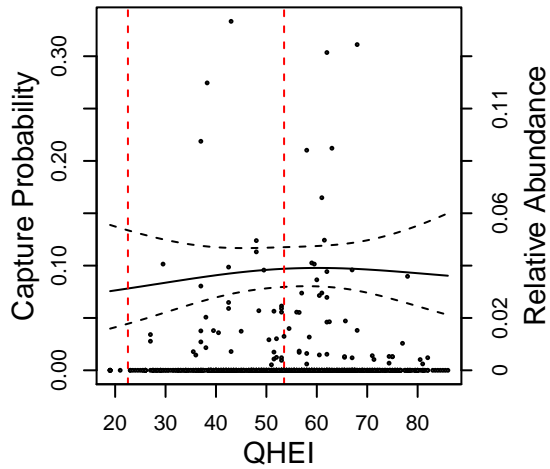
*Anax junius*



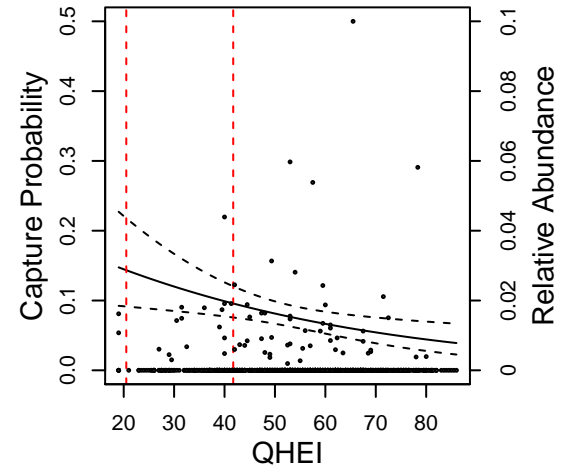
*Ancyronyx variegatus*



*Argia apicalis*

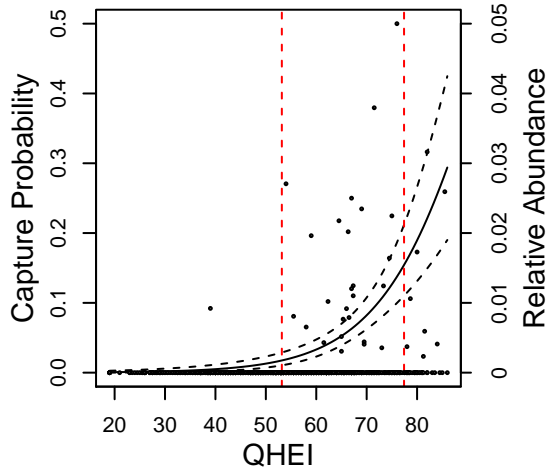


*Argia fumipennis violacea*

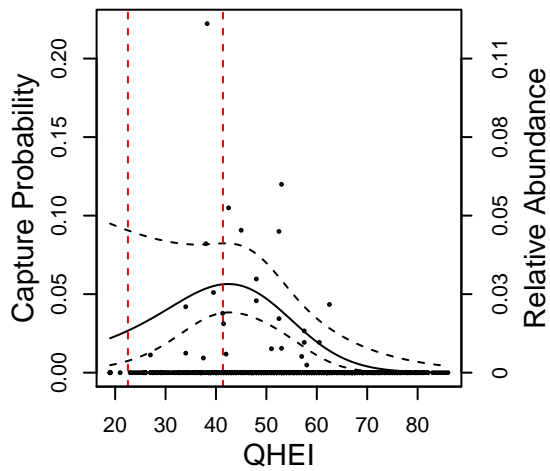


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

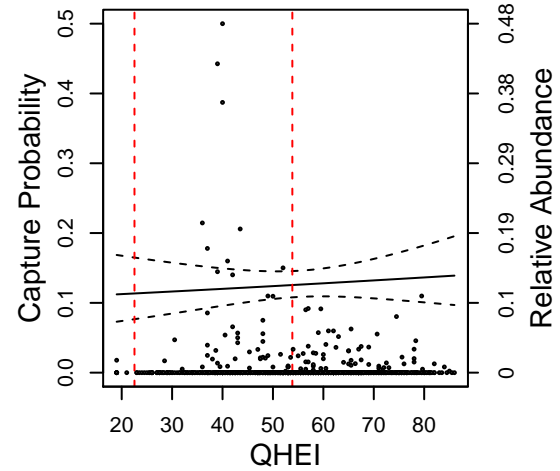
*Argia moesta*



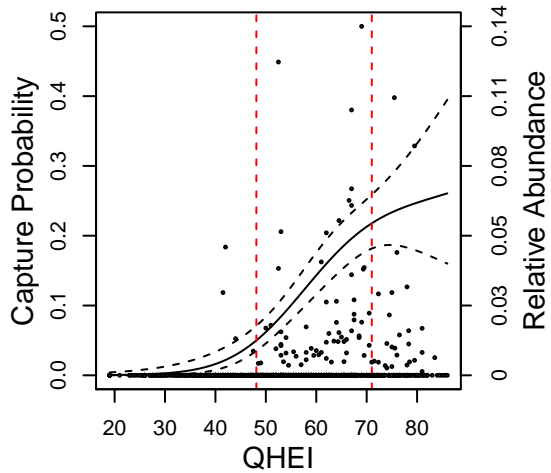
*Argia sedula*



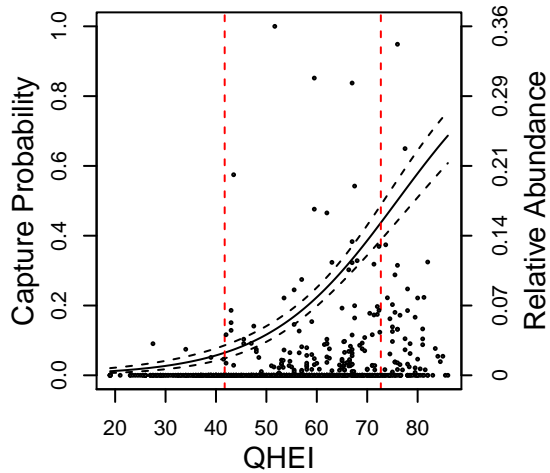
*Argia tibialis*



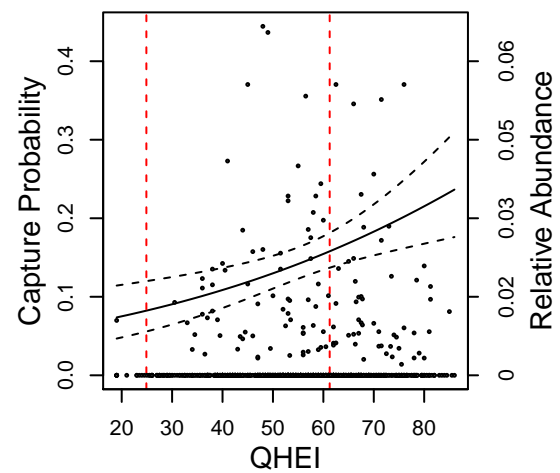
*Baetis flavistriga*



*Baetis intercalaris*

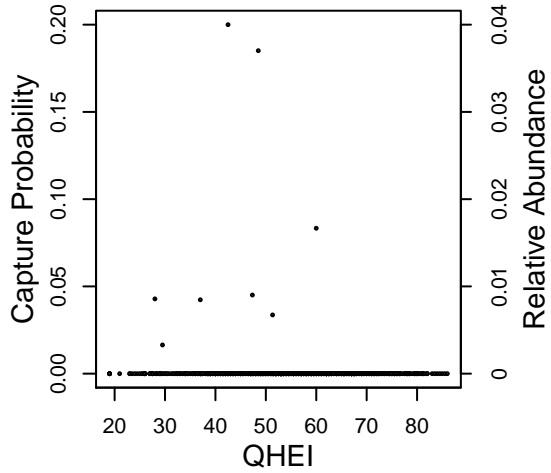


*Basiaeschna janata*

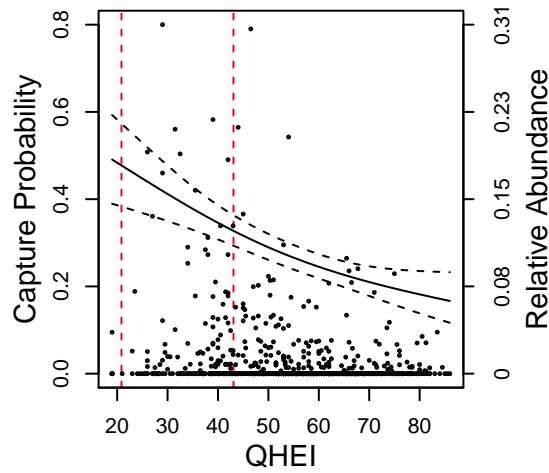


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

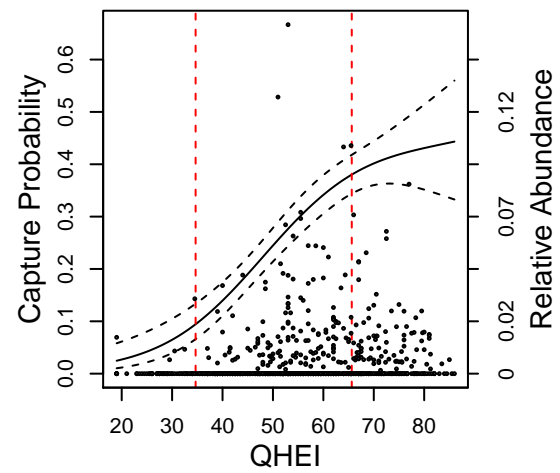
*Berosus infuscatus*



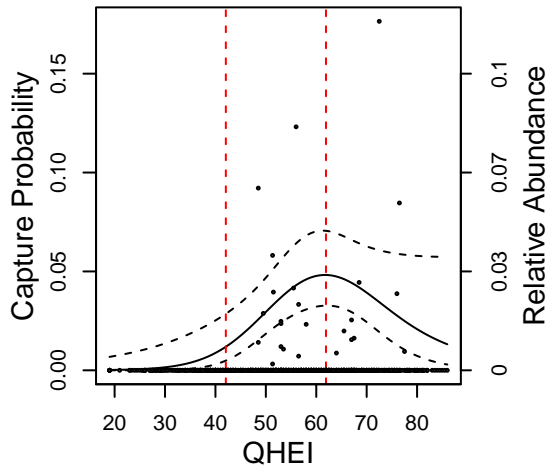
*Berosus peregrinus*



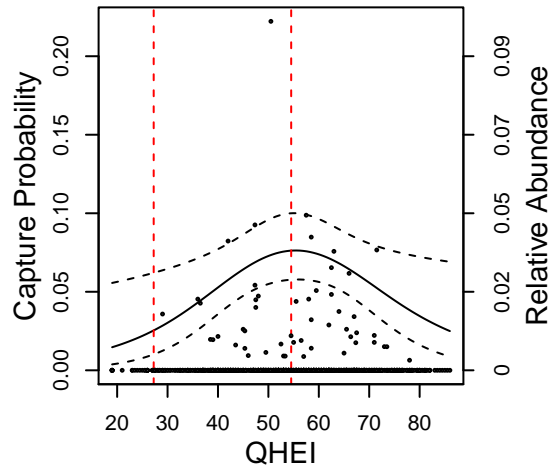
*Boyeria vinosa*



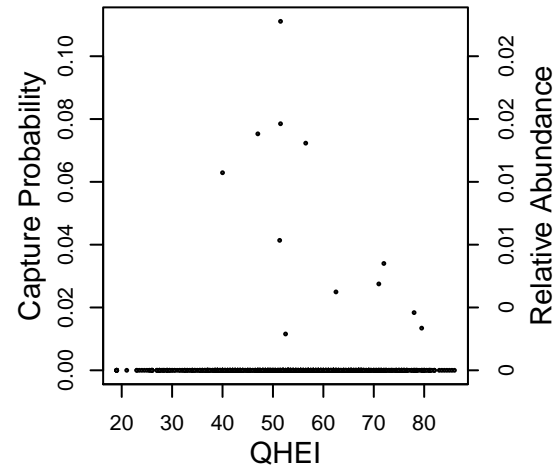
*Brachycentrus numerosus*



*Branchiura sowerbyi*



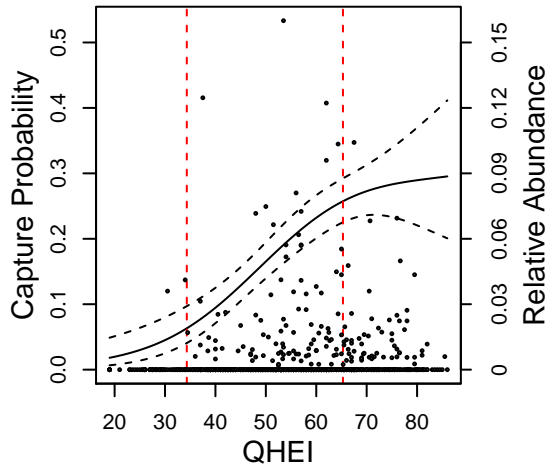
*Brillia flavifrons*



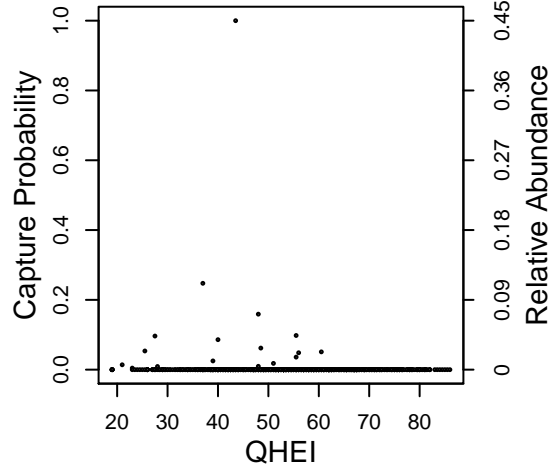


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

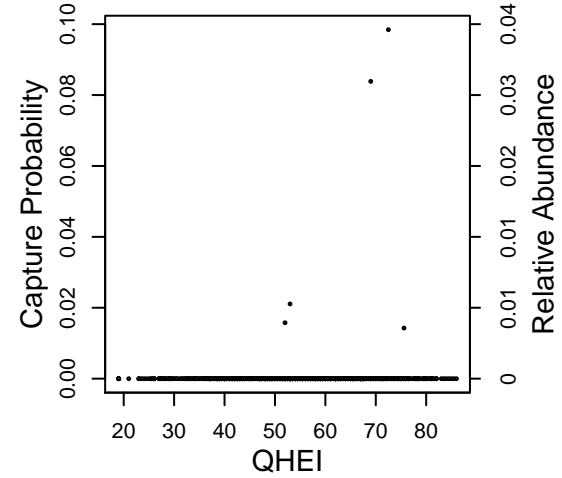
*Calopteryx maculata*



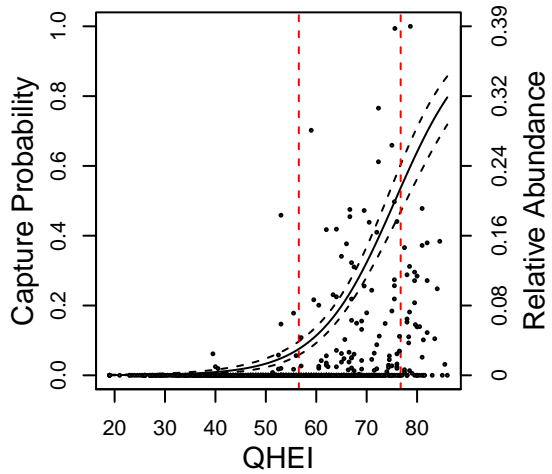
*Cambarus nebrascensis*



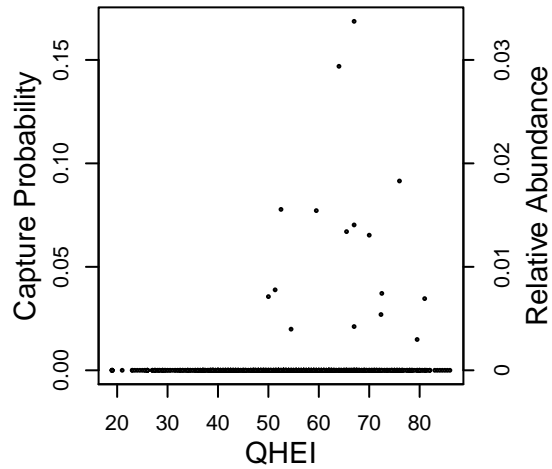
*Ceratopsyche alhedra*



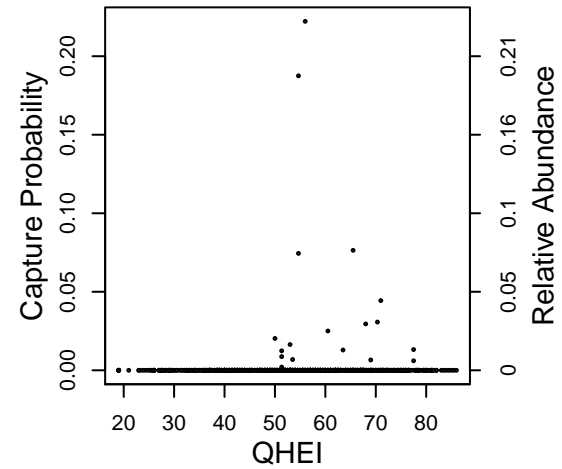
*Ceratopsyche checkerboard*



*Ceratopsyche slossonae*

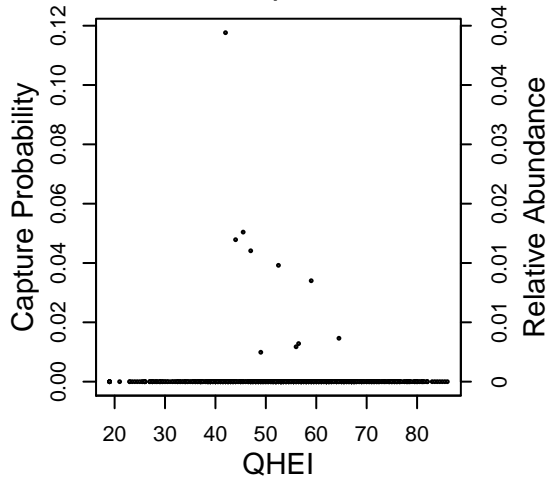


*Ceratopsyche sparna*

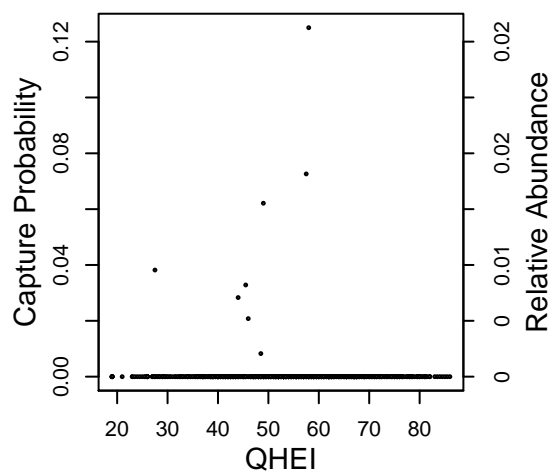


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

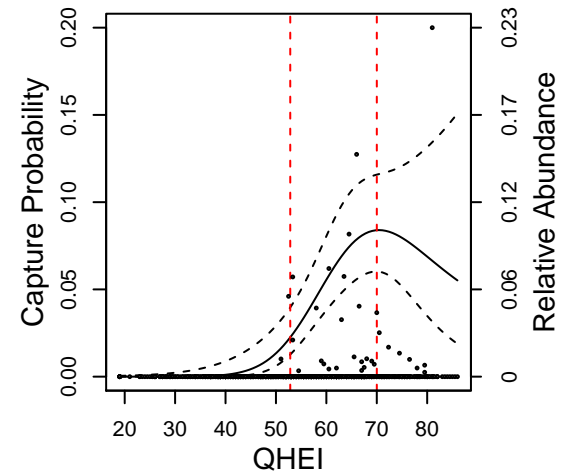
*Chauliodes pectinicornis*



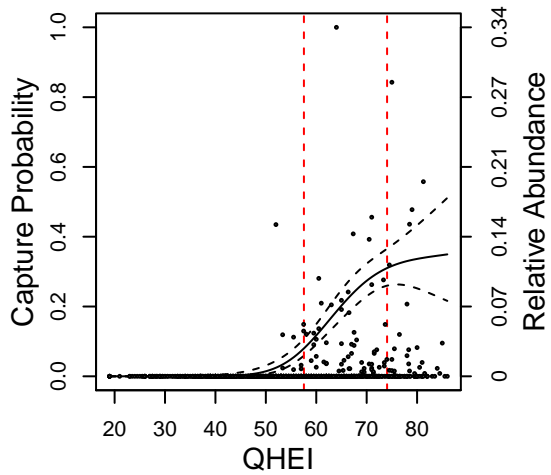
*Chauliodes rastricornis*



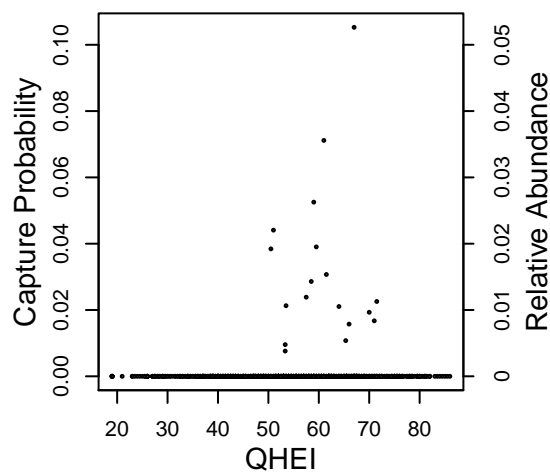
*Chimarra aterrima*



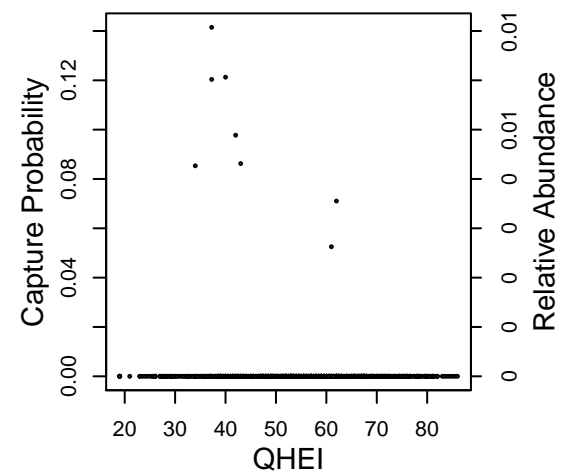
*Chimarra obscura*



*Choroterpes basalis*

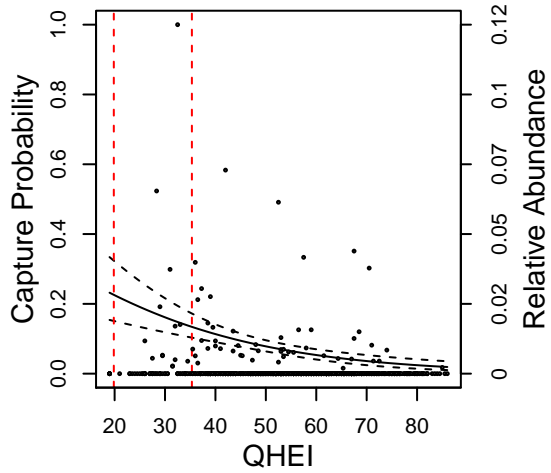


*Climacia areolaris*

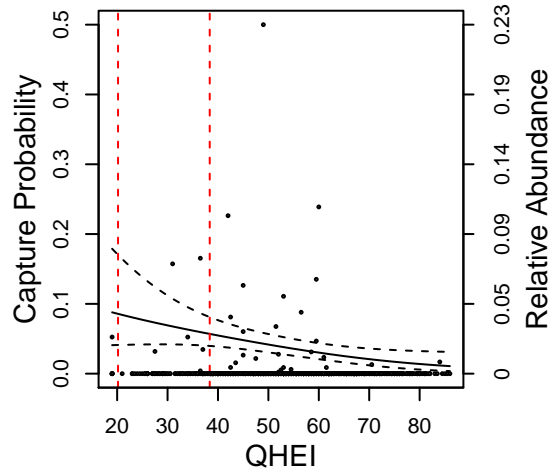


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

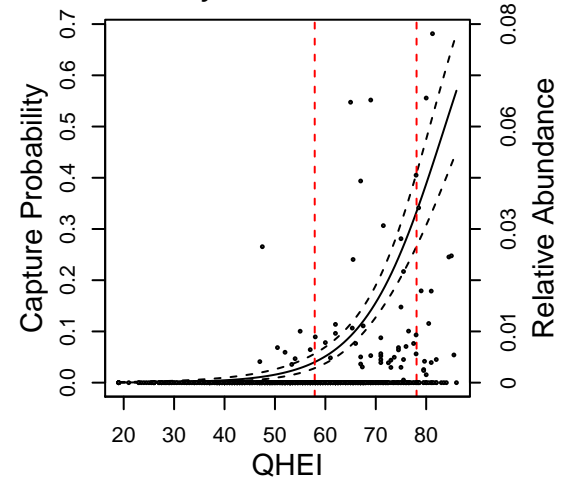
*Clintanypus pinguis*



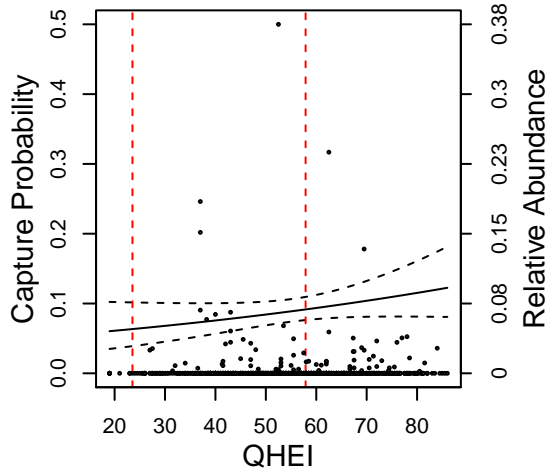
*Coptotomus loticus*



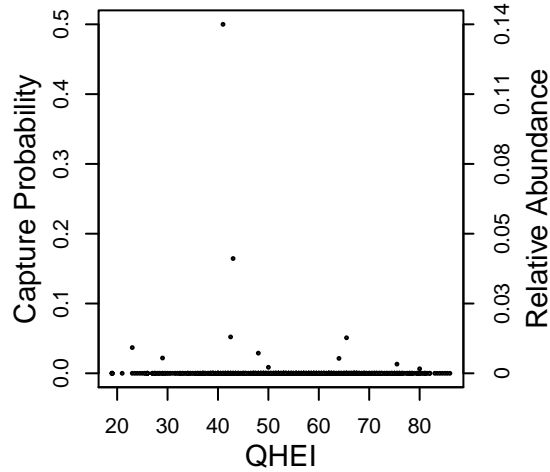
*Corydalus cornutus*



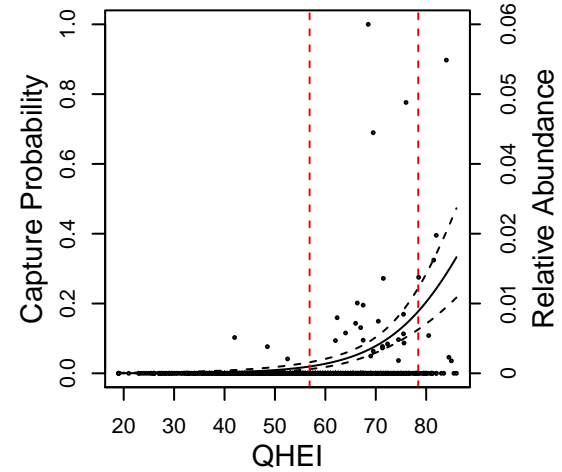
*Cricotopus (cricotopus)*



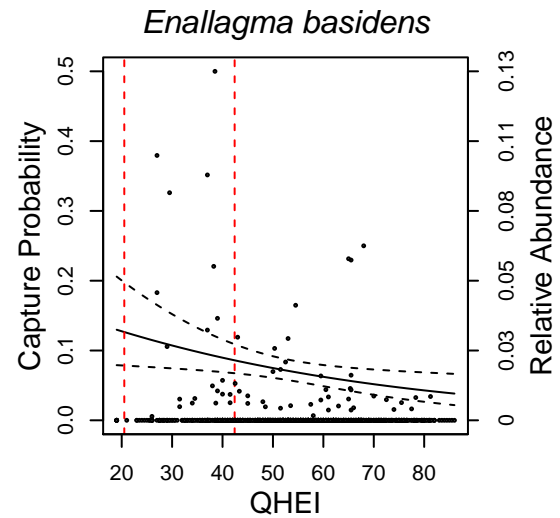
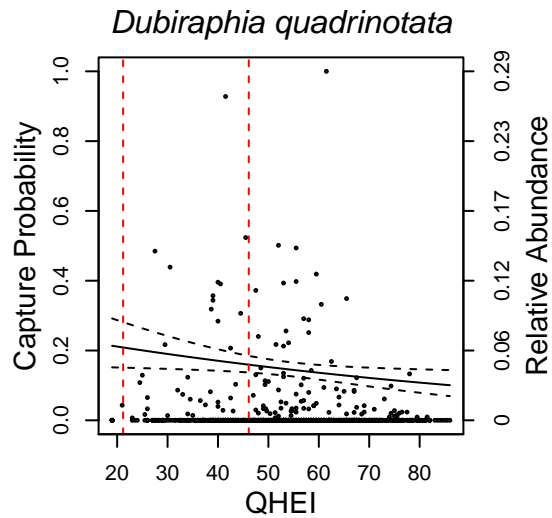
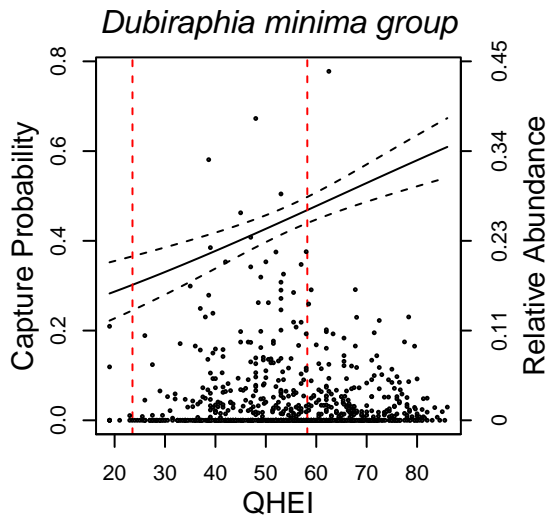
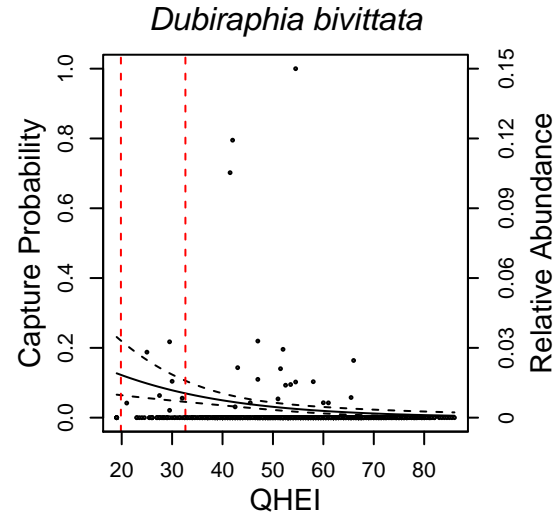
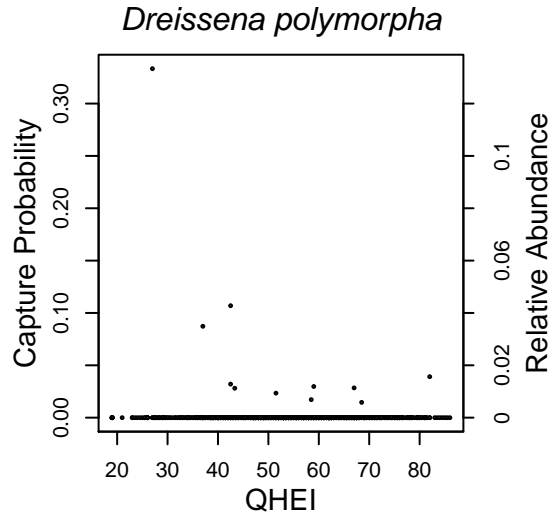
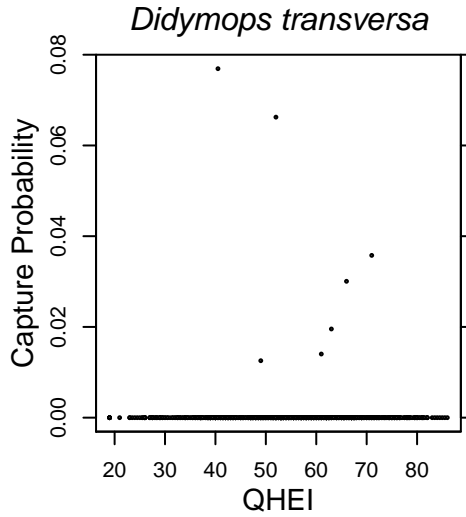
*Cricotopus sylvestris* group



*Cricotopus trifascia*

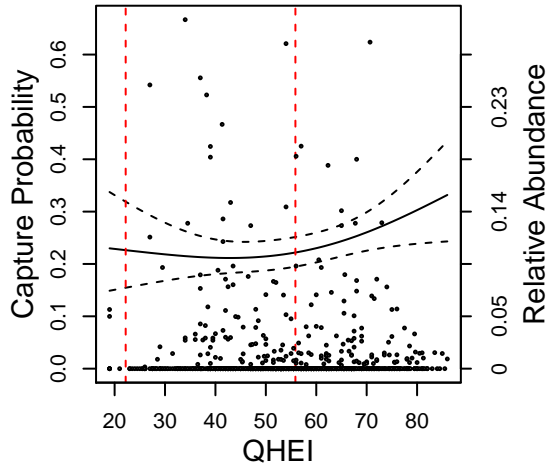


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

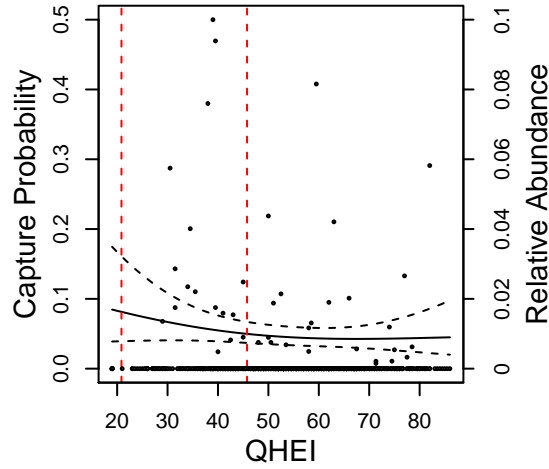


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

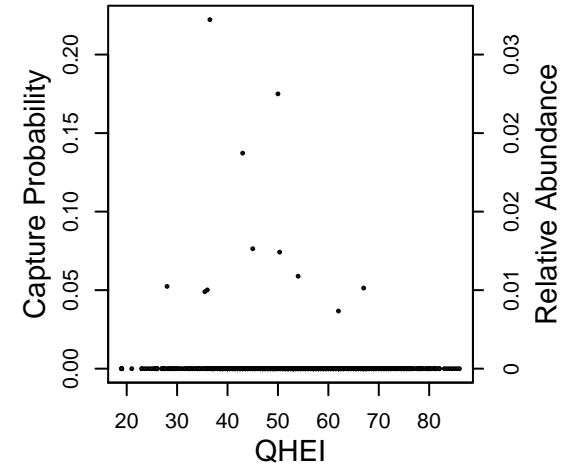
*Enallagma divagans*



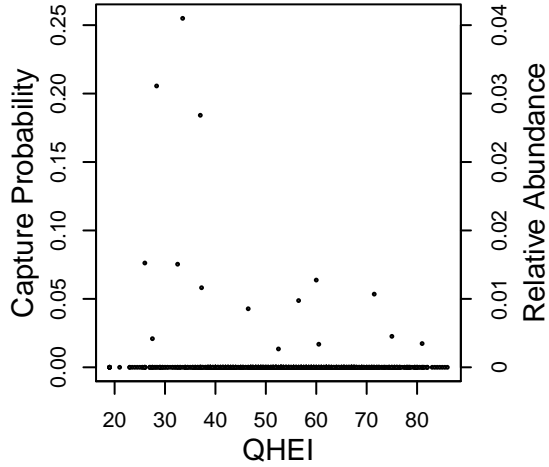
*Enallagma exsulans*



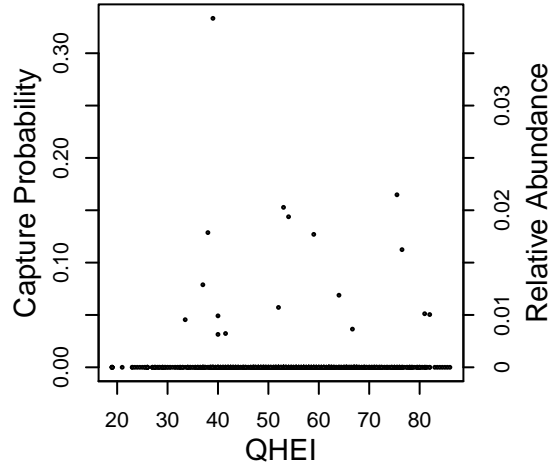
*Enallagma signatum*



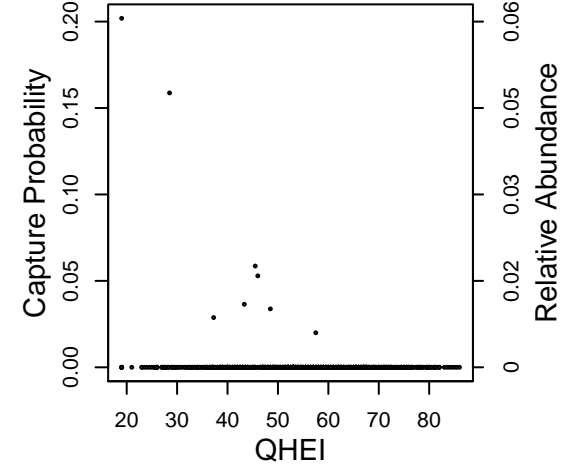
*Enochrus ochraceus*



*Enochrus pygmaeus*

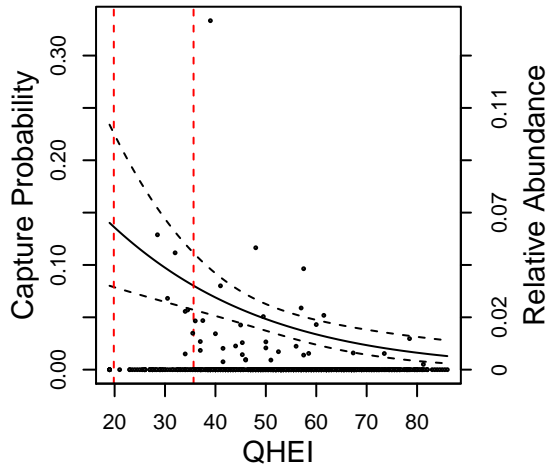


*Epitheca (tetragoneuria)*

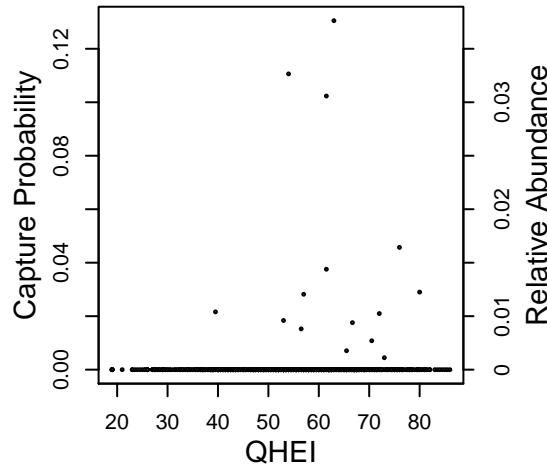


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

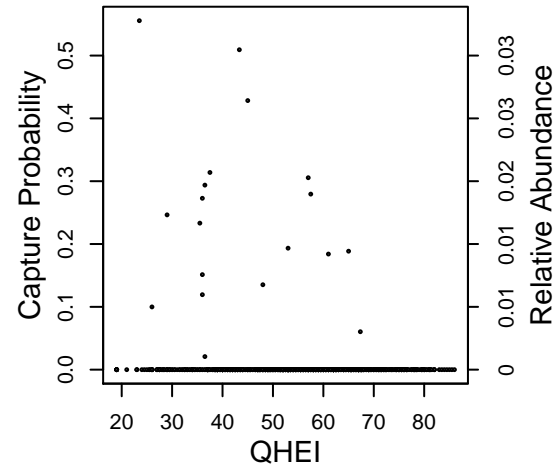
*Epitheca princeps*



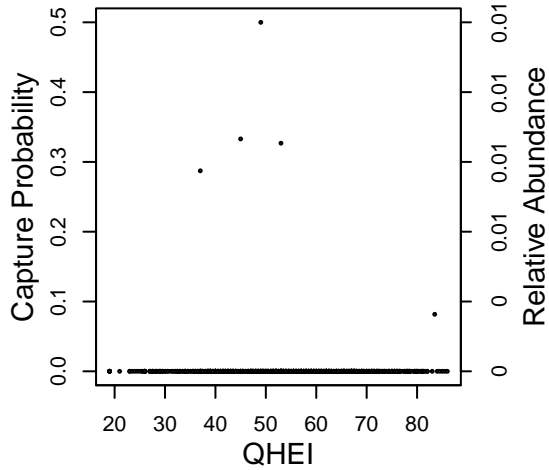
*Erpetogomphus designatus*



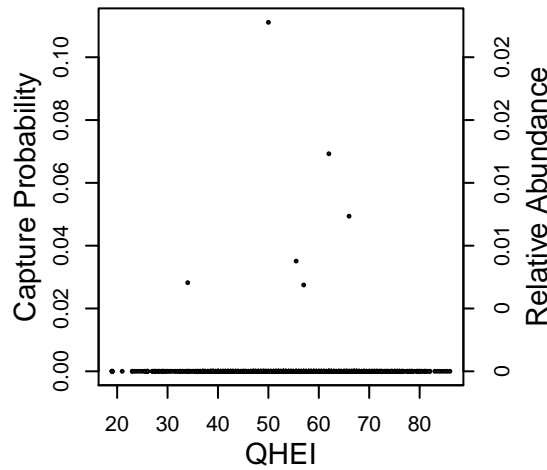
*Erythemis simplicicollis*



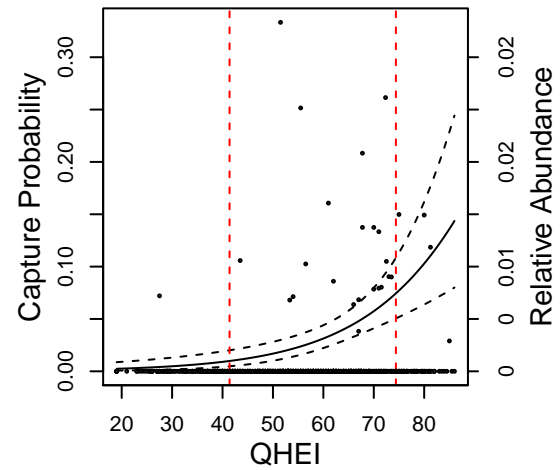
*Gelastocoris oculatus*



*Gyretes sinuatus*

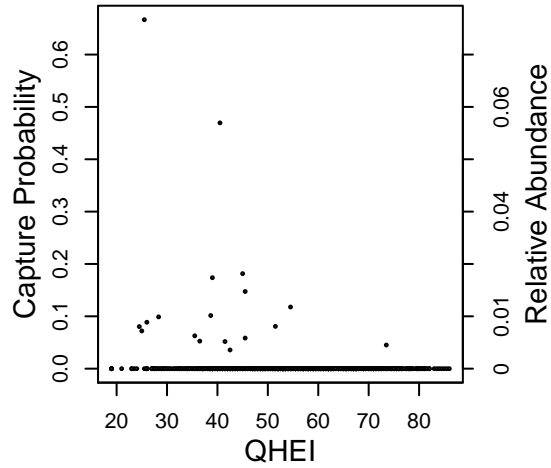


*Hagenius brevistylus*

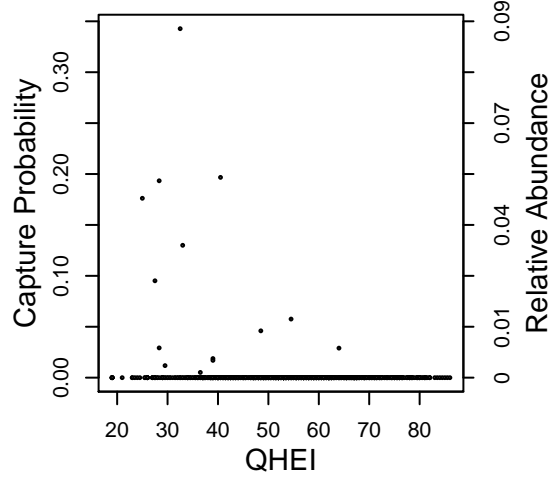


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

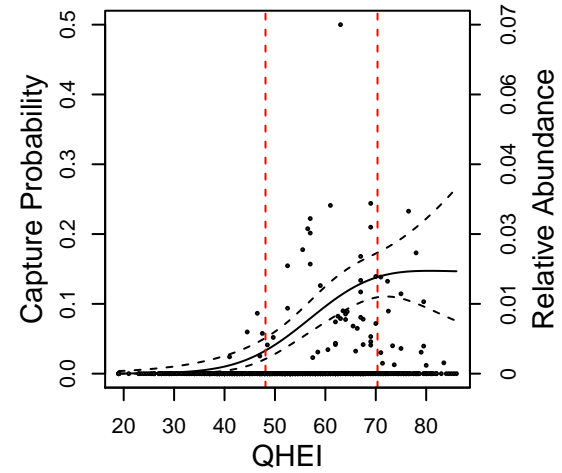
*Haliplus borealis*



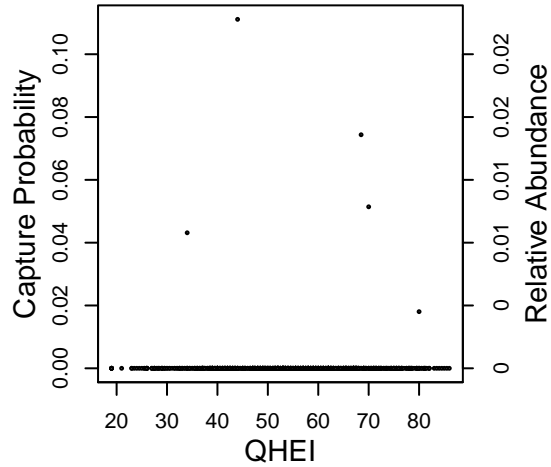
*Haliplus immaculicollis*



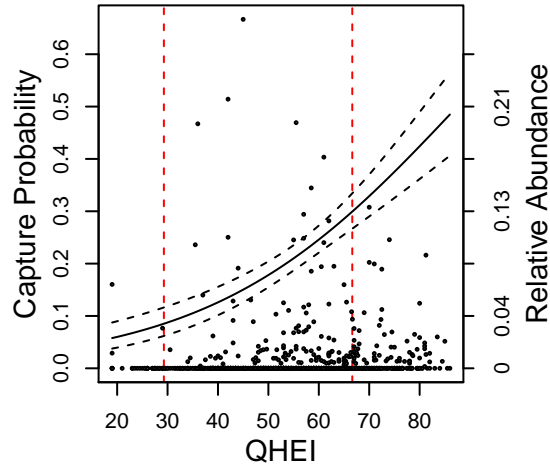
*Helichus basalis*



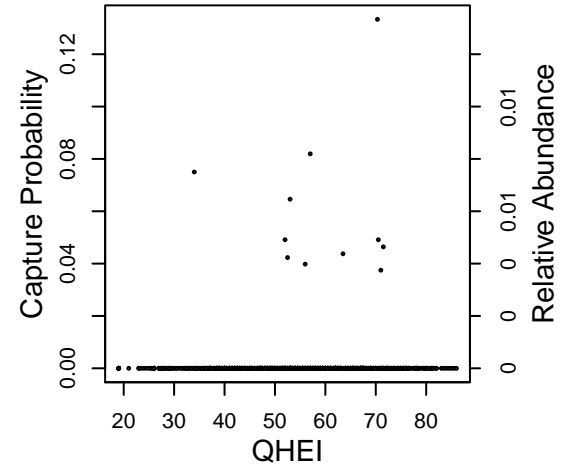
*Helichus fastigiatus*



*Helichus lithophilus*

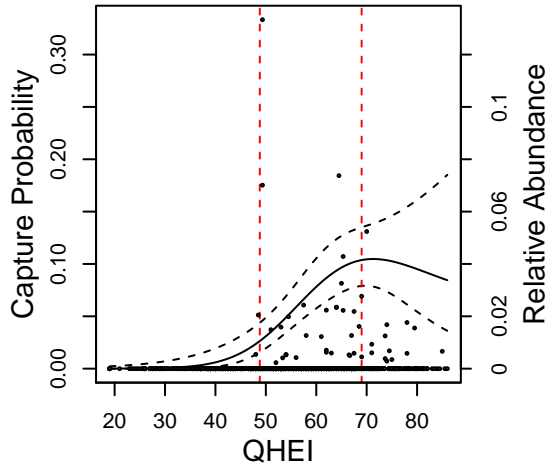


*Helichus striatus*

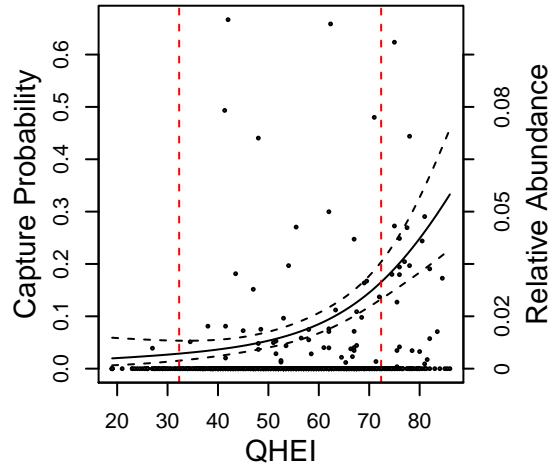


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

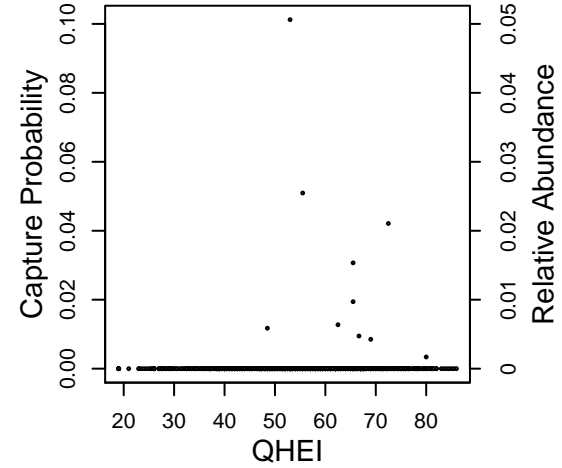
*Helicopsyche borealis*



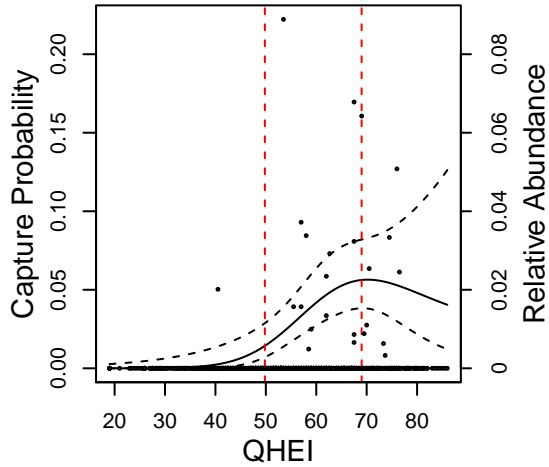
*Hetaerina americana*



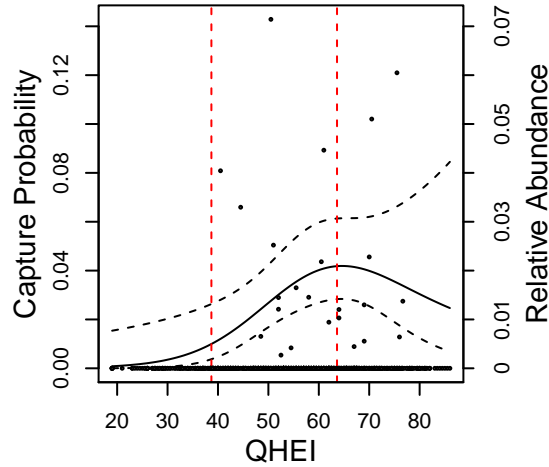
*Hetaerina titia*



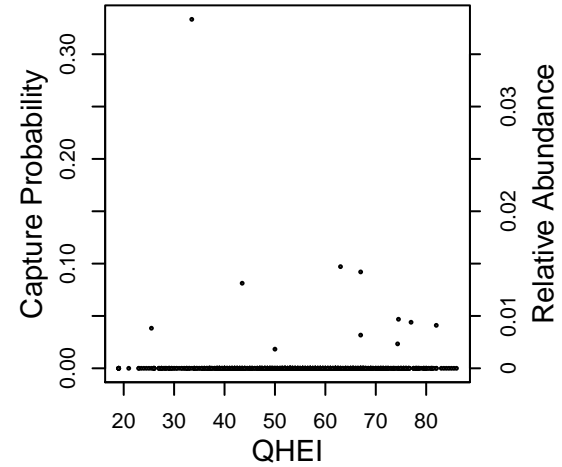
*Heterosternuta ohionis*



*Heterosternuta pulcher*



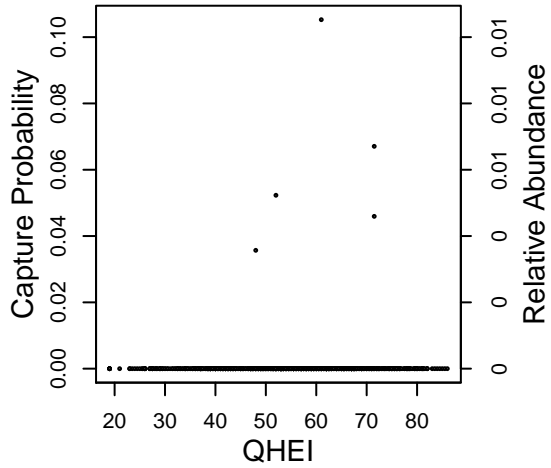
*Heterosternuta wickhami*



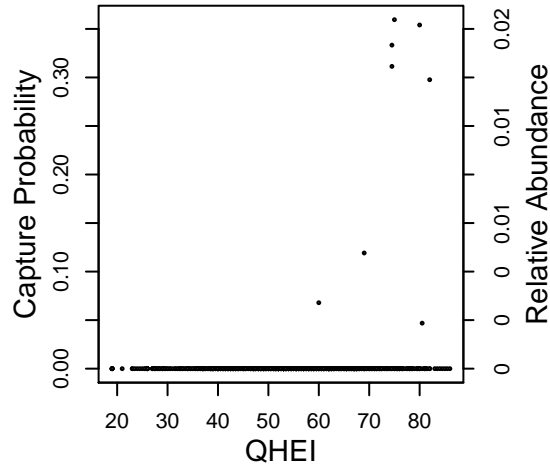


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

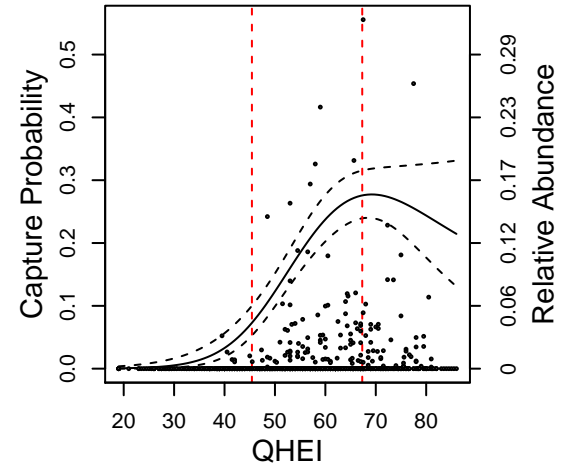
*Hydrometra martini*



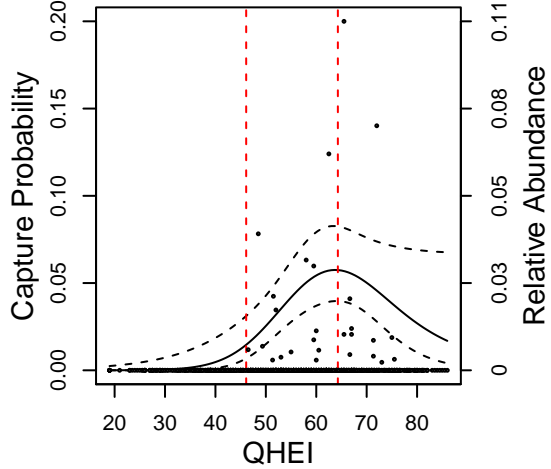
*Hydropsyche aerata*



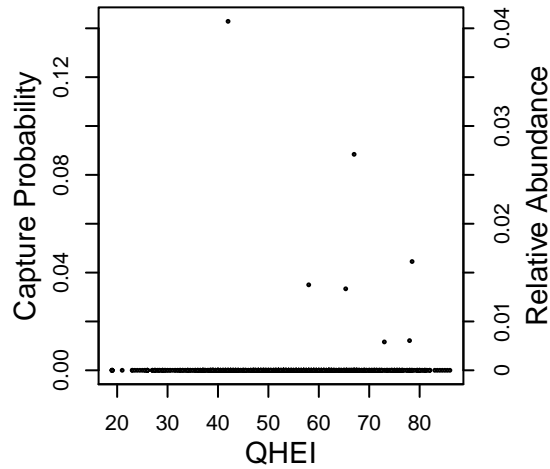
*Hydropsyche betteni* group



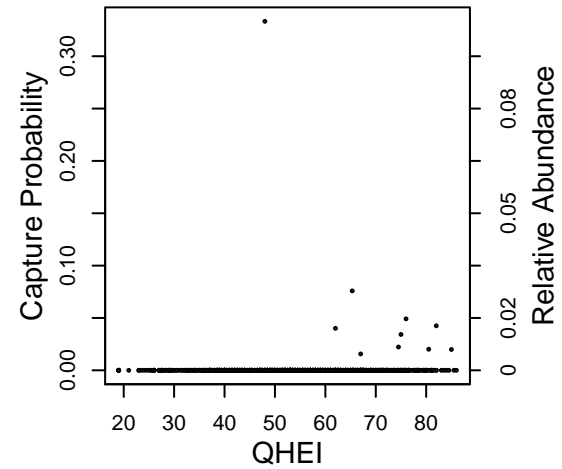
*Hydropsyche bidens*



*Hydropsyche cuanis*

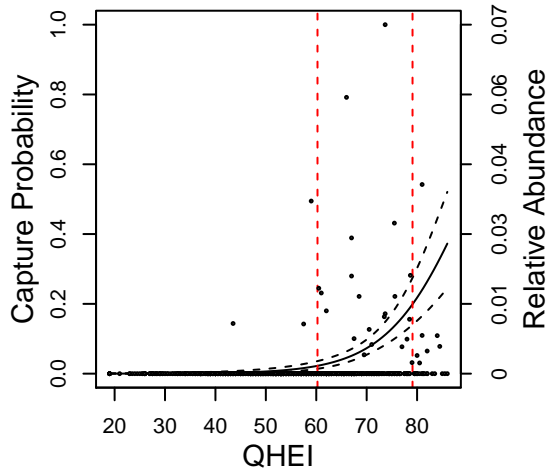


*Hydropsyche demora*

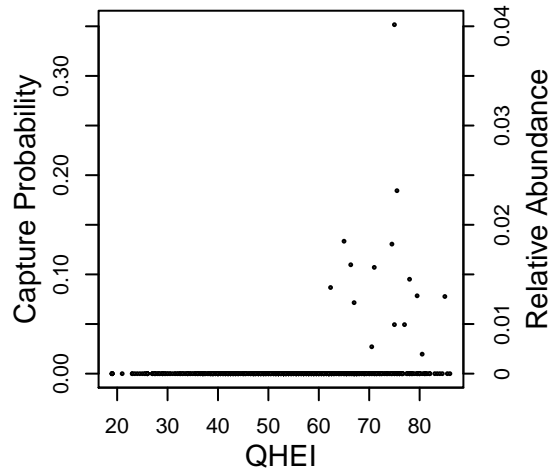


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

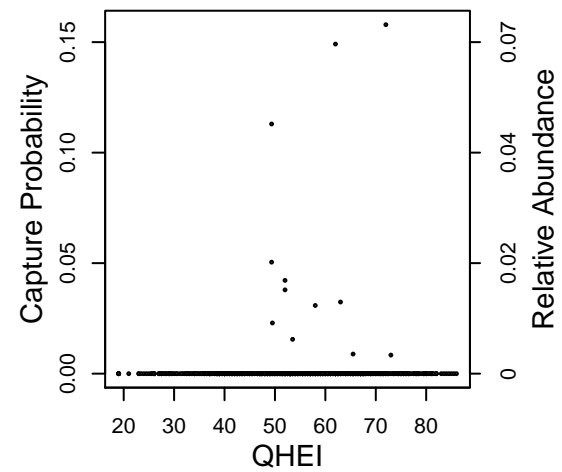
*Hydropsyche dicantha*



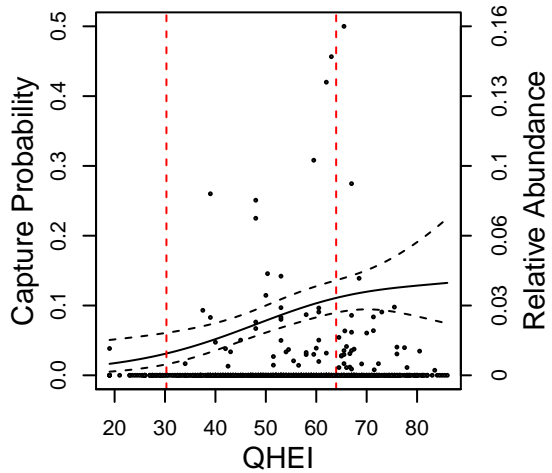
*Hydropsyche frisoni*



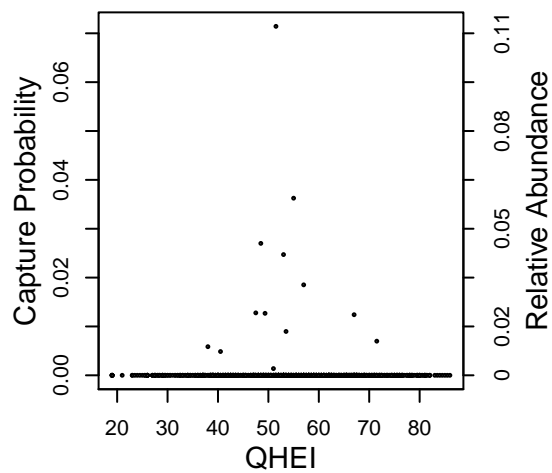
*Hydropsyche orris*



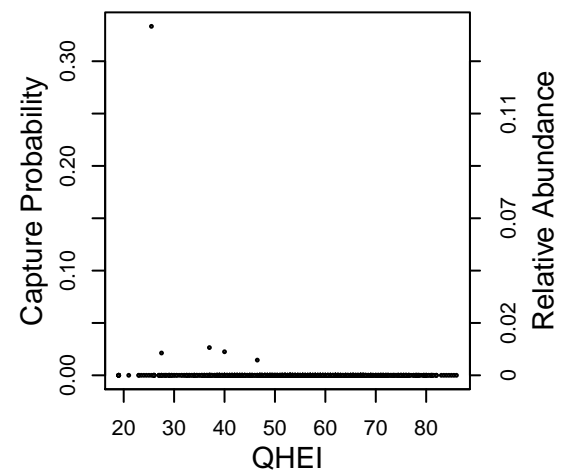
*Hydropsyche simulans*



*Hydropsyche venularis*

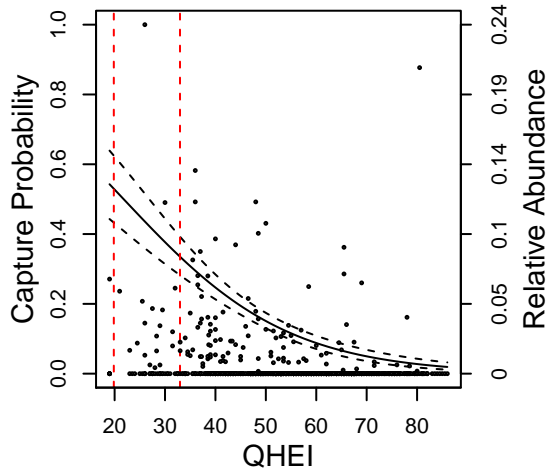


*Hydrovatus pustulatus*

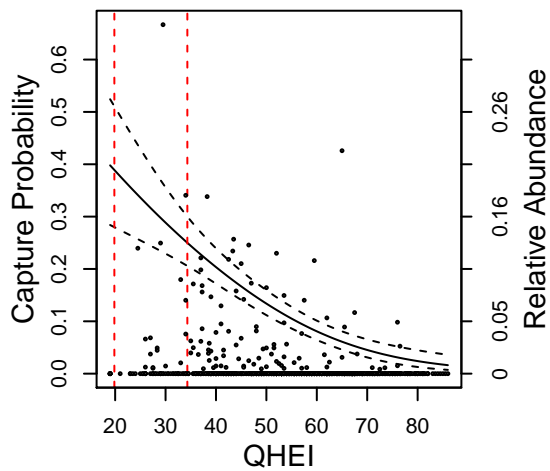


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

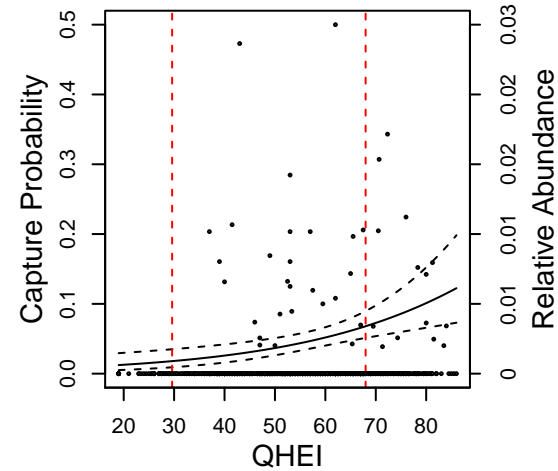
*Ischnura posita*



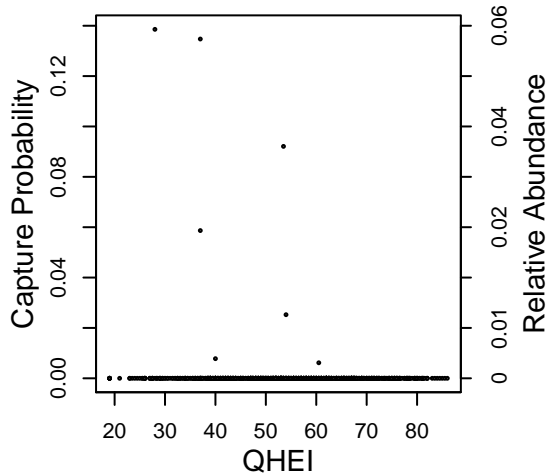
*Ischnura verticalis*



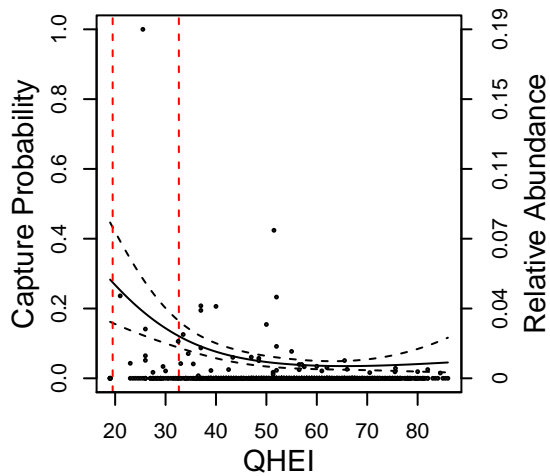
*Labrundinia pilosella*



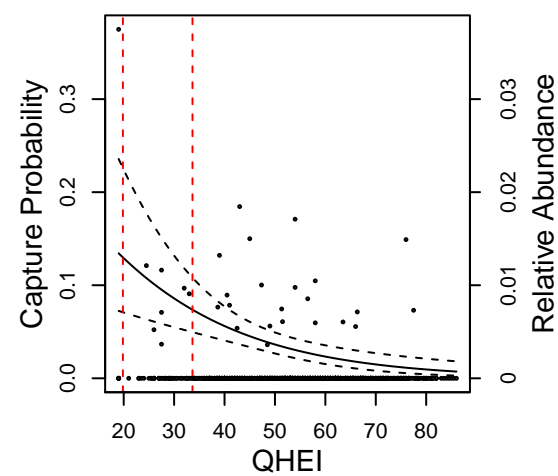
*Laccophilus fasciatus*



*Laccophilus maculosus*

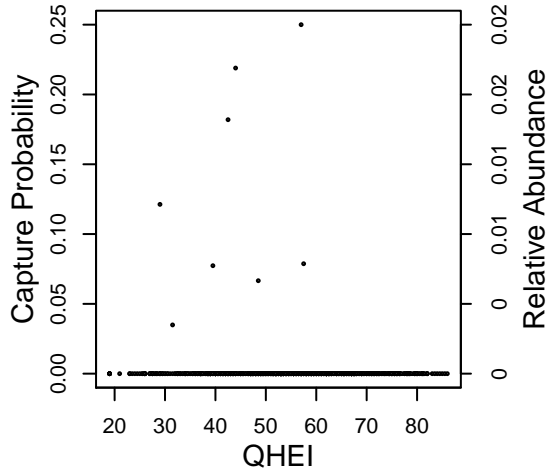


*Liodessus affinis complex*

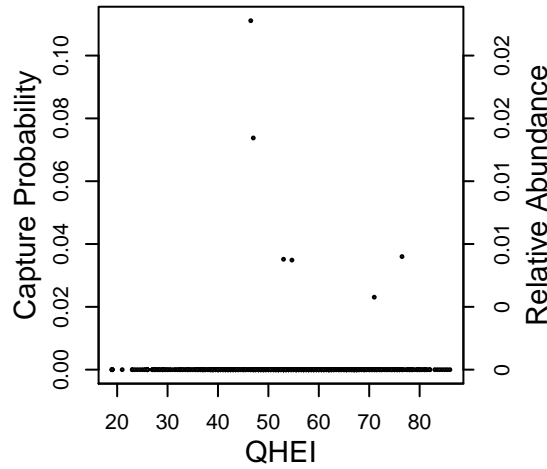


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

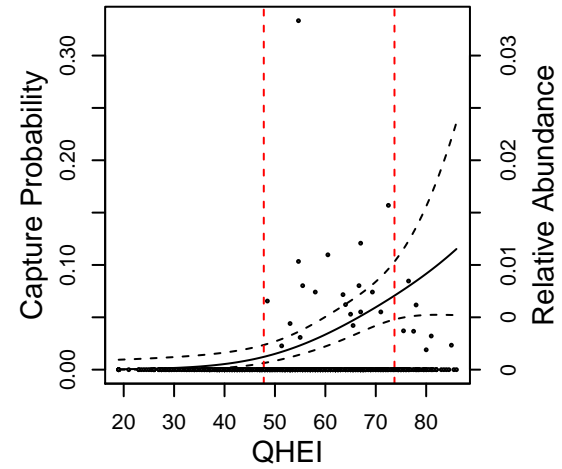
*Liodesus flavicollis*



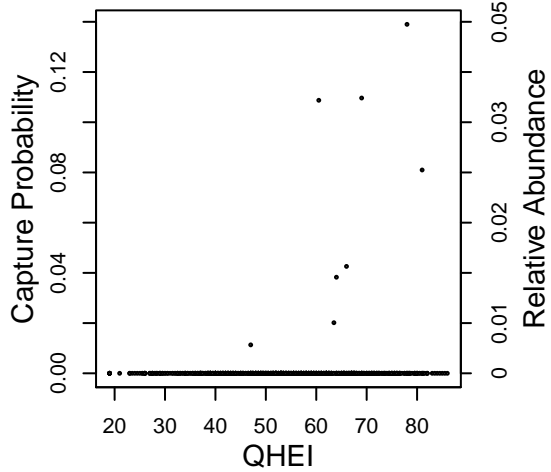
*Lype diversa*



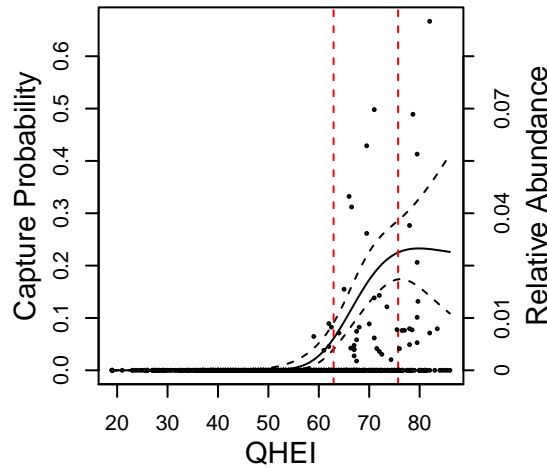
*Maccaffertium exiguum*



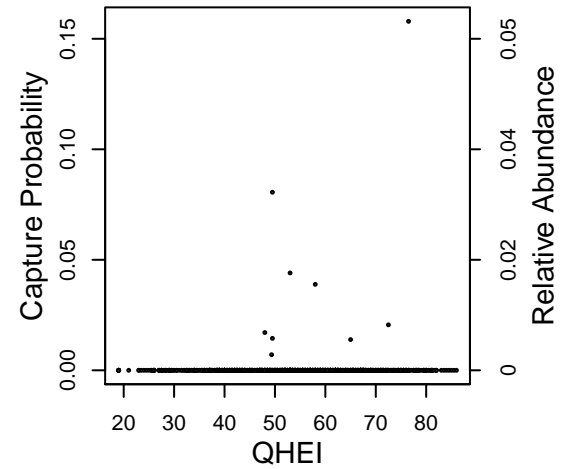
*Maccaffertium luteum*



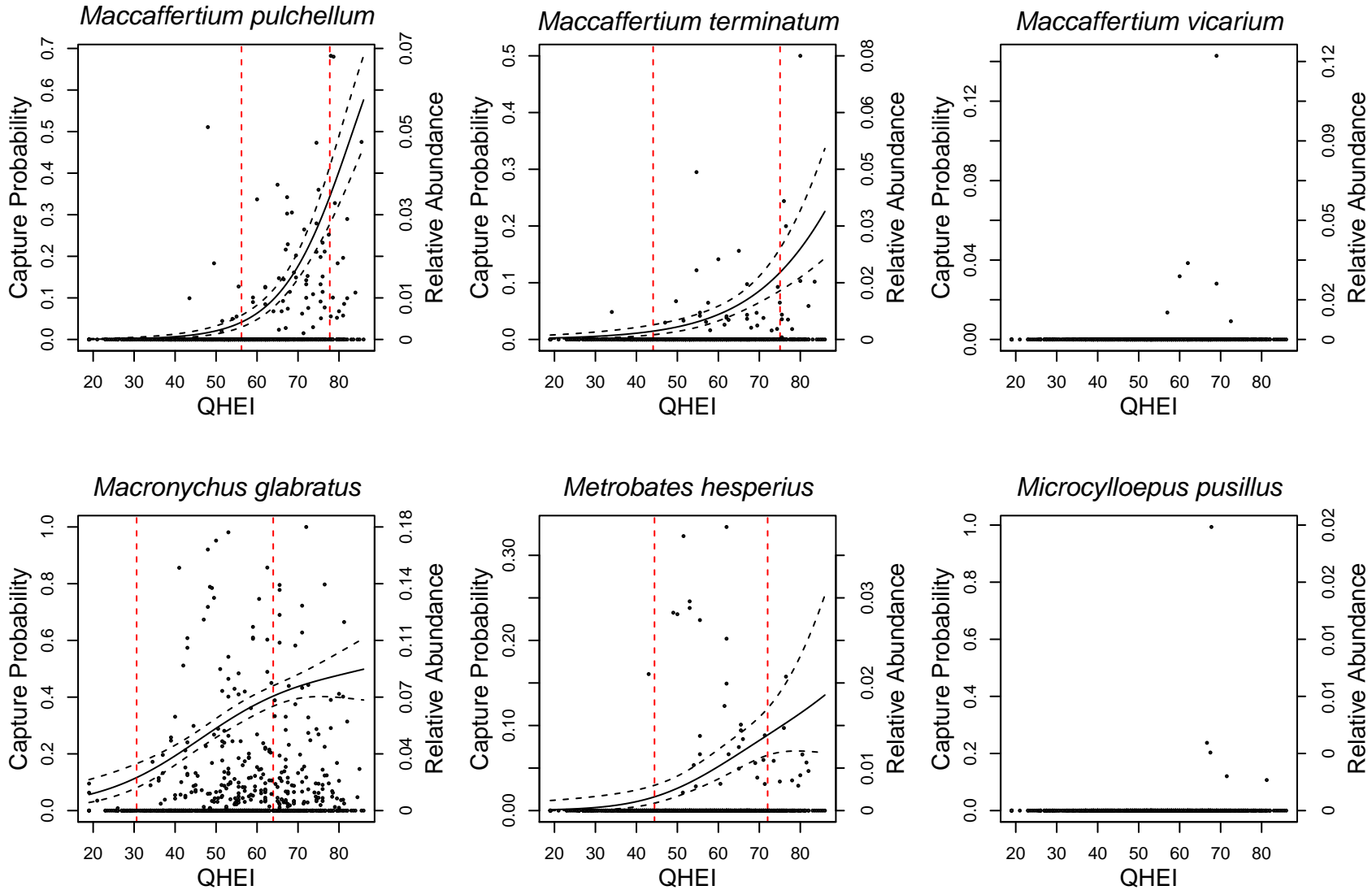
*Maccaffertium mediopunctatum*



*Maccaffertium mexicanum integrum*

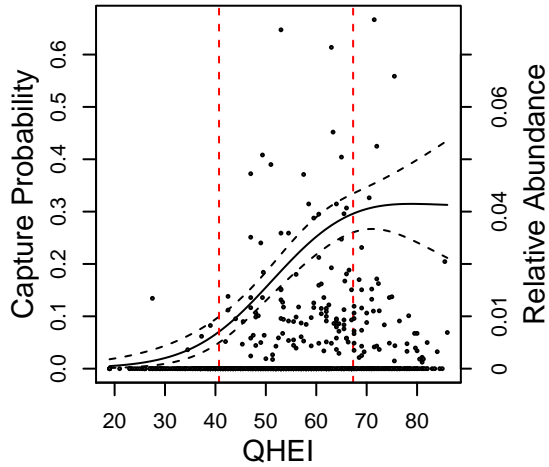


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

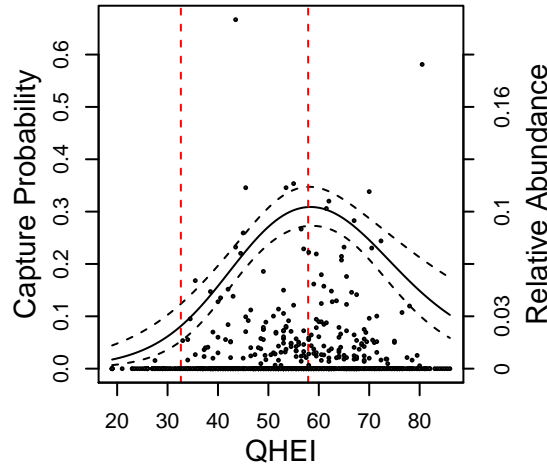


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

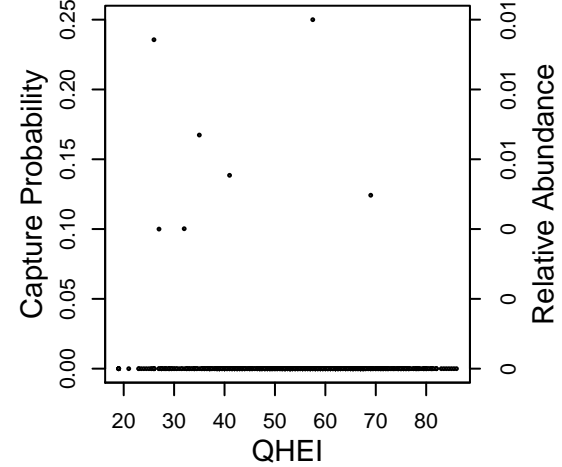
*Microtendipes pedellus* group



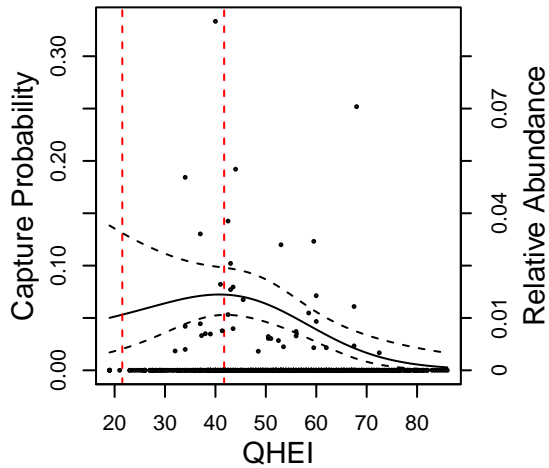
*Microvelia americana*



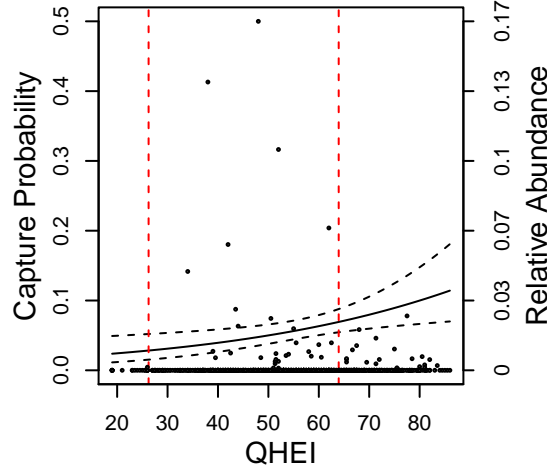
*Microvelia pulchella*



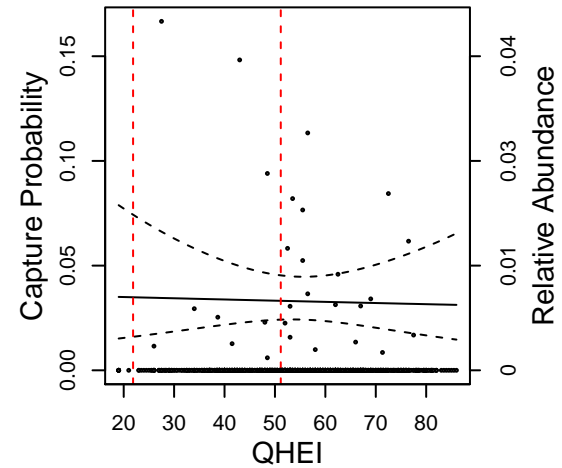
*Nasiaeschna pentacantha*



*Nectopsyche candida/exquisita*

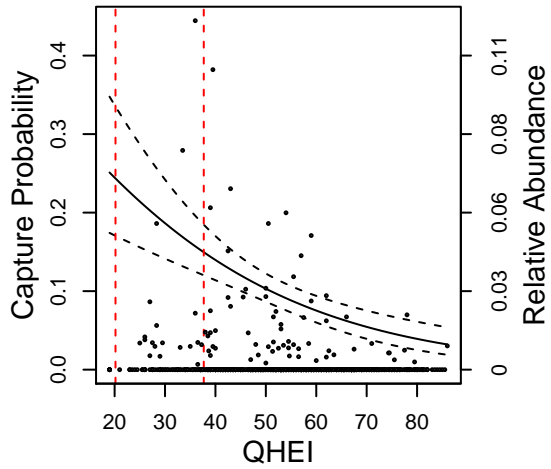


*Nectopsyche diarina*

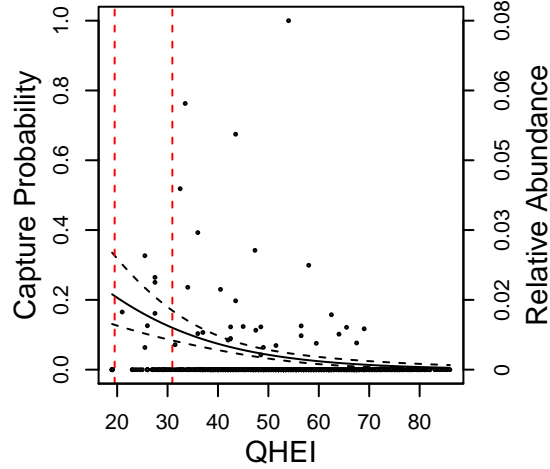


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

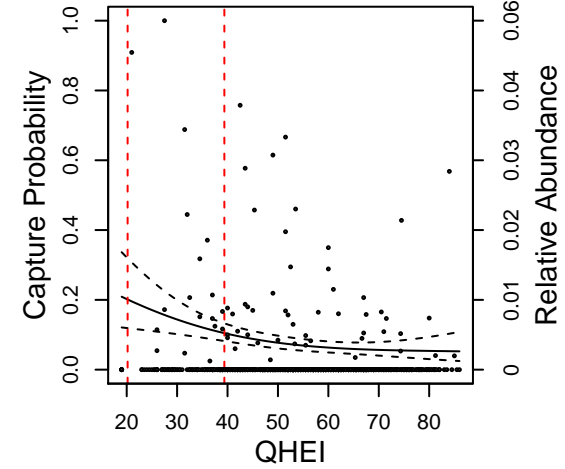
*Neoplea striola*



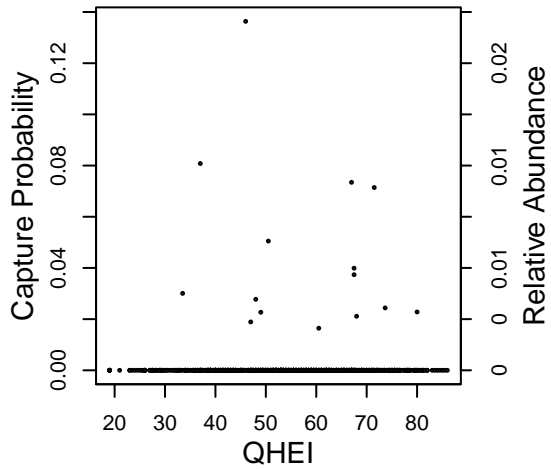
*Neoporus clypealis*



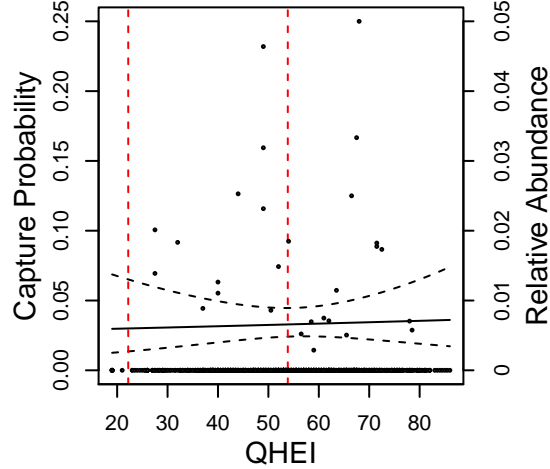
*Neoporus dimidiatus*



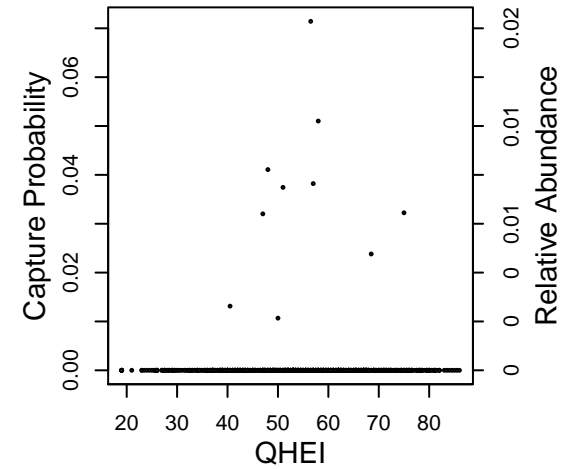
*Neoporus striatopunctatus*



*Neoporus tennetum*

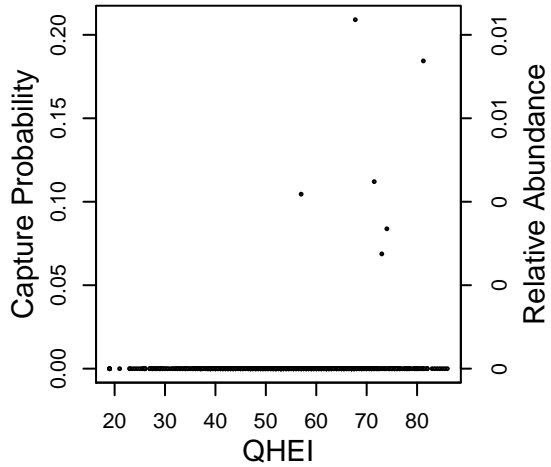


*Nepa apiculata*

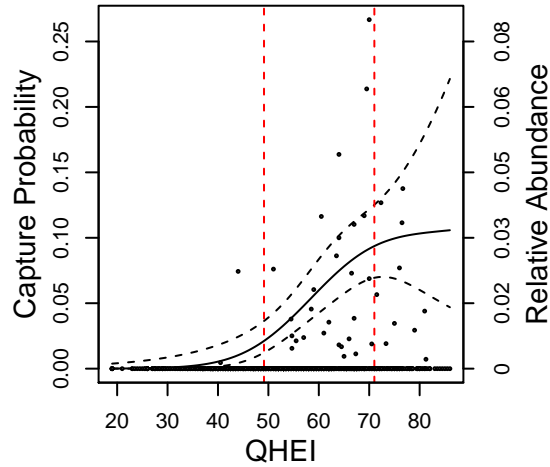


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

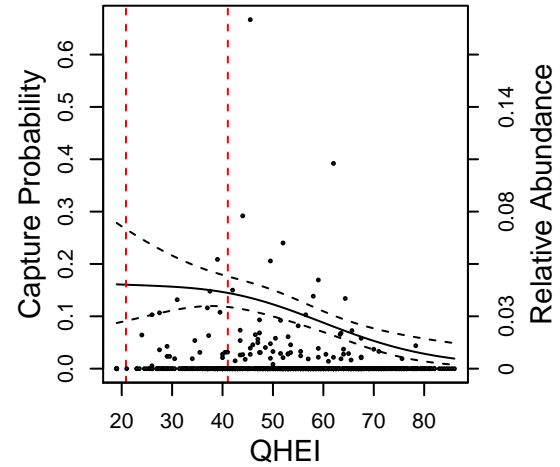
*Neurocordulia yamaskanensis*



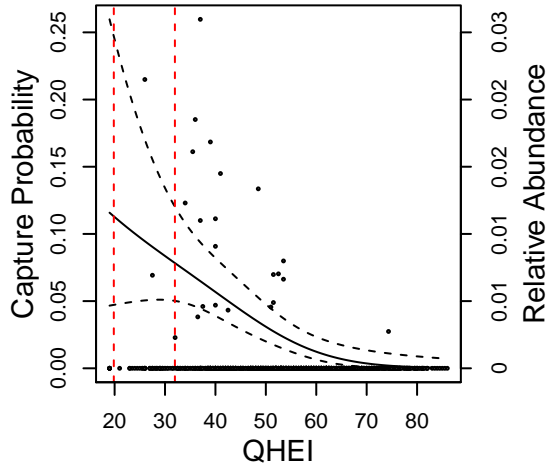
*Nigronia serricornis*



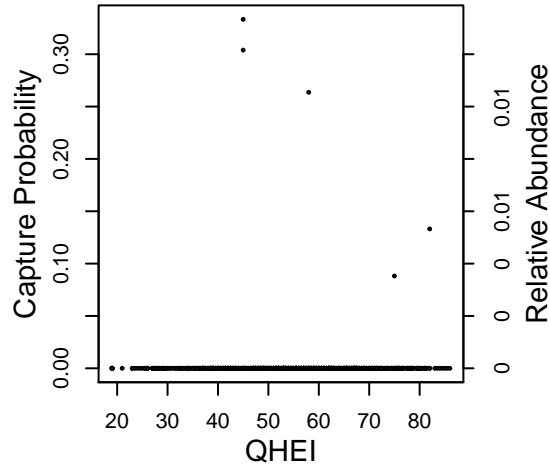
*Notonecta irrorata*



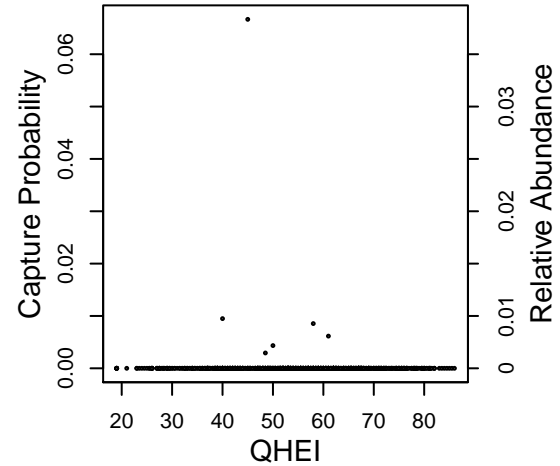
*Notonecta lunata*



*Oecetis avara*



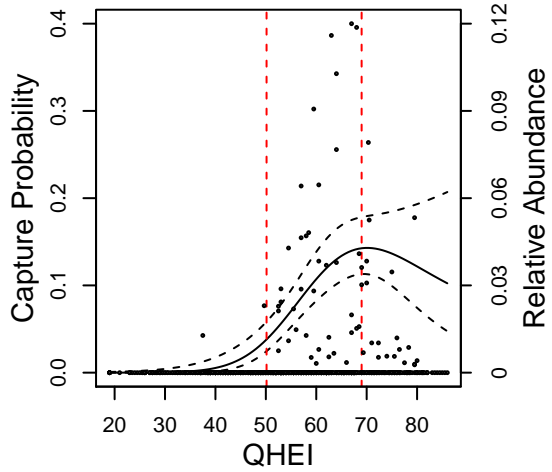
*Oecetis nocturna*



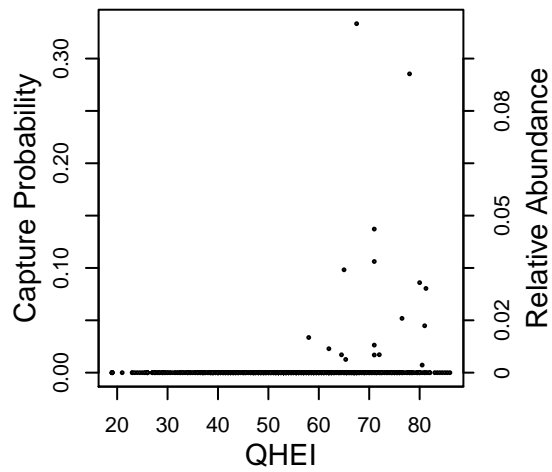


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

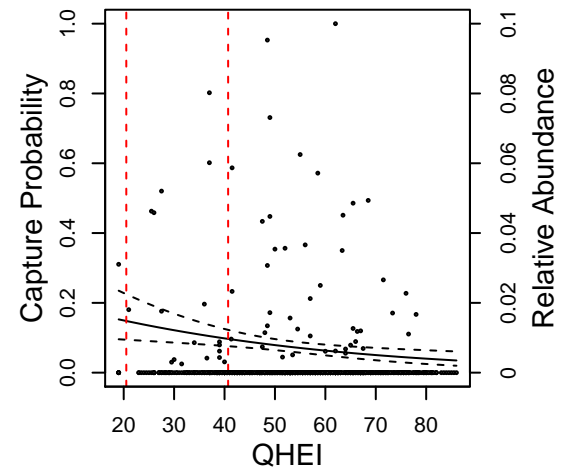
*Optioservus fastiditus*



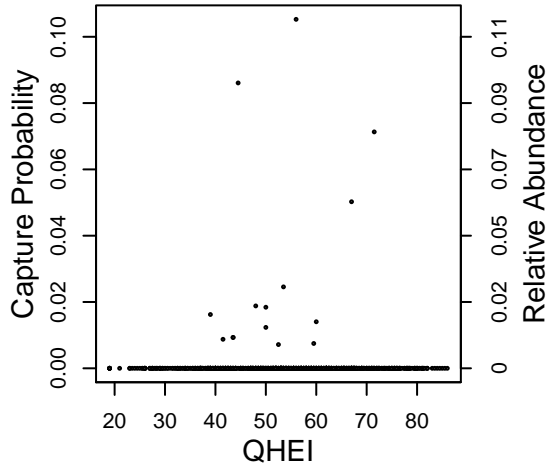
*Optioservus trivittatus*



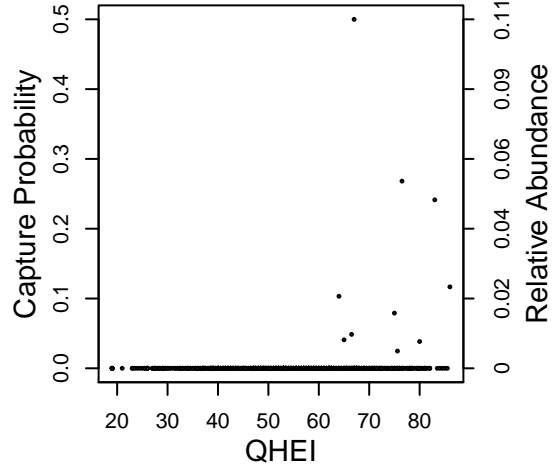
*Orconectes immunis*



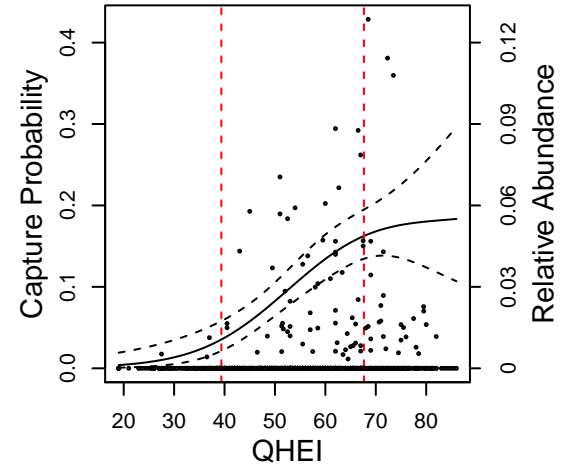
*Orconectes indianensis*



*Orconectes juvenilis*

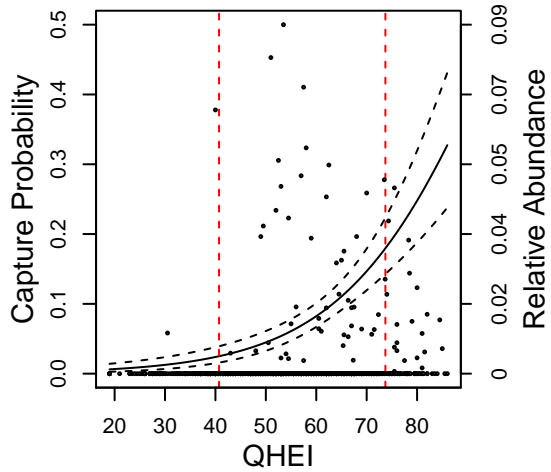


*Orconectes propinquus*

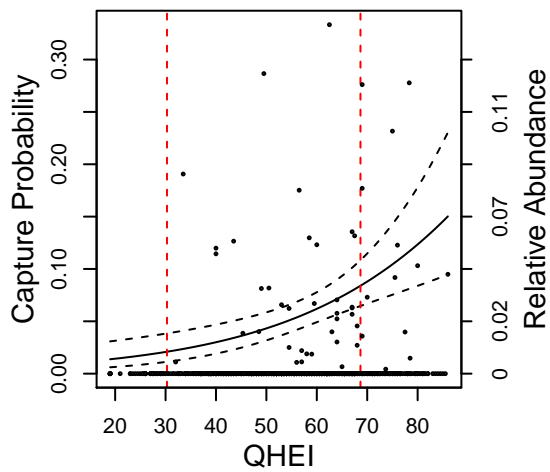


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

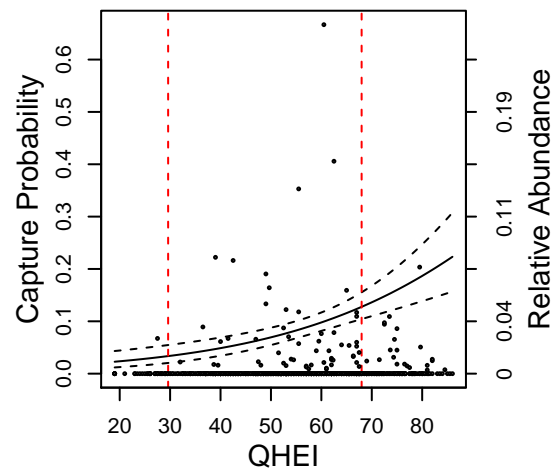
*Orconectes rusticus*



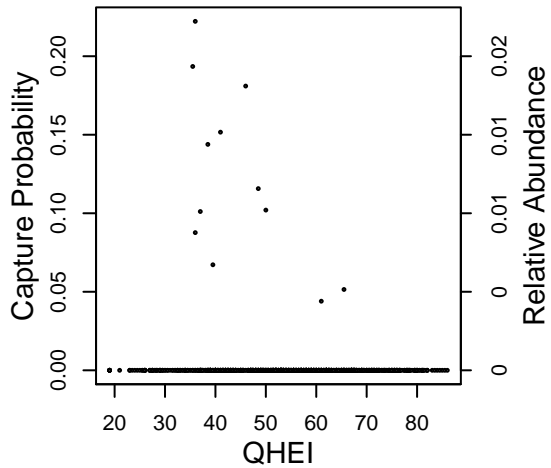
*Orconectes sloanii*



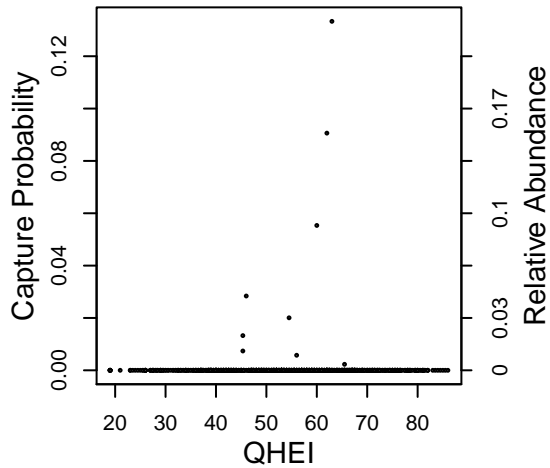
*Orconectes virilis*



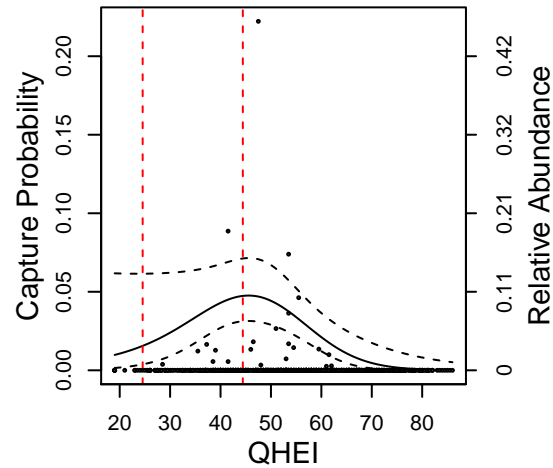
*Pachydiplax longipennis*



*Palaemonetes kadiakensis*

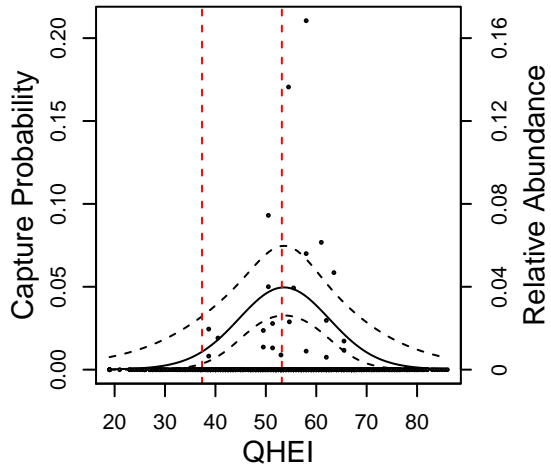


*Palmaricorixa buenoi*

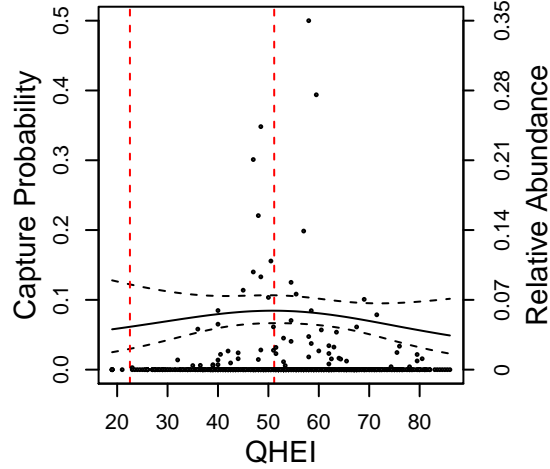


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

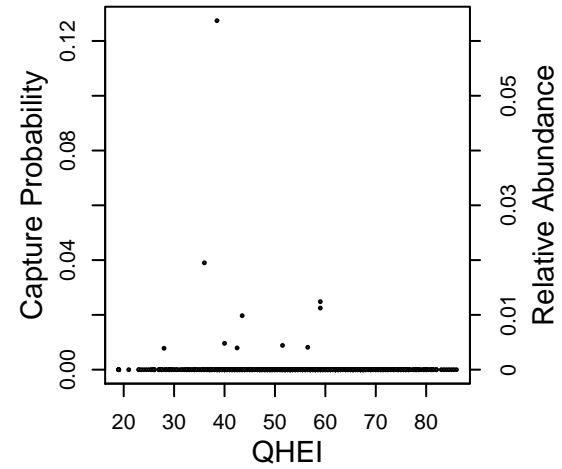
*Palmacorixa gillettei*



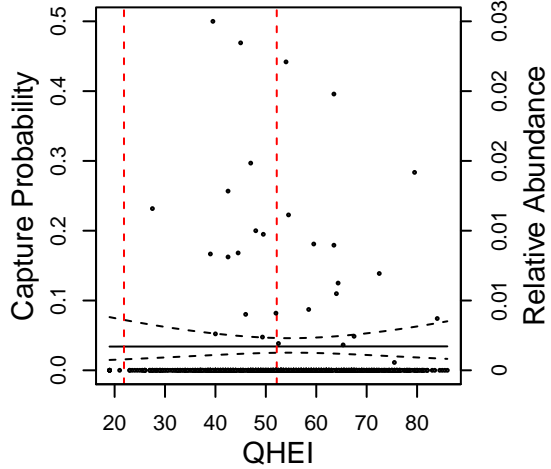
*Palmacorixa nana*



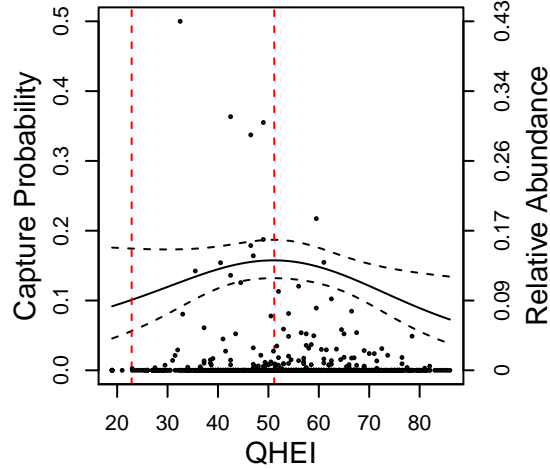
*Paragordius varius*



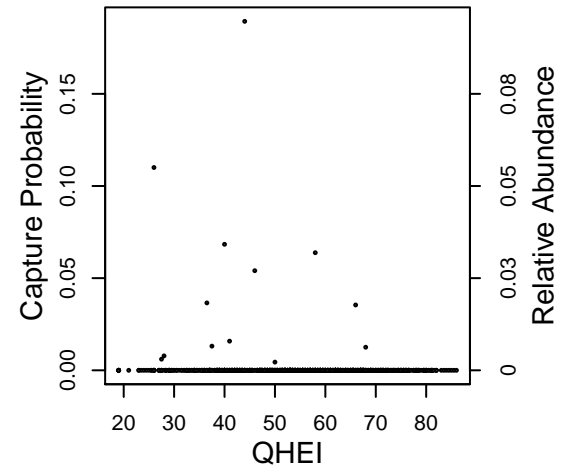
*Paralauterborniella nigrohalterale*



*Paratendipes albimanus*

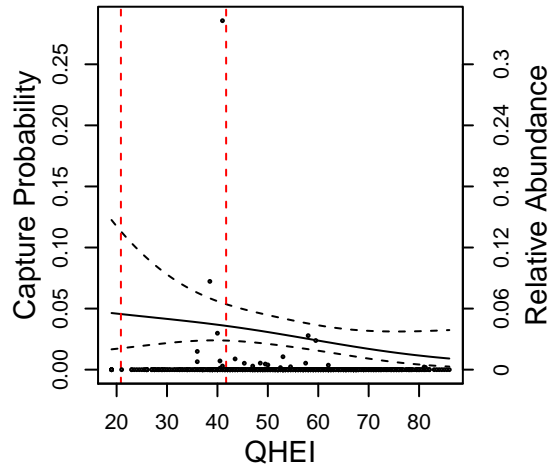


*Pelocoris femoratus*

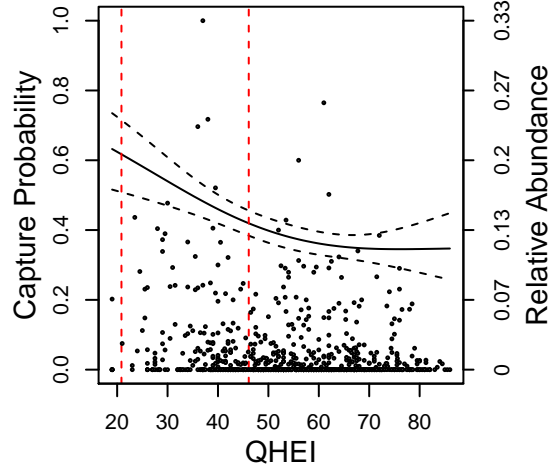


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

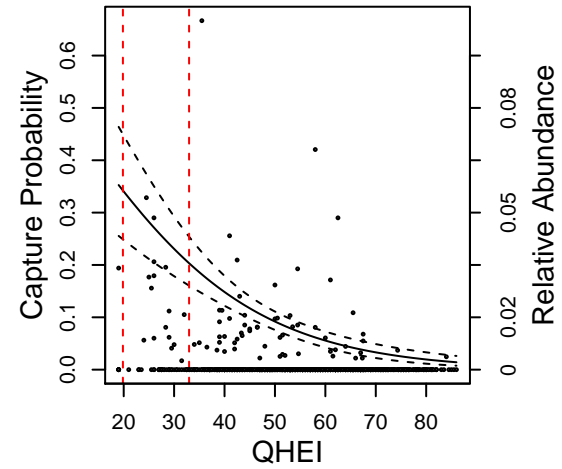
*Peltodytes dunavani*



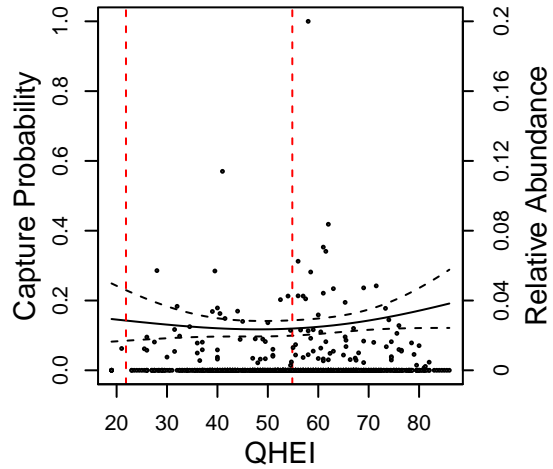
*Peltodytes duodecimpuntatus*



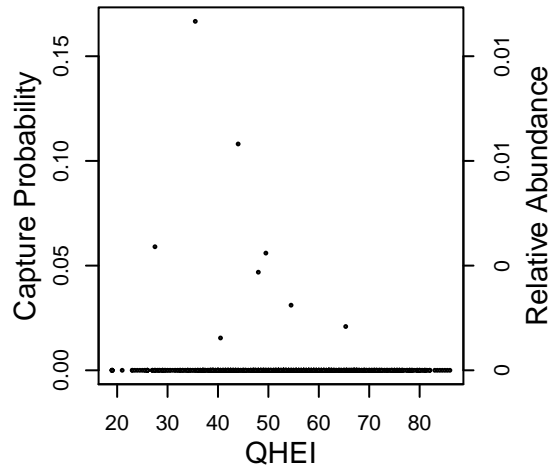
*Peltodytes edentulus*



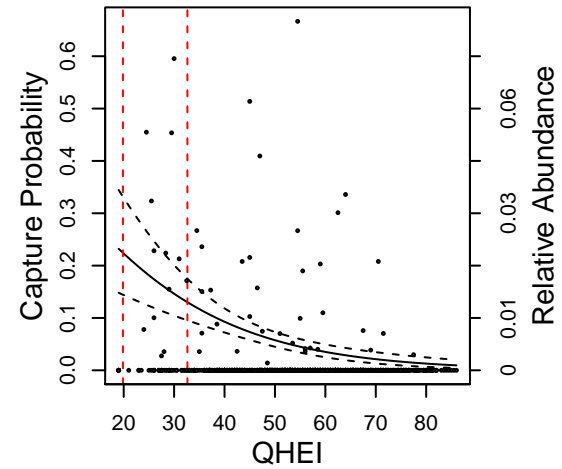
*Peltodytes lengi*



*Peltodytes litoralis*

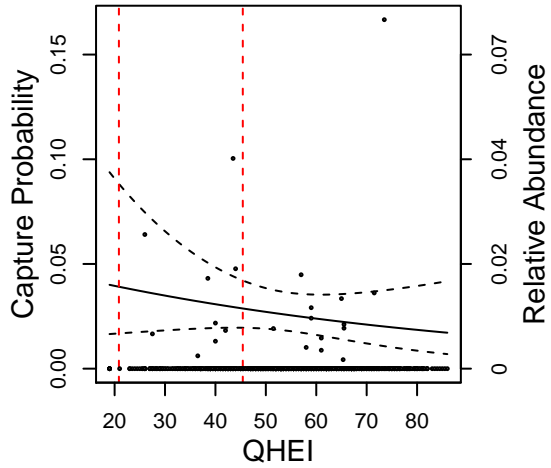


*Peltodytes muticus*

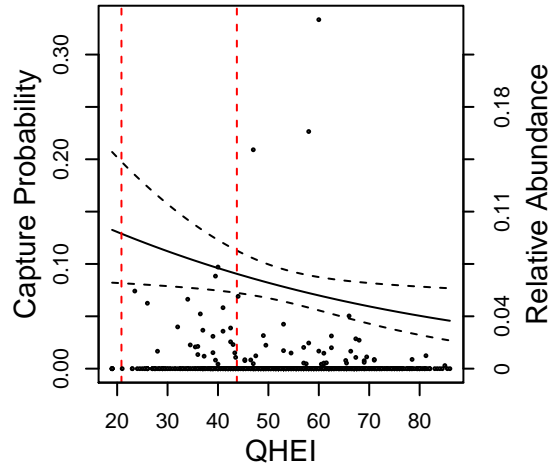


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

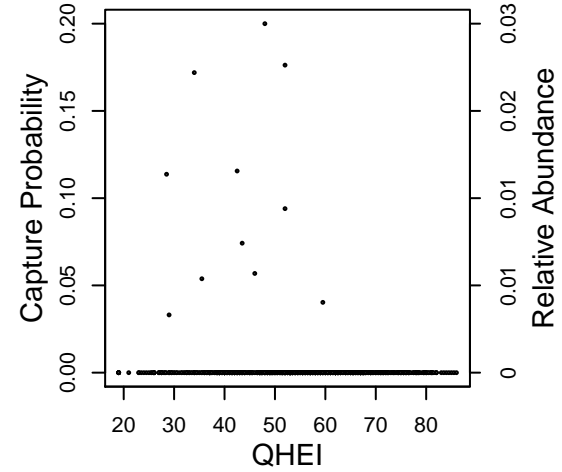
*Peltodytes pedunculatus*



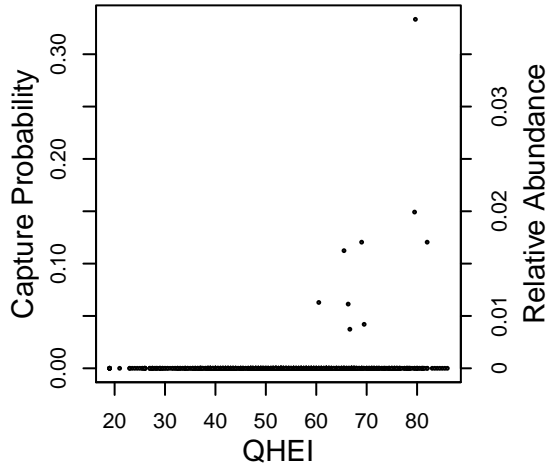
*Peltodytes sexmaculatus*



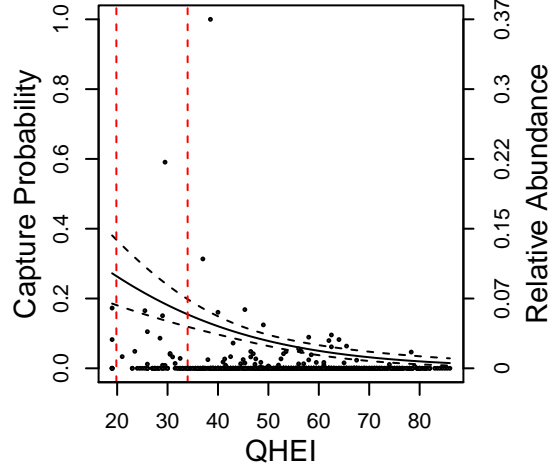
*Perithemis tenera*



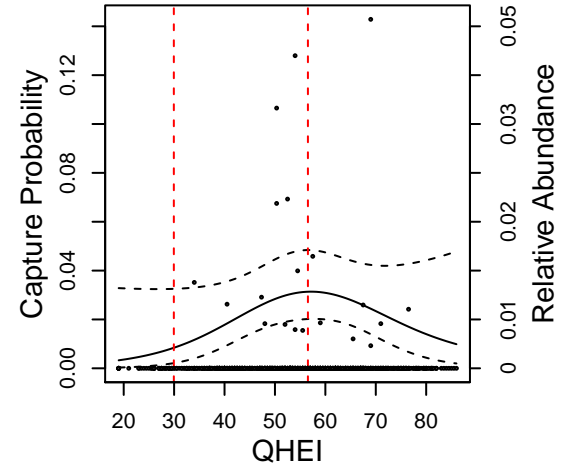
*Perlinella drymo*



*Plathemis lydia*

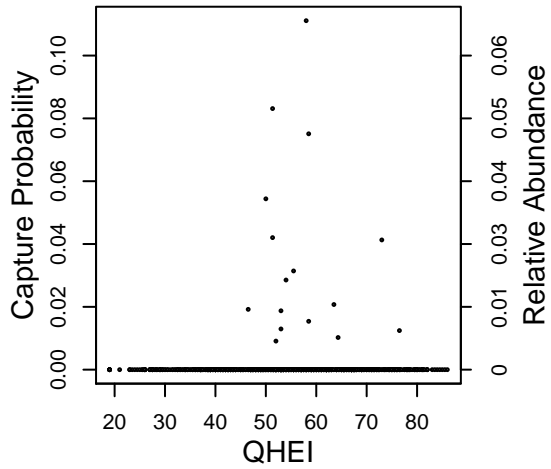


*Polypedilum (tripodura)*

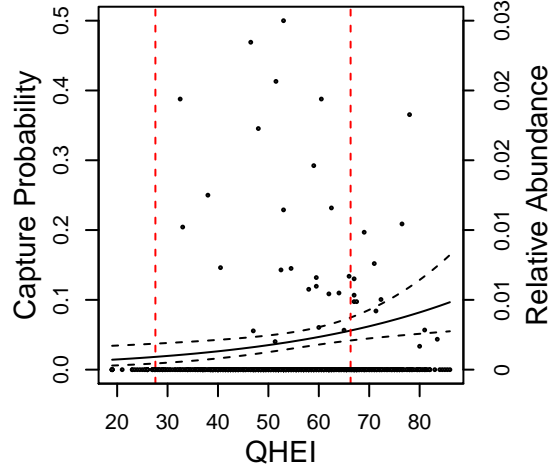


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

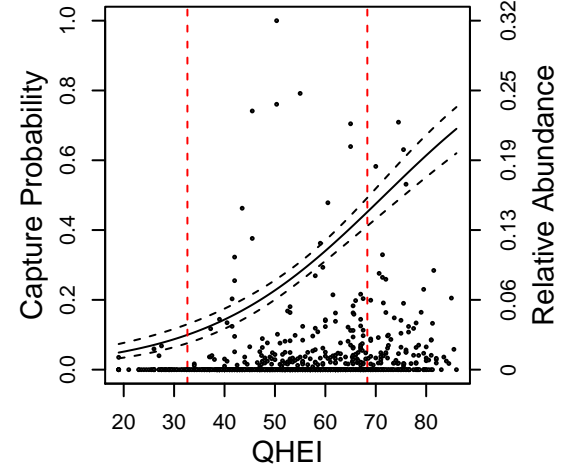
*Polypedilum aviceps*



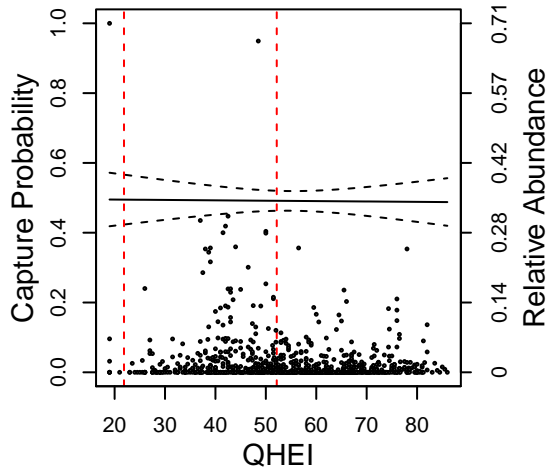
*Polypedilum fallax* group



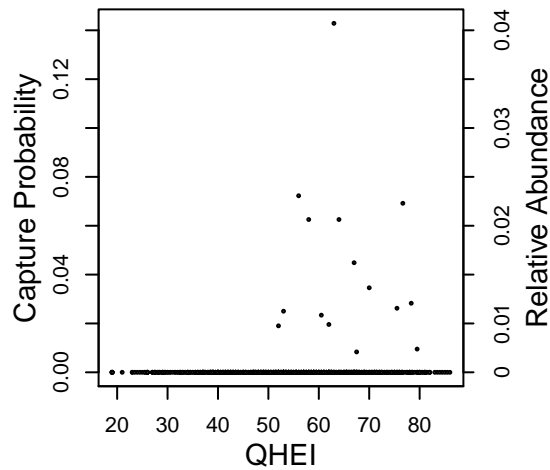
*Polypedilum flavum*



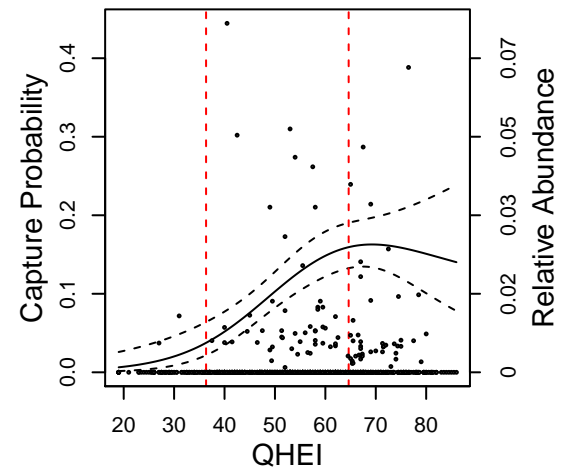
*Polypedilum illinoense* group



*Polypedilum laetum* group

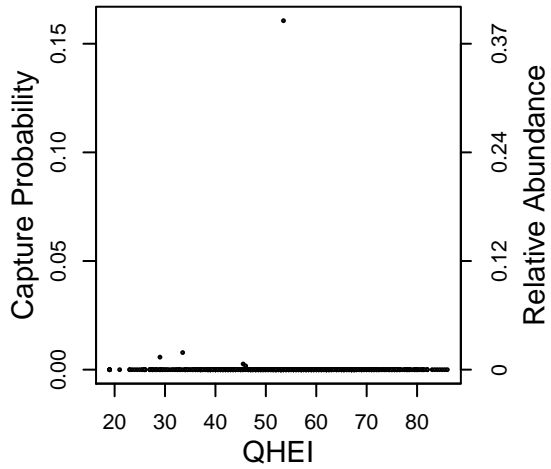


*Polypedilum scalaenum* group

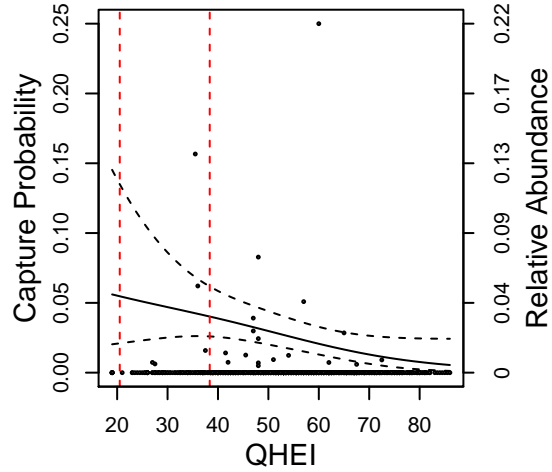


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

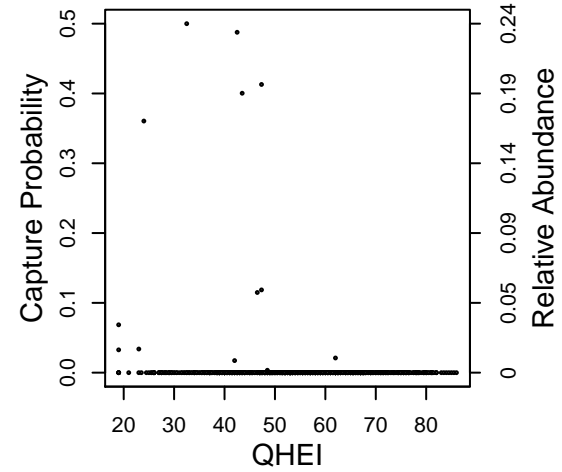
*Polypedilum tritum*



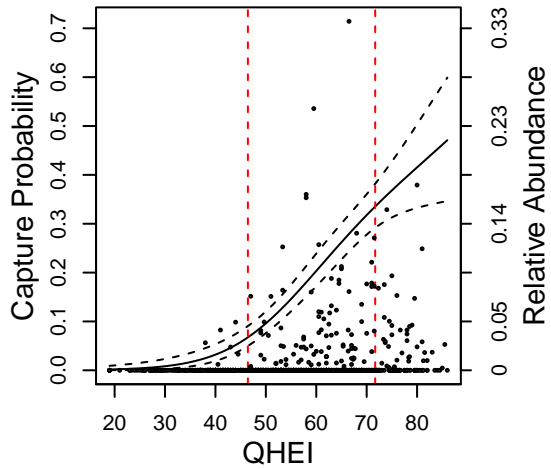
*Progomphus obscurus*



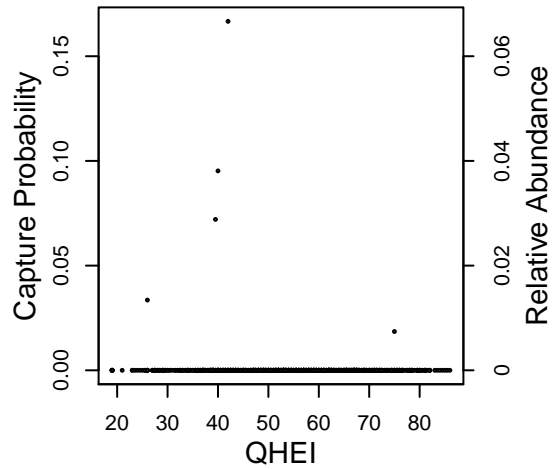
*Psectrotanypus dyari*



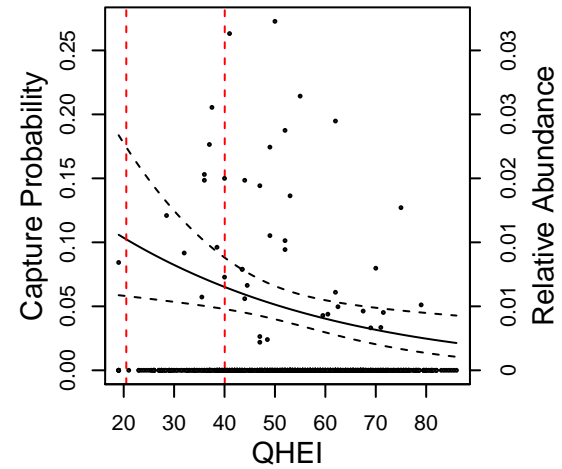
*Psephenus herricki*



*Ranatra australis*

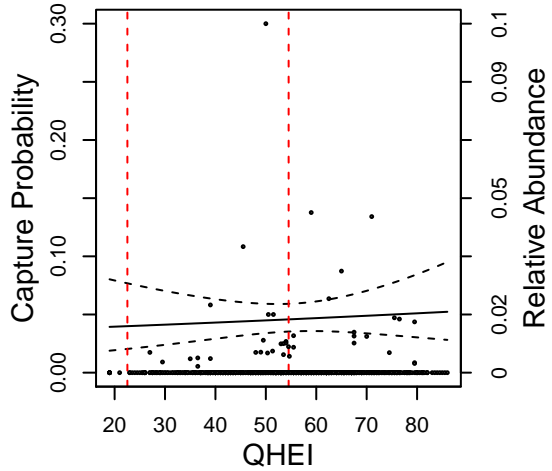


*Ranatra buenoi*

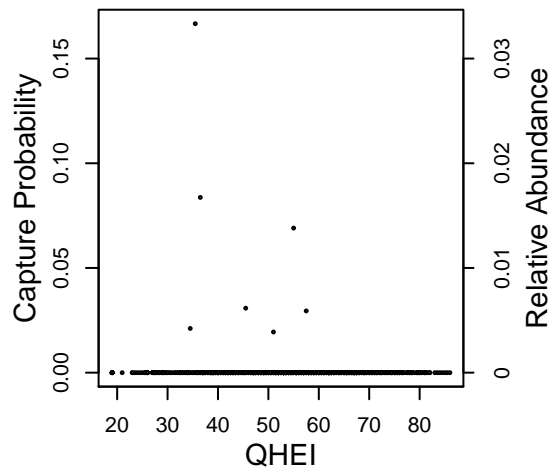


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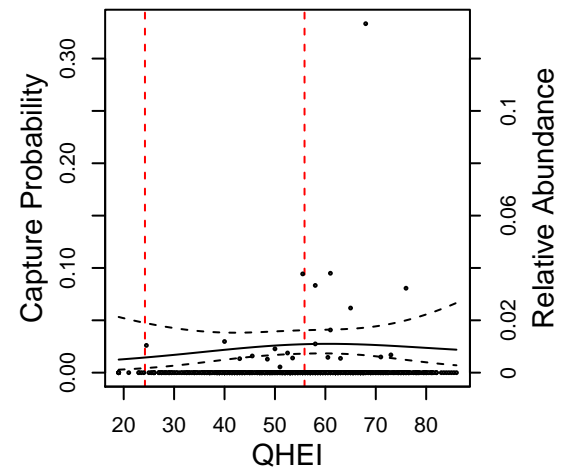
*Ranatra fusca*



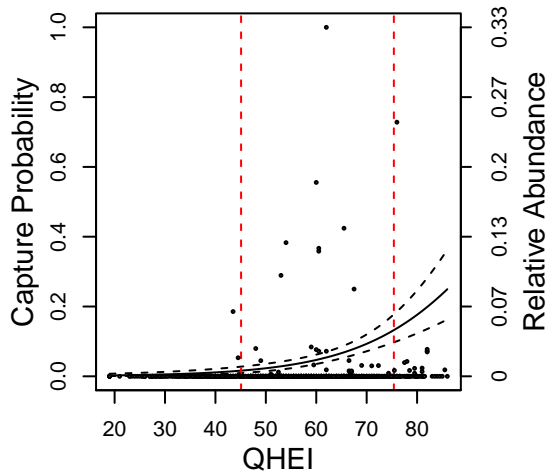
*Ranatra kirkaldyi*



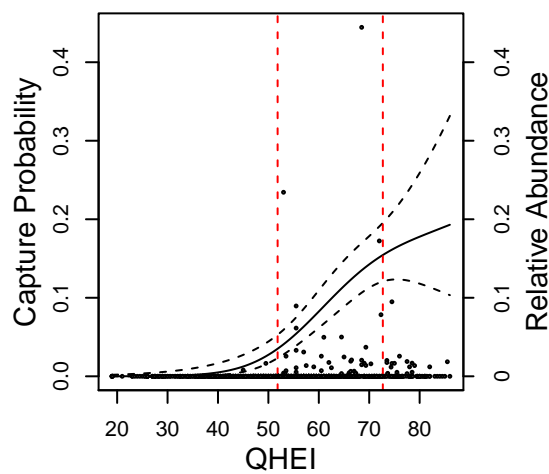
*Ranatra nigra*



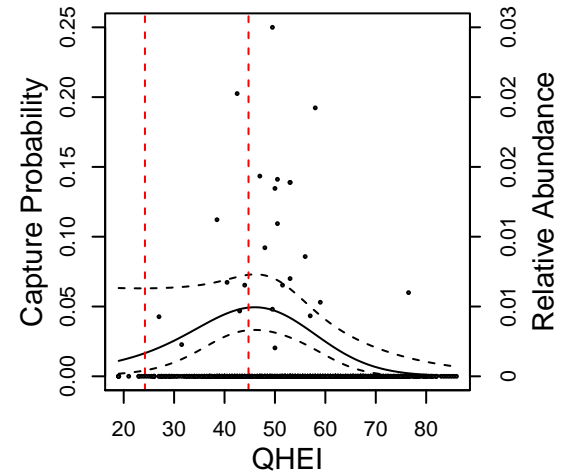
*Rhagovelia obesa*



*Rhagovelia oriander*



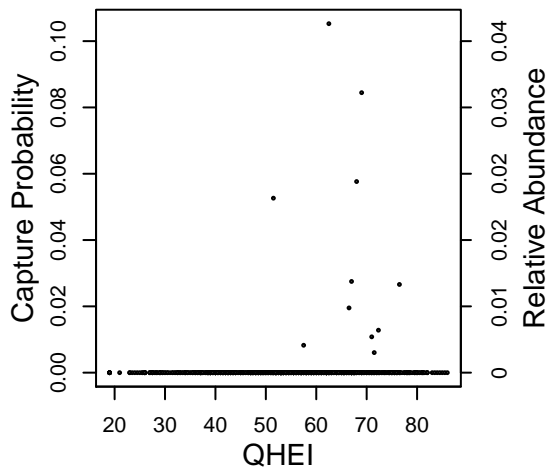
*Rheumatobates palosi*



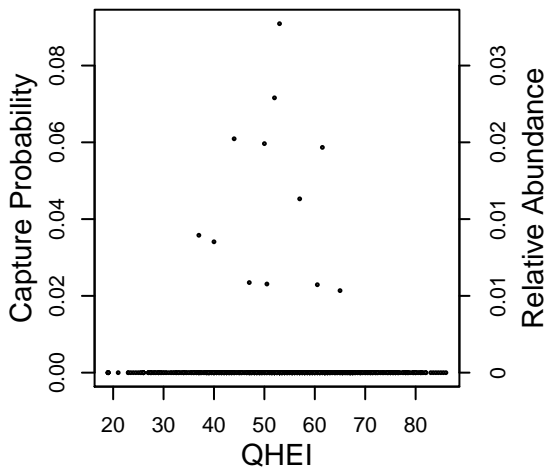


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

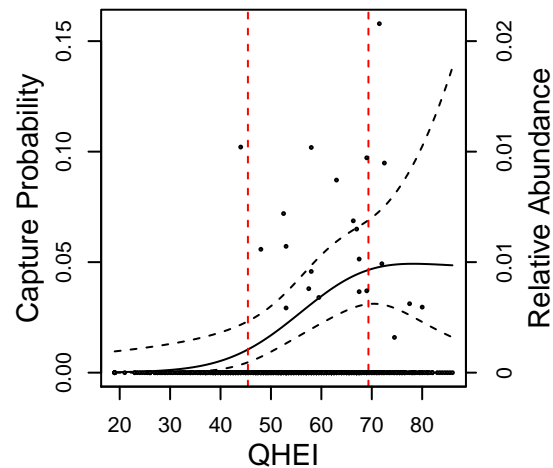
*Rheumatobates rileyi*



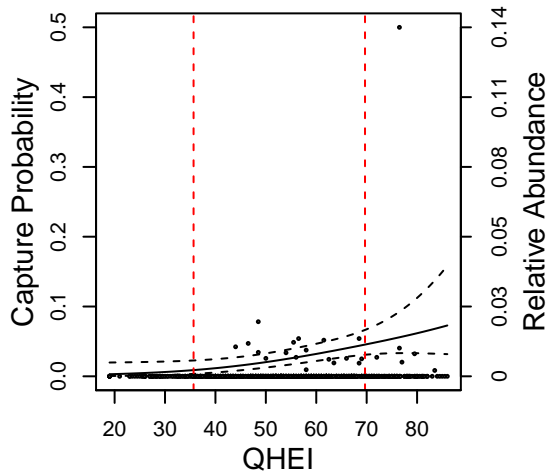
*Rheumatobates tenuipes*



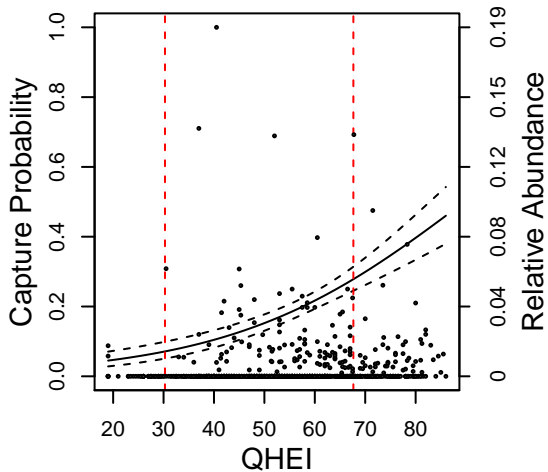
*Saetheria tylus*



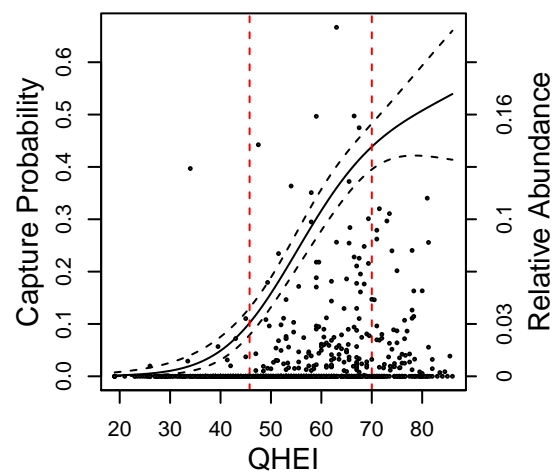
*Sperchopsis tessellata*



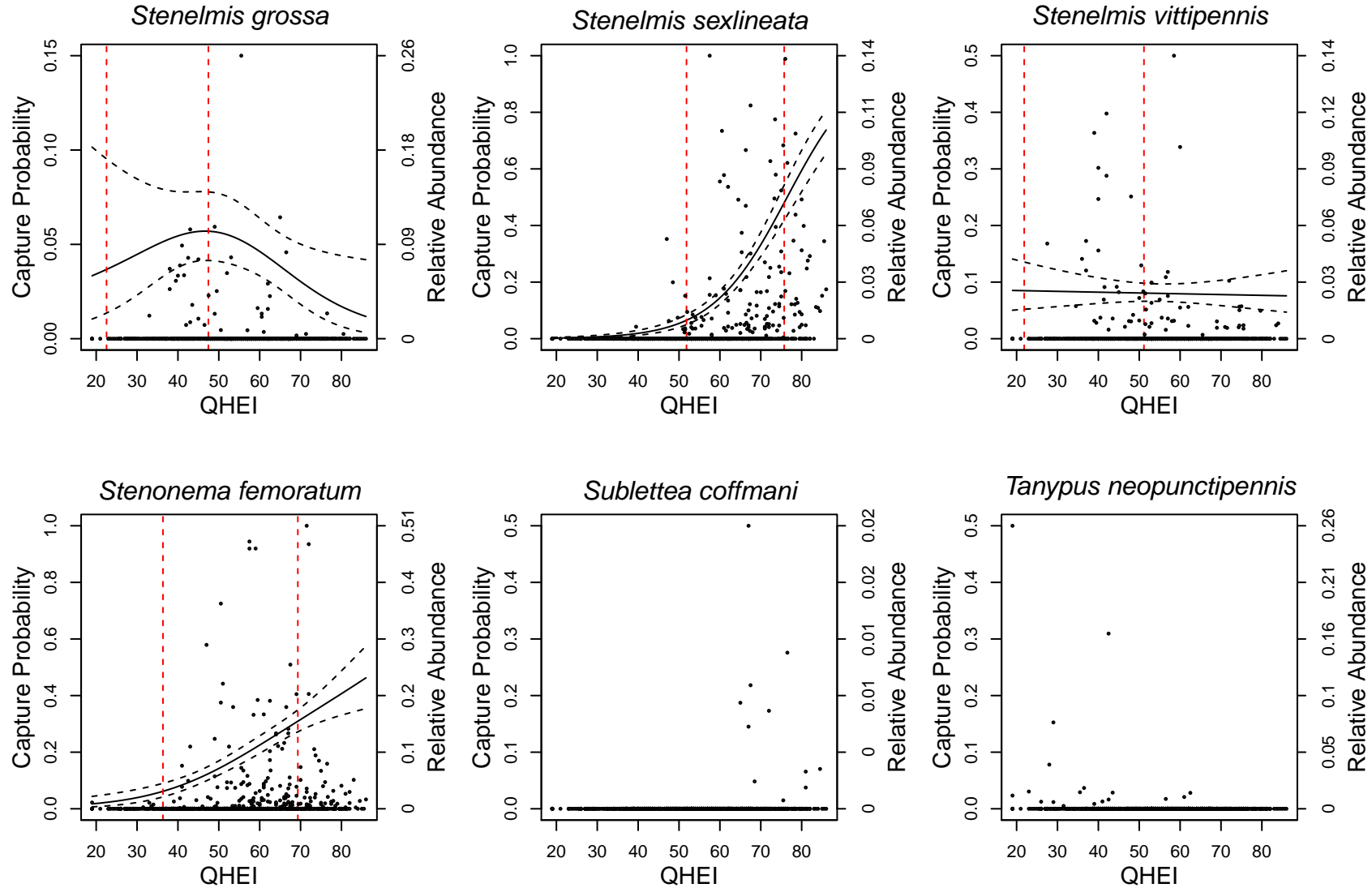
*Stenacron interpunctatum*



*Stenelmis crenata*

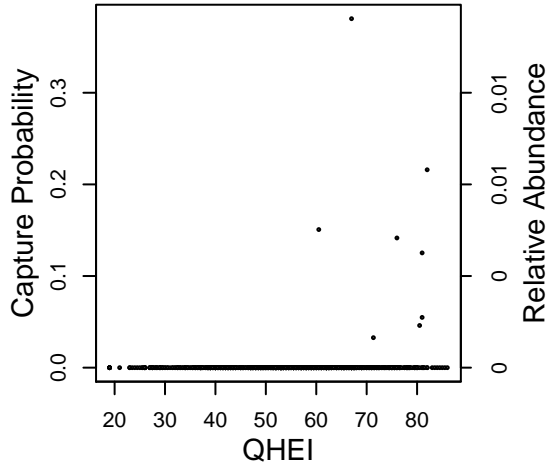


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

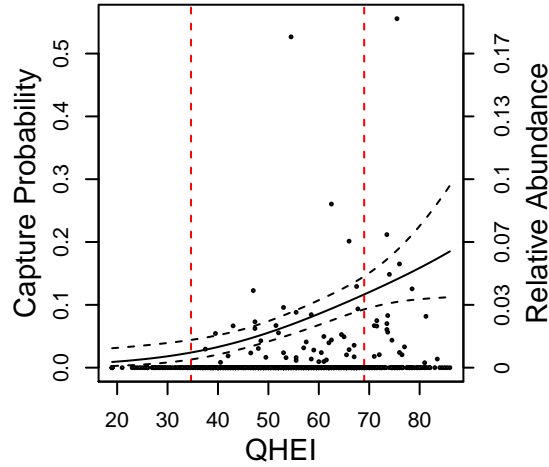


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

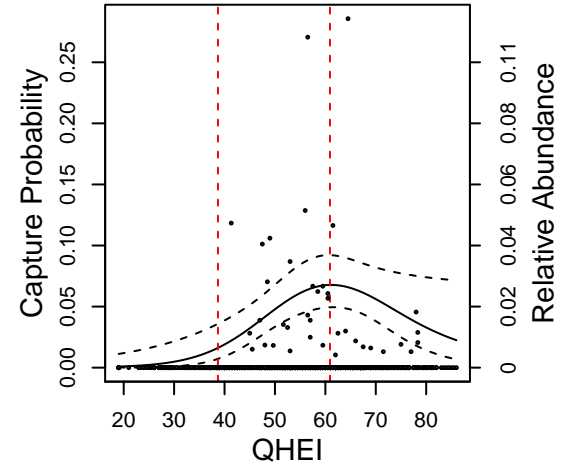
*Telopelopia okoboji*



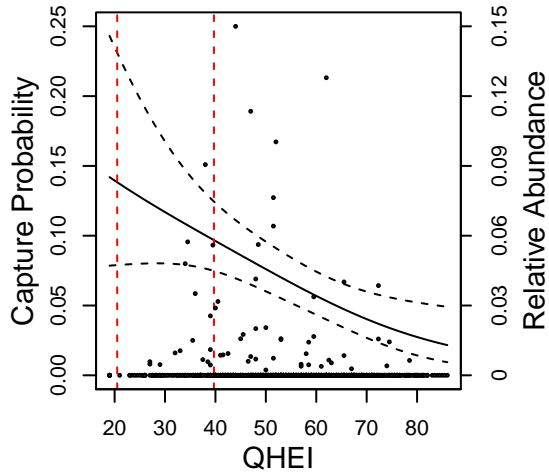
*Trepobates inermis/knighti*



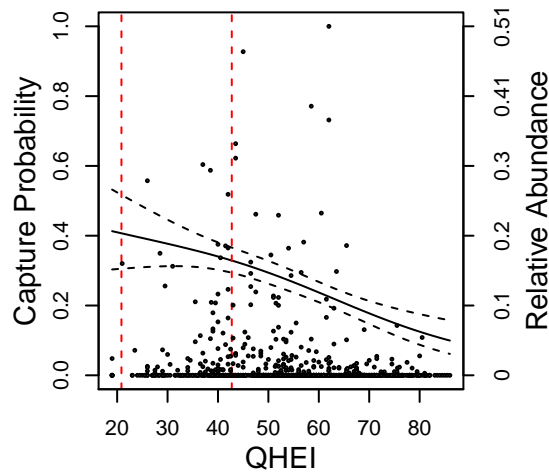
*Trepobates pictus*



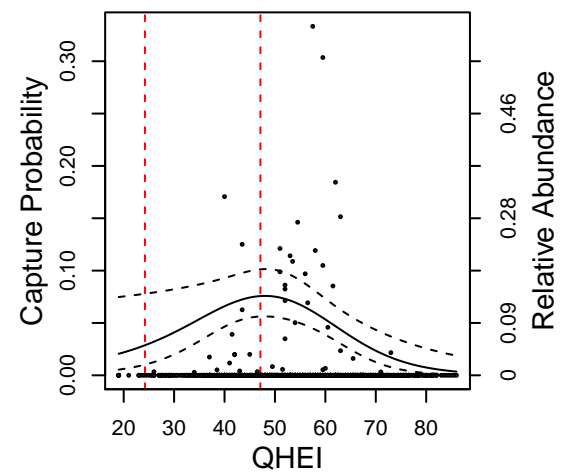
*Trepobates subnitidus*



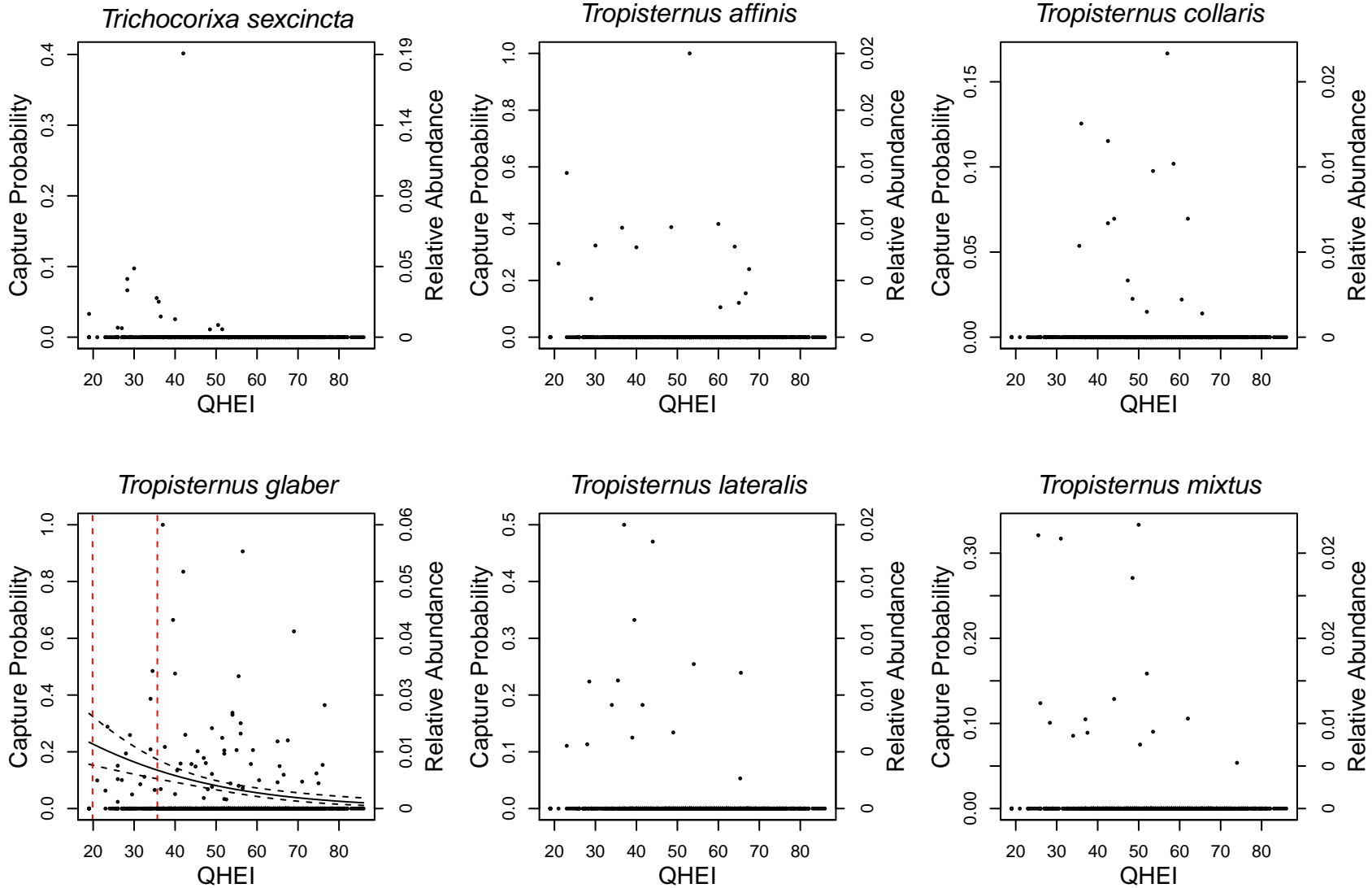
*Trichocorixa calva*



*Trichocorixa kanza*

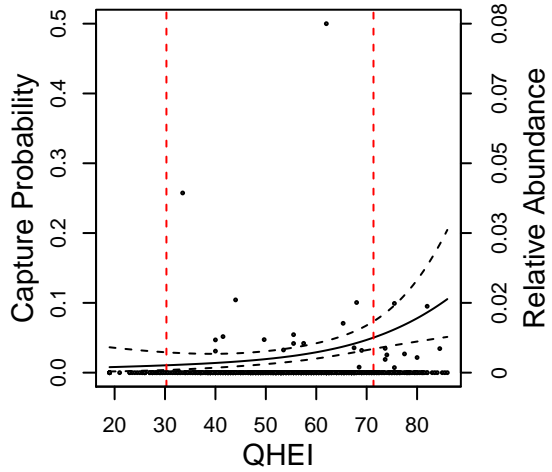


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

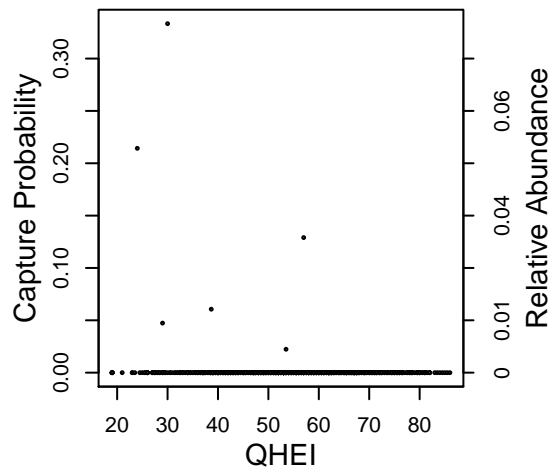


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

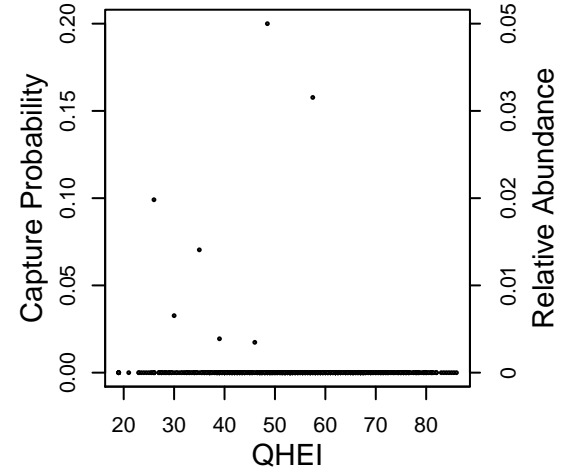
*Tropisternus natator*



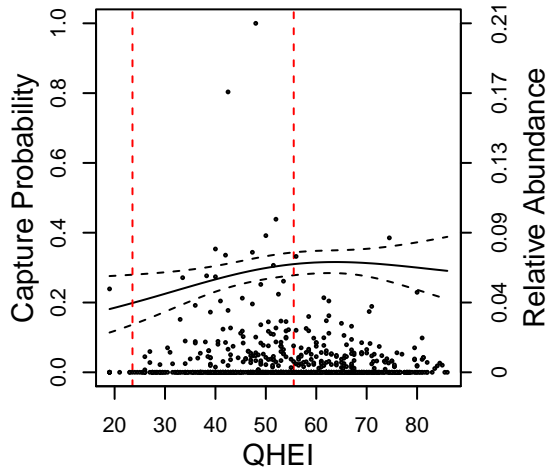
*Valvata bicarinata*



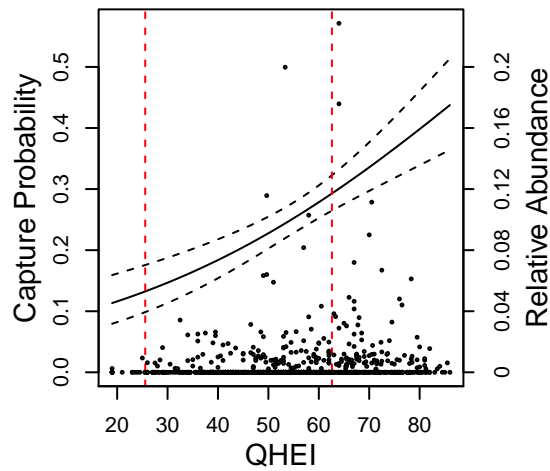
*Zavreliella marmorata*



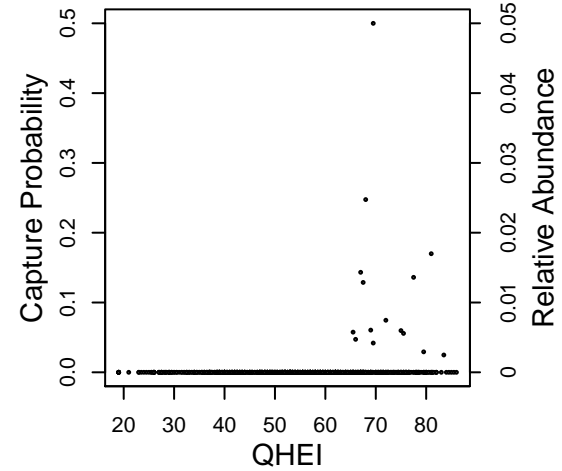
*Ablabesmyia*



*Acari*

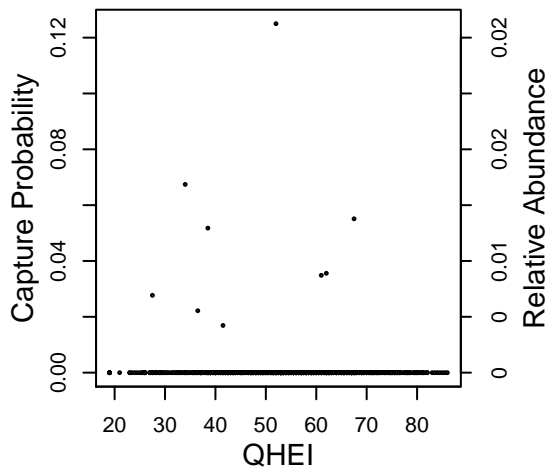


*Acentrella*

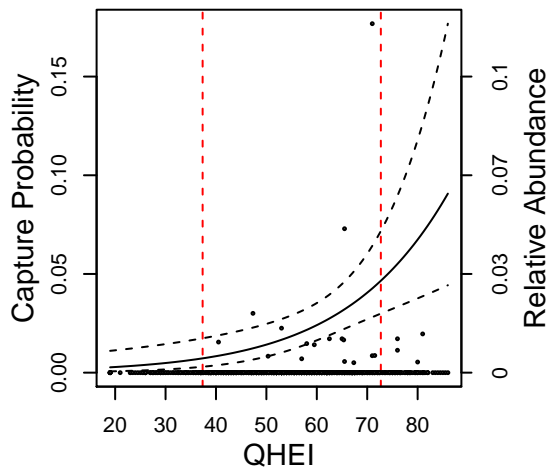


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

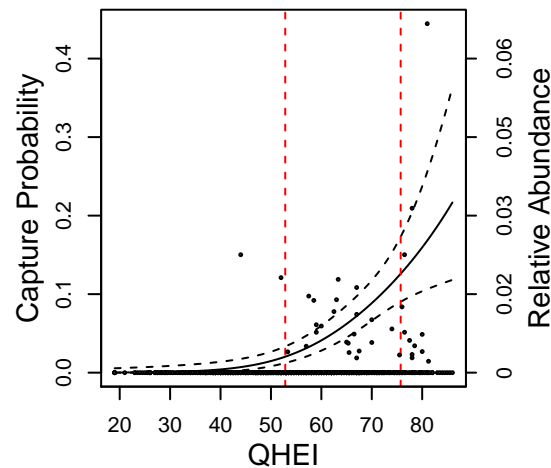
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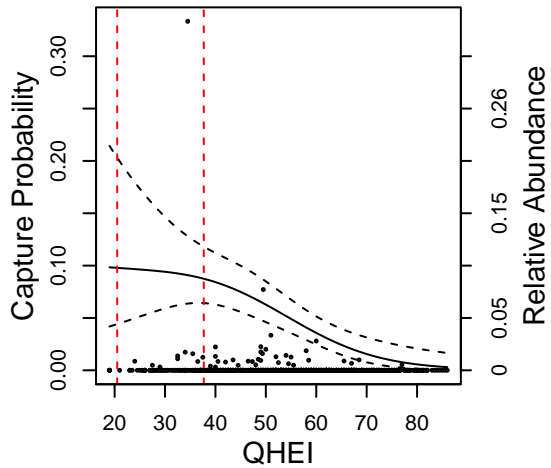
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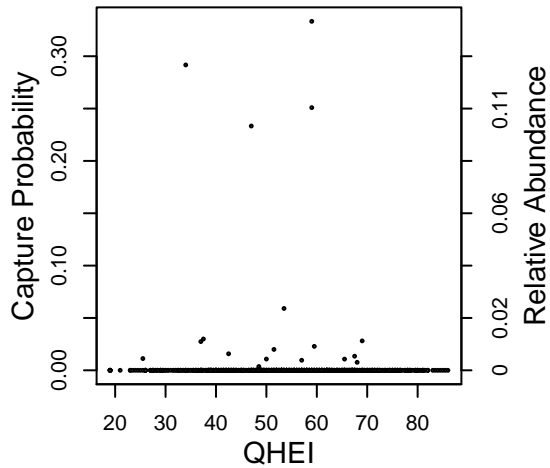
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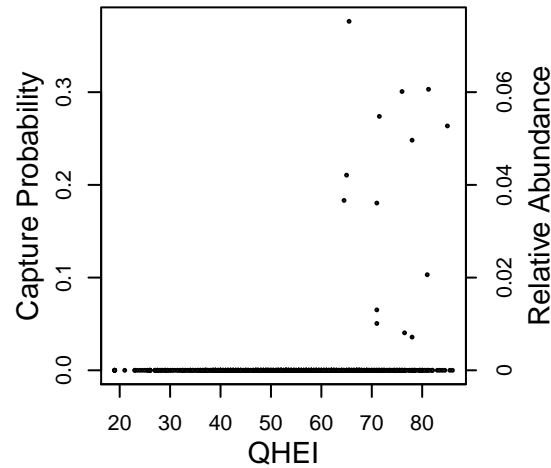
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*Agabus*

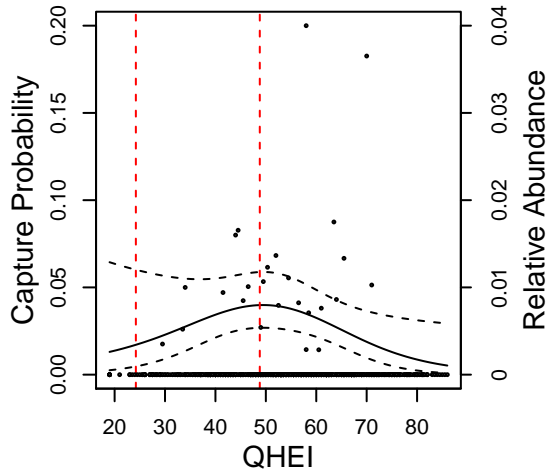


*Agnatina*

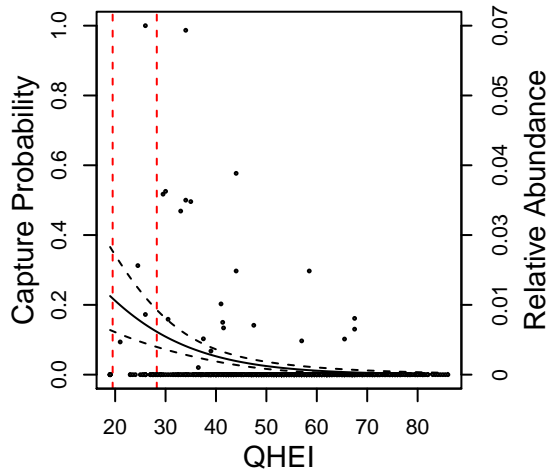


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

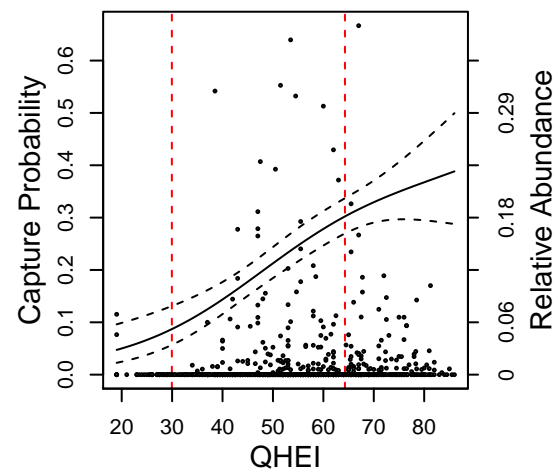
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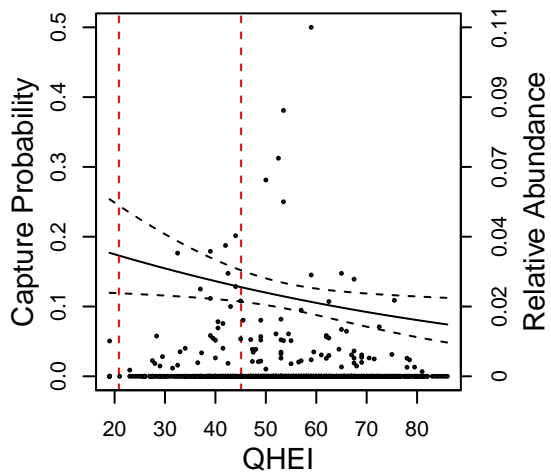
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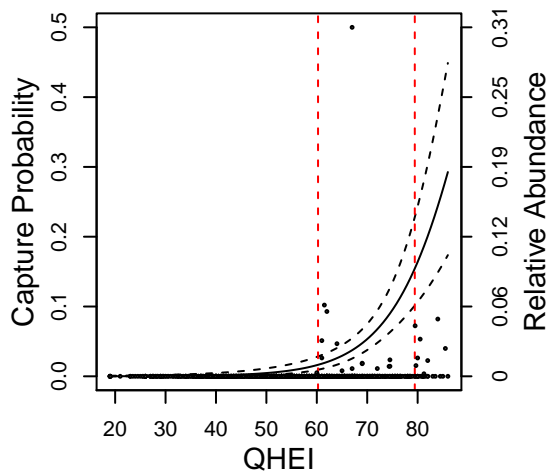
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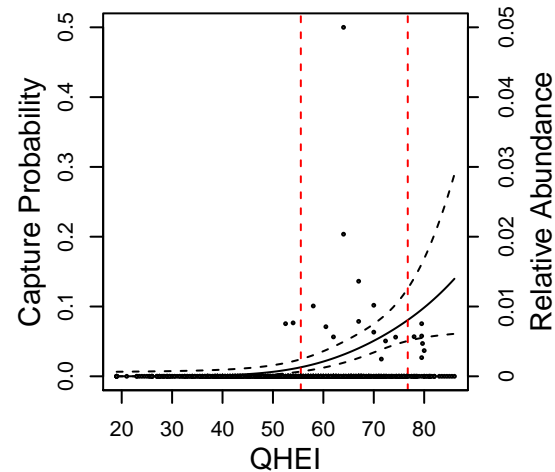
*Anopheles*



*Anthopotamus*

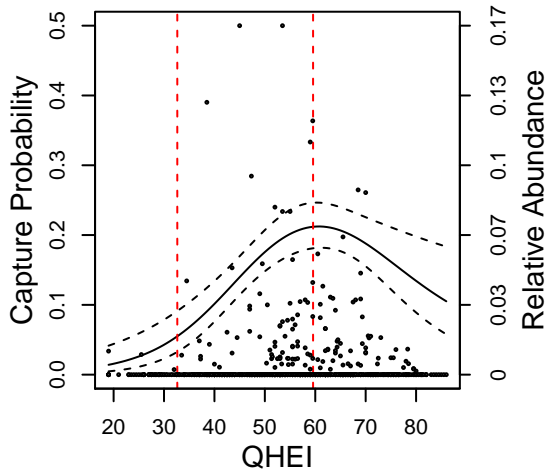


*Antocha*

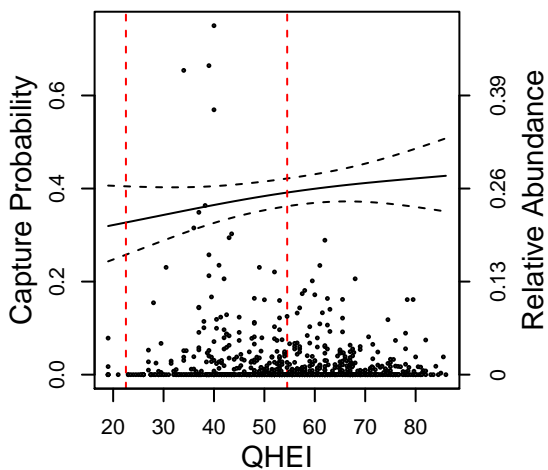


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

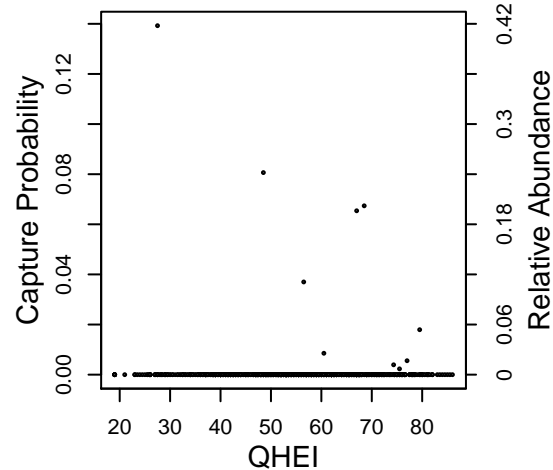
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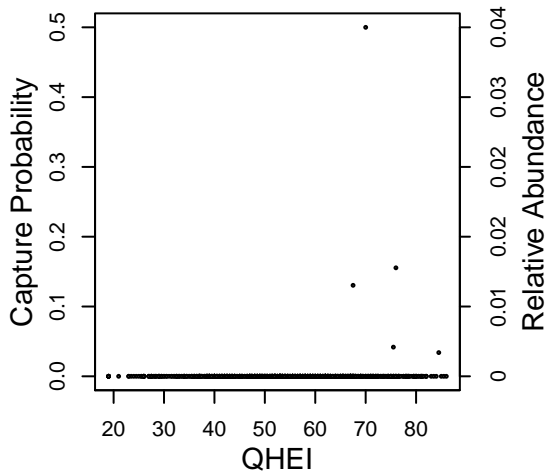
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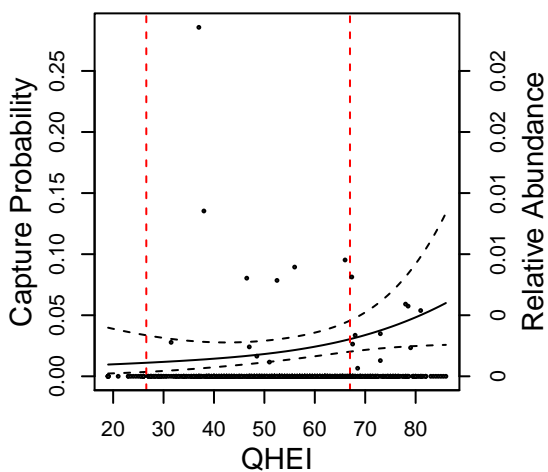
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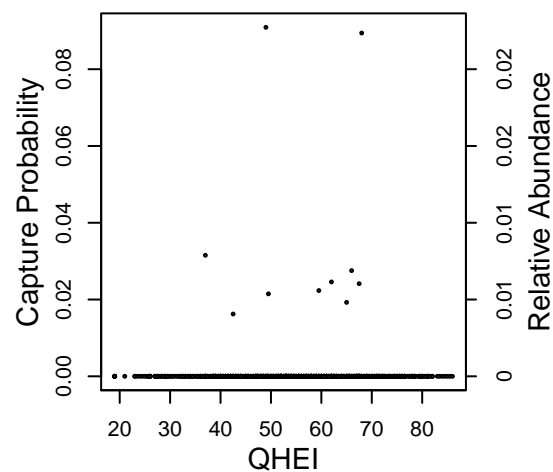
*Atherix*



*Atrichopogon*



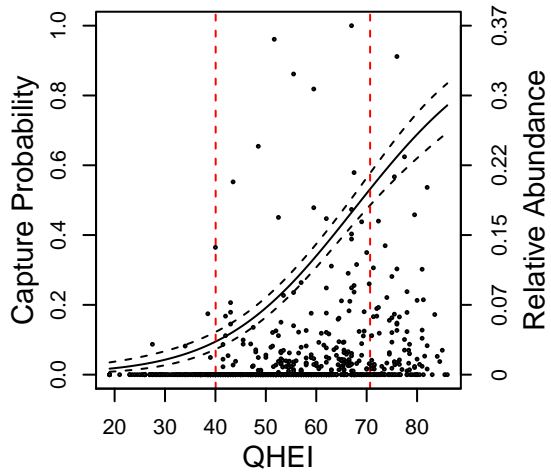
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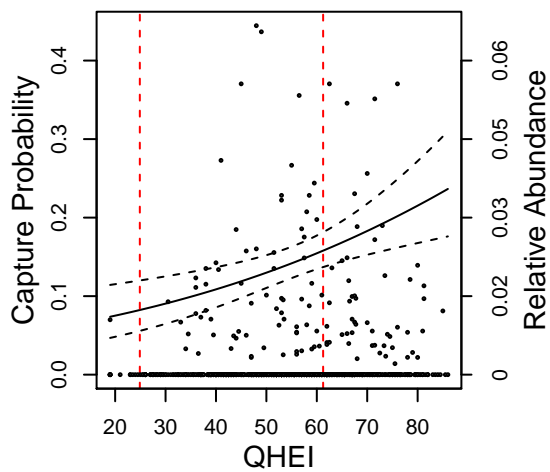


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

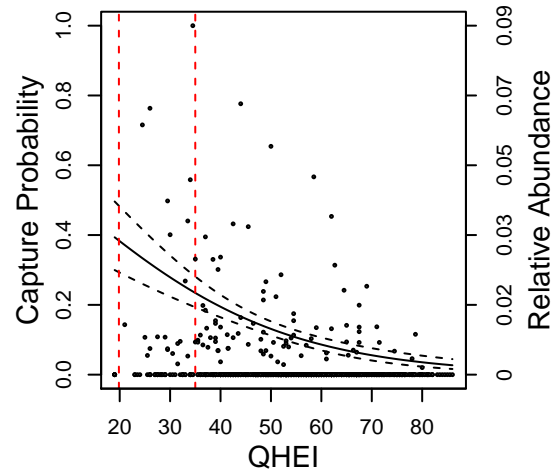
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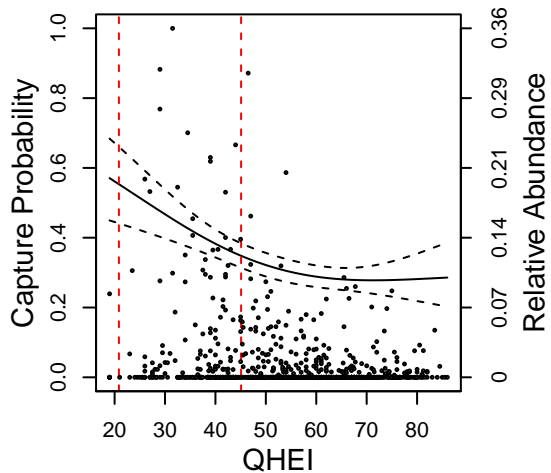
*Basiaeschna*



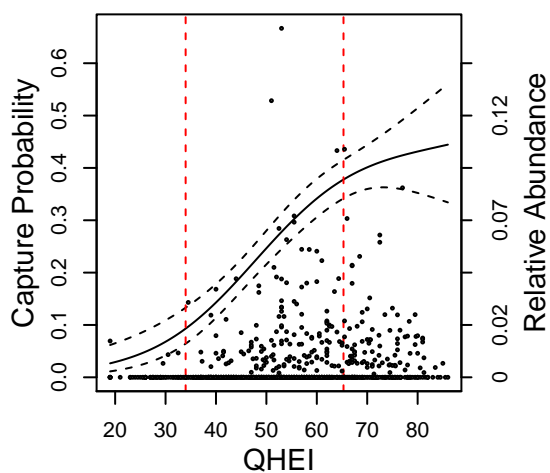
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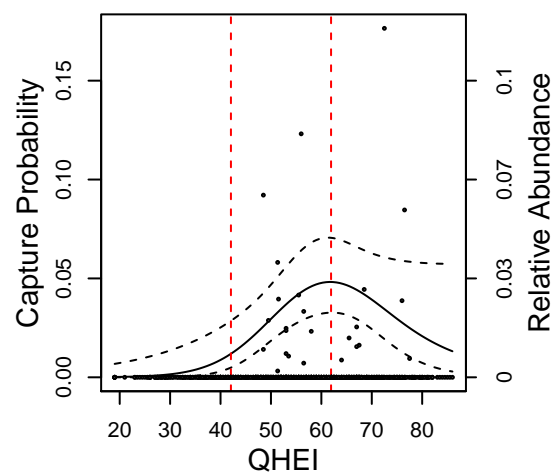
*Berosus*



*Boyeria*

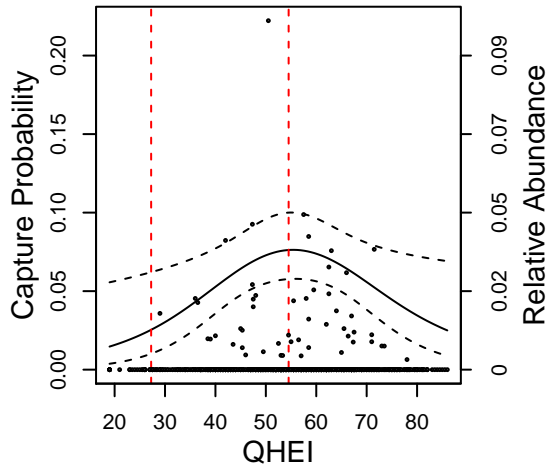


*Brachycentrus*

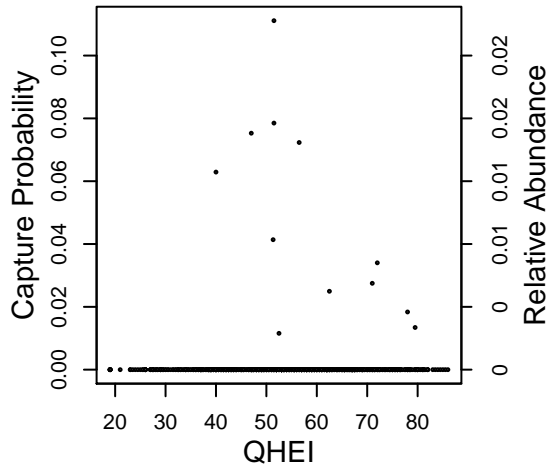


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

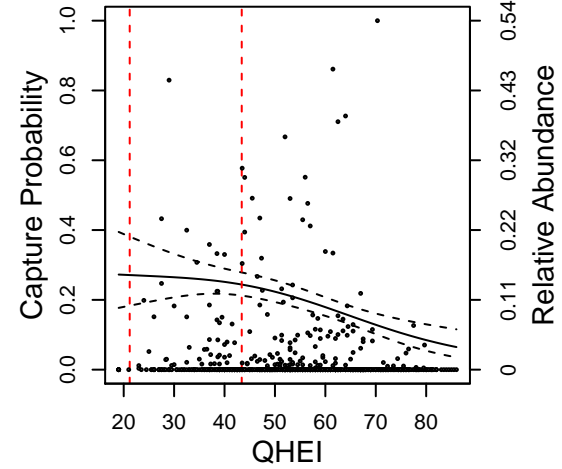
*Branchiura*



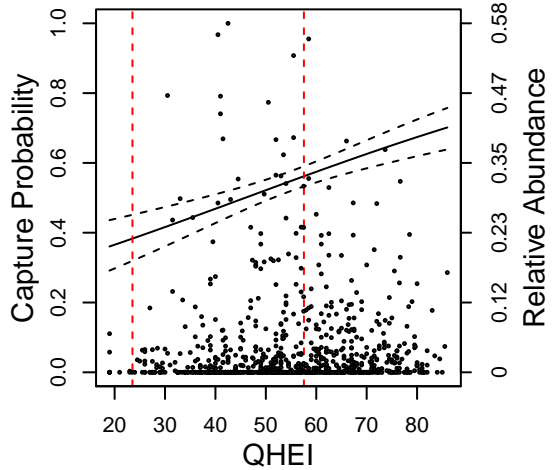
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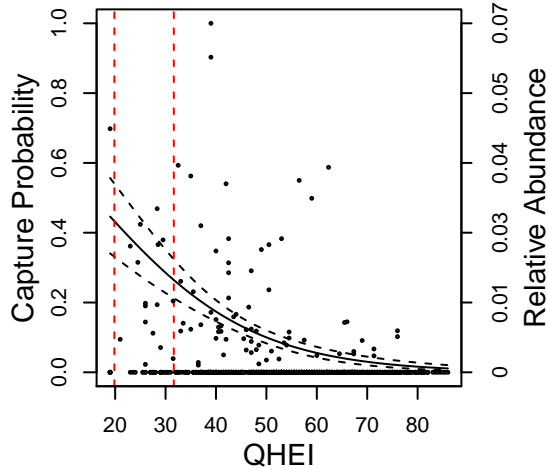
*Caecidotea*



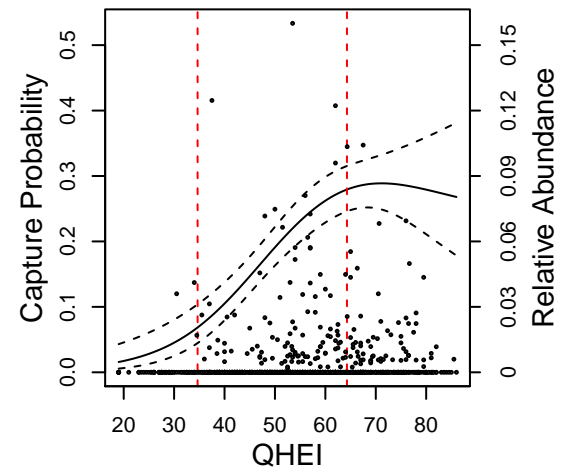
*Caenis*



*Callibaetis*

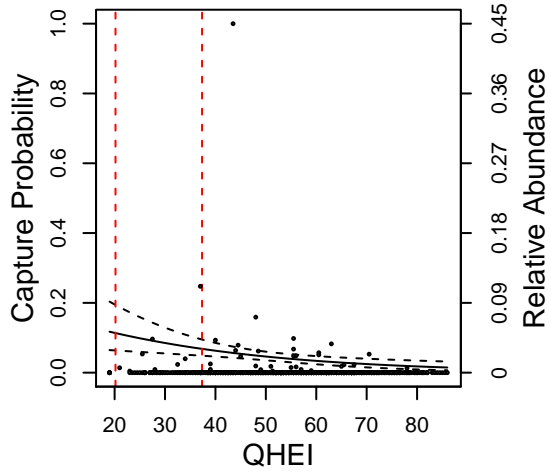


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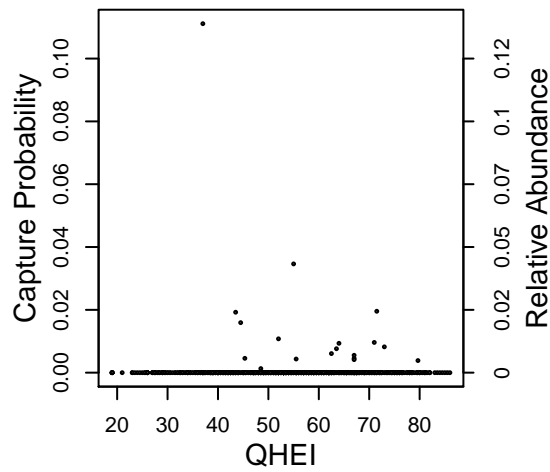


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

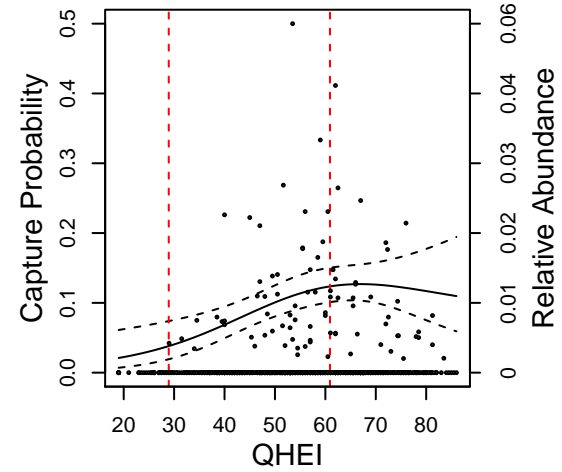
*Cambarus*



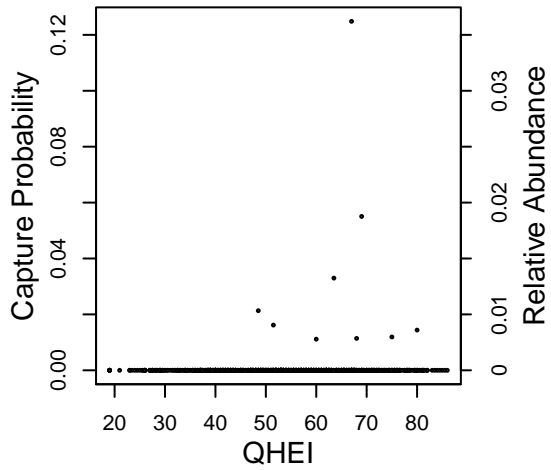
*Campeloma*



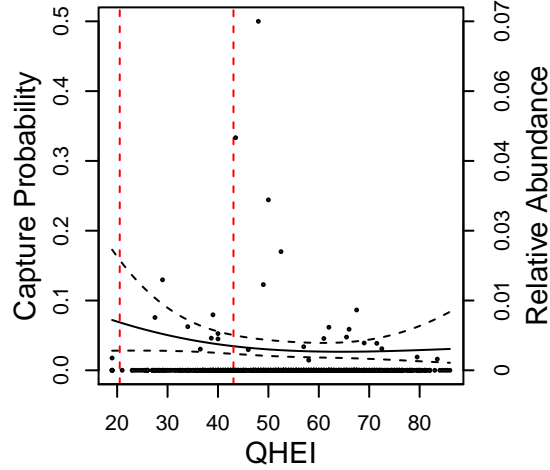
*Centroptilum*



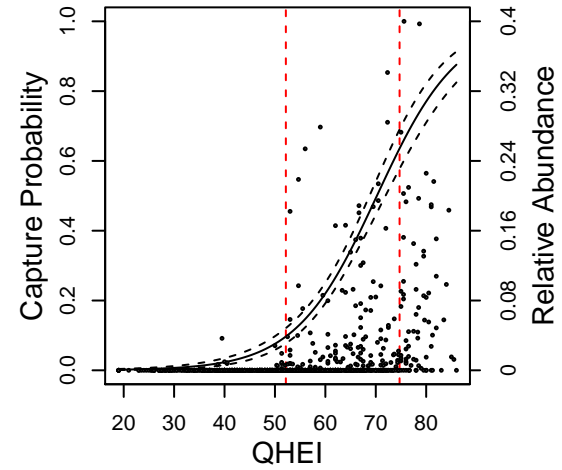
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*Ceratopogon*

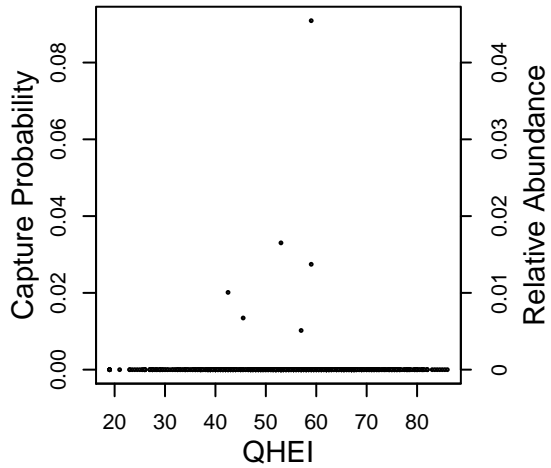


*Ceratopsyche*

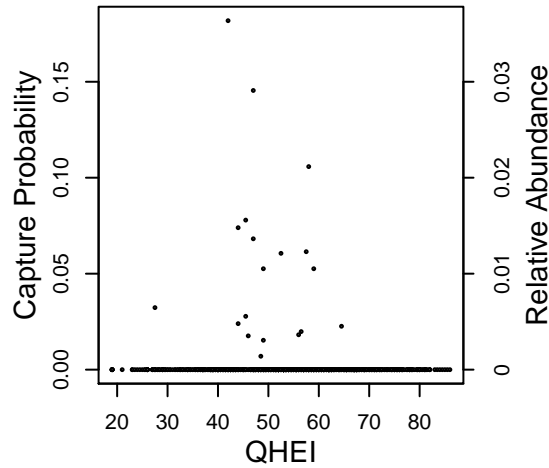


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

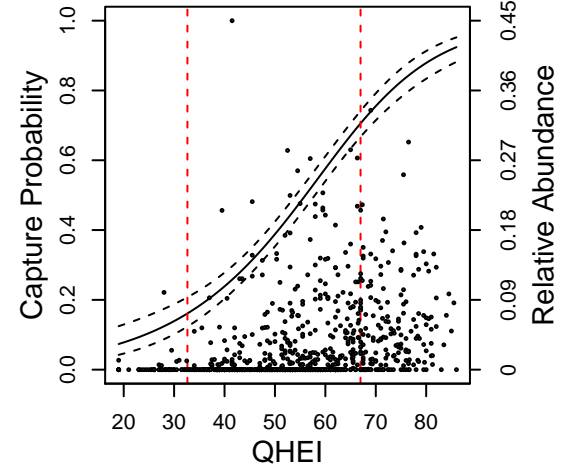
*Chaoborus*



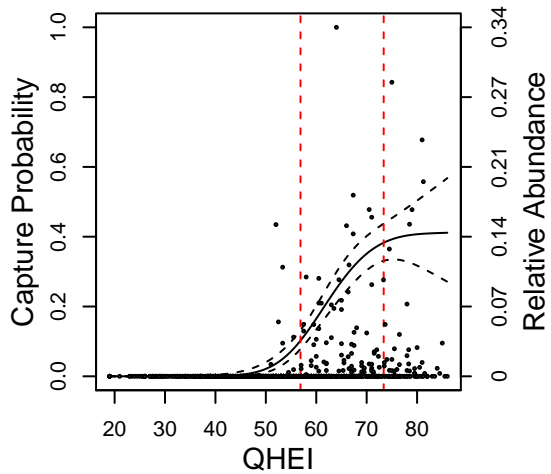
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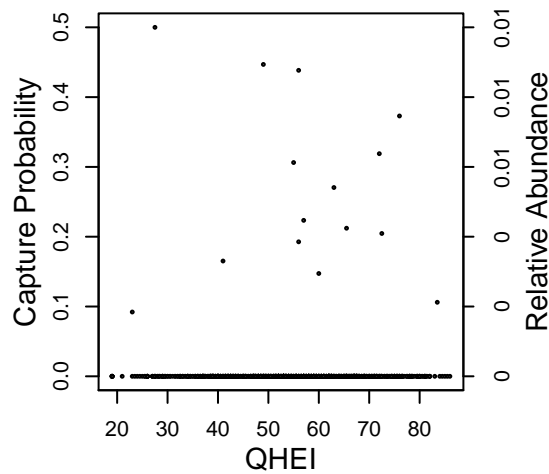
*Cheumatopsyche*



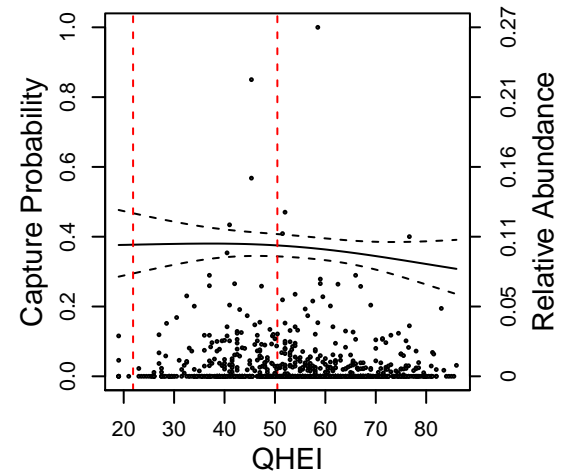
*Chimarra*



*Chironominae*

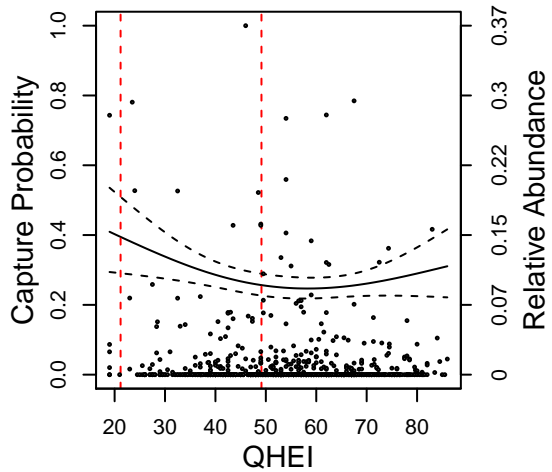


*Chironomini*

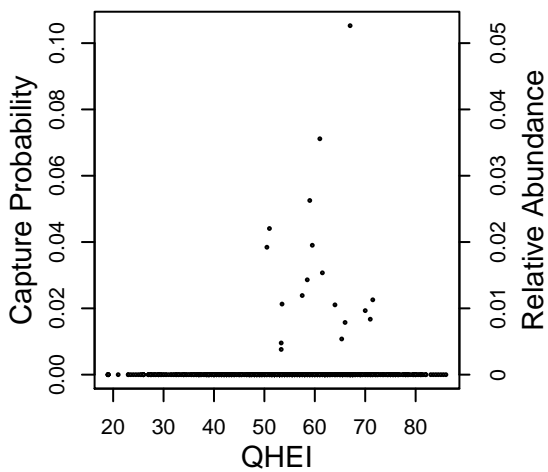


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

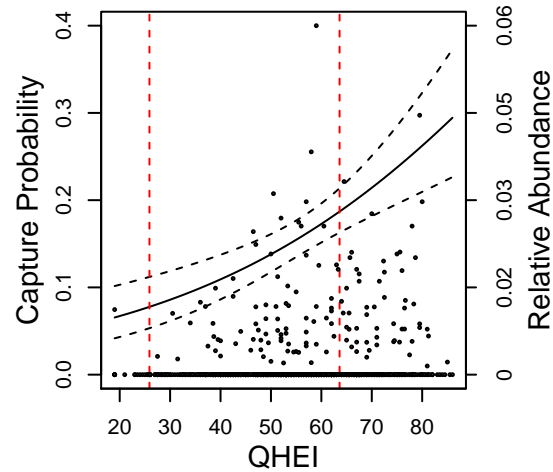
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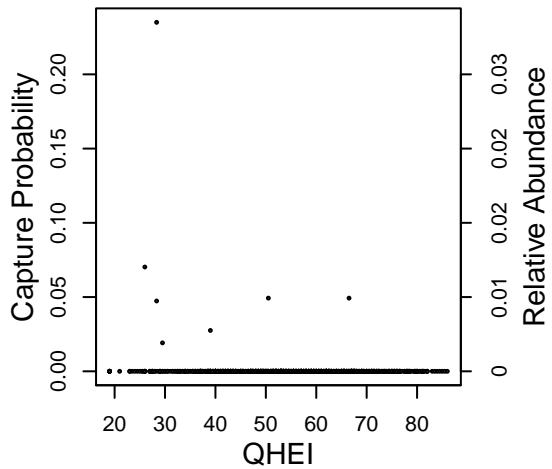
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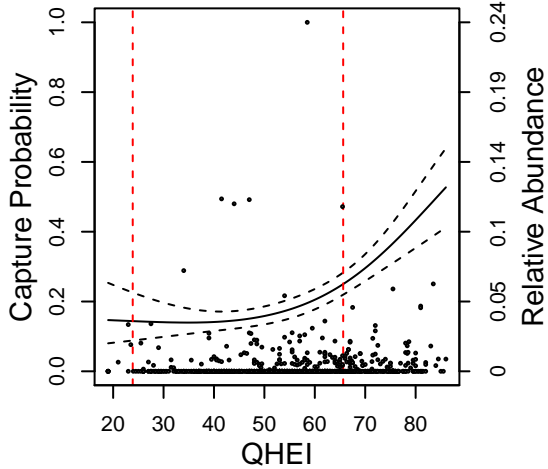
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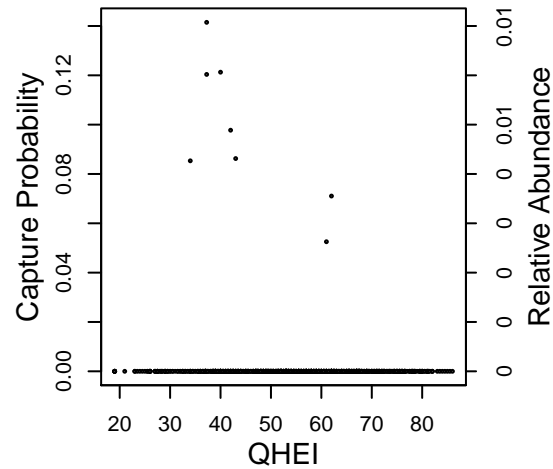
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*Cladotanytarsus*

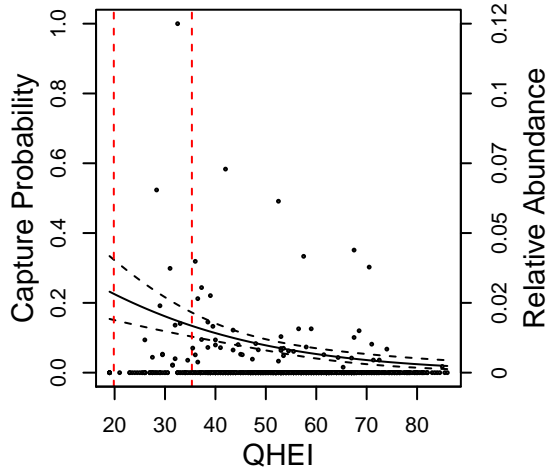


*Climacia*

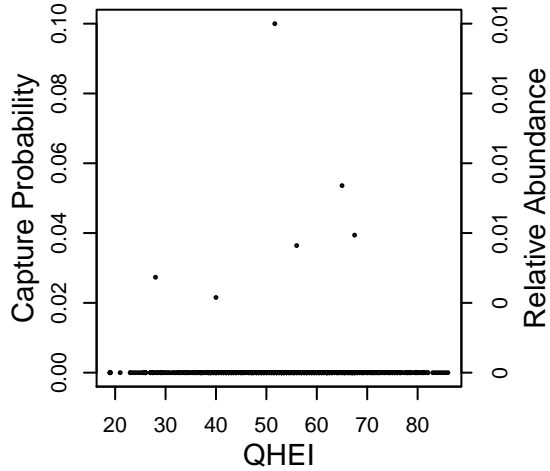


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

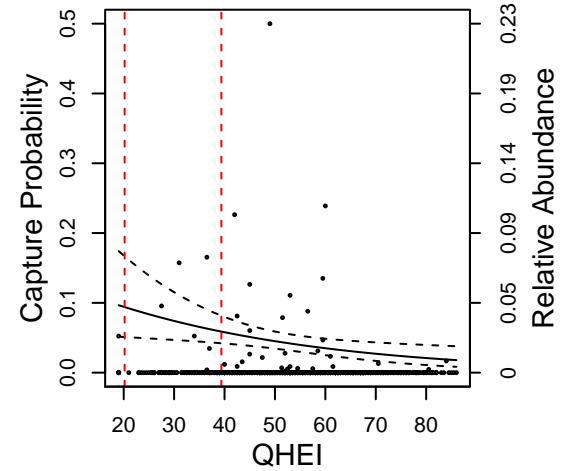
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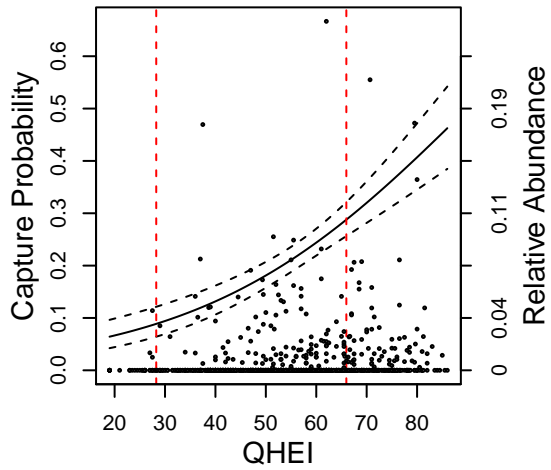
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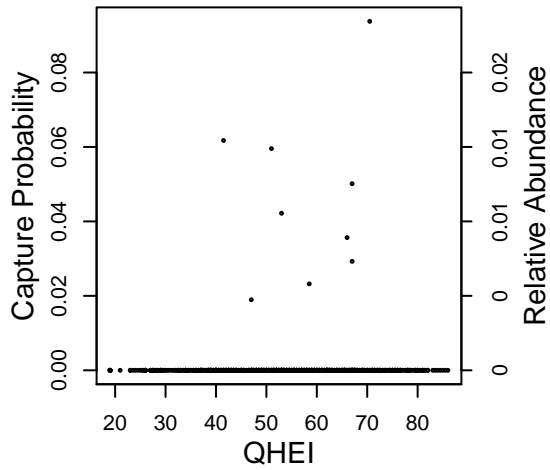
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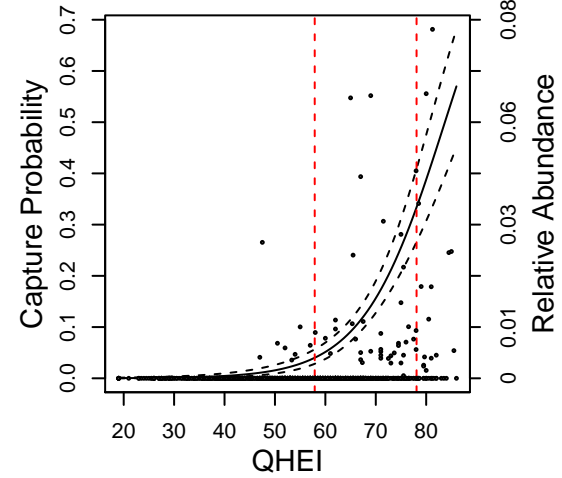
*Corbicula*



*Cordulegaster*

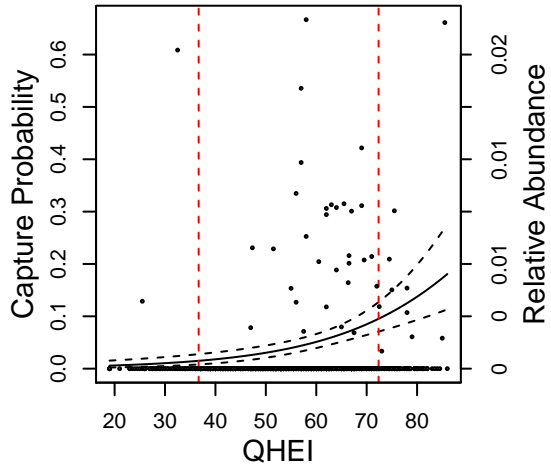


*Corydalus*

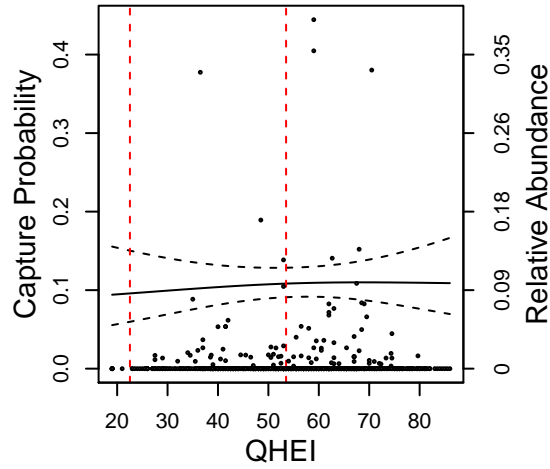


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

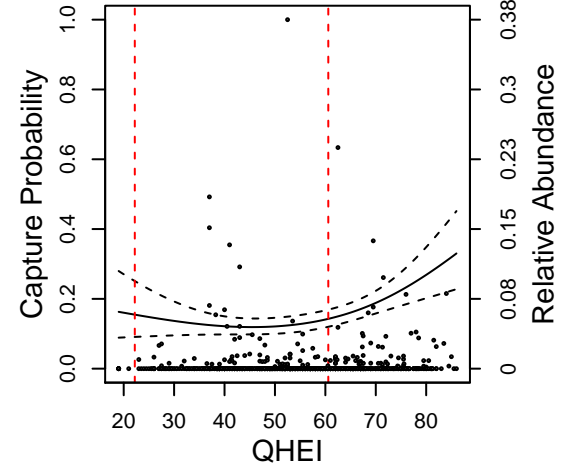
*Corynoneura*



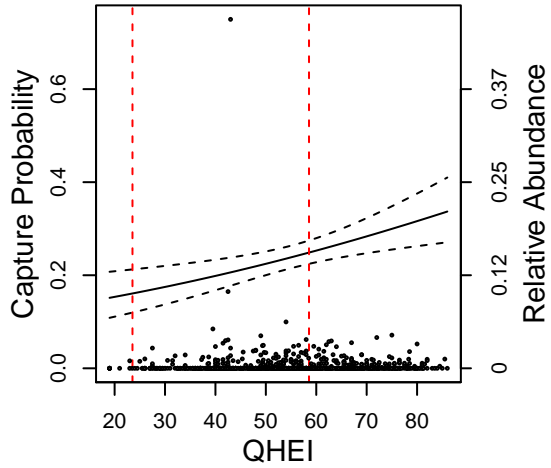
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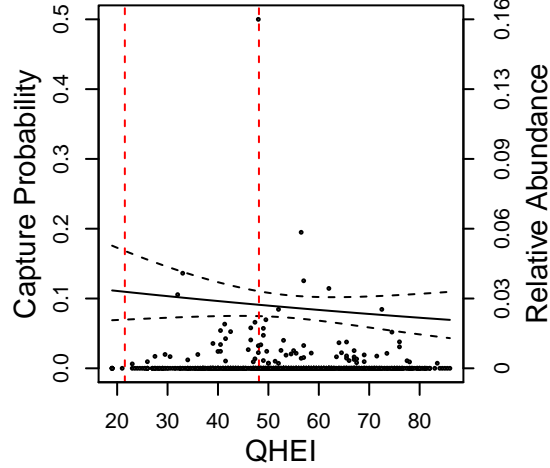
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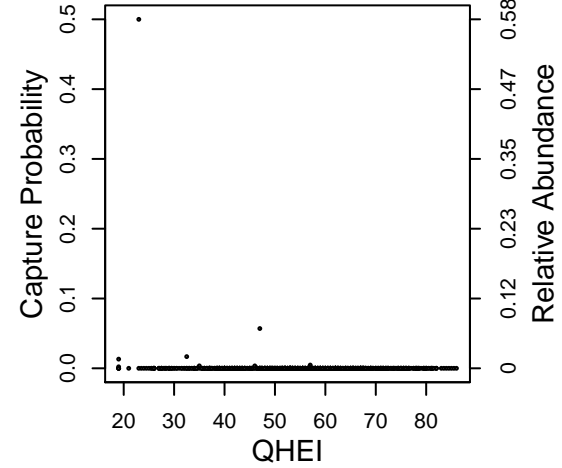
*Cryptochironomus*



*Cryptotendipes*

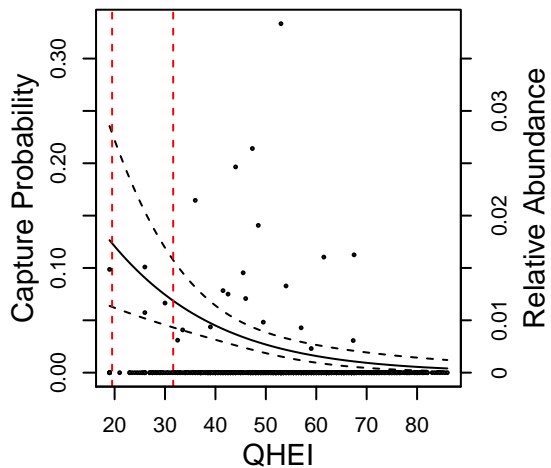


*Culex*

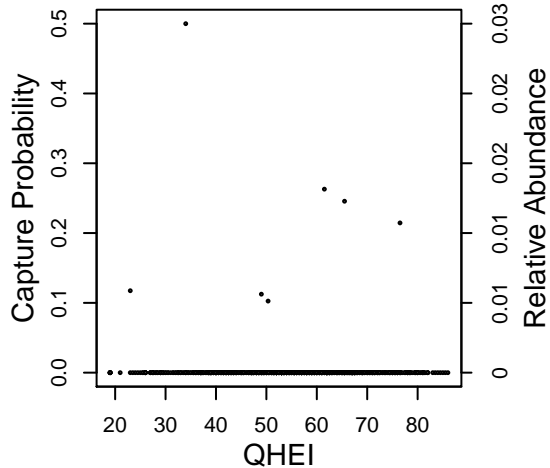


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

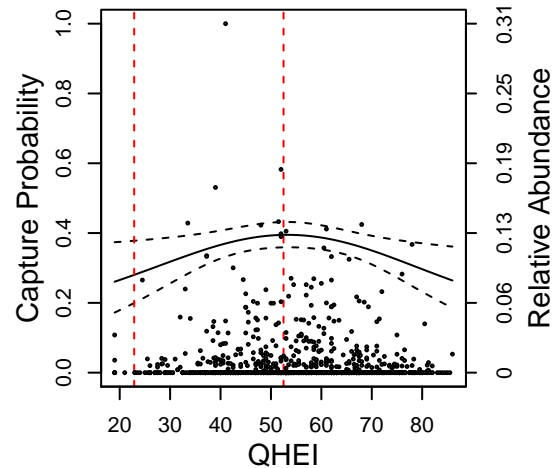
*Culicoides*



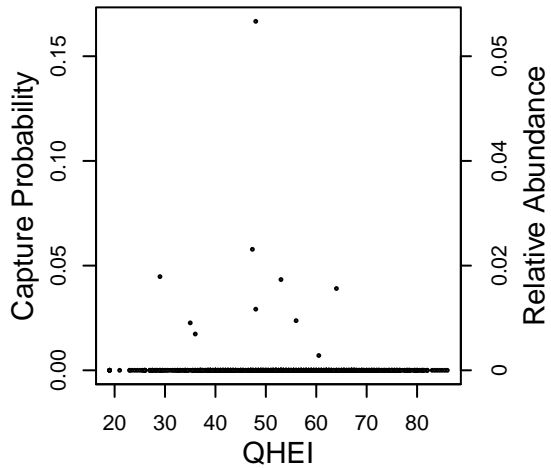
*Cymbiodyta*



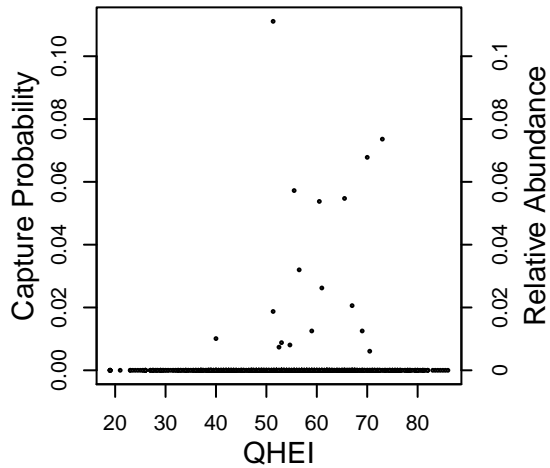
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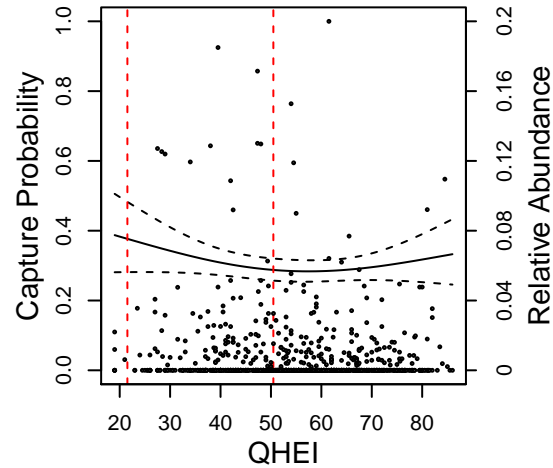
*Dasyhelea*



*Dicranota*



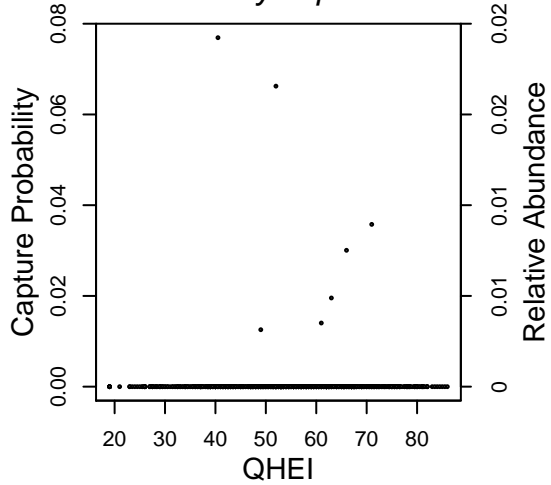
*Dicrotendipes*



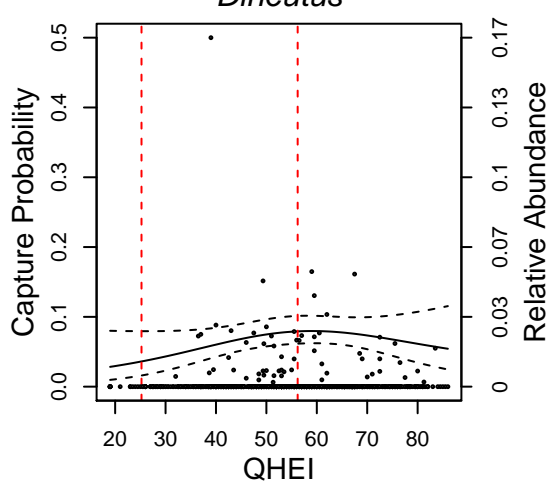


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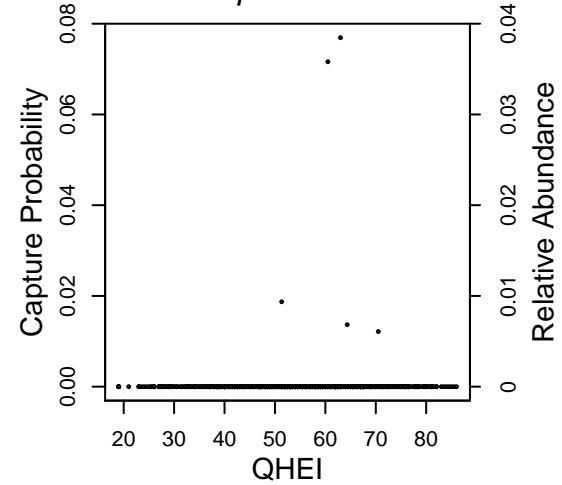
*Didymops*



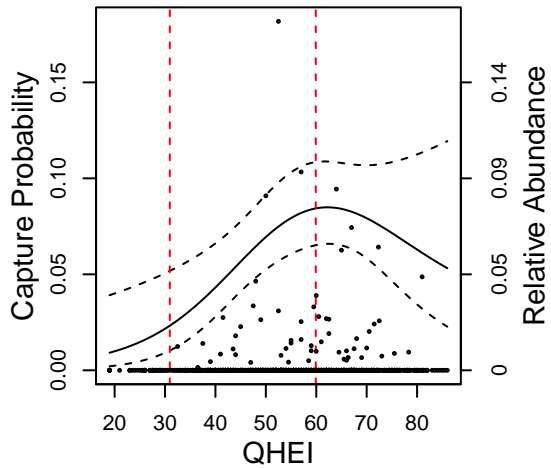
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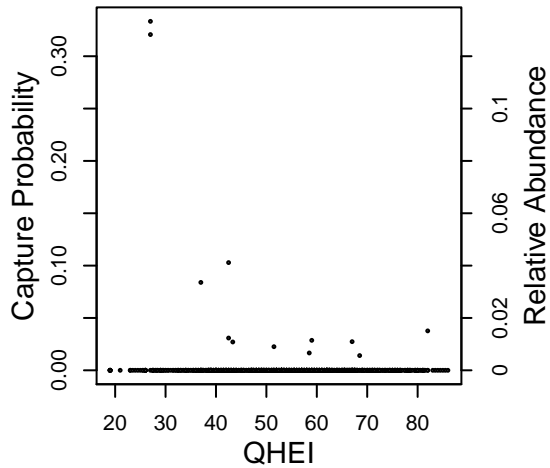
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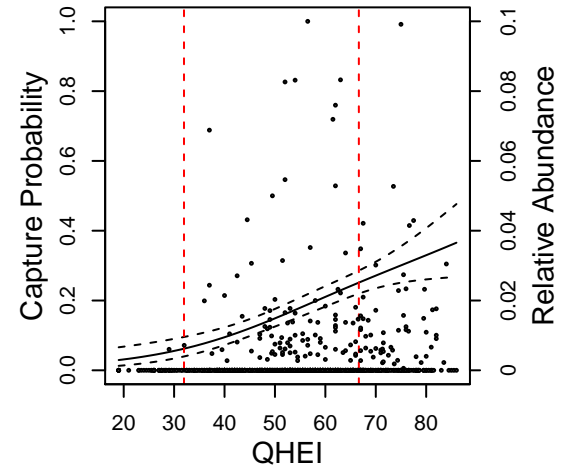
*Dixella*



*Dreissena*

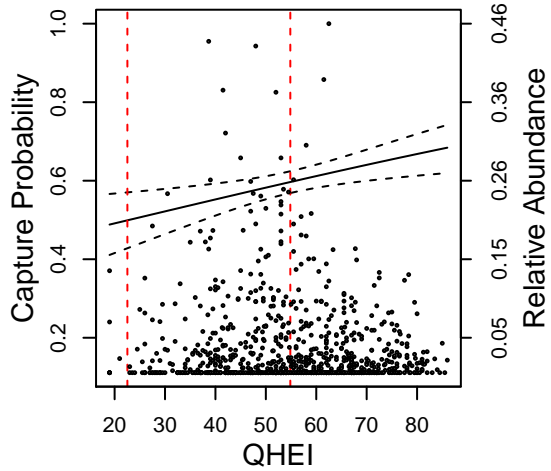


*Dromogomphus*

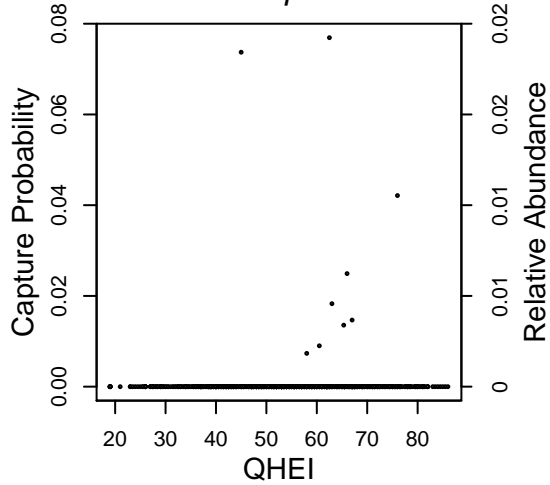


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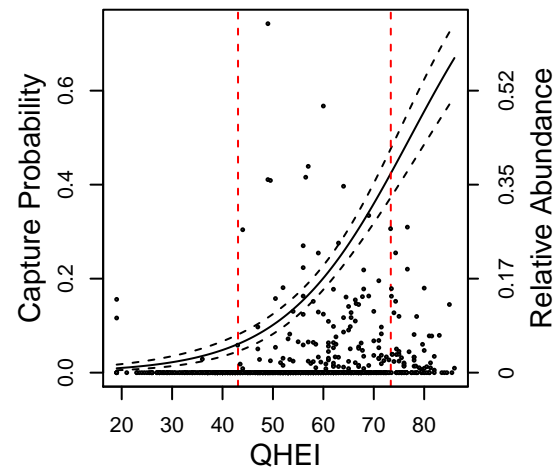
*Dubiraphia*



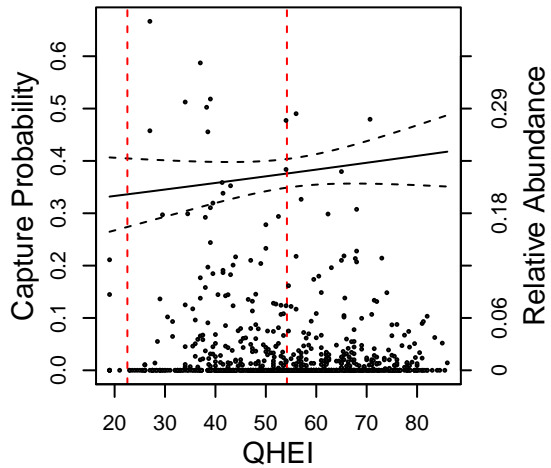
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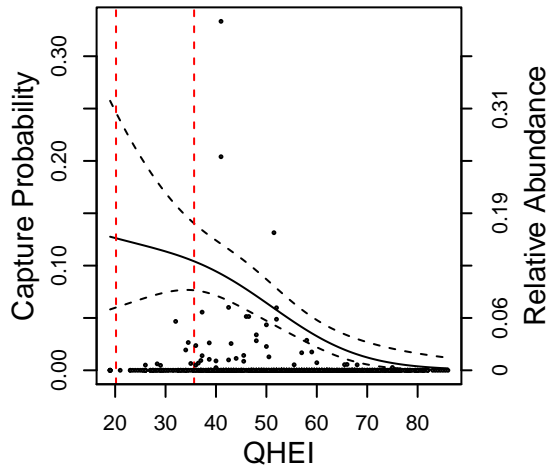
*Elimia*



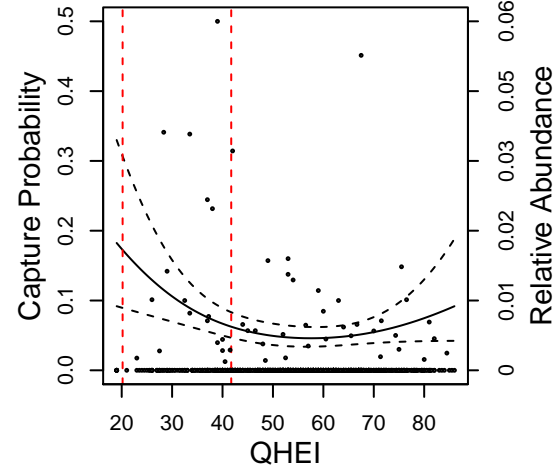
*Enallagma*



*Endochironomus*

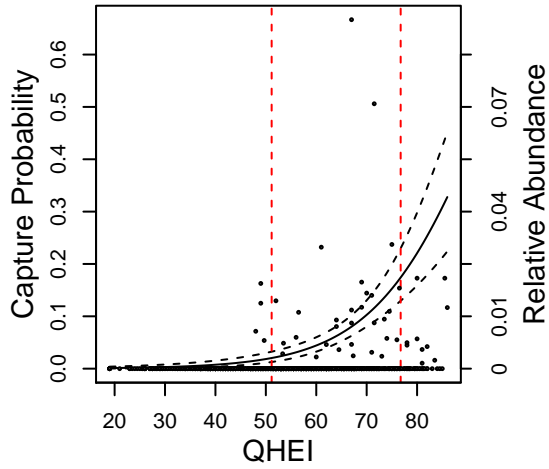


*Enochrus*

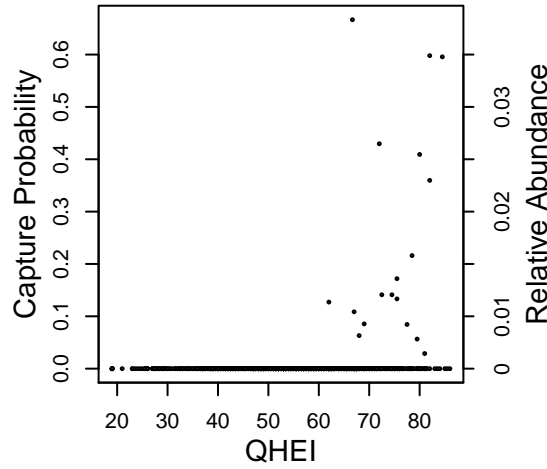


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

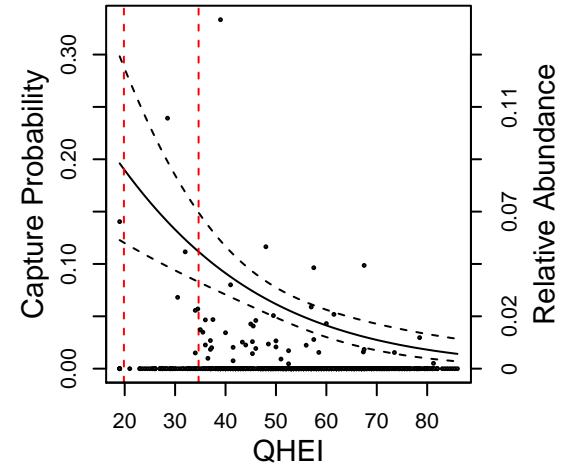
*Ephemera*



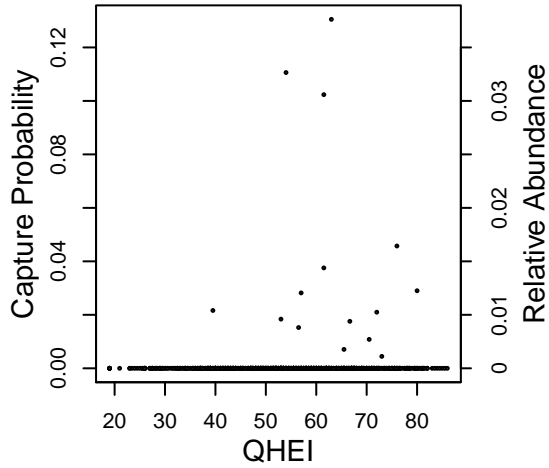
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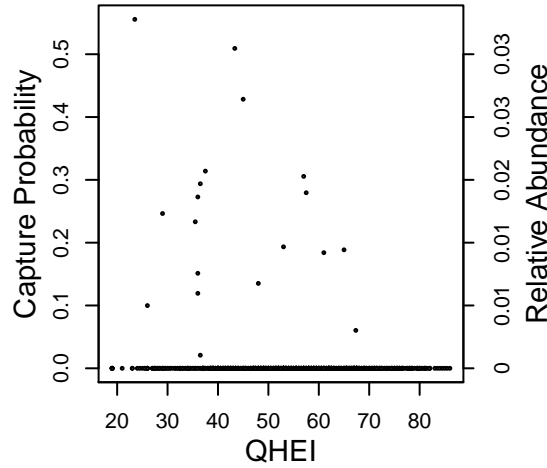
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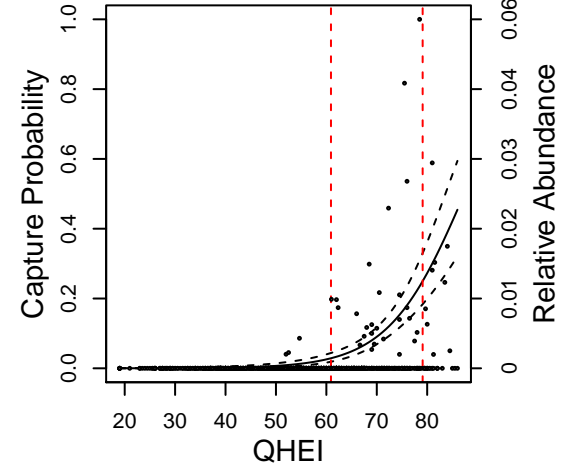
*Erpetogomphus*



*Erythemis*

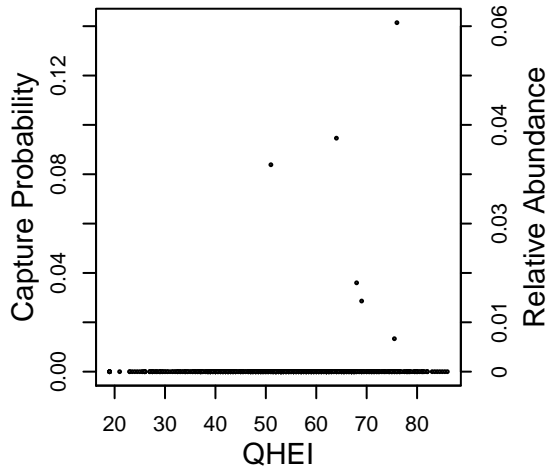


*Eukiefferiella*

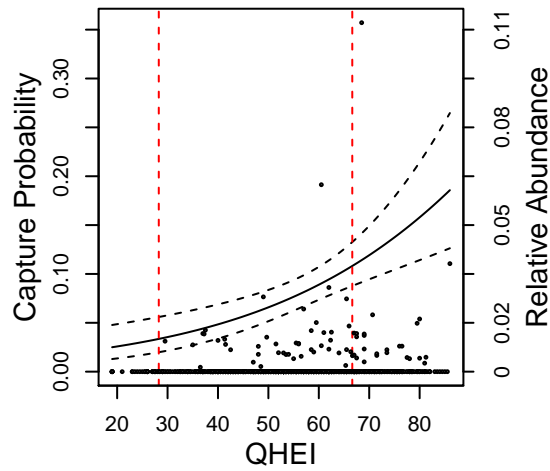


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

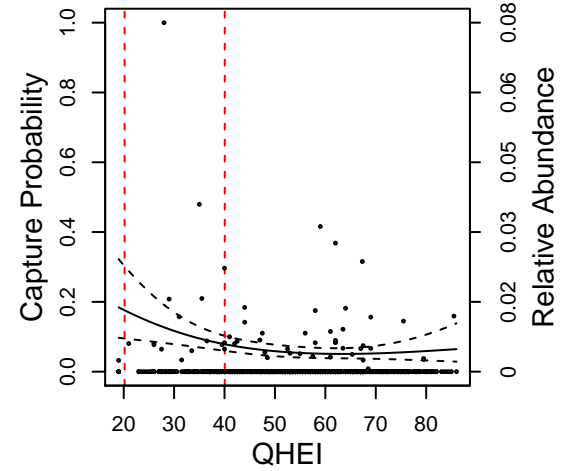
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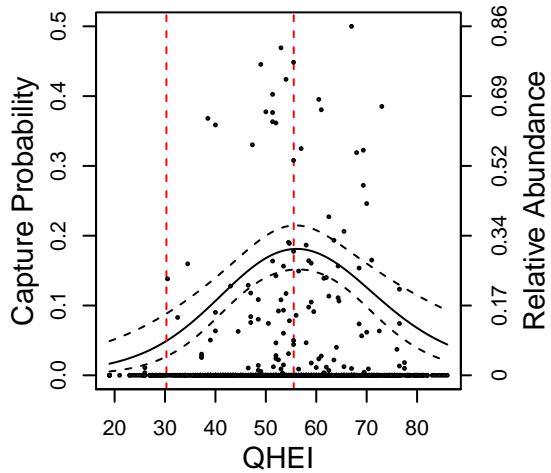
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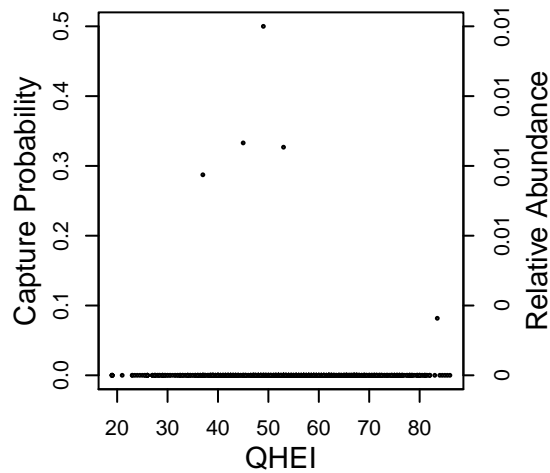
*Fossaria*



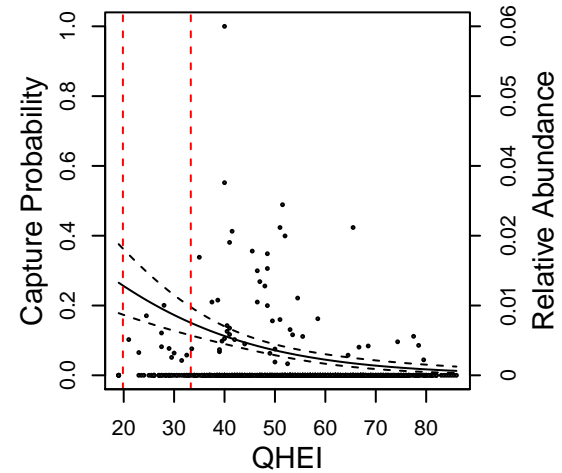
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*Gelastocoris*

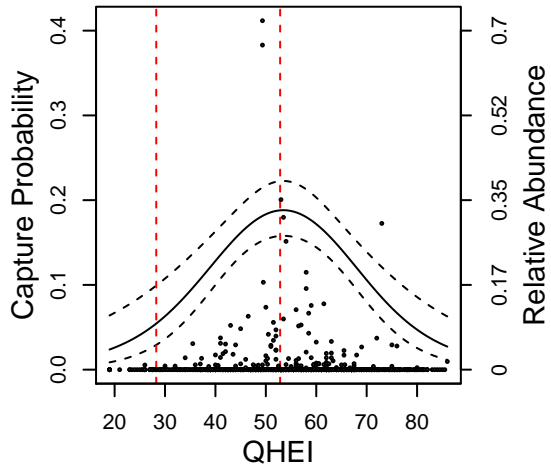


*Gerris*

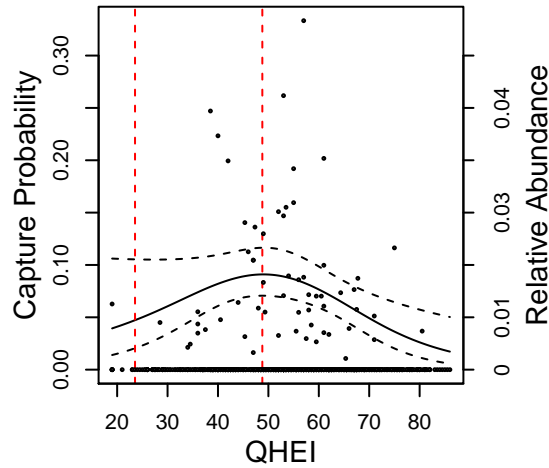


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

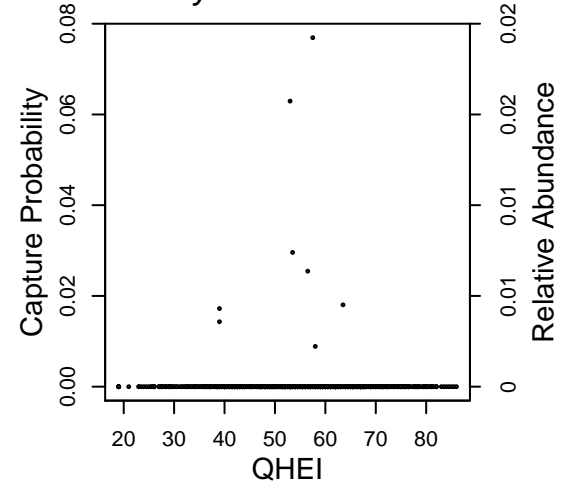
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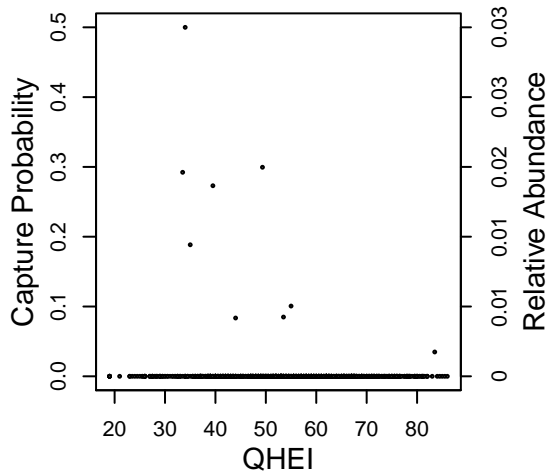
*Gomphus*



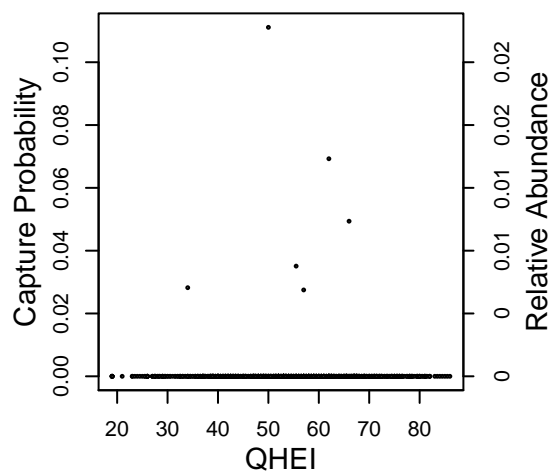
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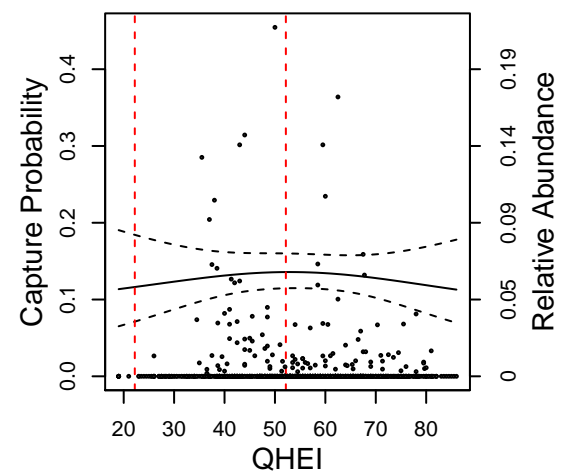
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*Gyretes*

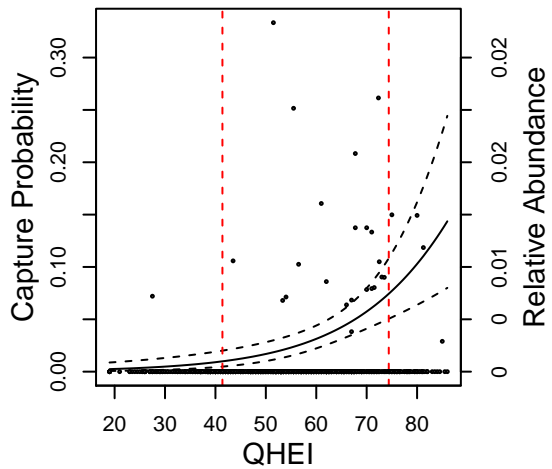


*Gyrinus*

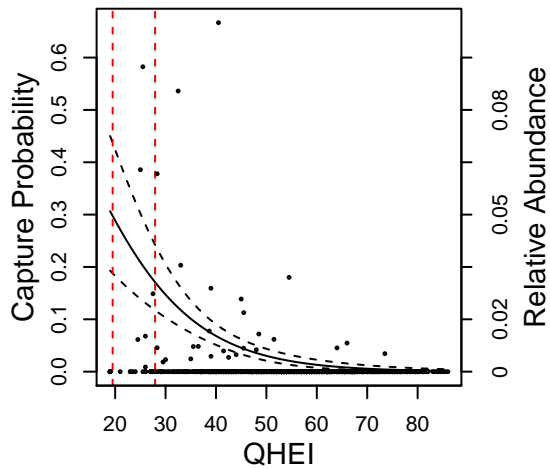


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

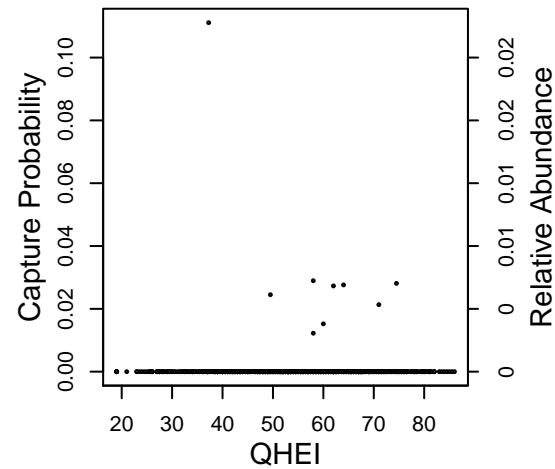
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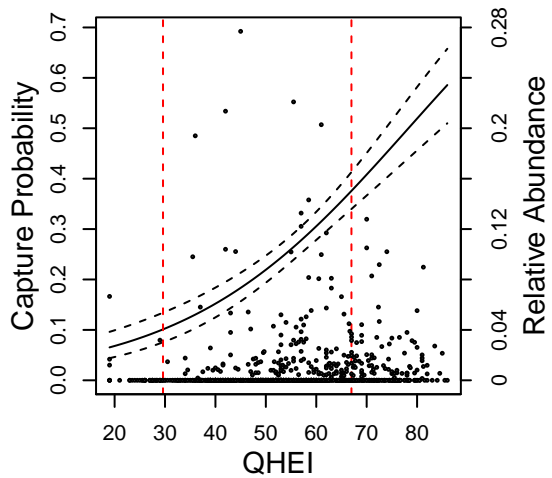
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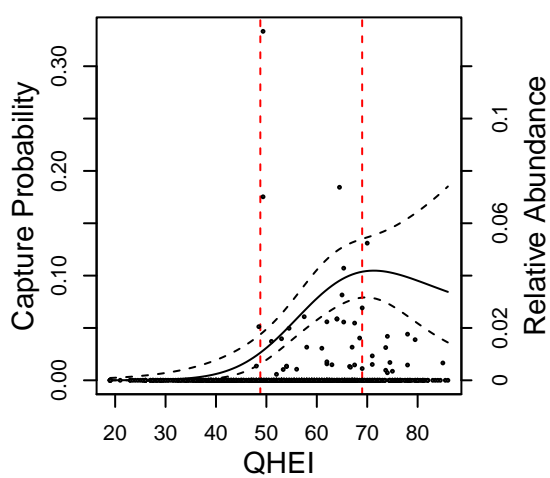
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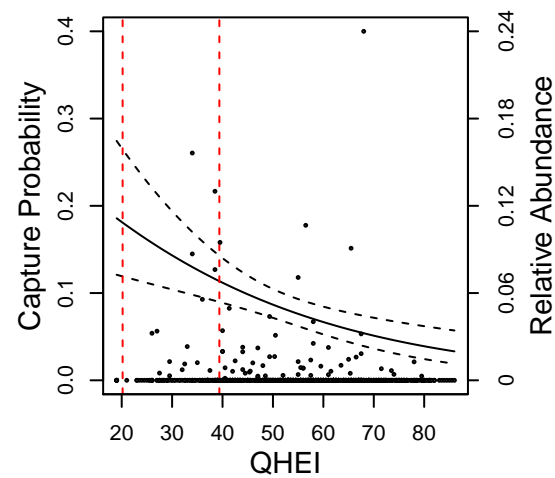
*Helichus*



*Helicopsyche*

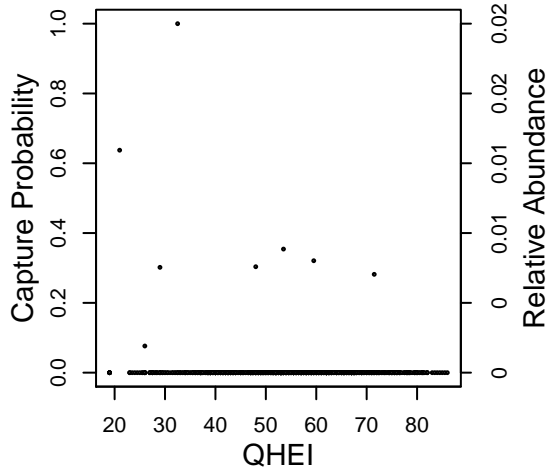


*Helisoma*

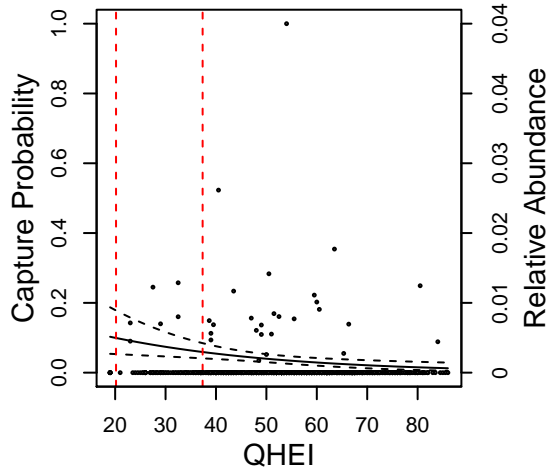


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

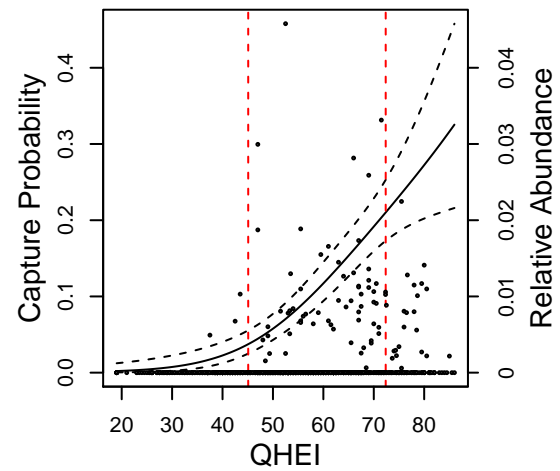
*Helochaeres*



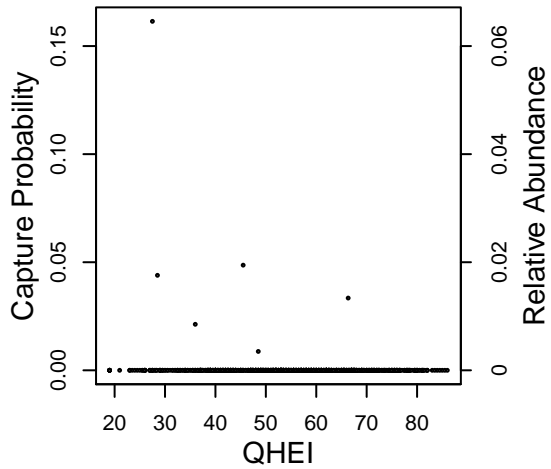
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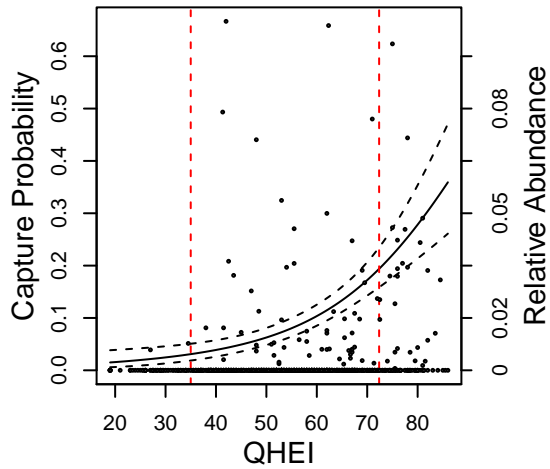
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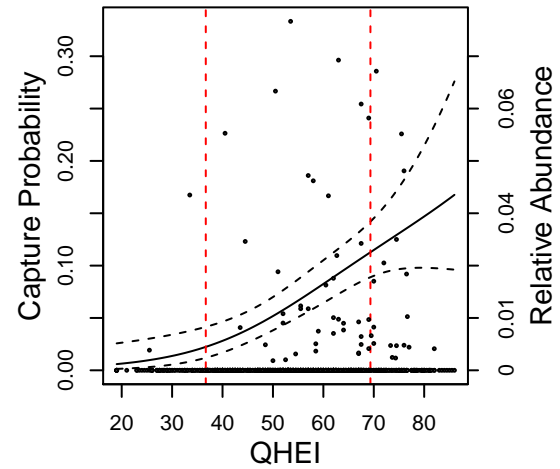
*Hesperocorixa*



*Hetaerina*

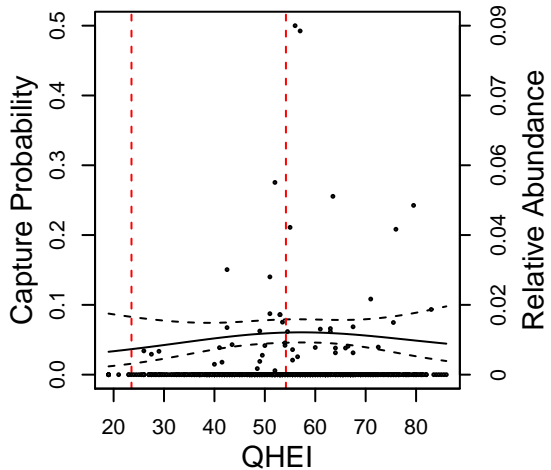


*Heterosternuta*

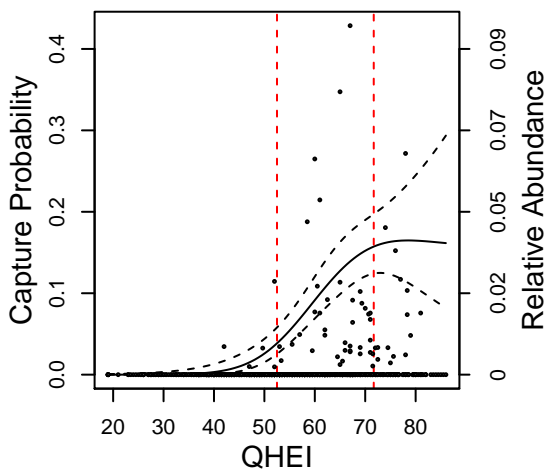


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

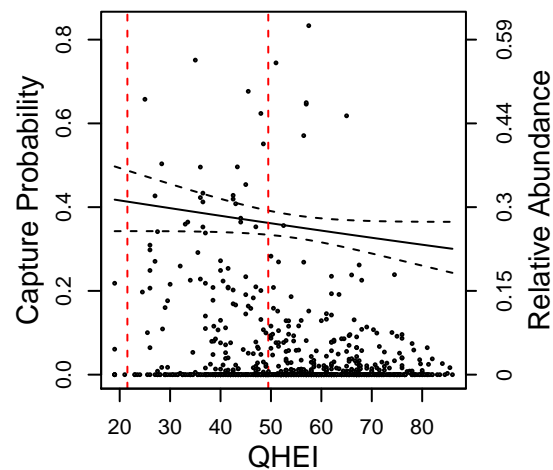
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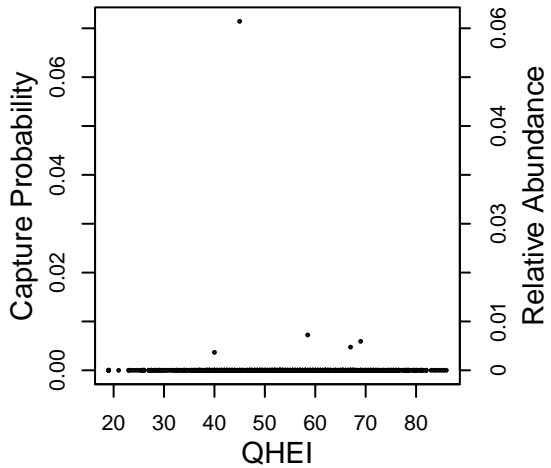
*Hexatoma*



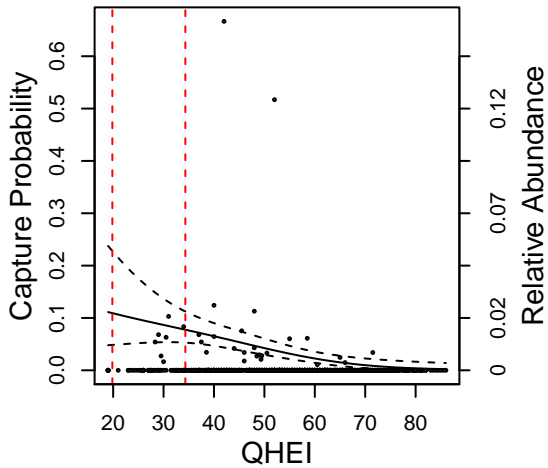
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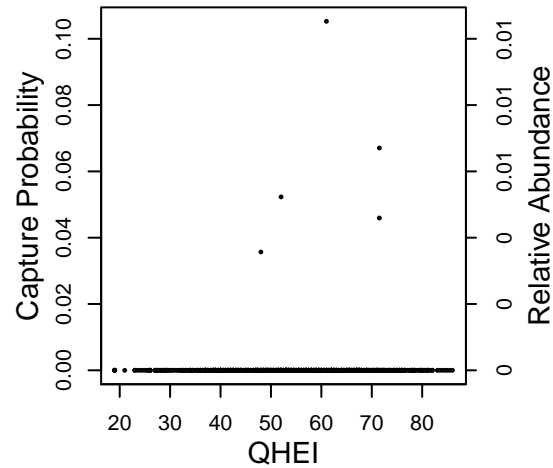
*Hydrobius*



*Hydrochus*



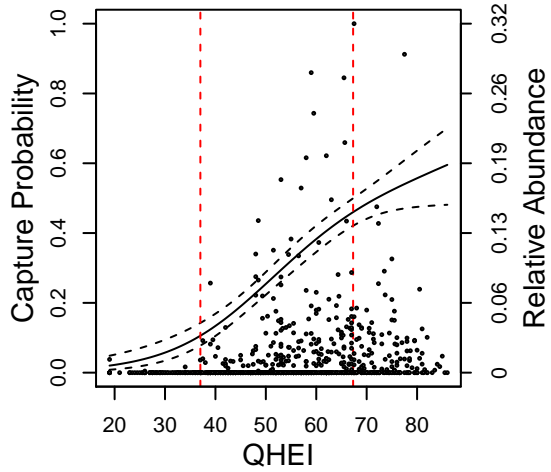
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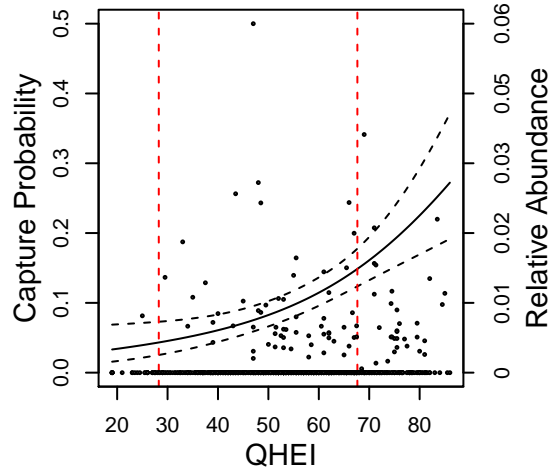


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

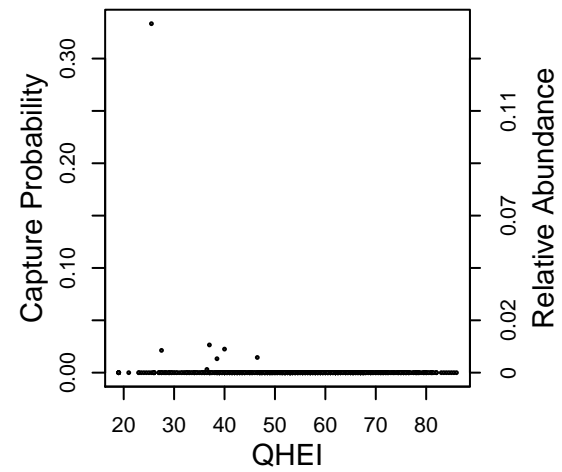
*Hydropsyche*



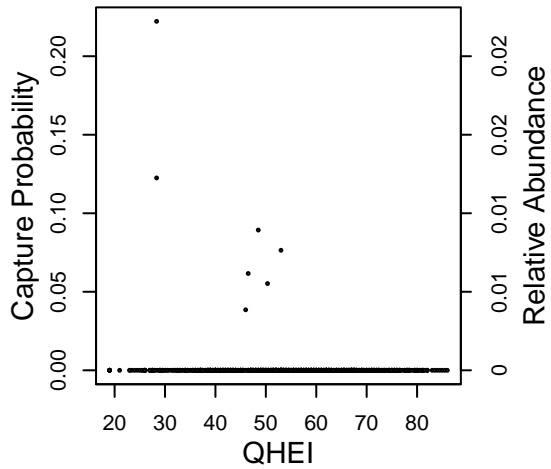
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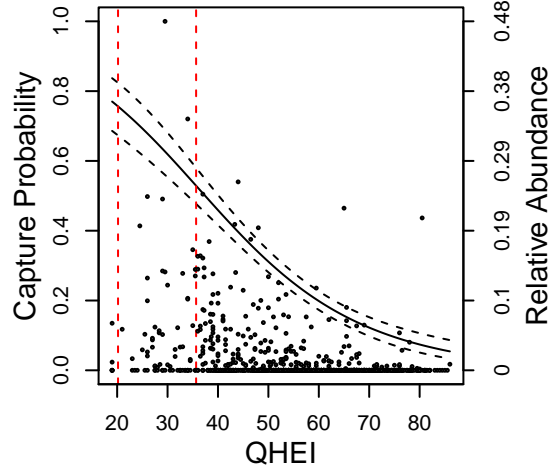
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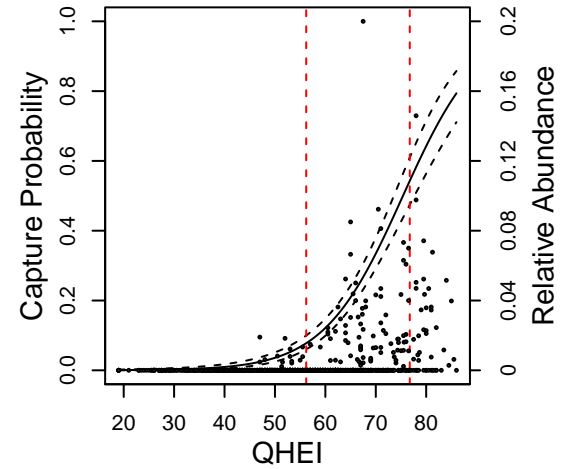
*Hygrotus*



*Ischnura*

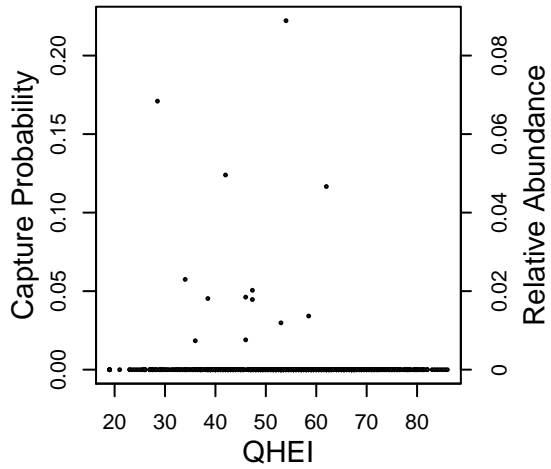


*Isonychia*

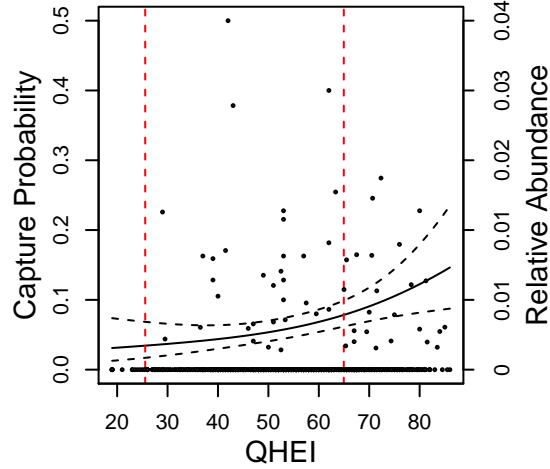


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

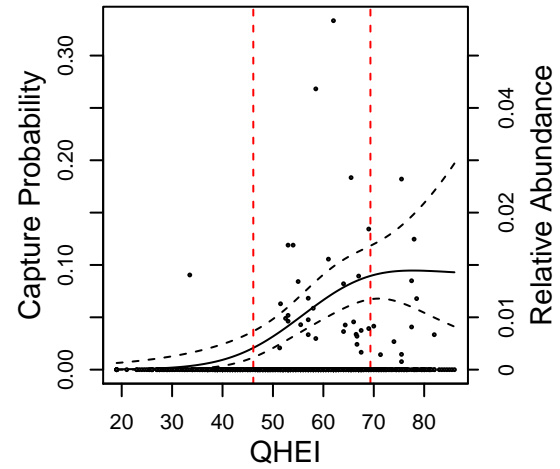
*Kiefferulus*



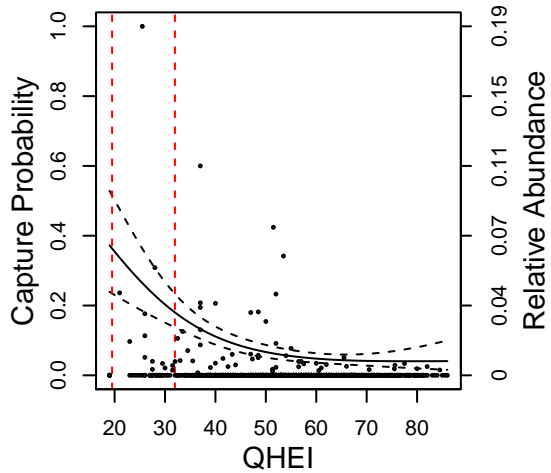
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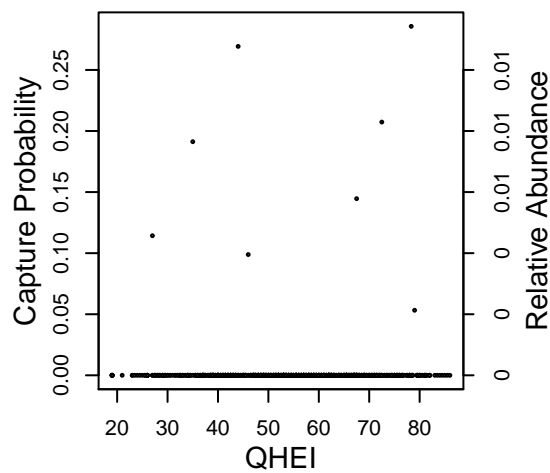
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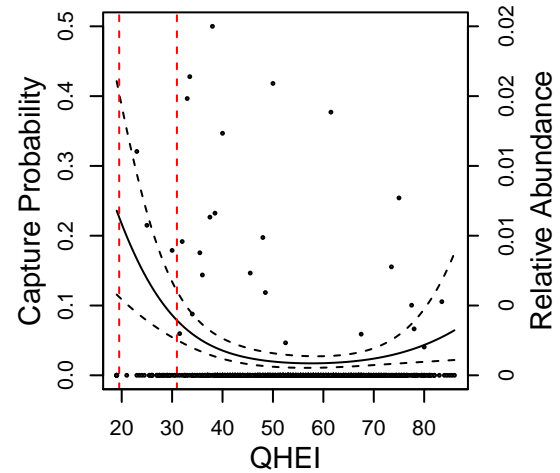
*Laccophilus*



*Laevapex*

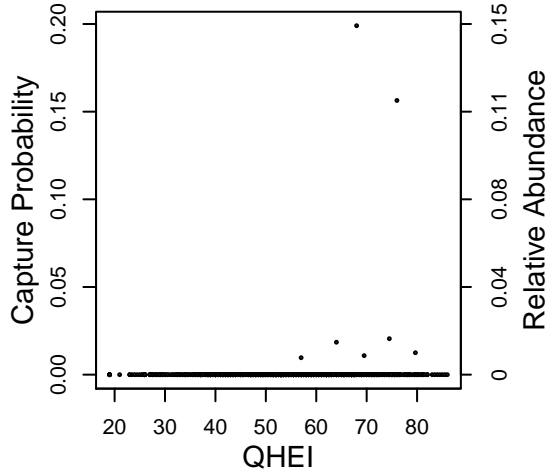


*Larsia*

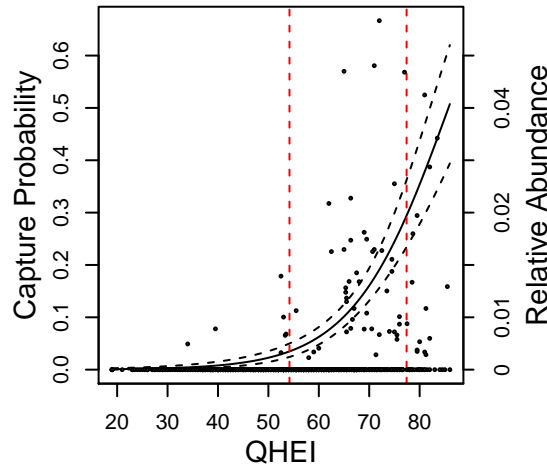


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

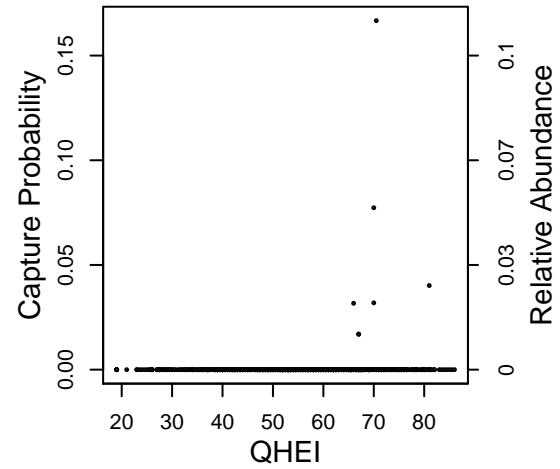
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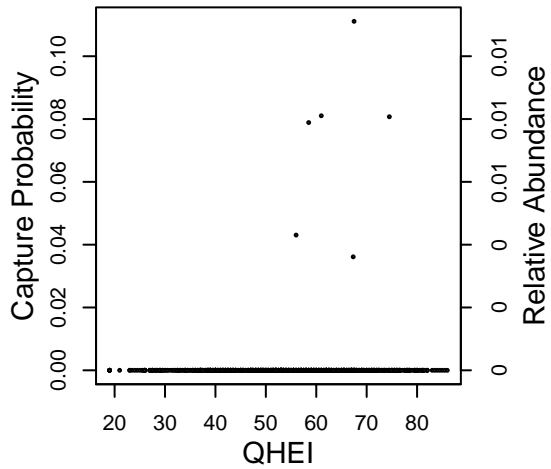
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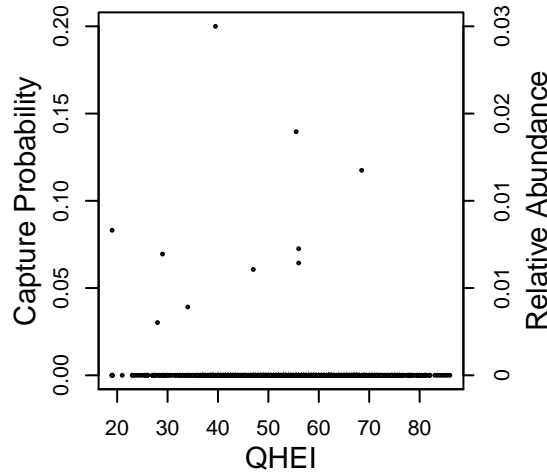
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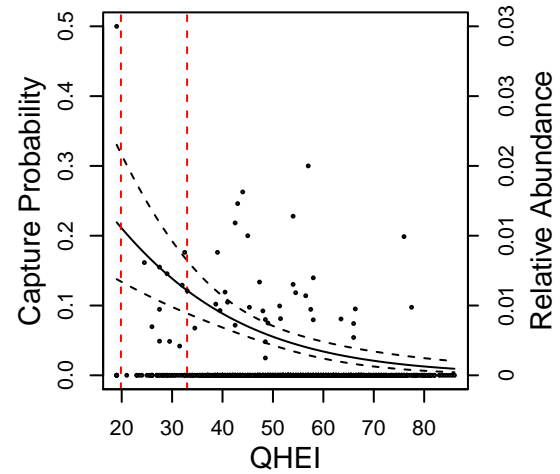
*Libellula*



*Limnoporus*

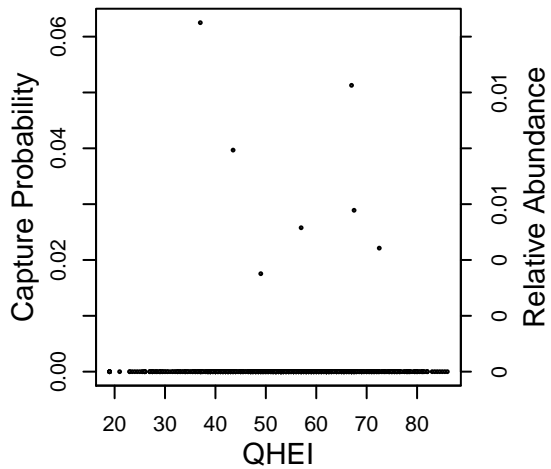


*Liodessus*

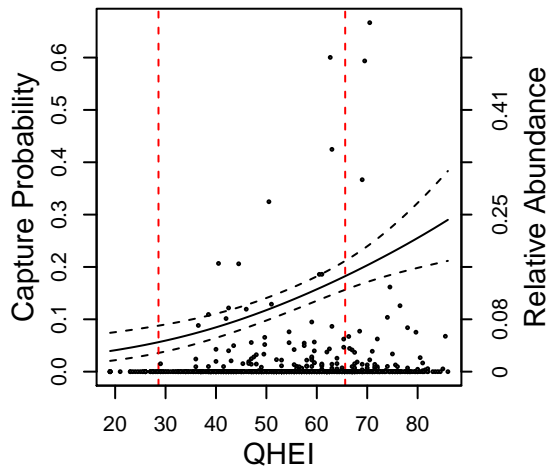


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

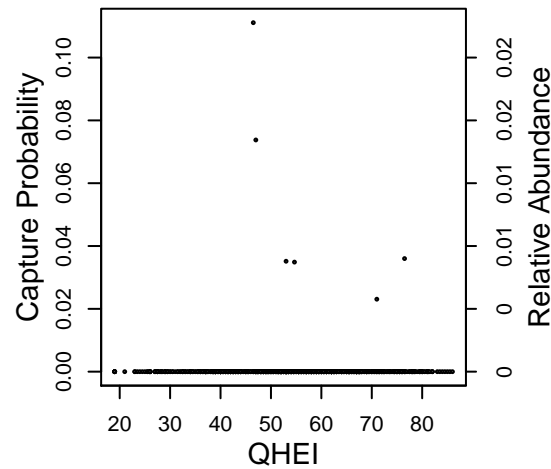
*Lioporeus*



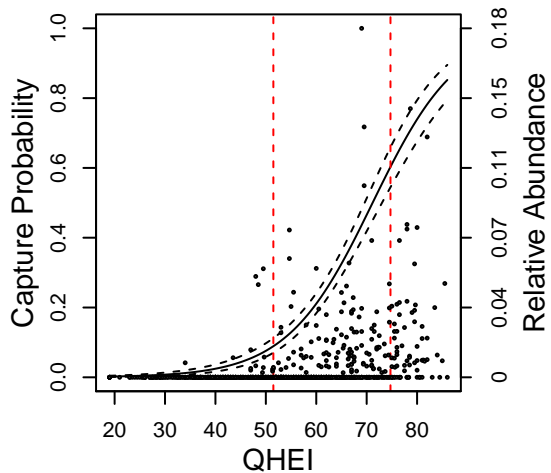
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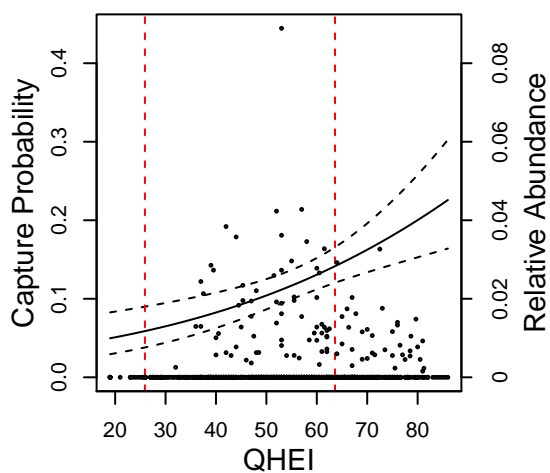
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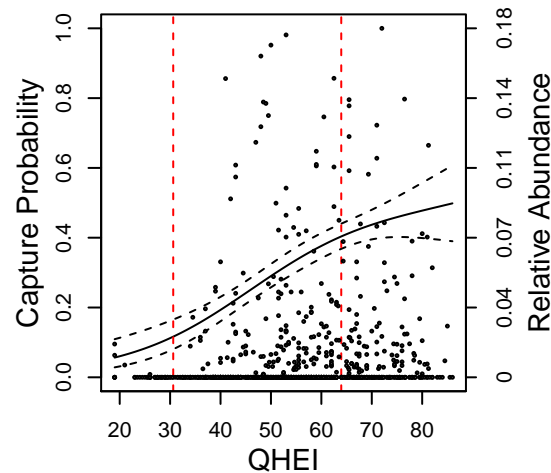
*Maccaffertium*



*Macromia*

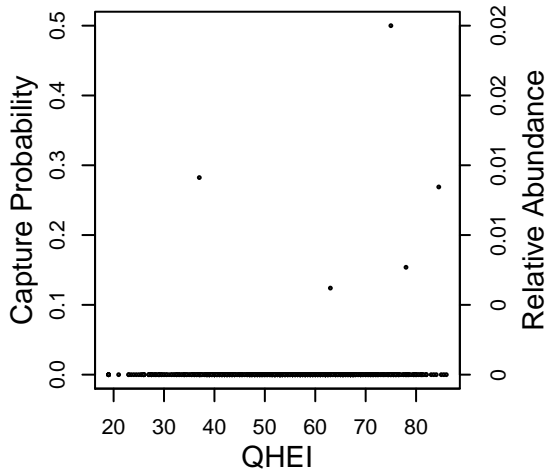


*Macronychus*

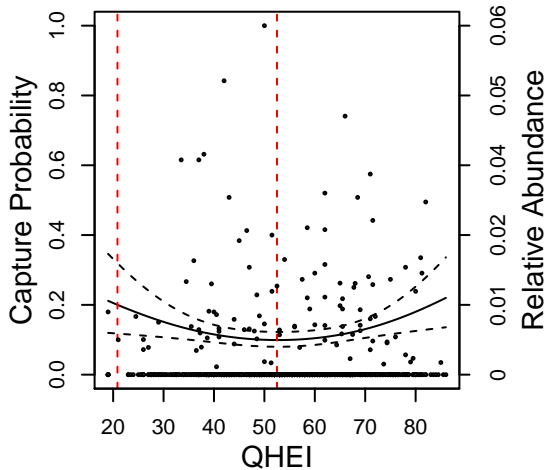


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

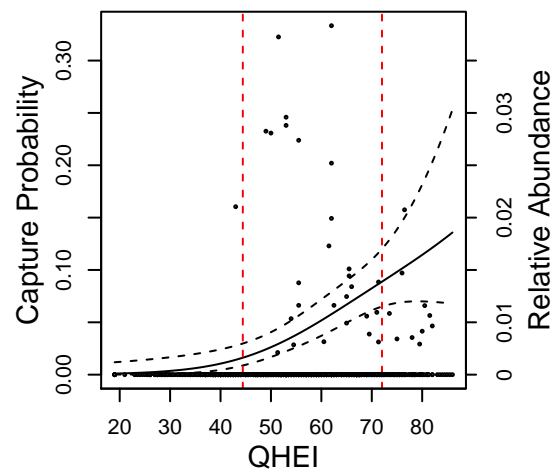
*Mallochohelea*



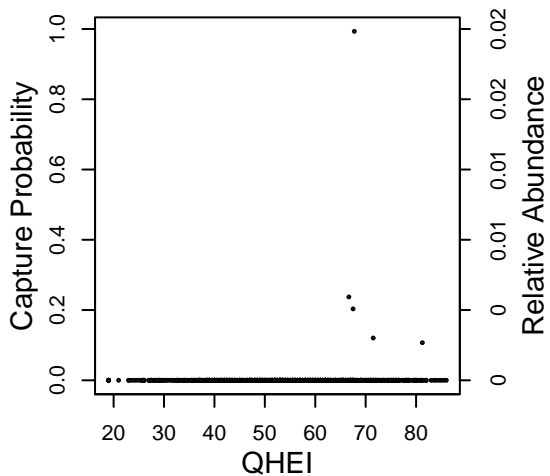
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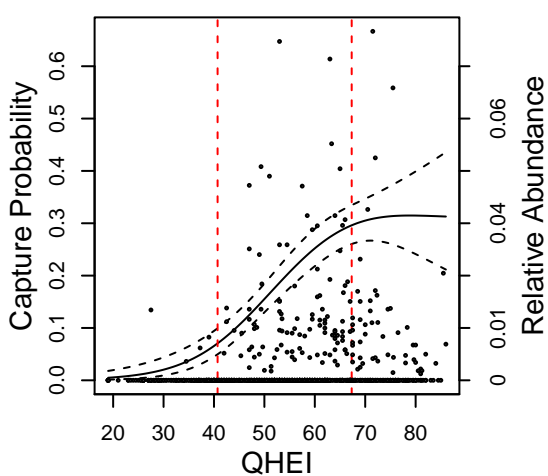
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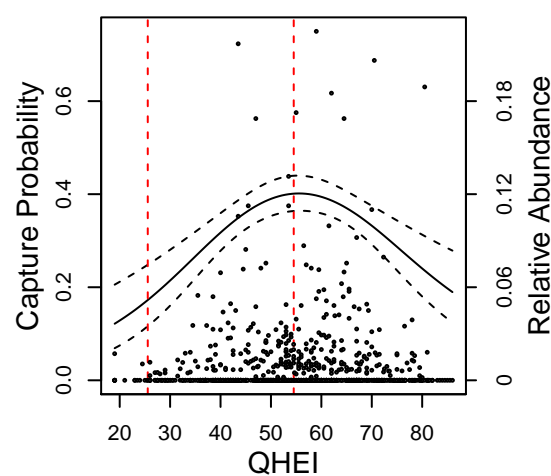
*Microcyloopus*



*Microtendipes*

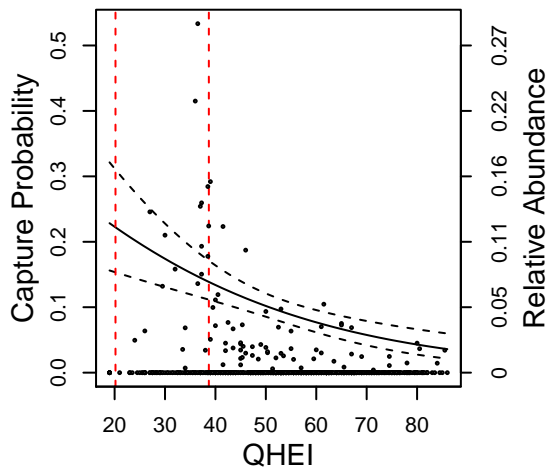


*Microvelia*

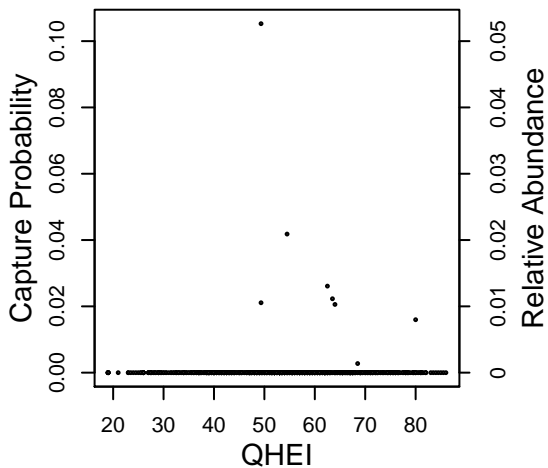


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

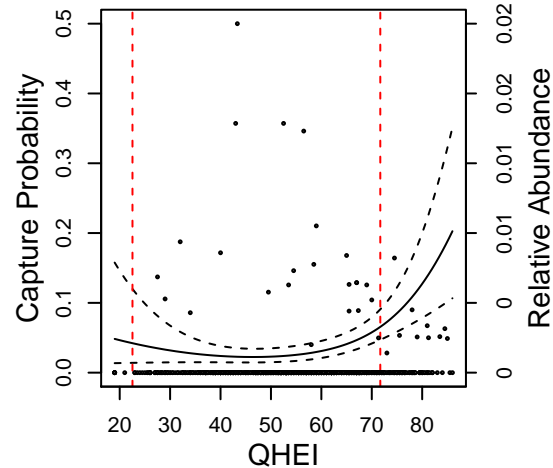
*Musculium*



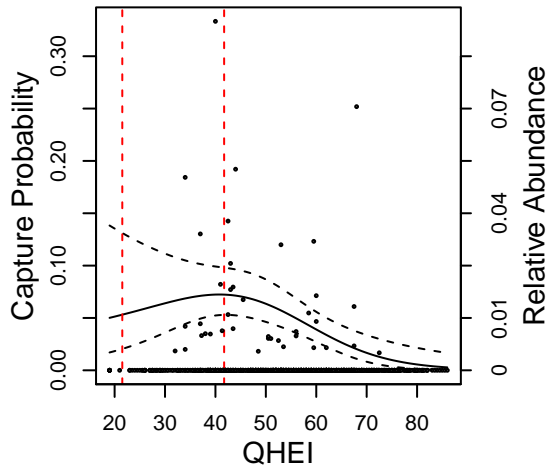
*Mystacides*



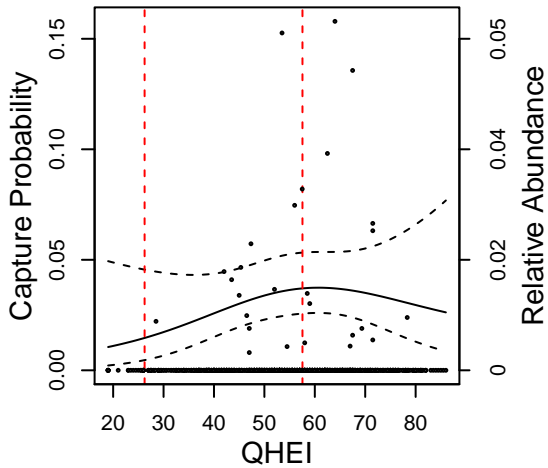
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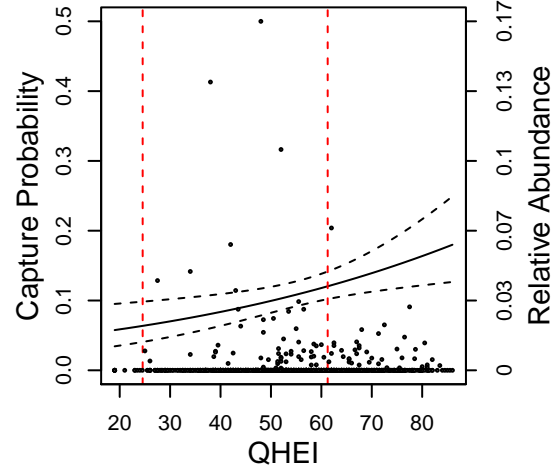
*Nasiaeschna*



*Natarsia*

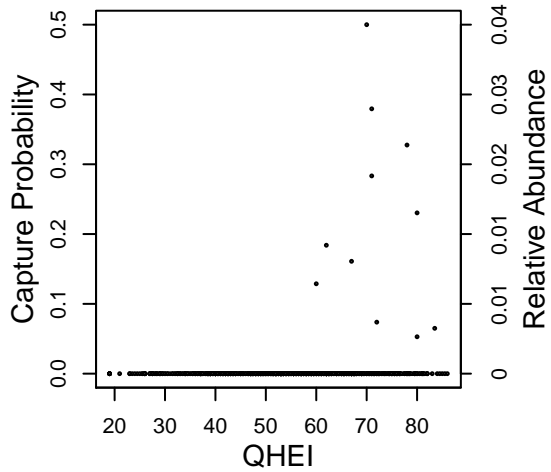


*Nectopsyche*

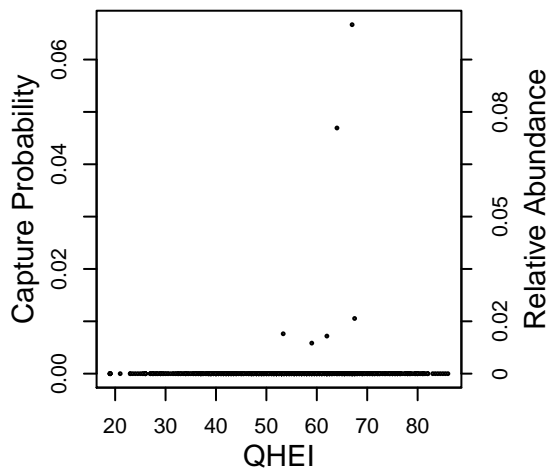


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

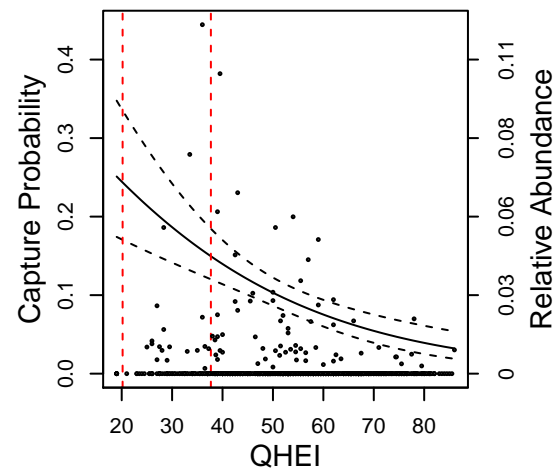
*Neoperla*



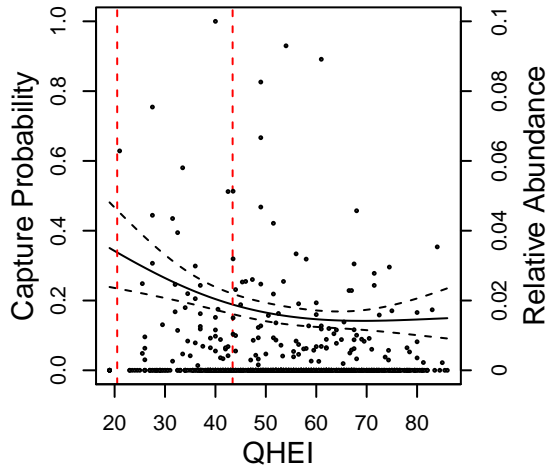
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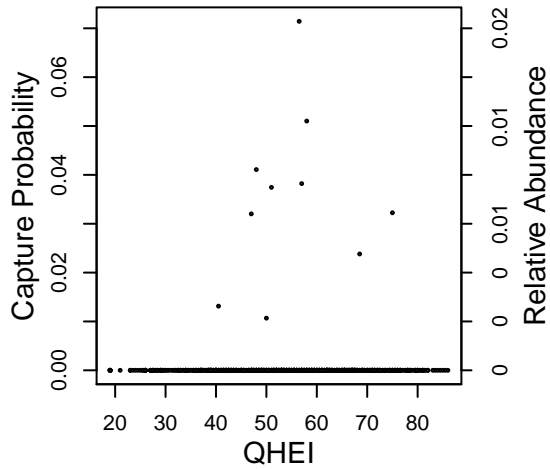
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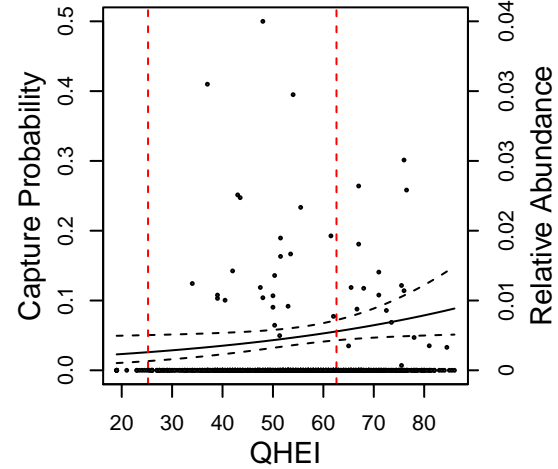
*Neoporus*



*Nepa*

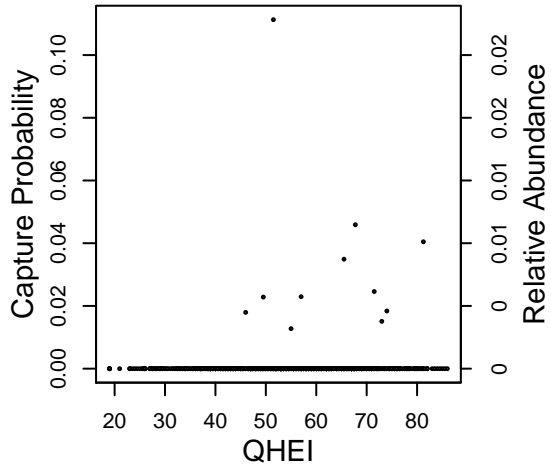


*Neureclipsis*

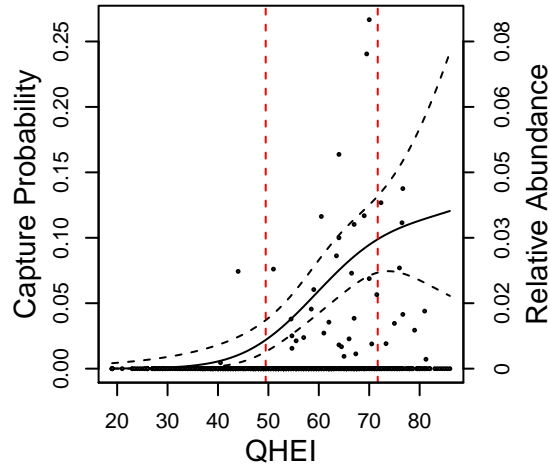


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

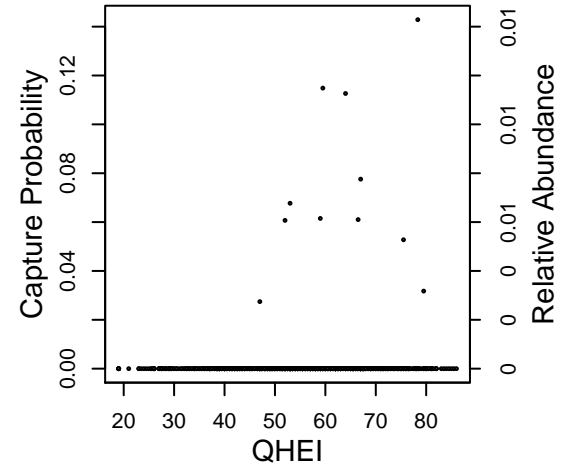
*Neurocordulia*



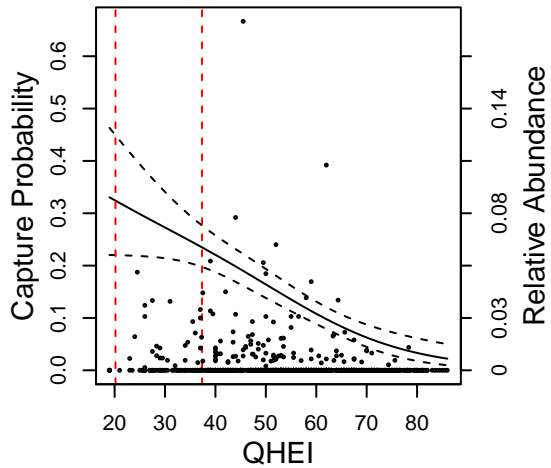
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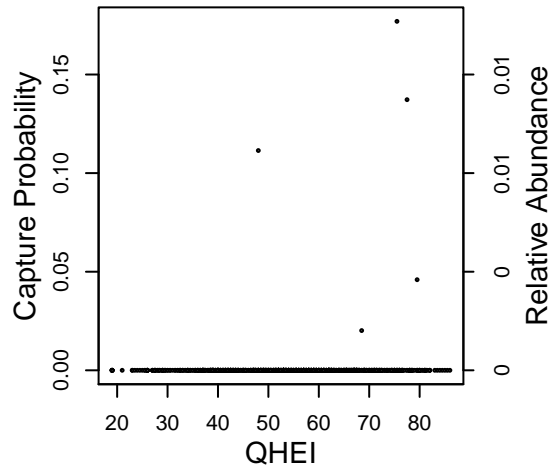
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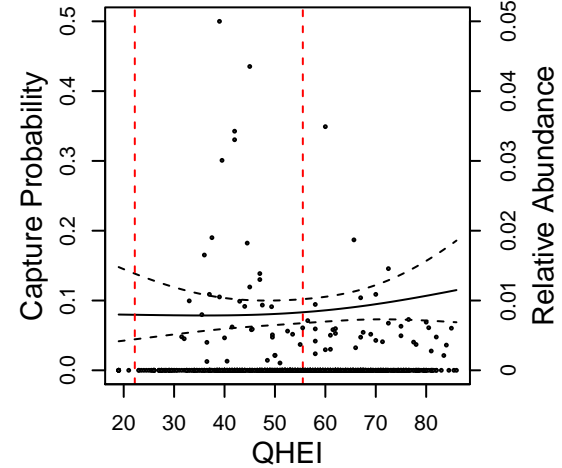
*Notonecta*



*Ochrotrichia*



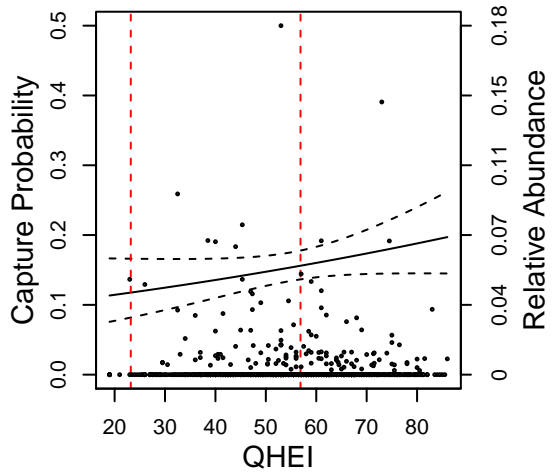
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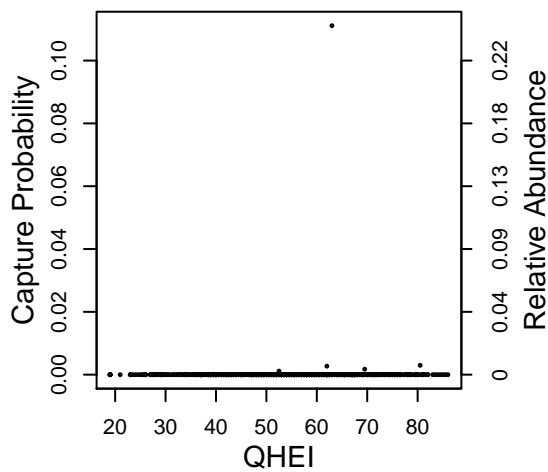


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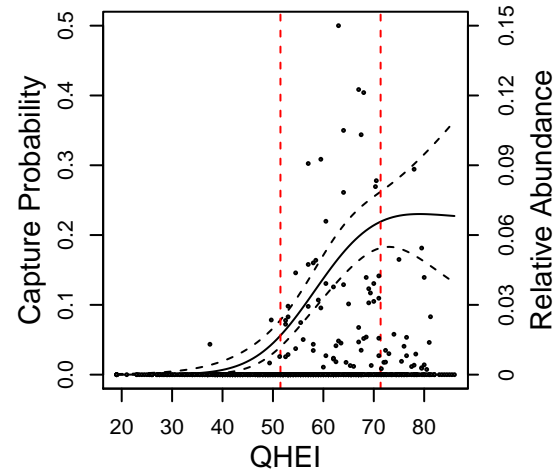
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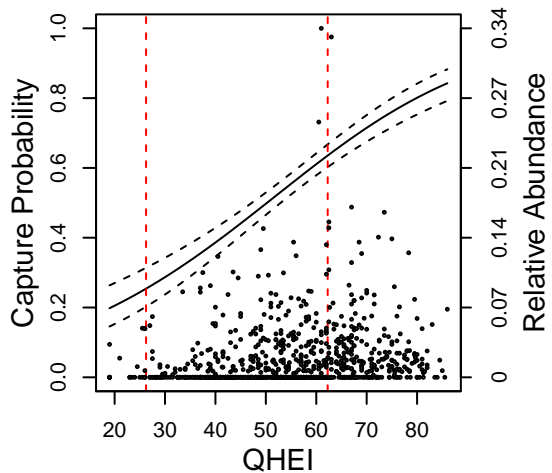
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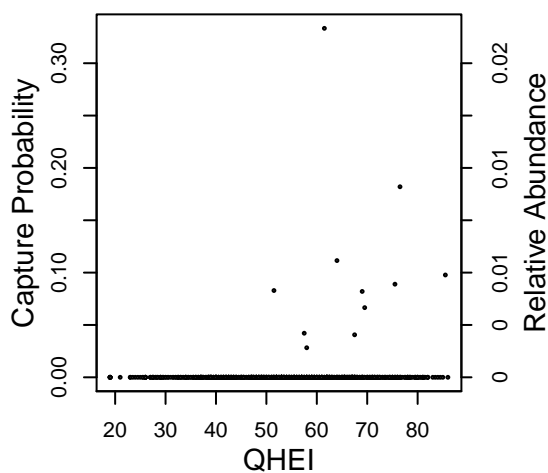
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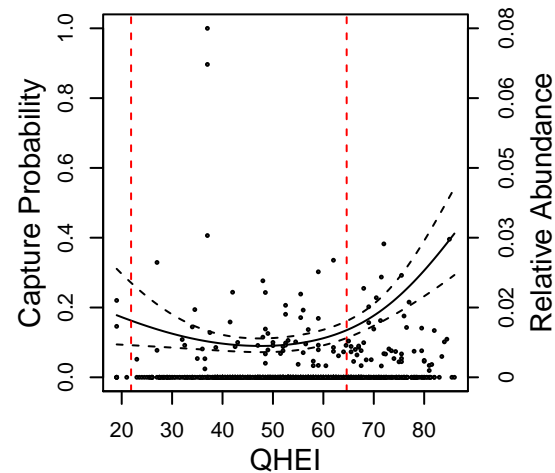
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*Ormosia*

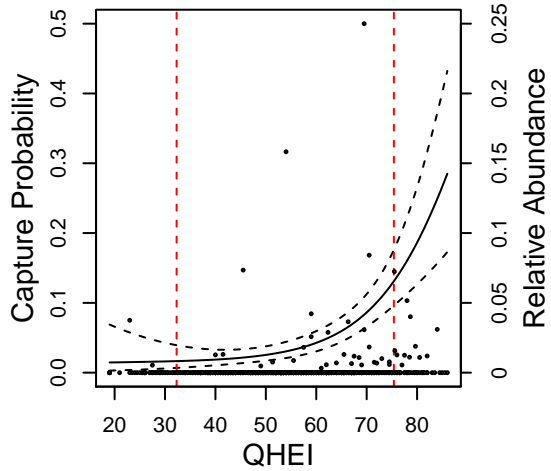


*Orthocladiinae*

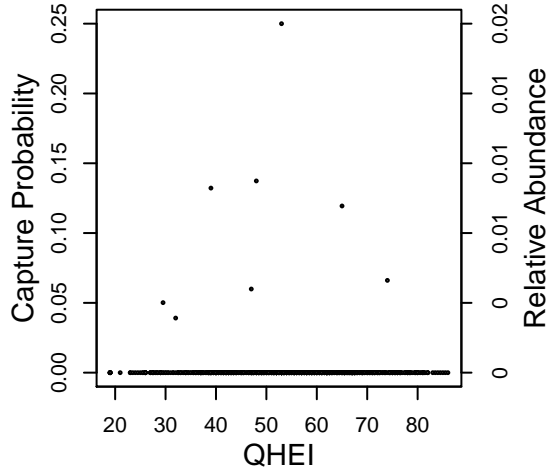


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

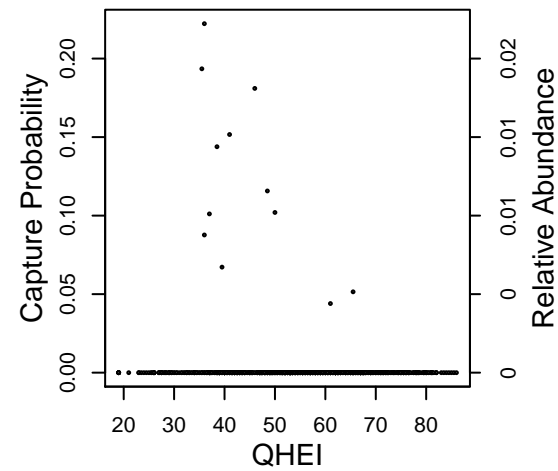
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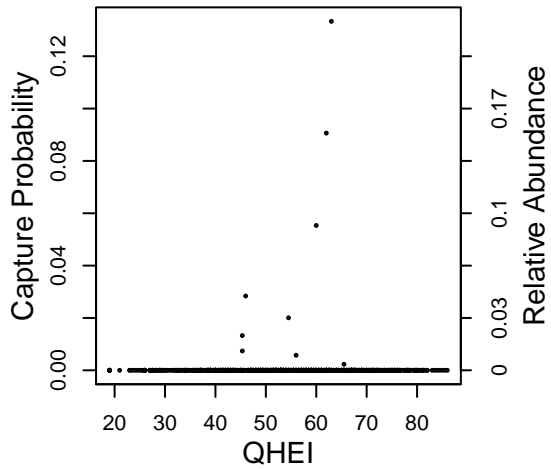
*Oxyethira*



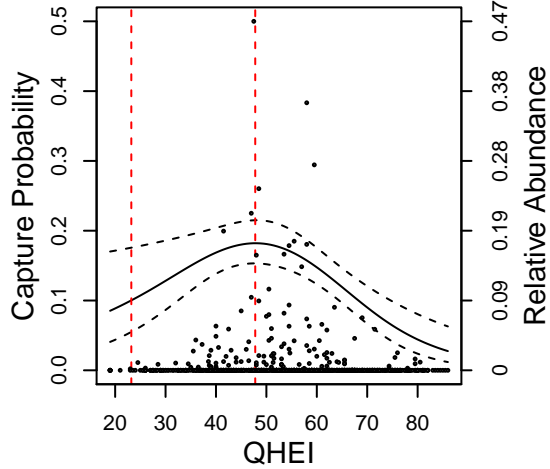
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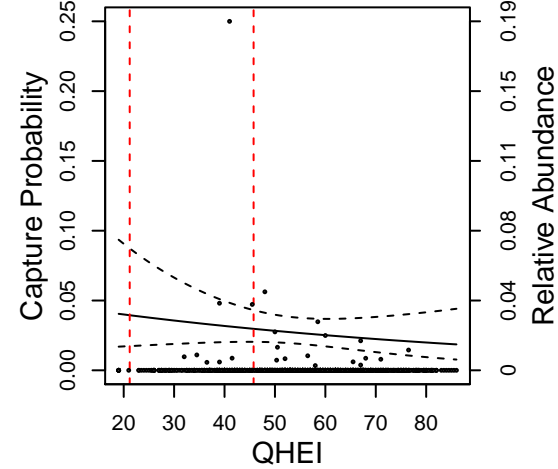
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*Palmarixia*

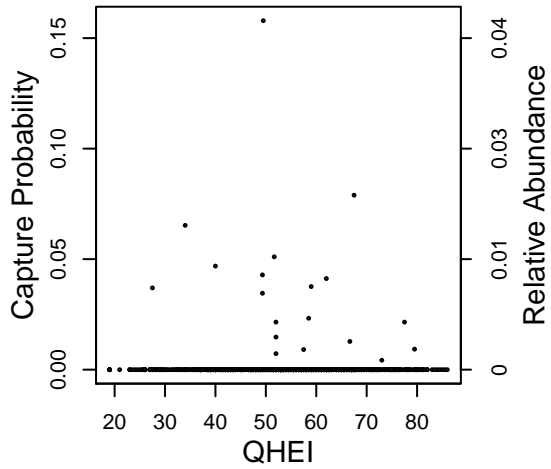


*Parachironomus*

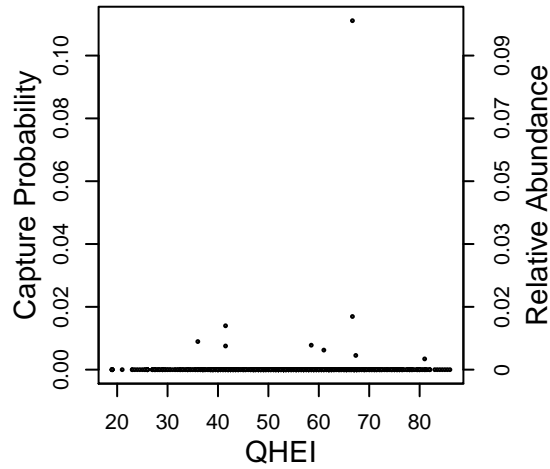


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

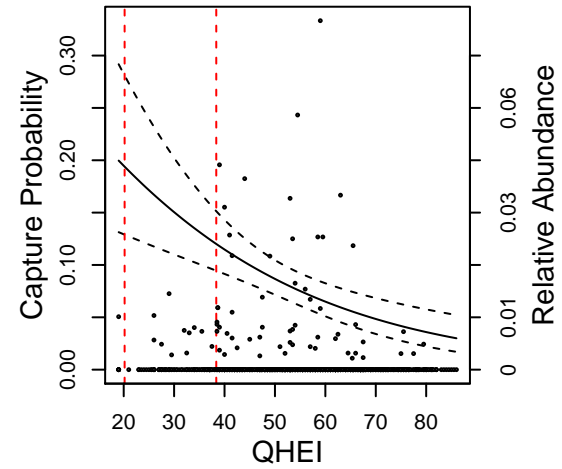
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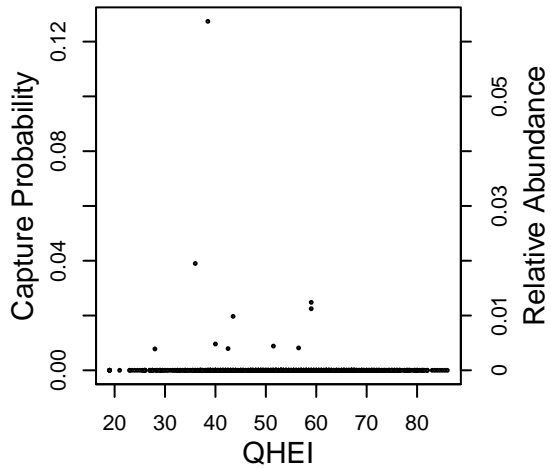
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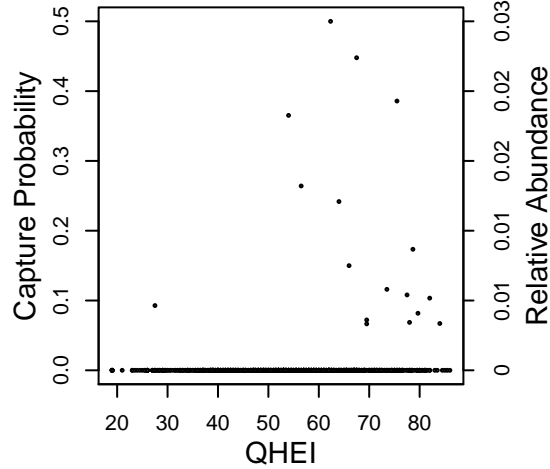
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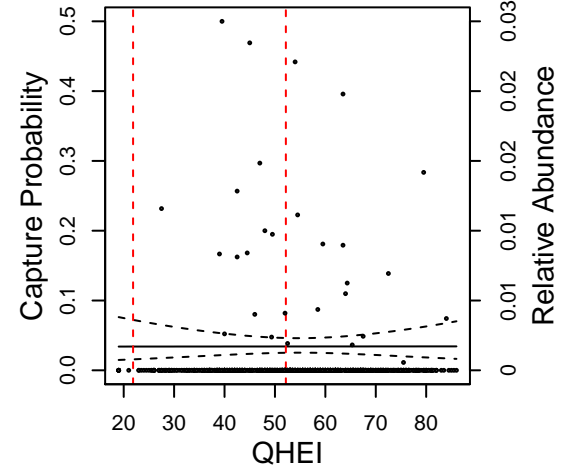
*Paragordius*



*Parakiefferiella*

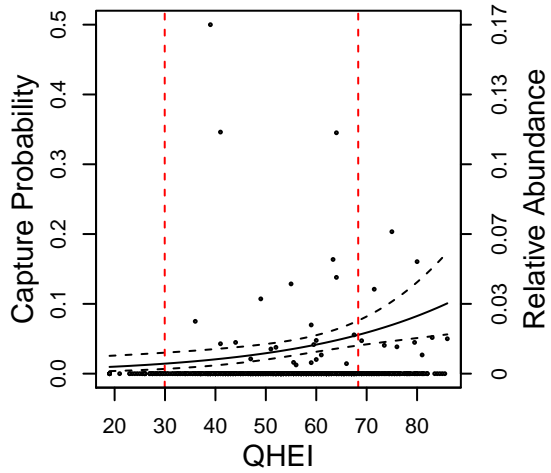


*Paralauterborniella*

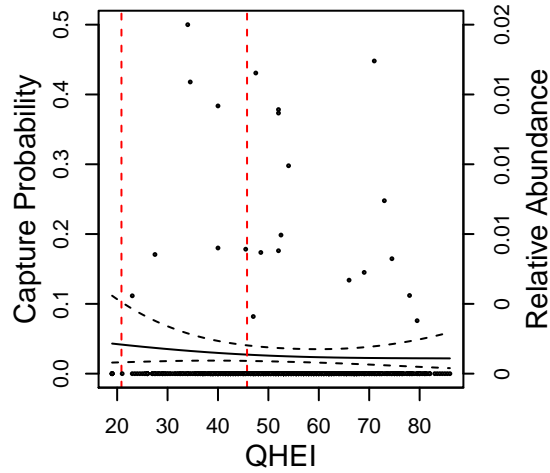


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

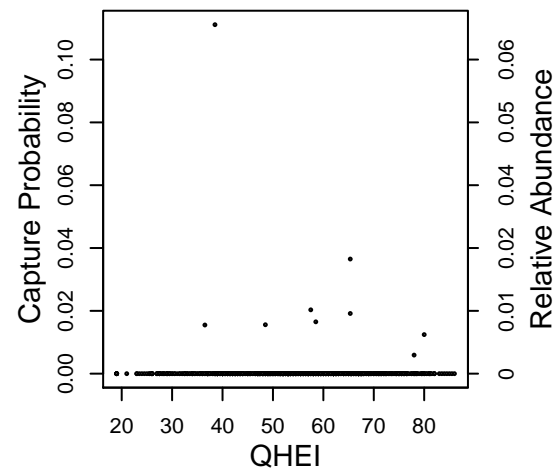
*Paraleptophlebia*



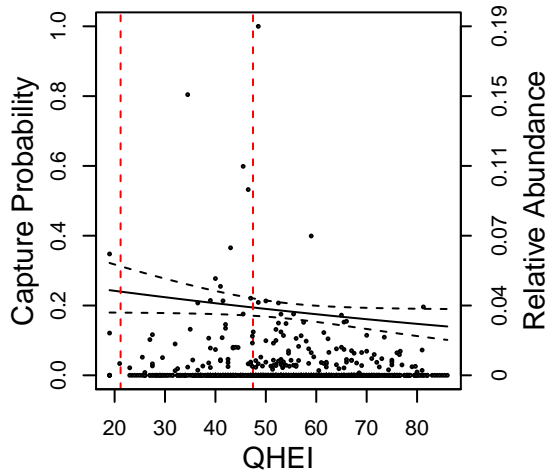
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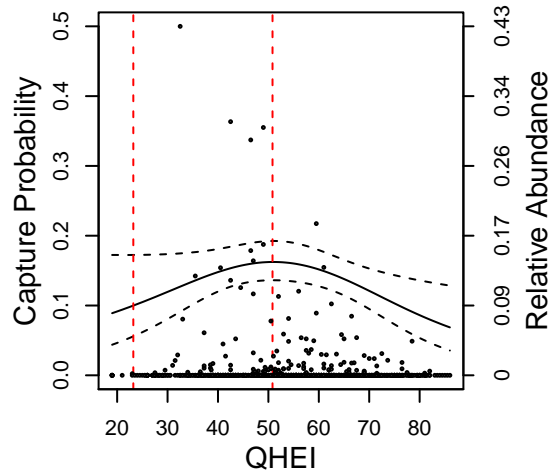
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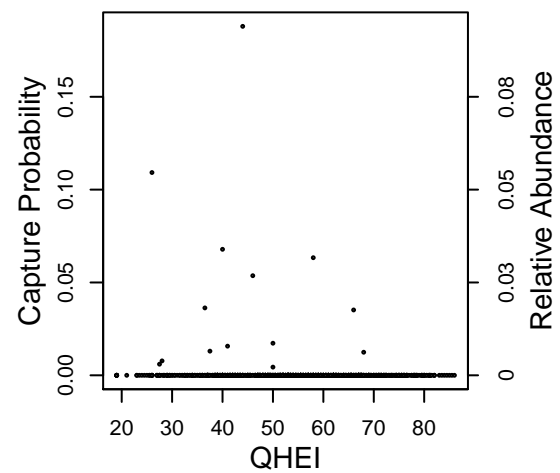
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*Paratendipes*

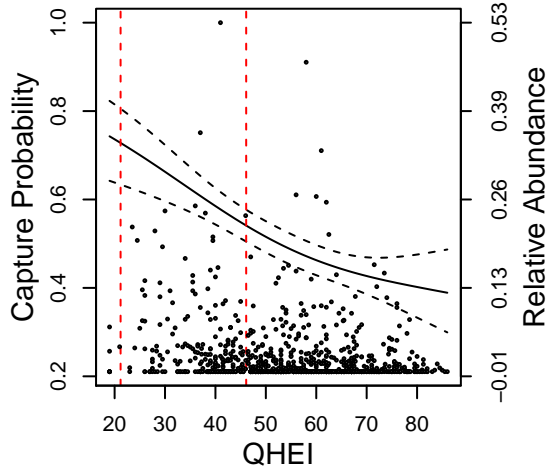


*Pelocoris*

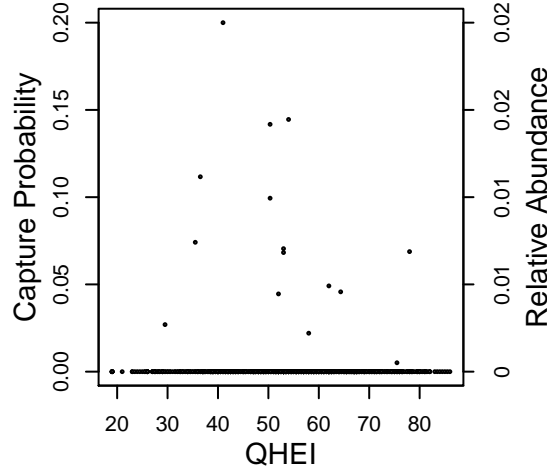


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

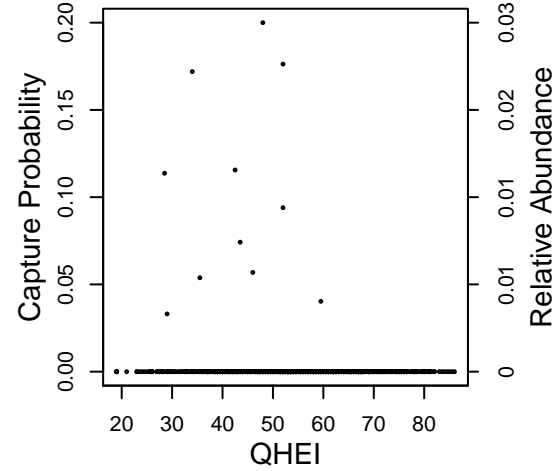
*Peltodytes*



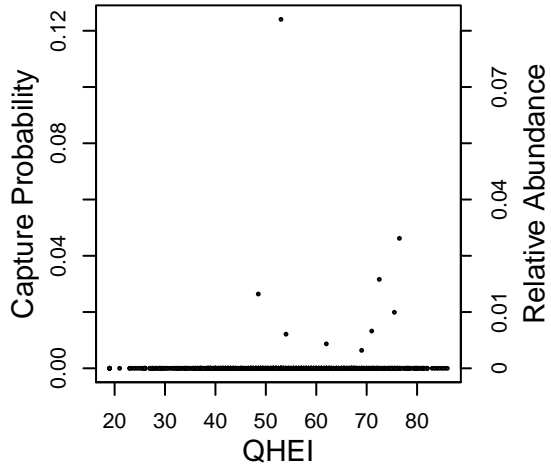
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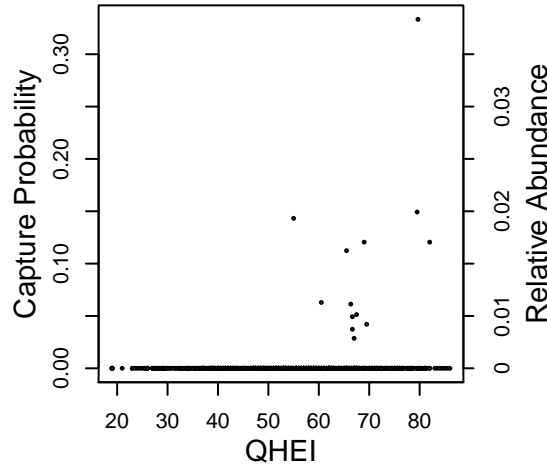
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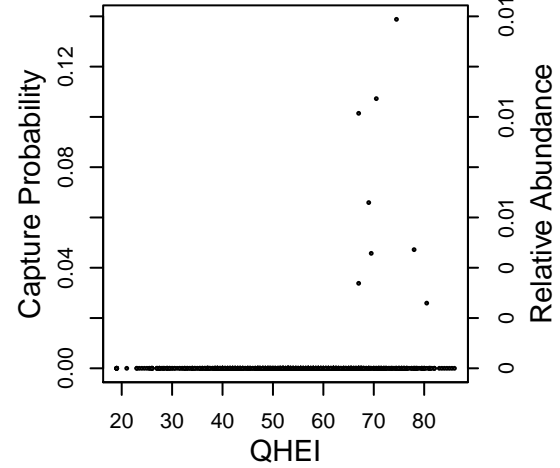
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*Perlinella*

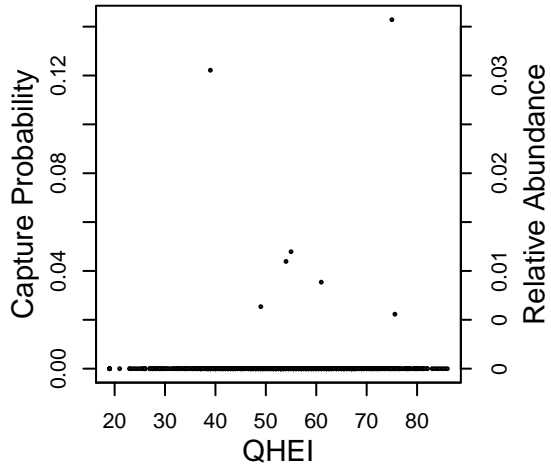


*Petrophila*

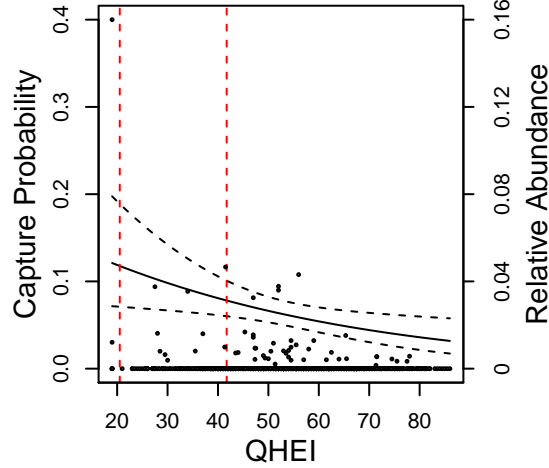


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

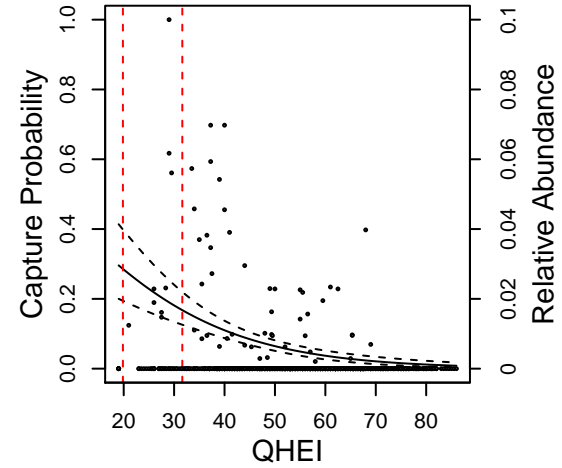
*Pilaria*



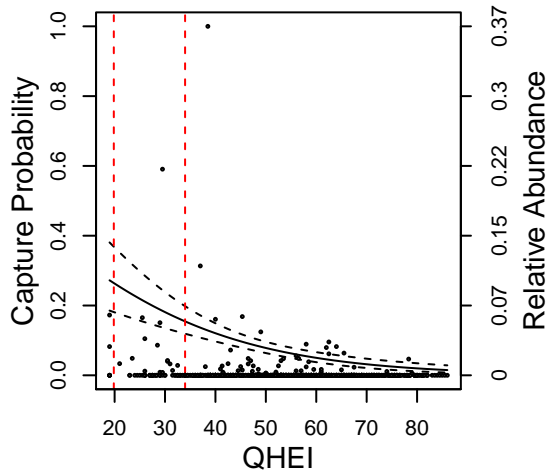
*Pisidium*



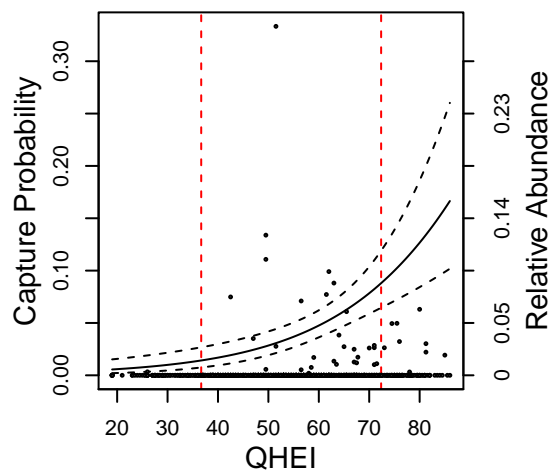
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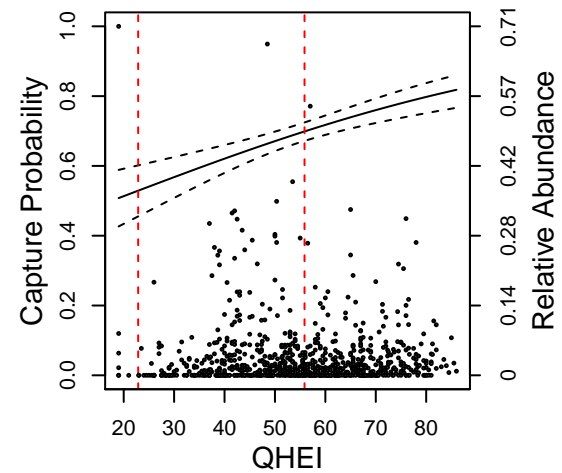
*Platheimis*



*Pleurocera*

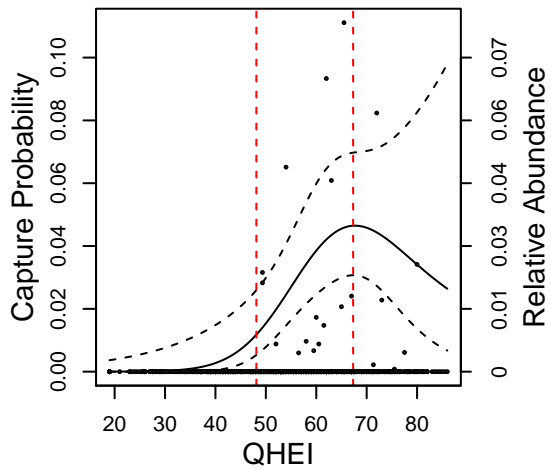


*Polypedilum*

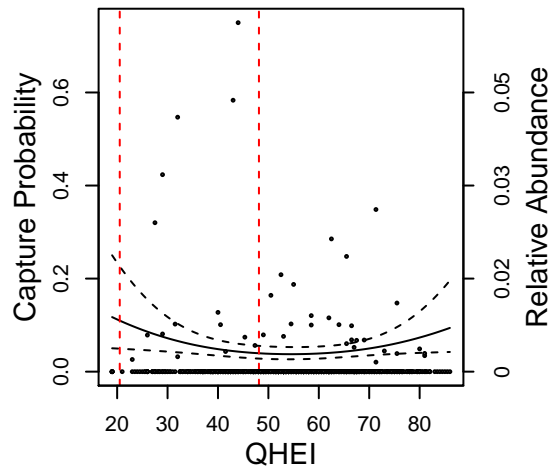


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

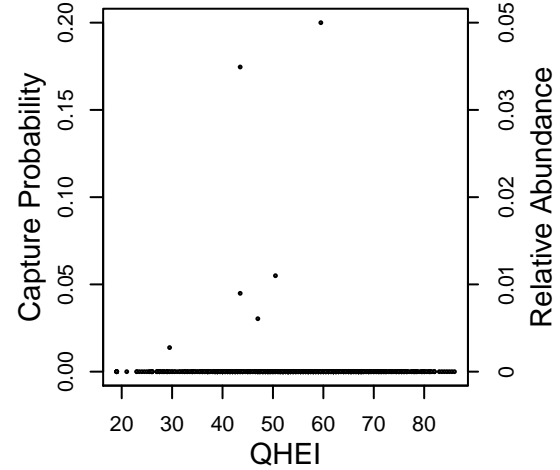
*Potamyia*



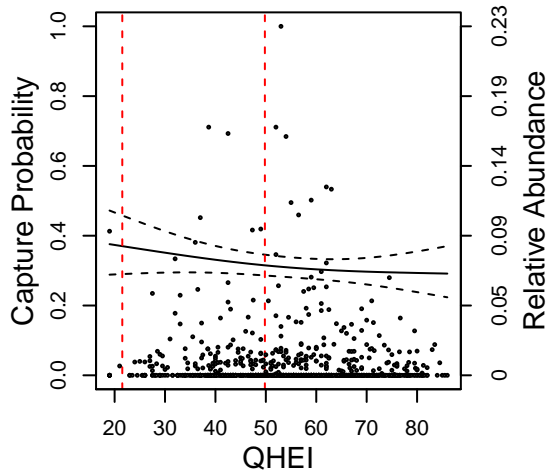
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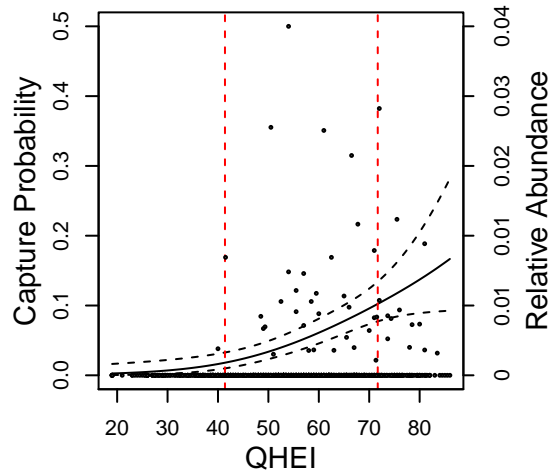
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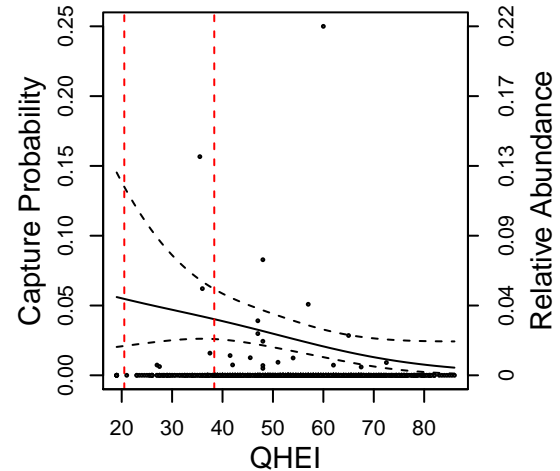
*Procladius*



*Procloeon*

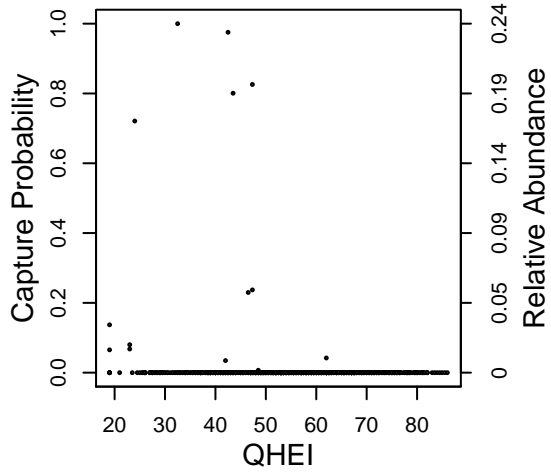


*Progomphus*

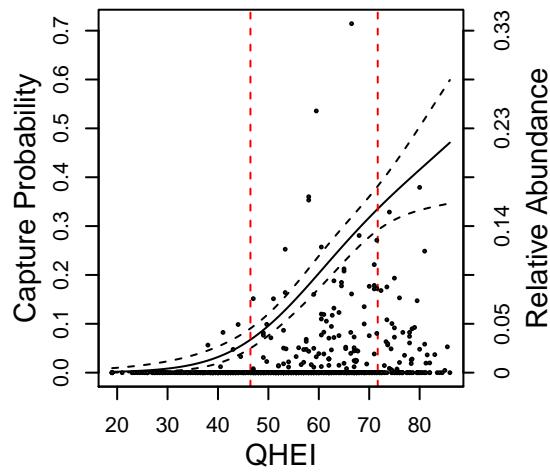


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

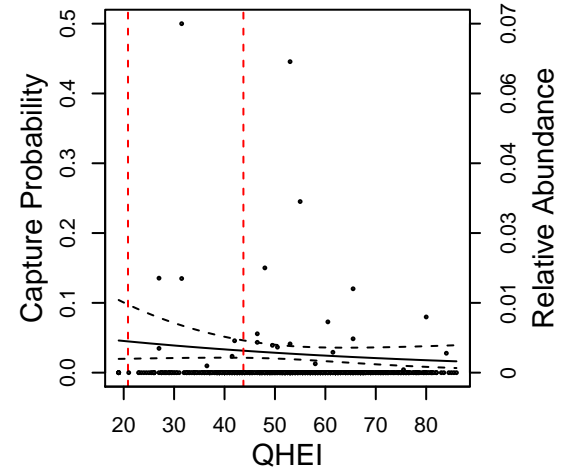
*Psectrotanypus*



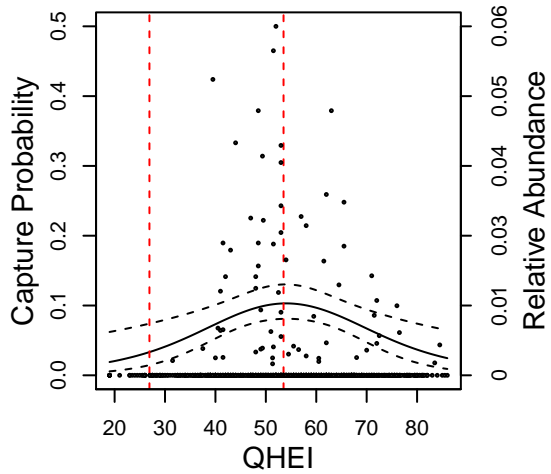
*Psephenus*



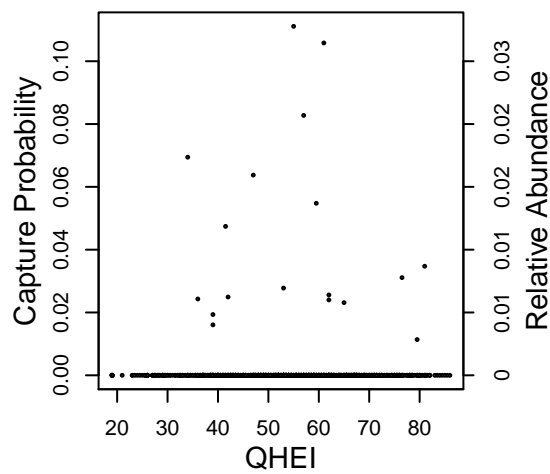
*Pseudochironomus*



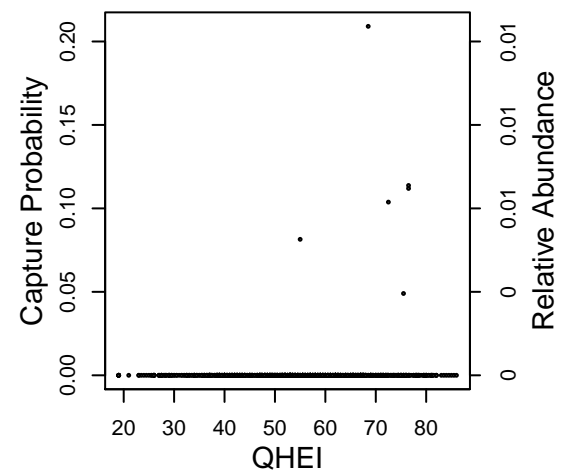
*Pseudocloeon*



*Pseudosuccinea*



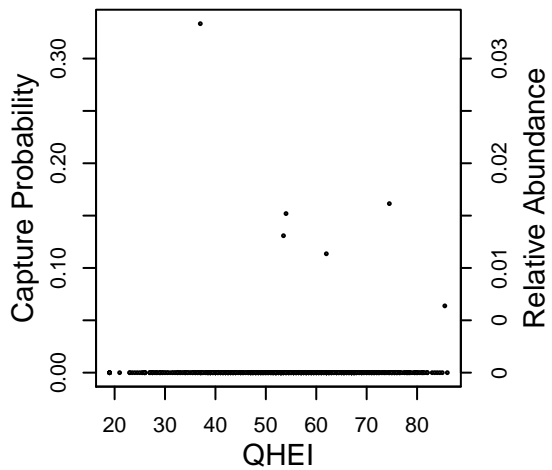
*Pteronarcys*



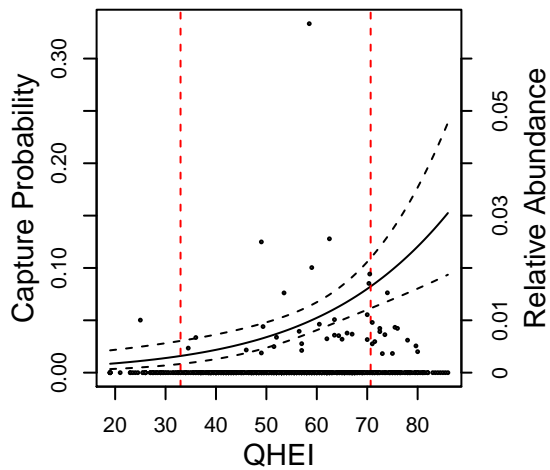


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

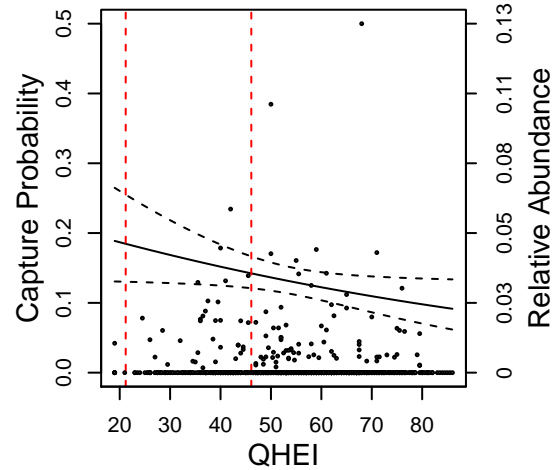
*Ptilostomis*



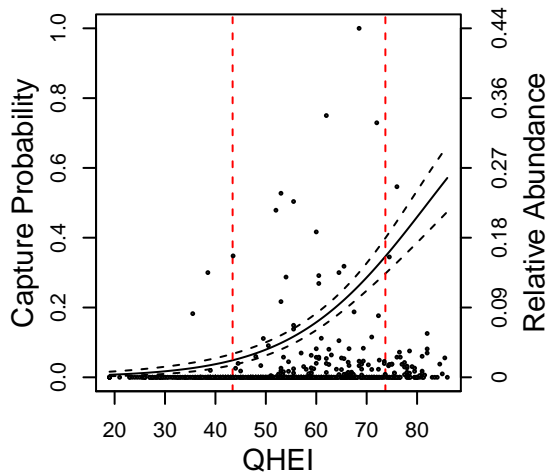
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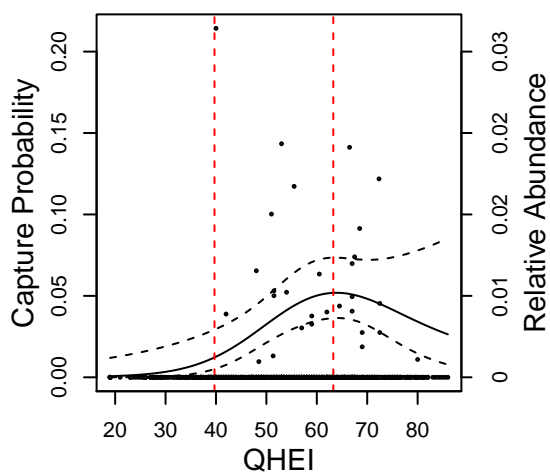
*Ranatra*



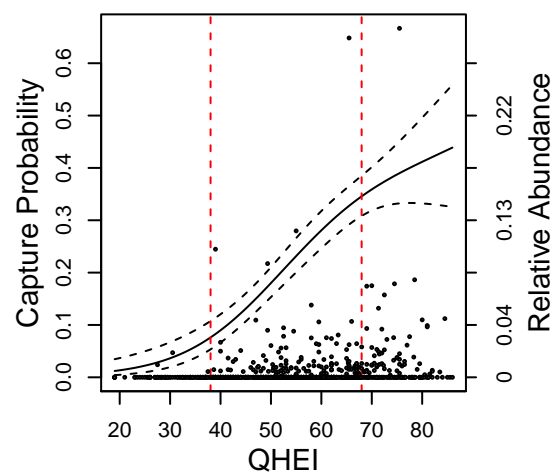
*Rhagovelia*



*Rheocricotopus*

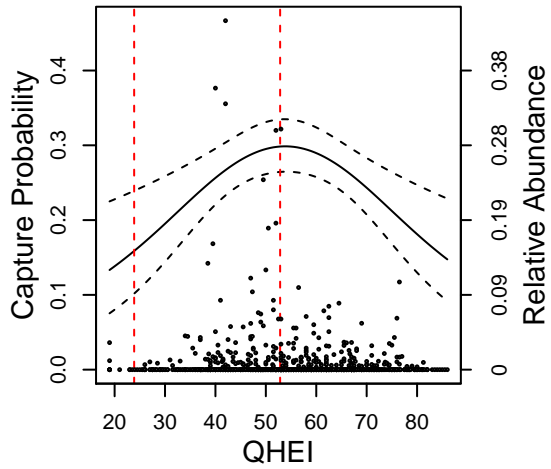


*Rheotanytarsus*

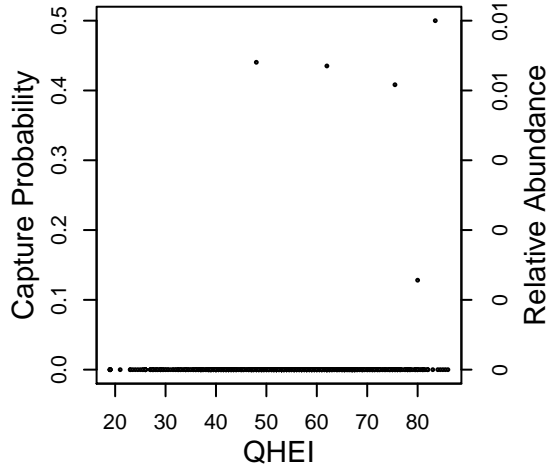


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

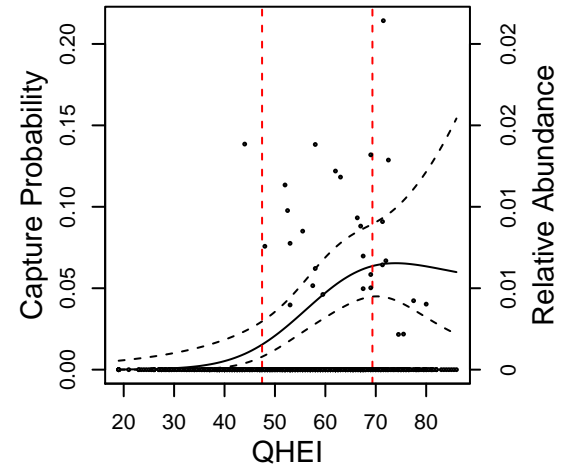
*Rheumatobates*



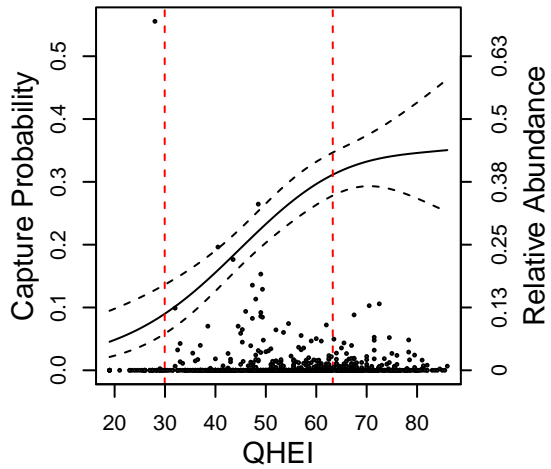
*Robackia*



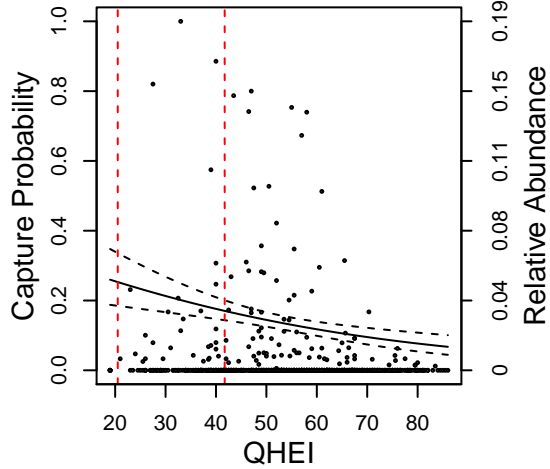
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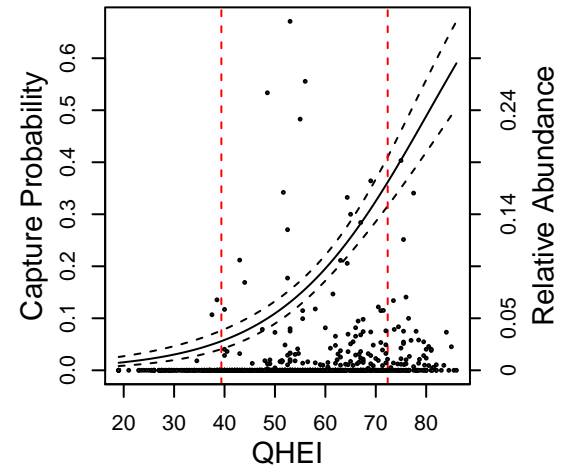
*Sialis*



*Sigara*

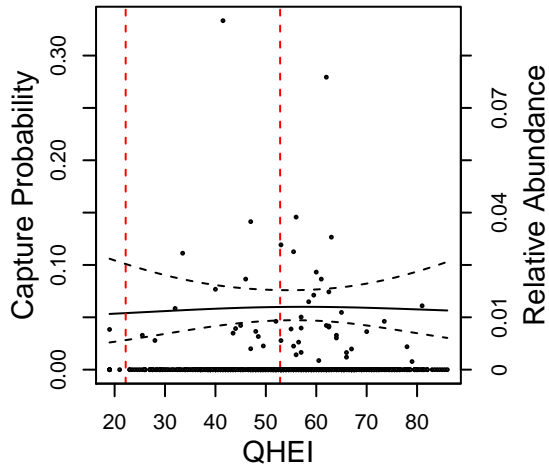


*Simulium*

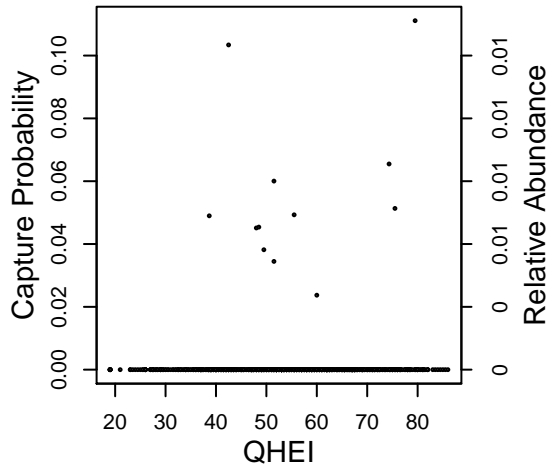


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

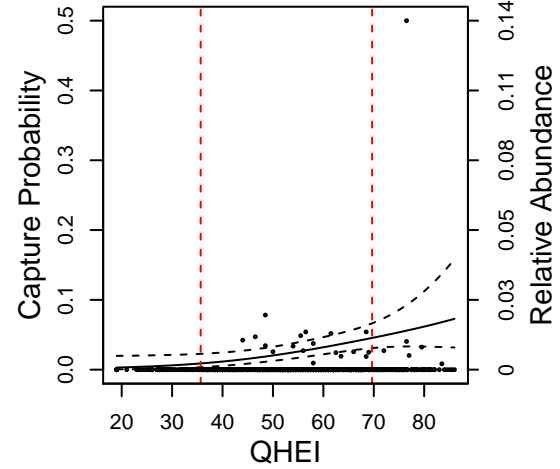
*Somatochlora*



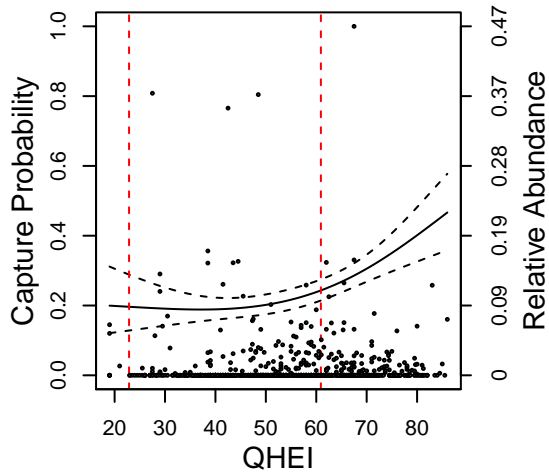
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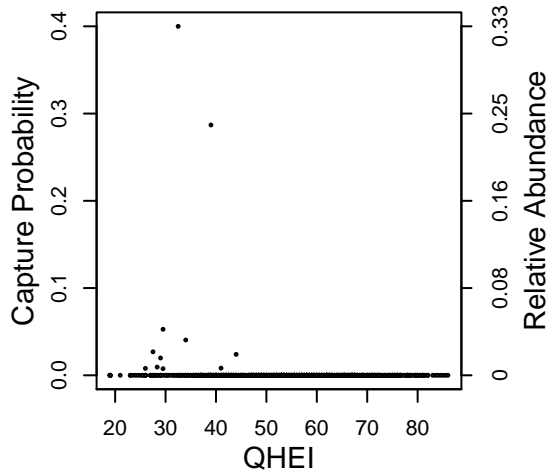
*Sperchopsis*



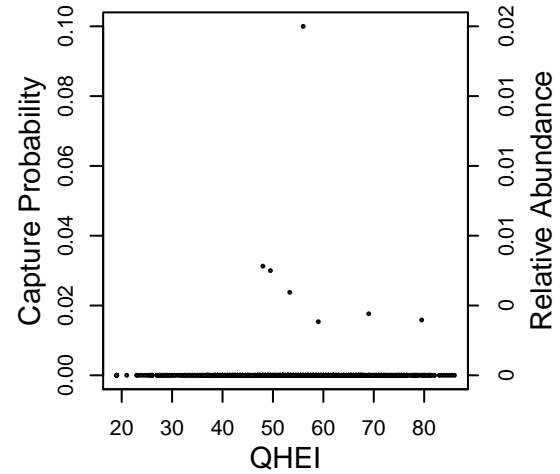
*Sphaerium*



*Stagnicola*

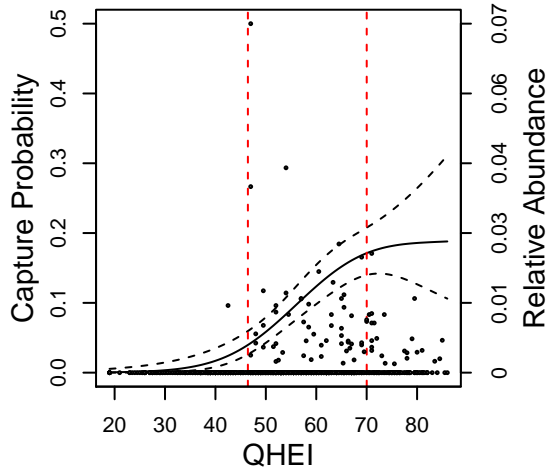


*Stempellina*

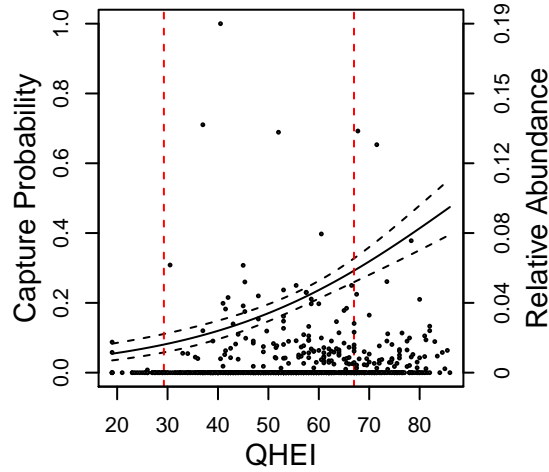


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

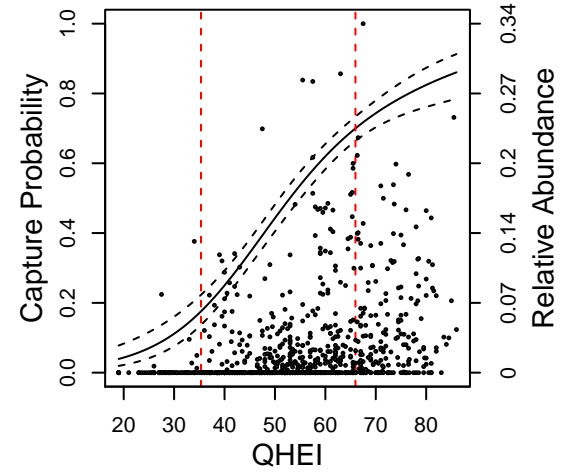
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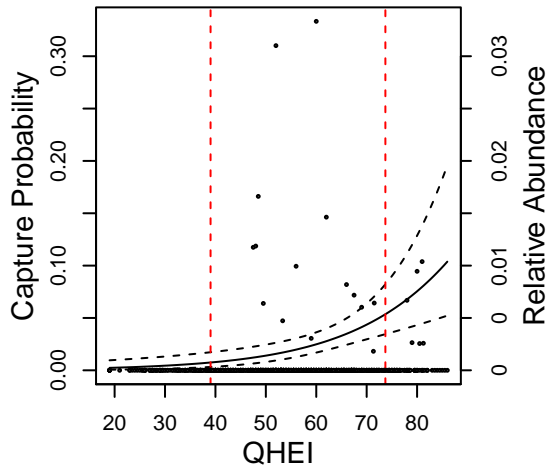
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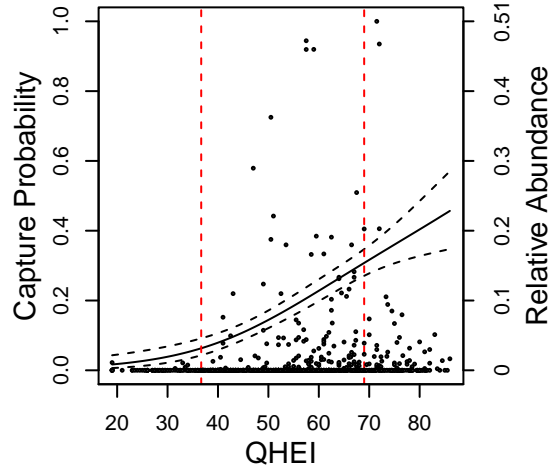
*Stenelmis*



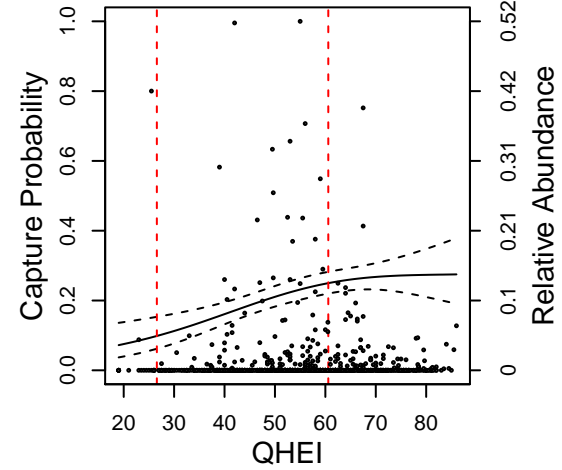
*Stenochironomus*



*Stenonema*

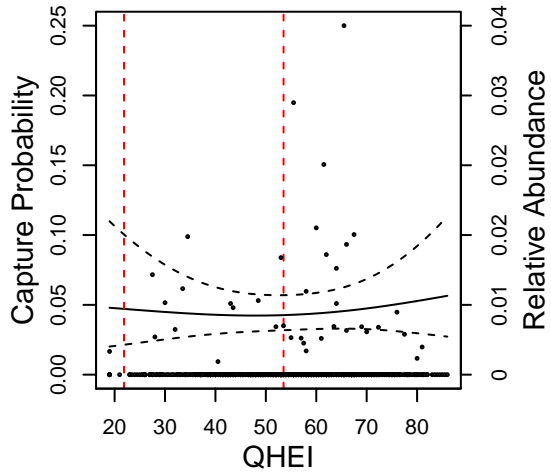


*Stictochironomus*

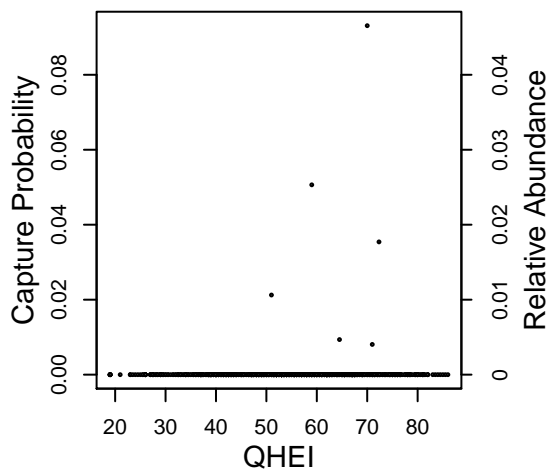


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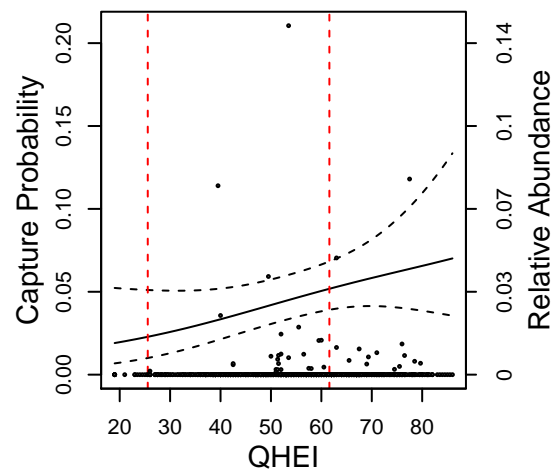
*Stratiomys*



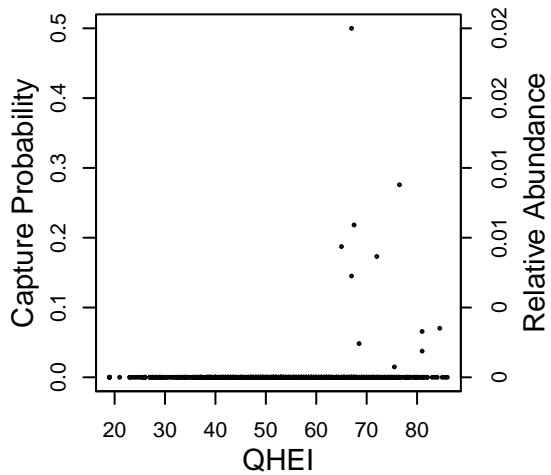
*Stylogomphus*



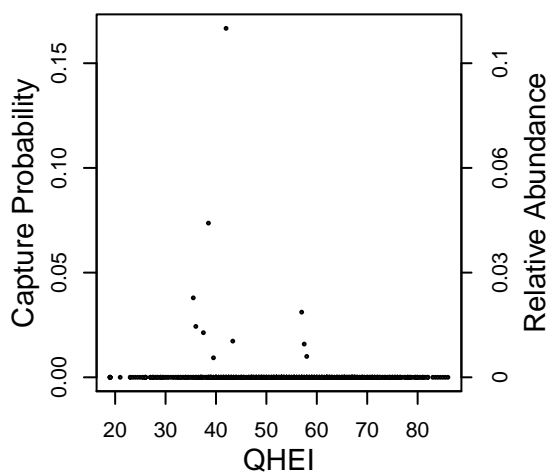
*Stylurus*



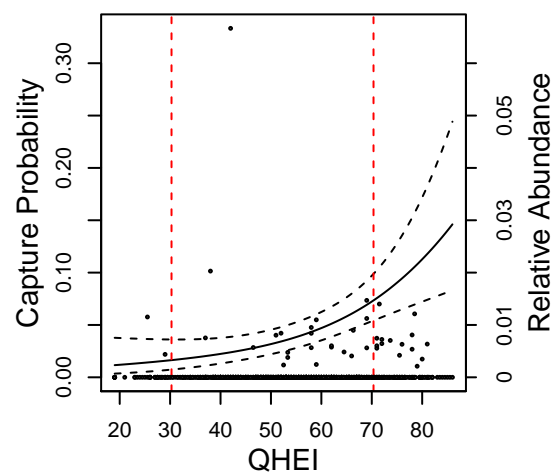
*Sublettea*



*Sympetrum*

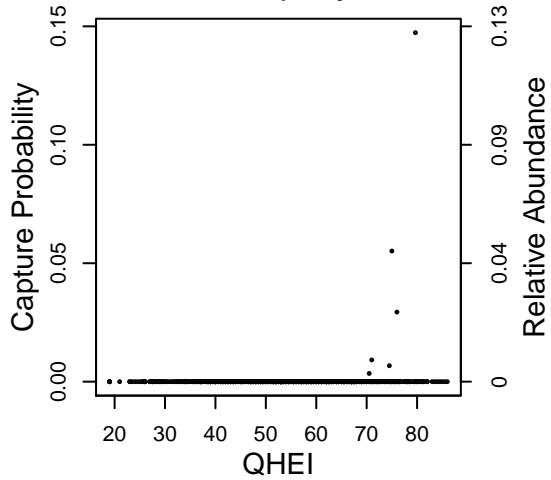


*Tabanus*

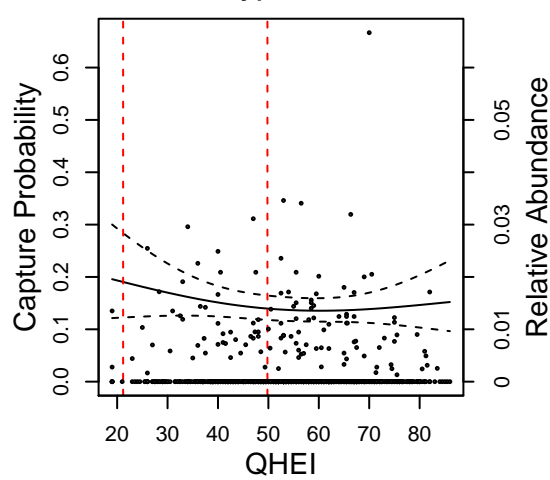


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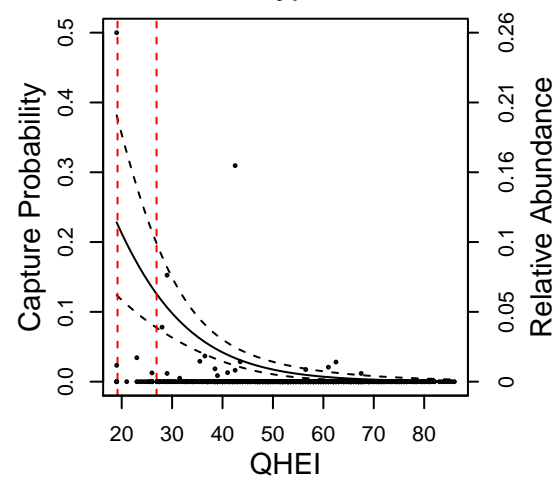
*Taeniopteryx*



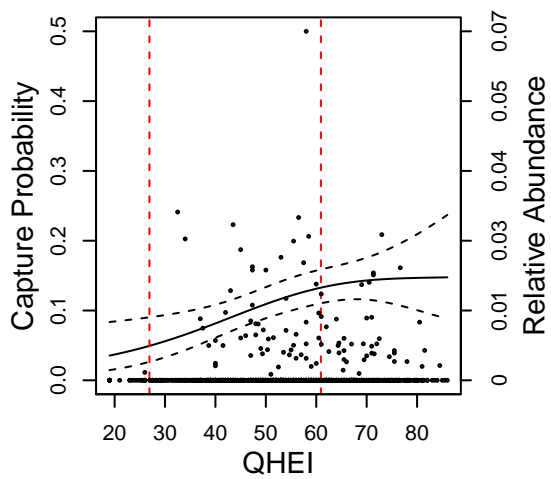
*Tanypodinae*



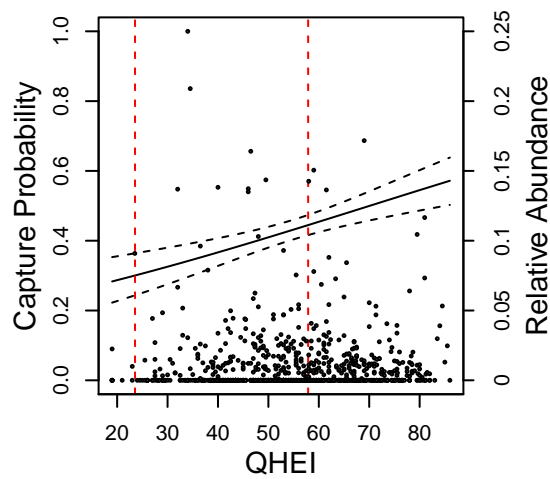
*Tanypus*



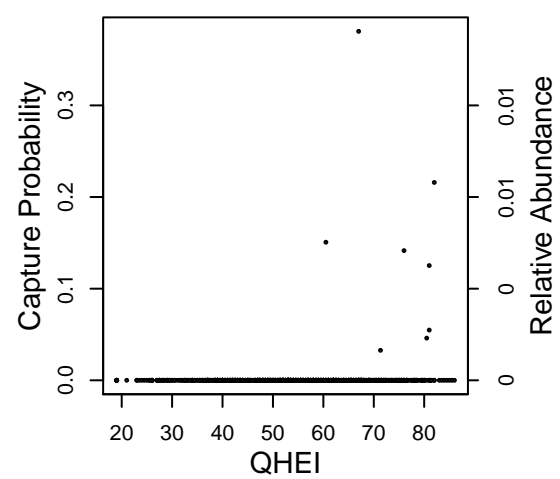
*Tanytarsini*



*Tanytarsus*

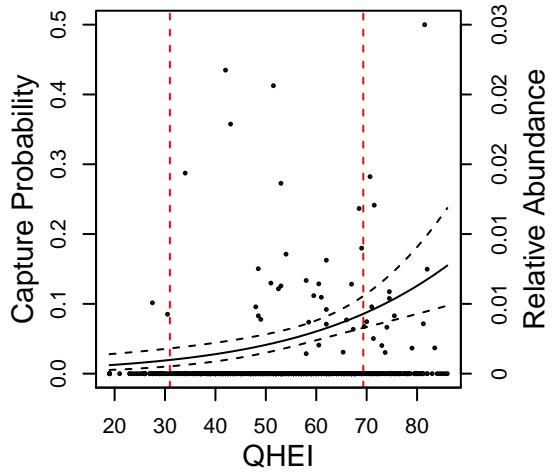


*Telopelopia*

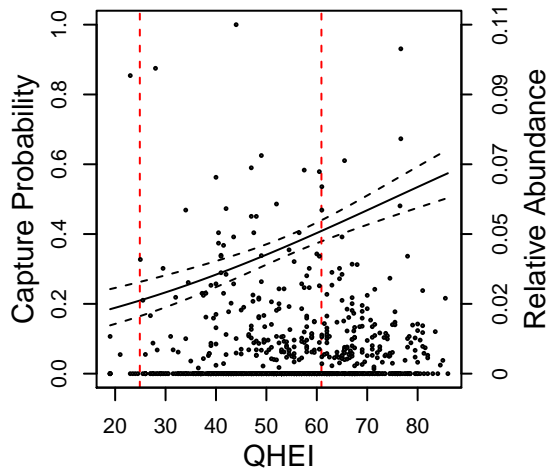


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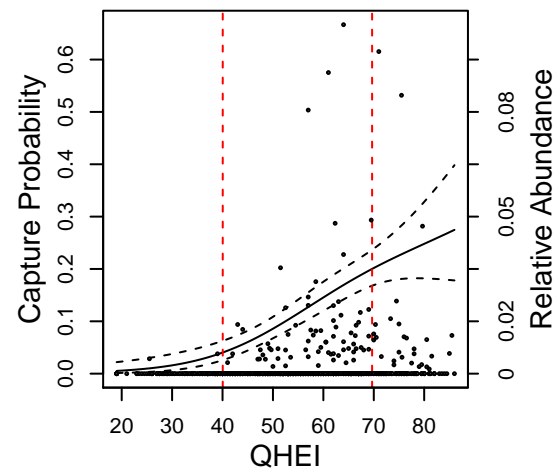
*Thienemanniella*



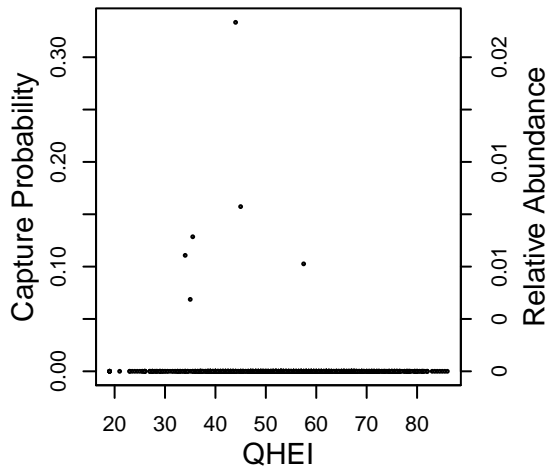
*Thienemannimyia*



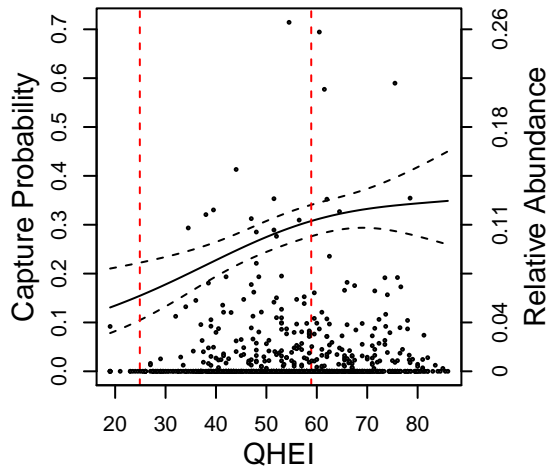
*Tipula*



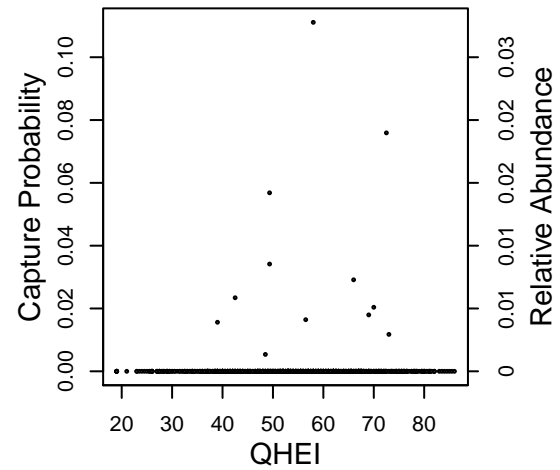
*Tramea*



*Trepobates*

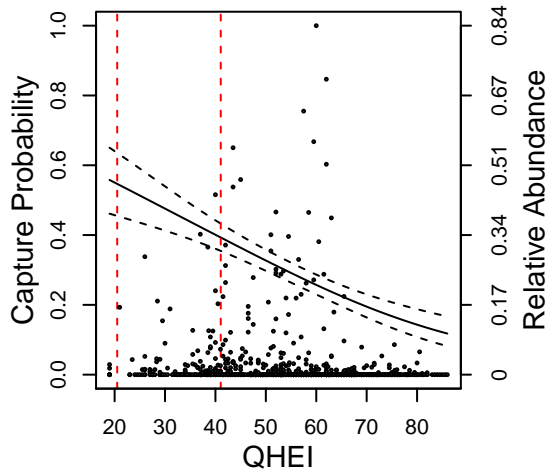


*Triaenodes*

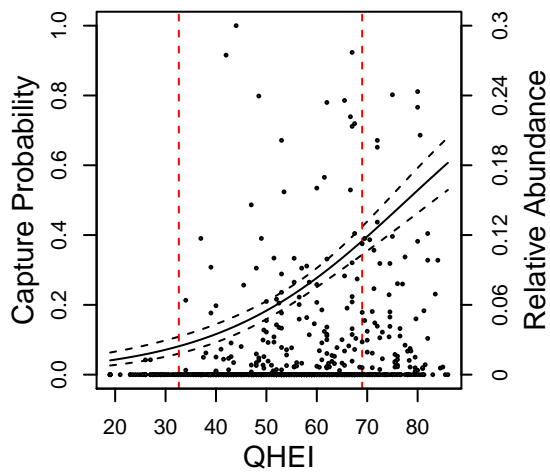


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

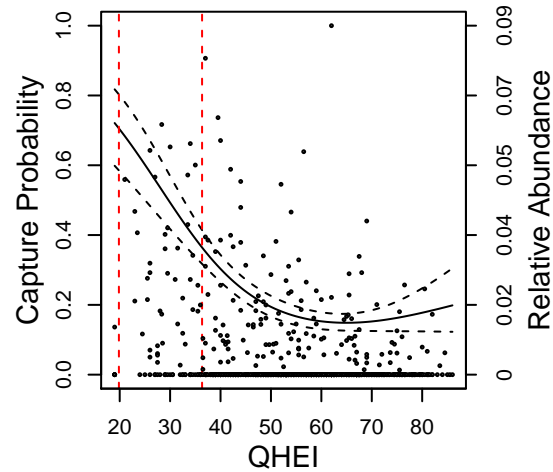
*Trichocorixa*



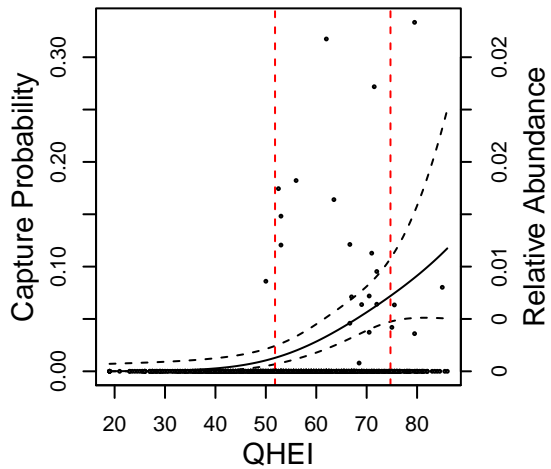
*Tricorythodes*



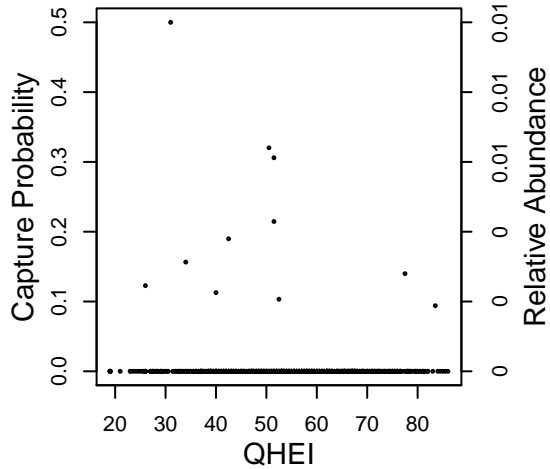
*Tropisternus*



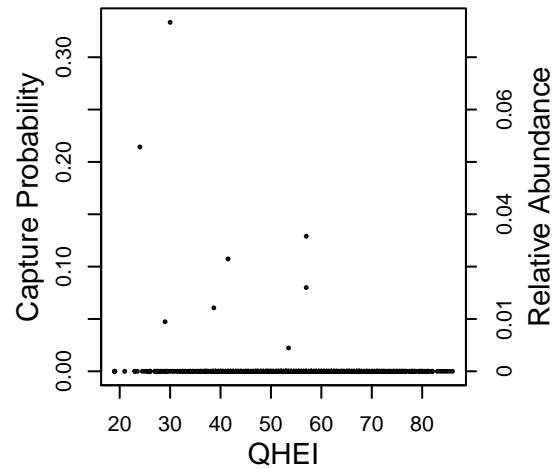
*Tvetenia*



*Uvarus*



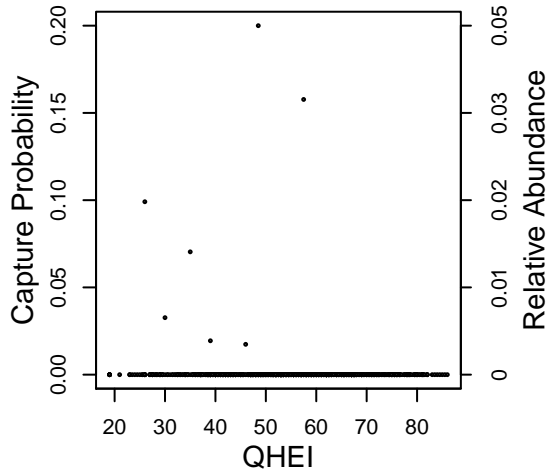
*Valvata*



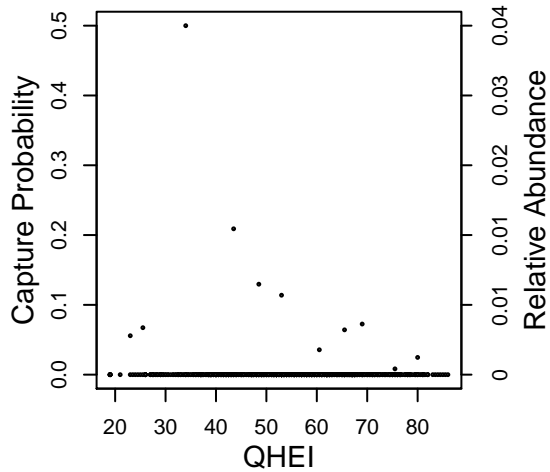


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

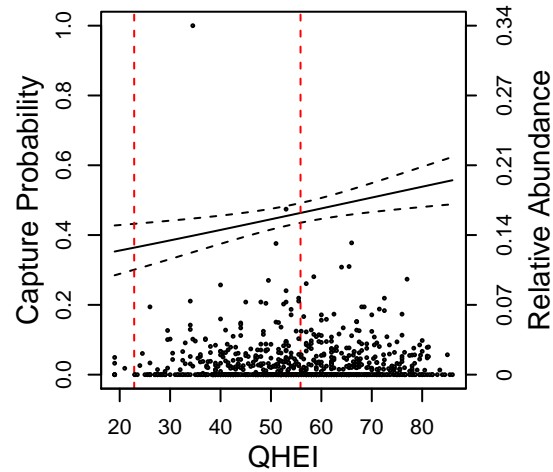
*Zavreliella*



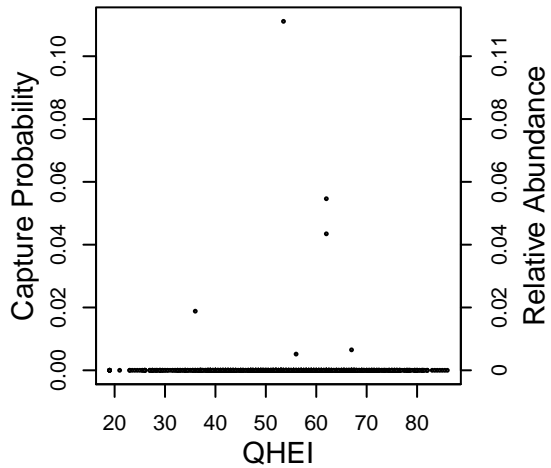
*Zavrelimyia*



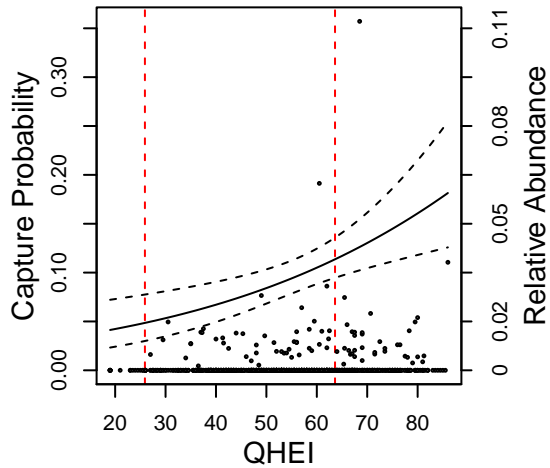
*Aeshnidae*



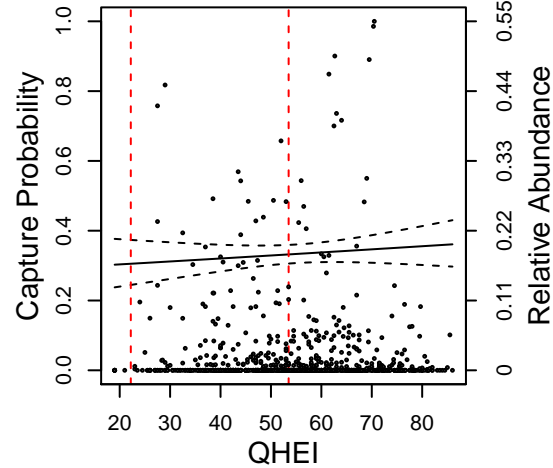
*Amphipoda*



*Ancylidae*

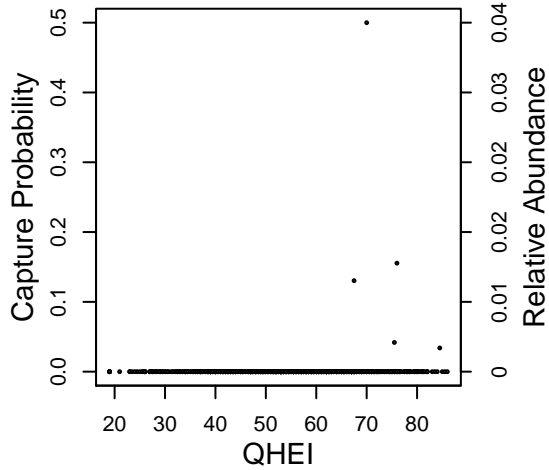


*Asellidae*

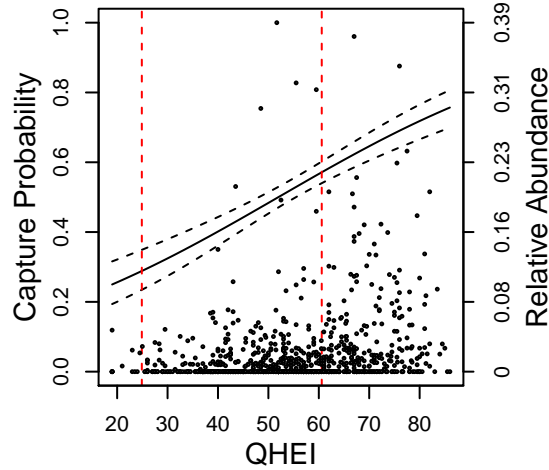


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

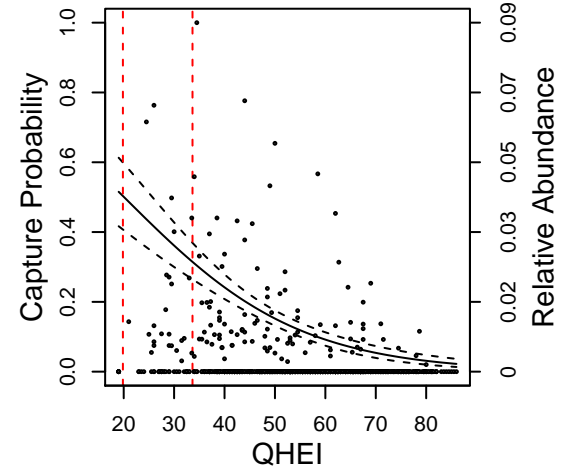
*Athericidae*



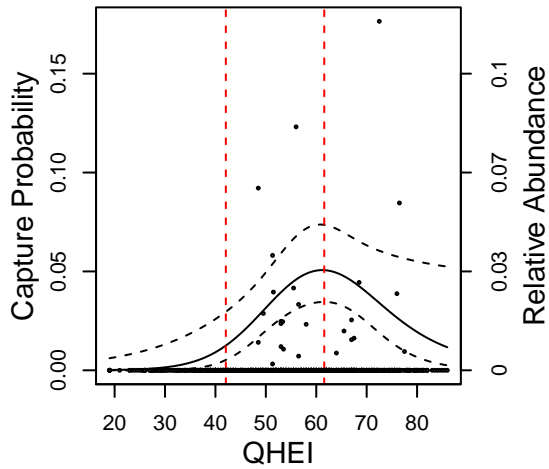
*Baetidae*



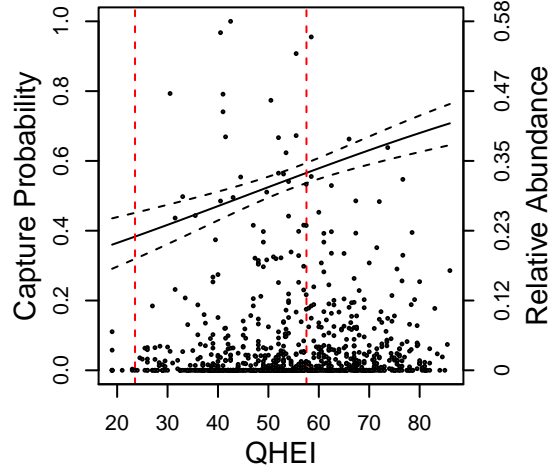
*Belostomatidae*



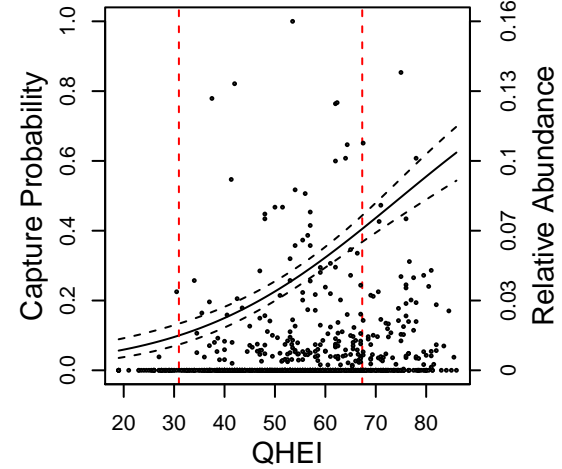
*Brachycentridae*



*Caenidae*

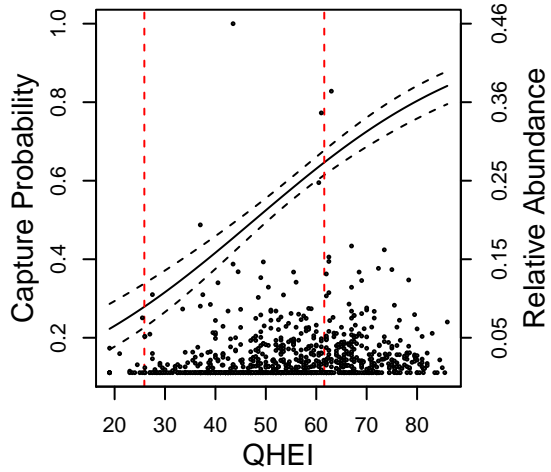


*Calopterygidae*

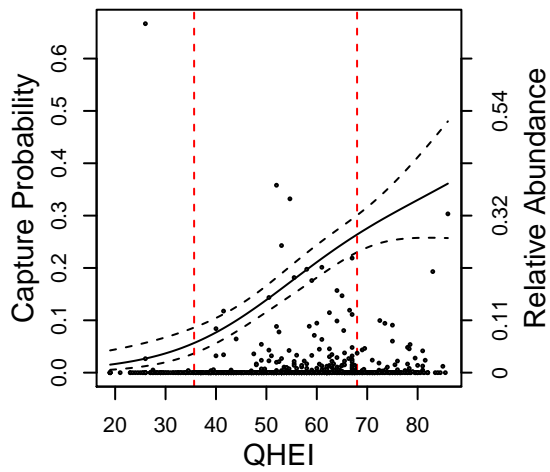


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

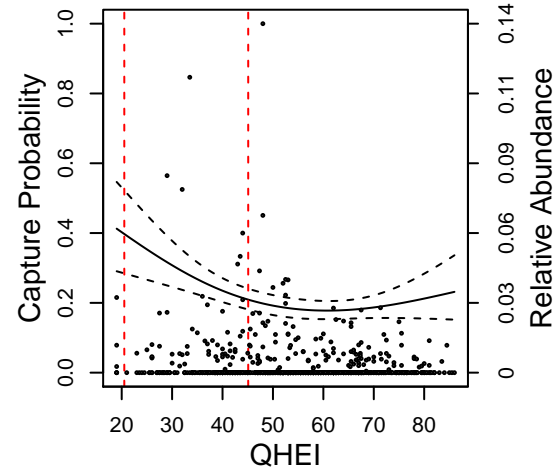
*Cambaridae*



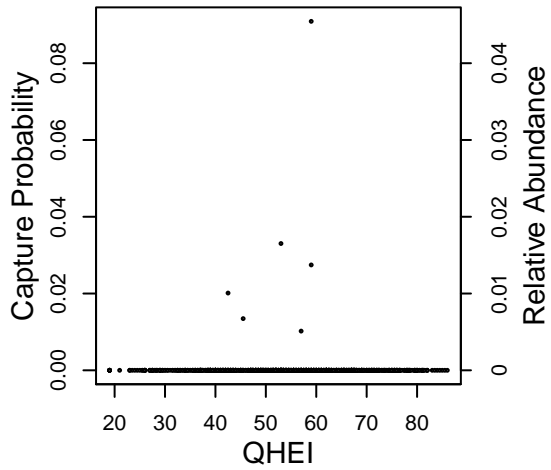
*Cambarincolidae*



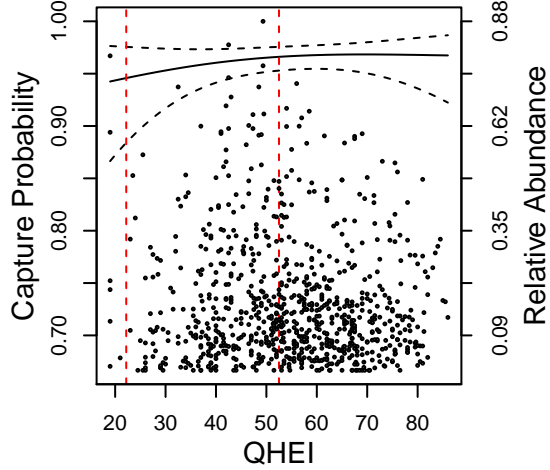
*Ceratopogonidae*



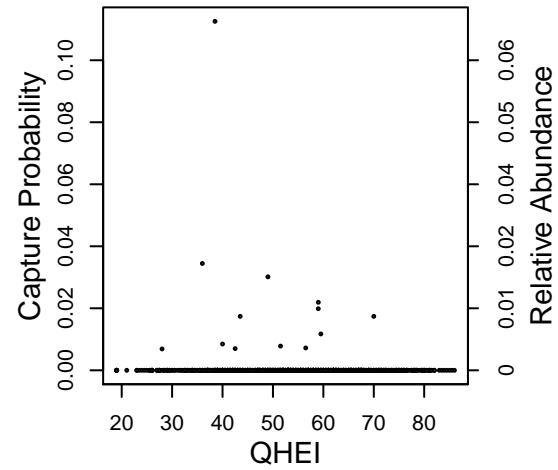
*Chaoboridae*



*Chironomidae*

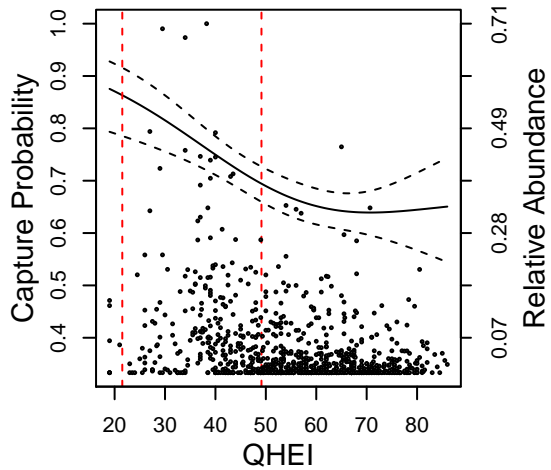


*Chordodidae*

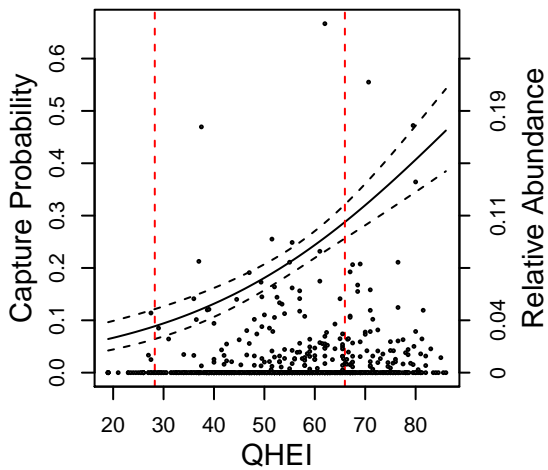


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

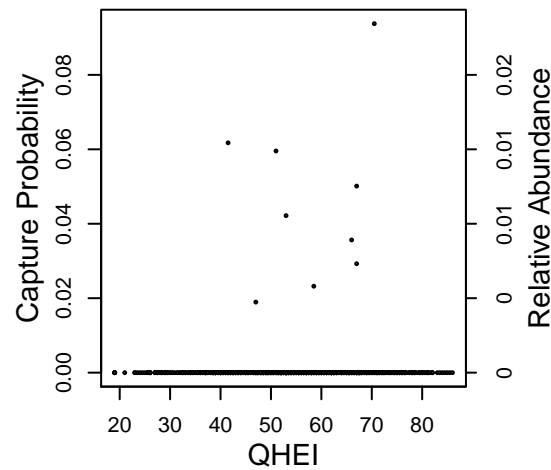
*Coenagrionidae*



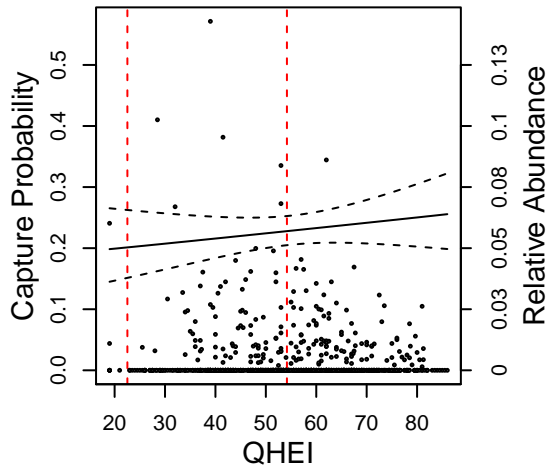
*Corbiculidae*



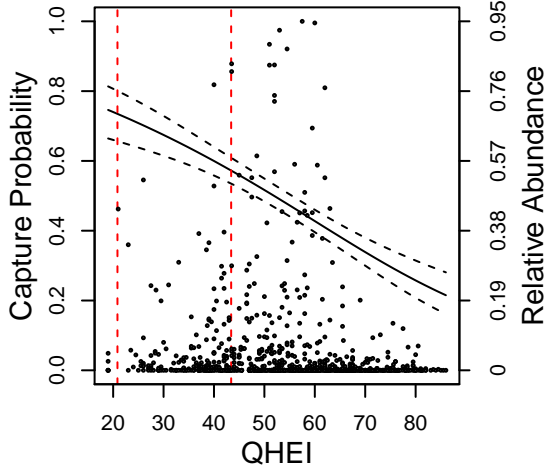
*Cordulegastridae*



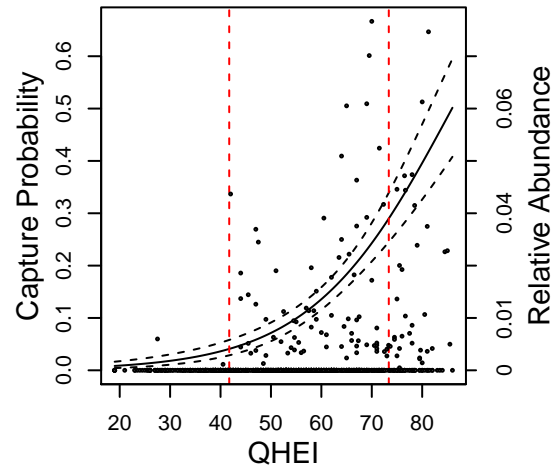
*Corduliidae*



*Corixidae*

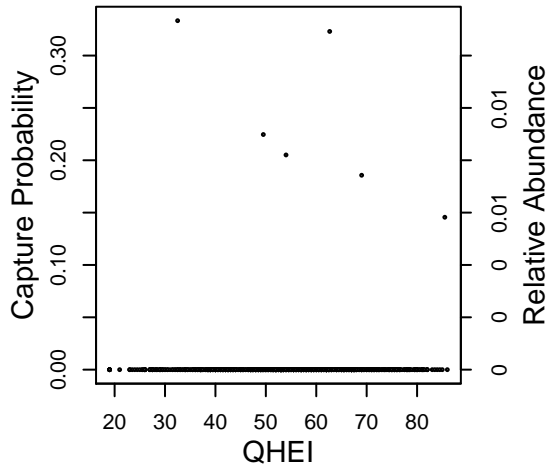


*Corydalidae*

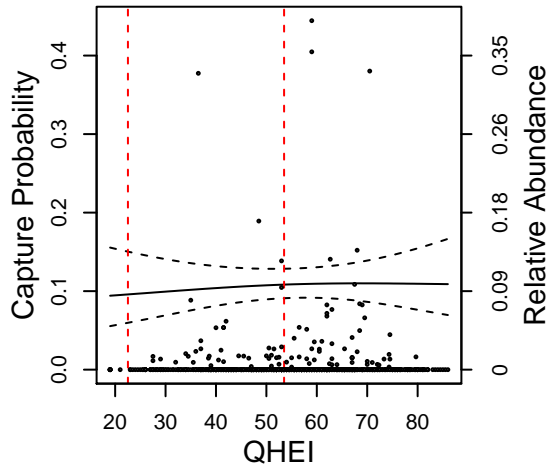


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

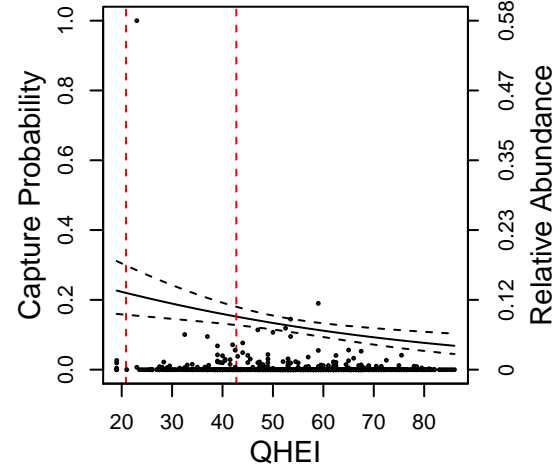
*Crambidae*



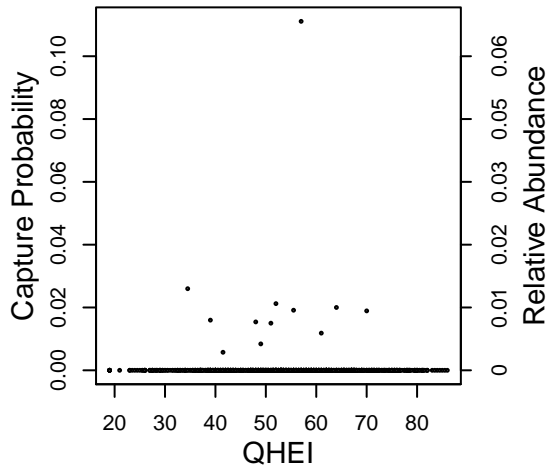
*Crangonyctidae*



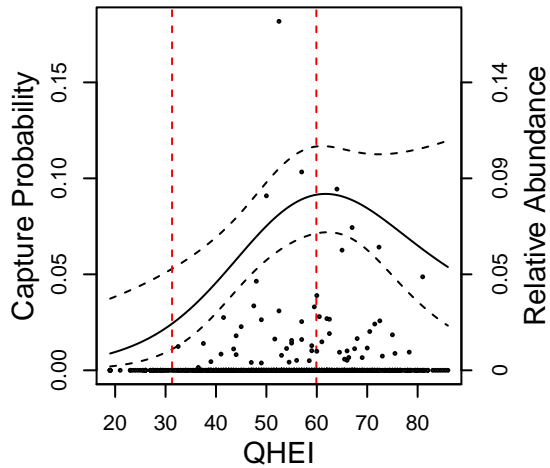
*Culicidae*



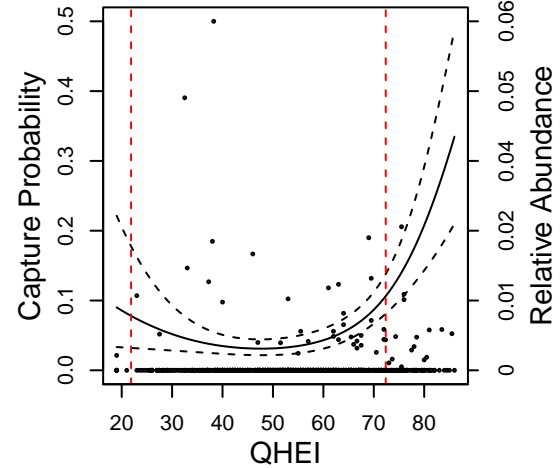
*Curculionidae*



*Dixidae*

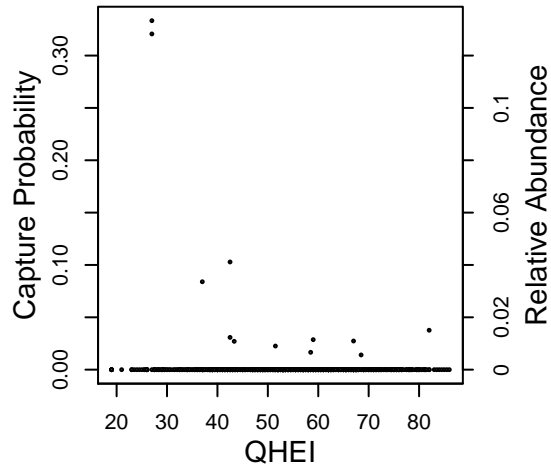


*Dorylaimidae*

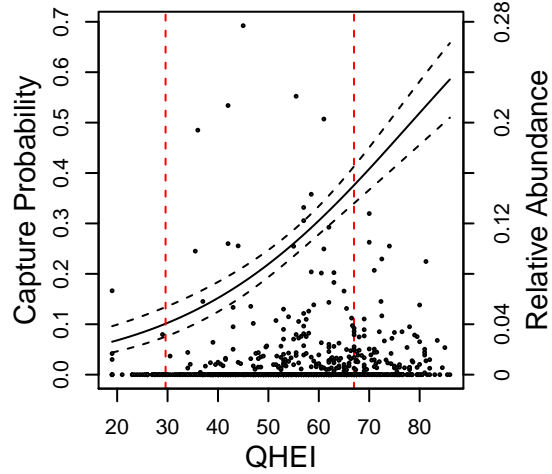


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

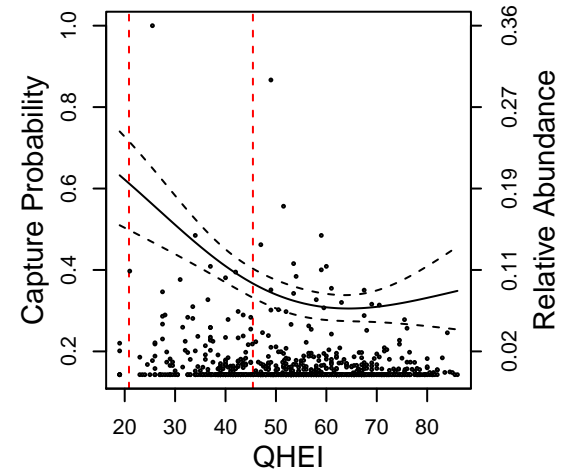
*Dreissenidae*



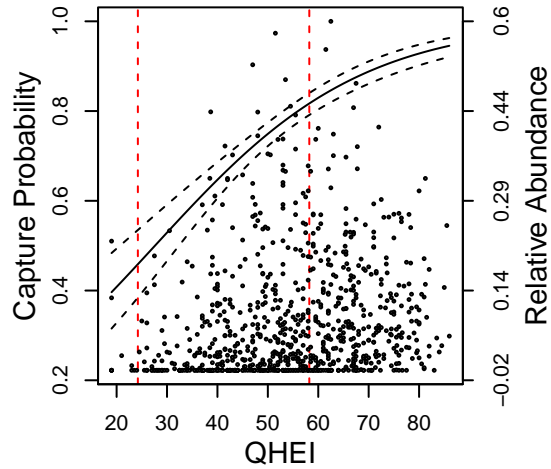
*Dryopidae*



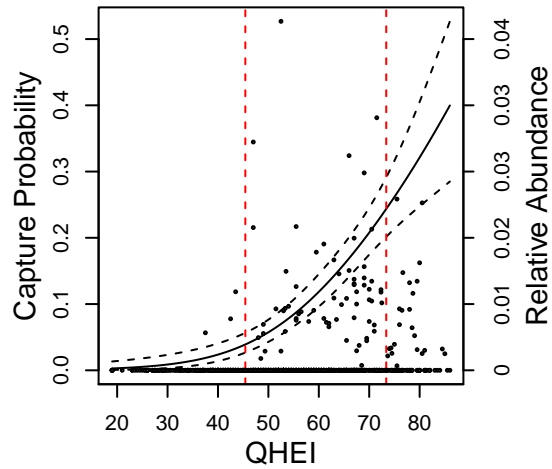
*Dytiscidae*



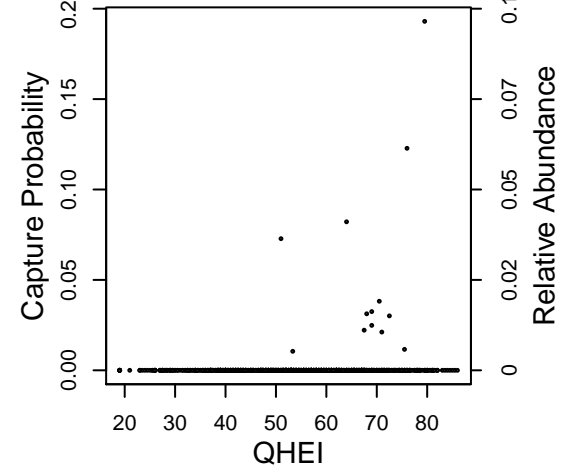
*Elmidae*



*Empididae*

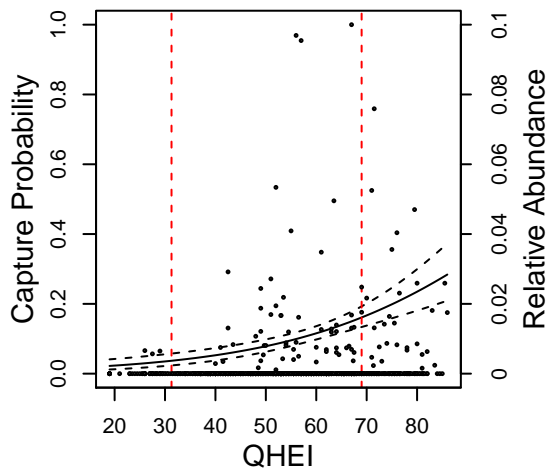


*Ephemerellidae*

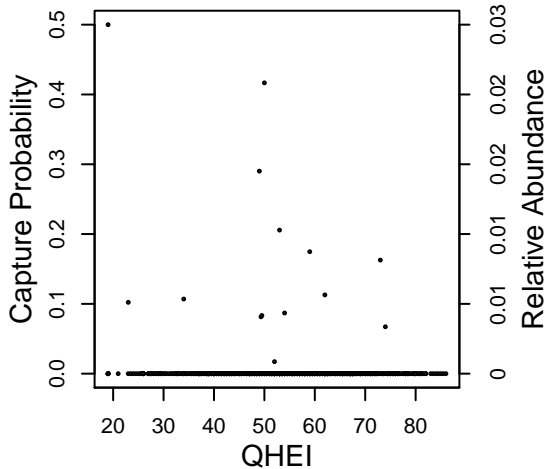


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

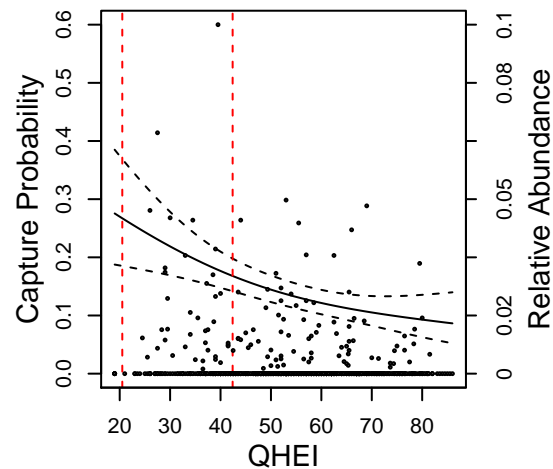
*Ephemeridae*



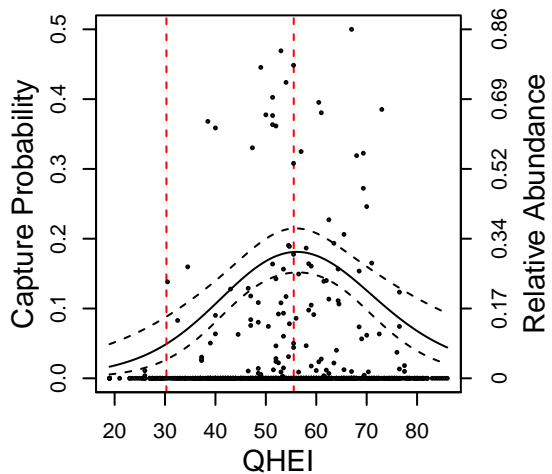
*Ephydriidae*



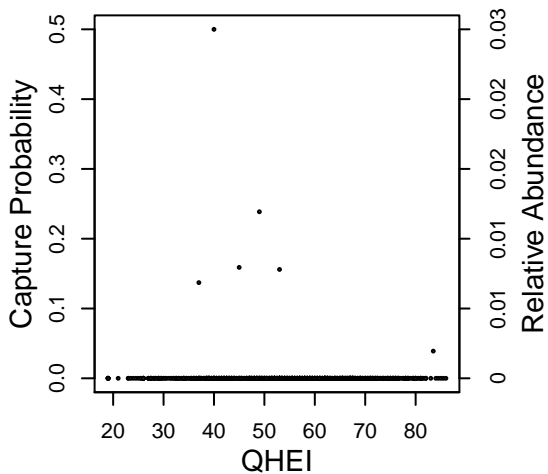
*Erpobdellidae*



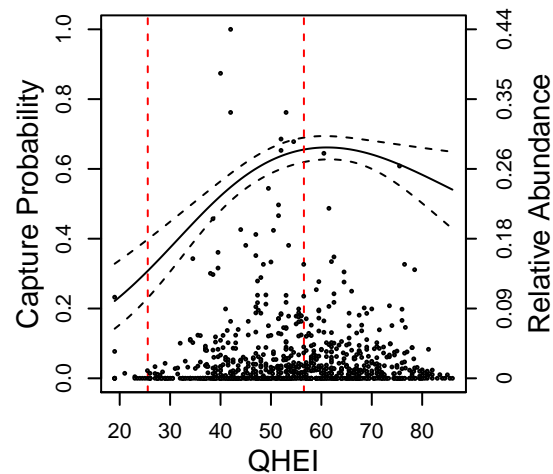
*Gammaridae*



*Gelastocoridae*

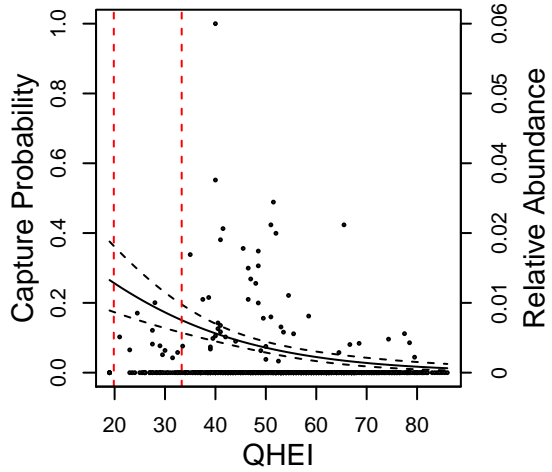


*Gerridae*

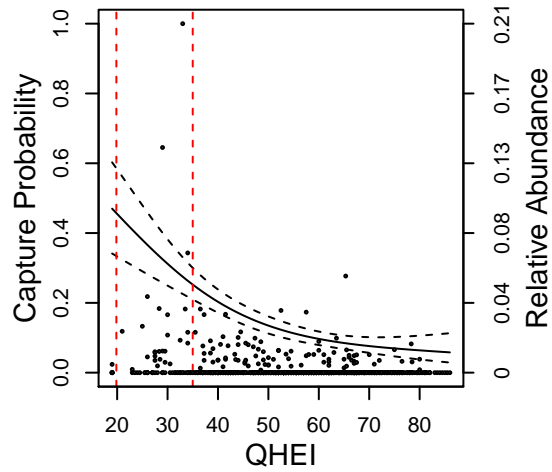


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

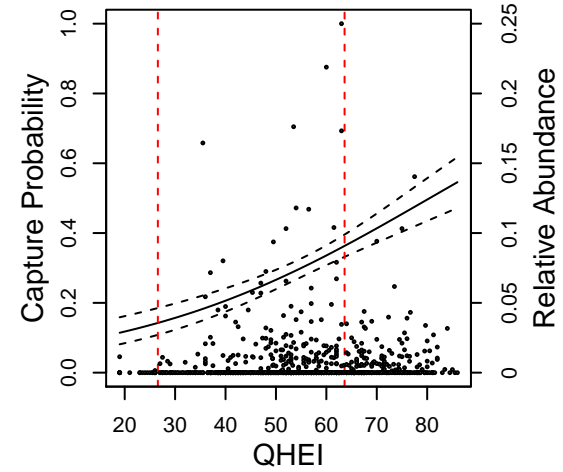
*GERRIDAE*



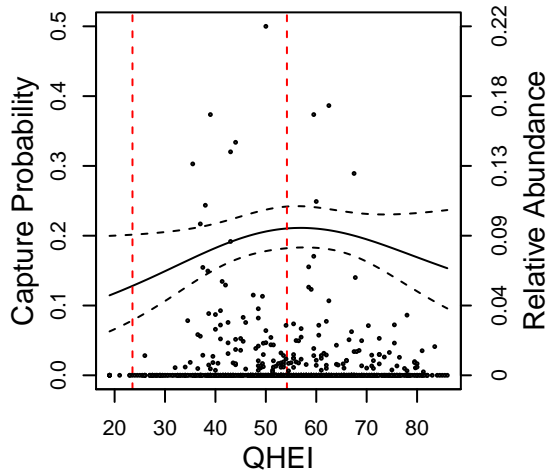
*Glossiphoniidae*



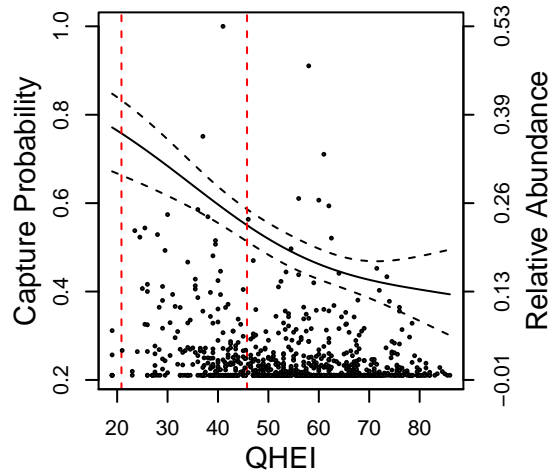
*Gomphidae*



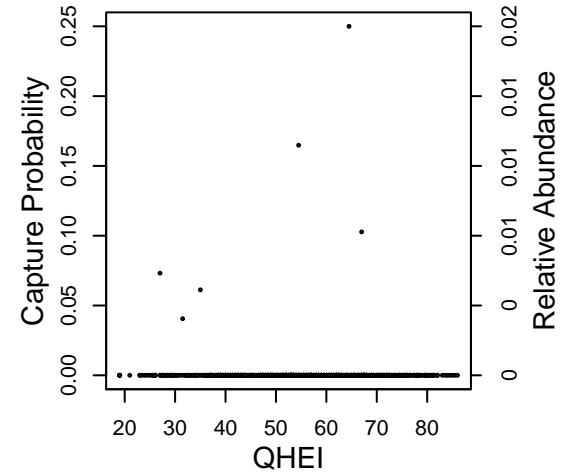
*Gyrinidae*



*Haliplidae*



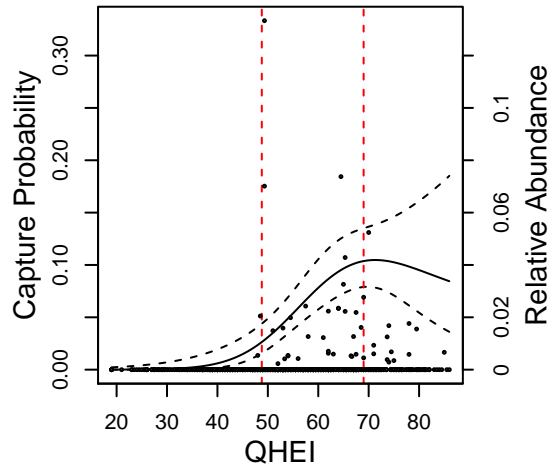
*Hebridae*



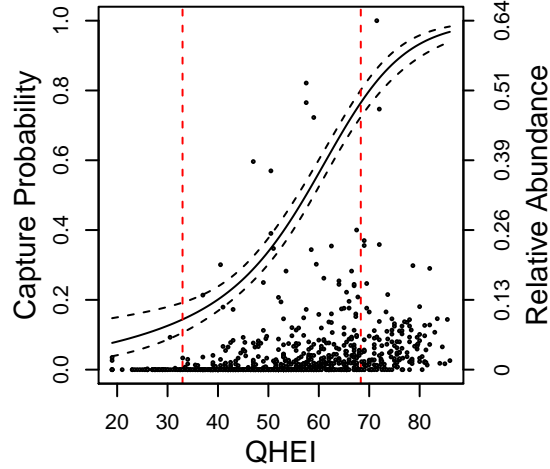


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

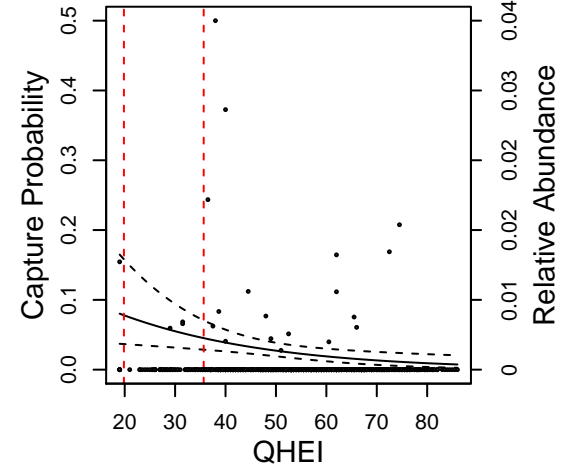
*Helicopsychidae*



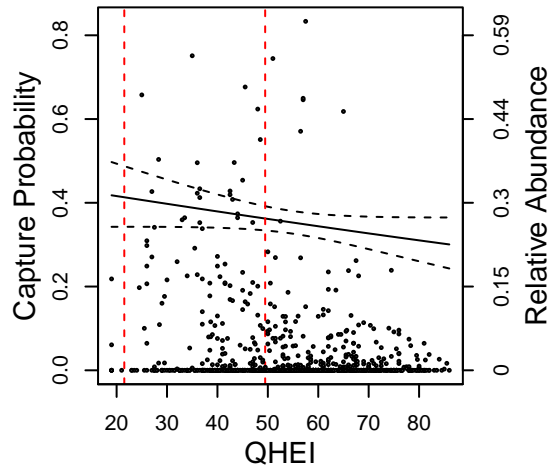
*Heptageniidae*



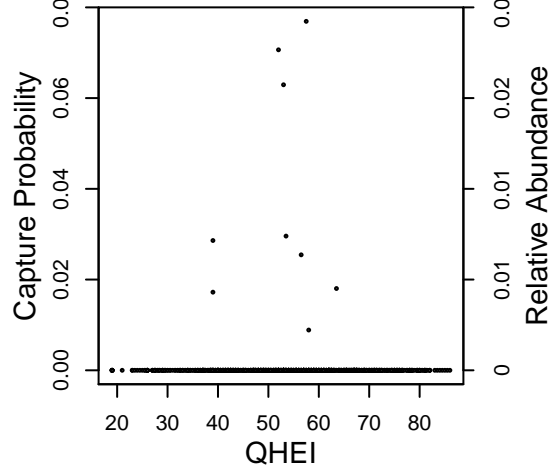
*Heteroceridae*



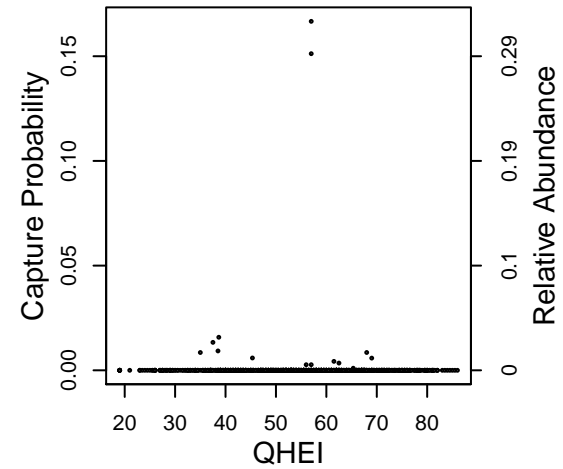
*Hyalellidae*



*Hydraenidae*

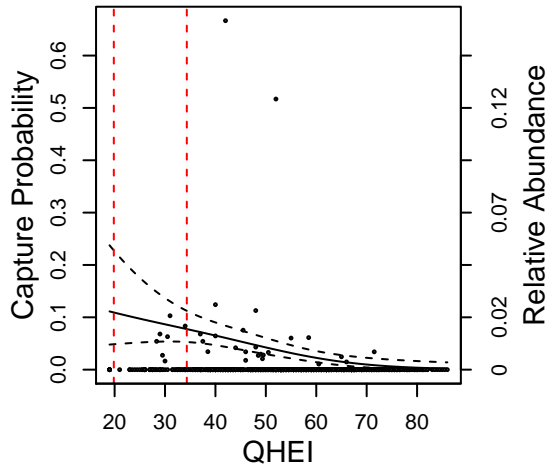


*Hydrobiidae*

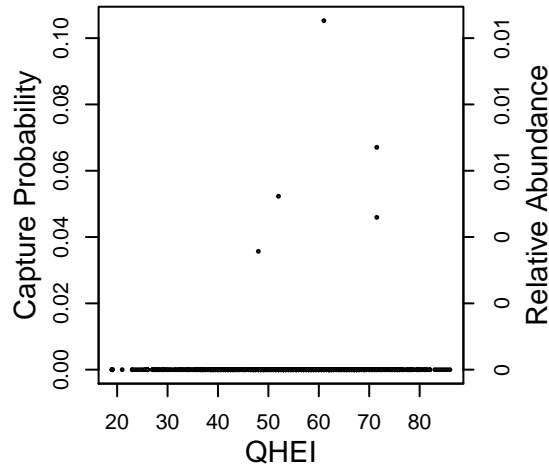


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

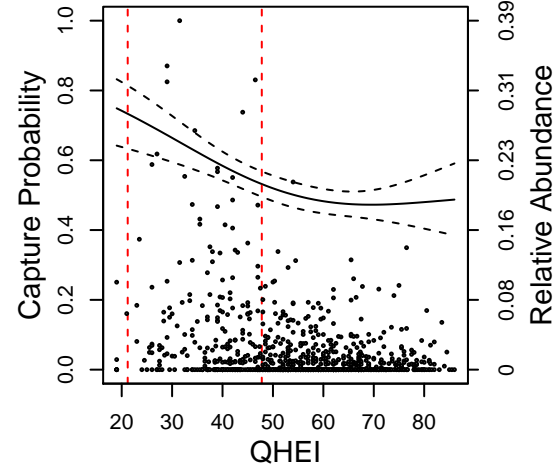
*Hydrochidae*



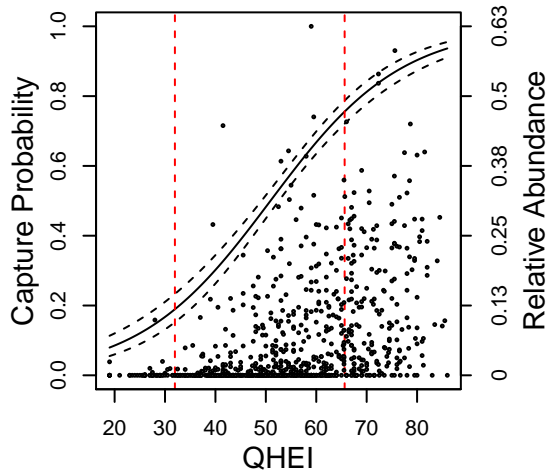
*Hydrometridae*



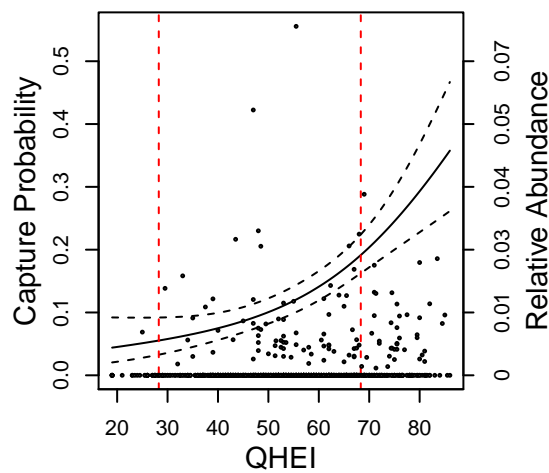
*Hydrophilidae*



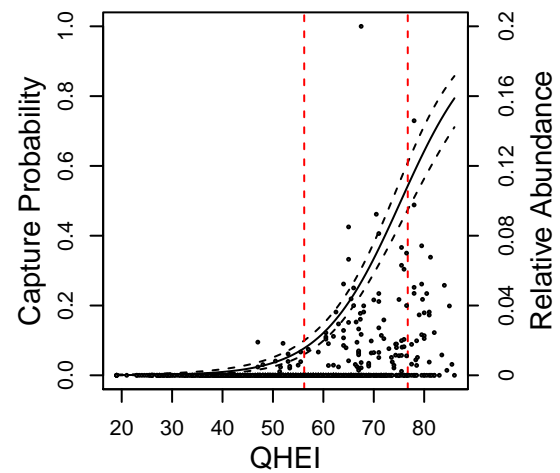
*Hydropsychidae*



*Hydroptilidae*

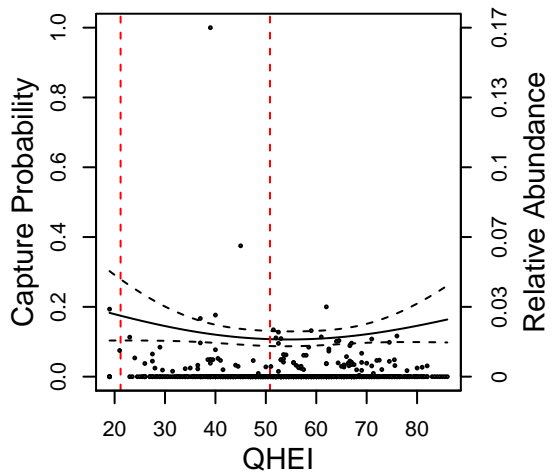


*Isonychiidae*

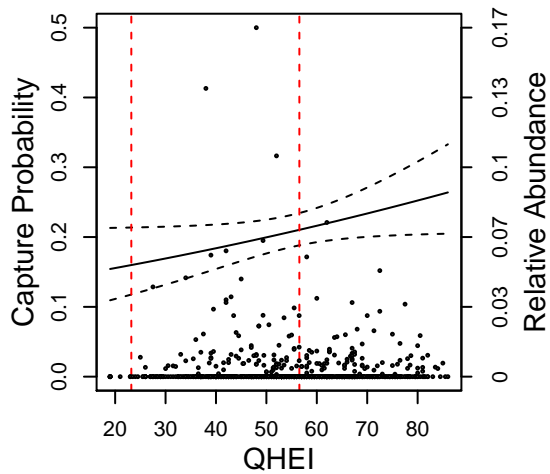


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

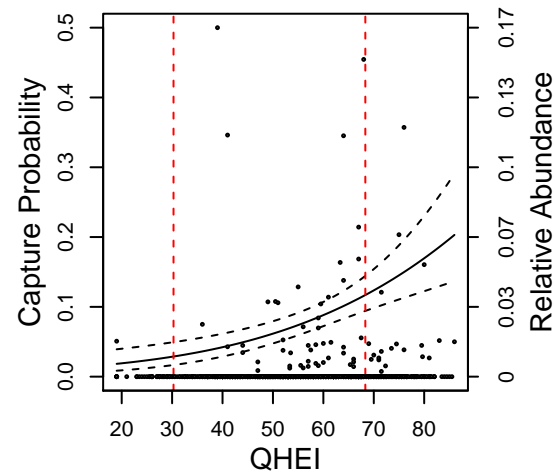
*Isotomidae*



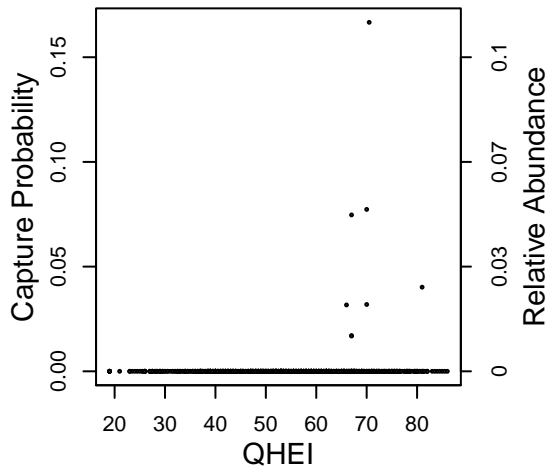
*Leptoceridae*



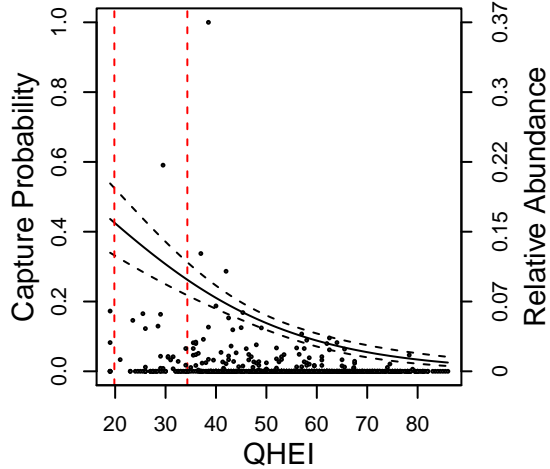
*Leptophlebiidae*



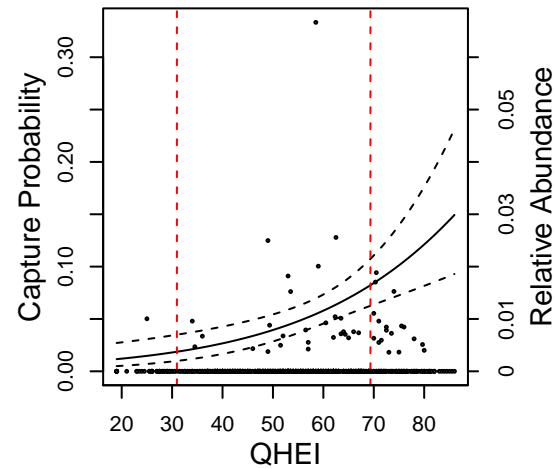
*Leuctridae*



*Libellulidae*

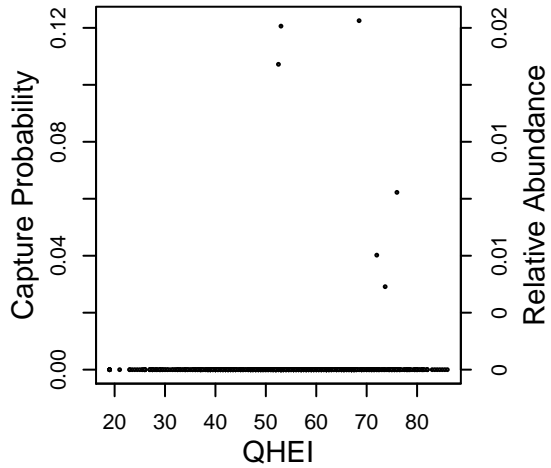


*Limnephilidae*

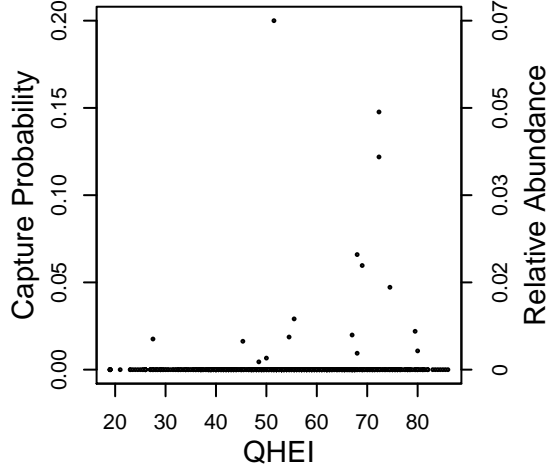


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

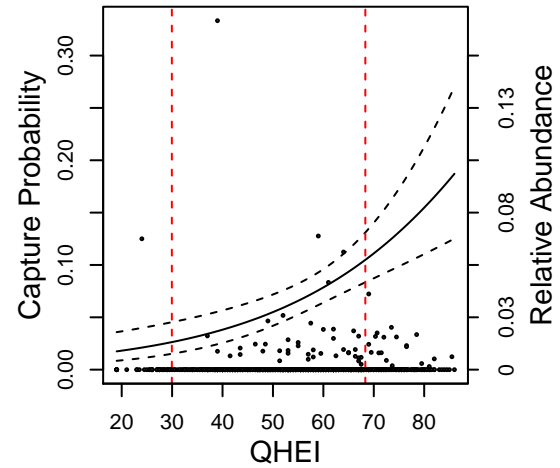
*Limnichidae*



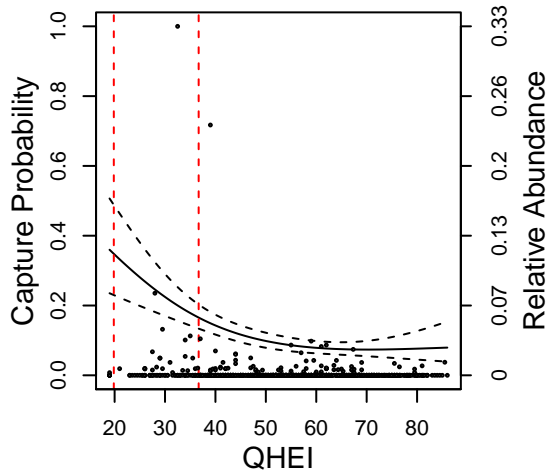
*Lumbricidae*



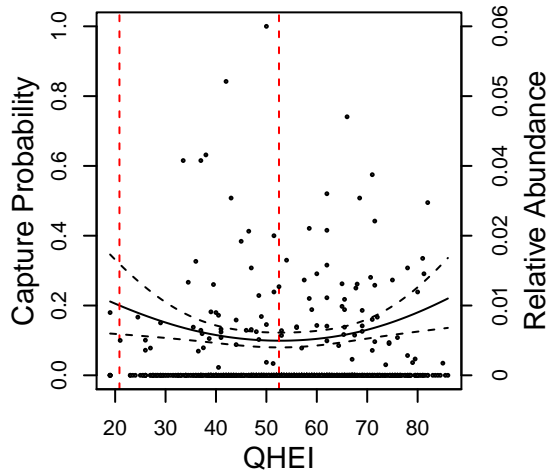
*Lumbriculidae*



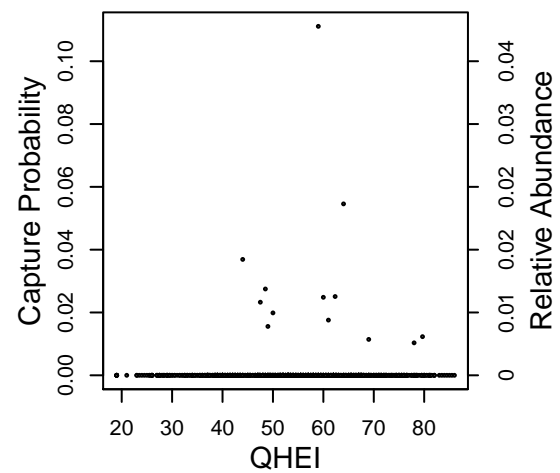
*Lymnaeidae*



*Mesoveliidae*

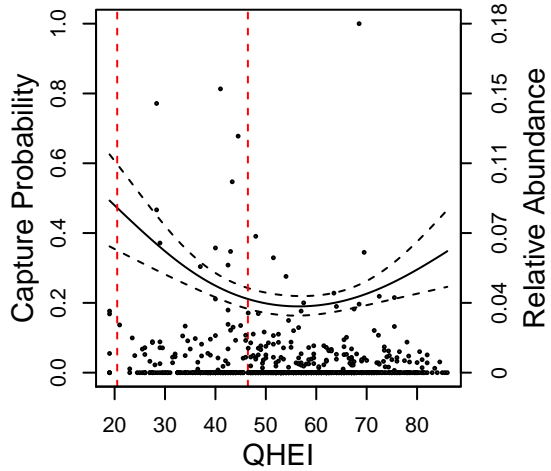


*Muscidae*

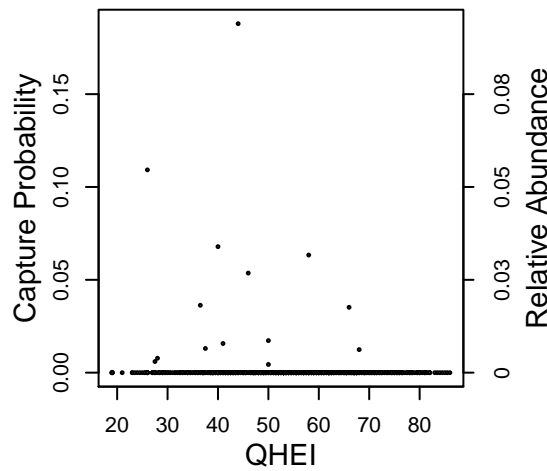


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

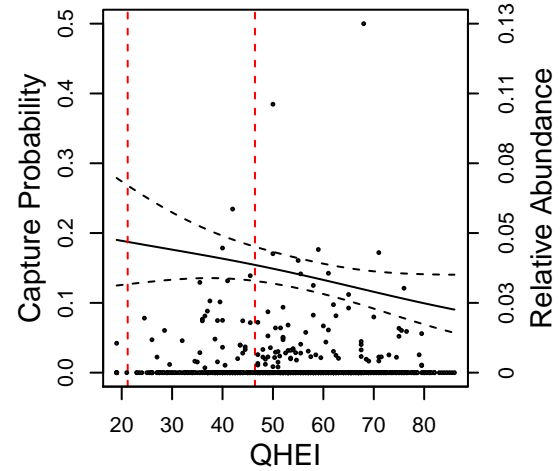
*Naididae*



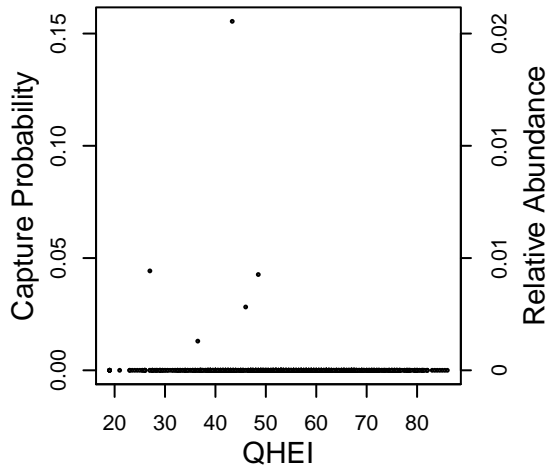
*Naucoridae*



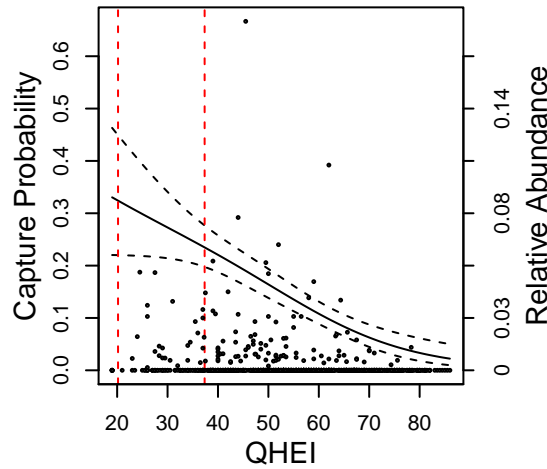
*Nepidae*



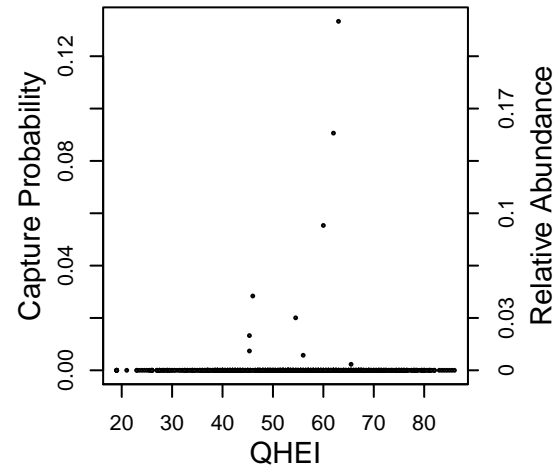
*Noteridae*



*Notonectidae*

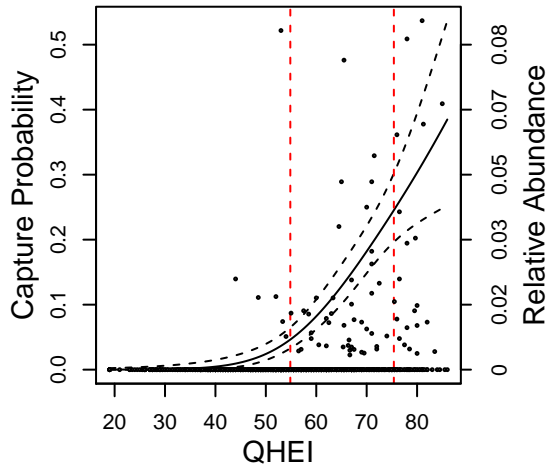


*Palaemonidae*

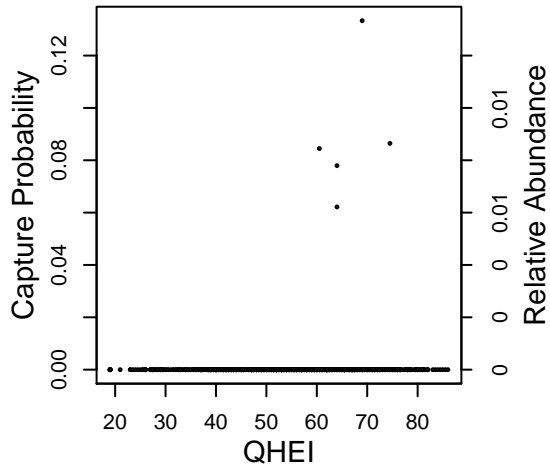


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

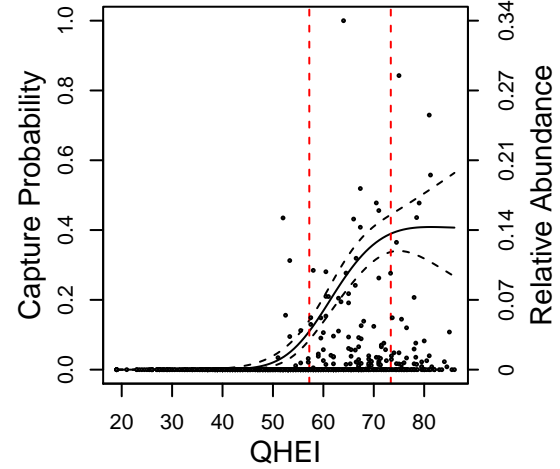
*Perlidae*



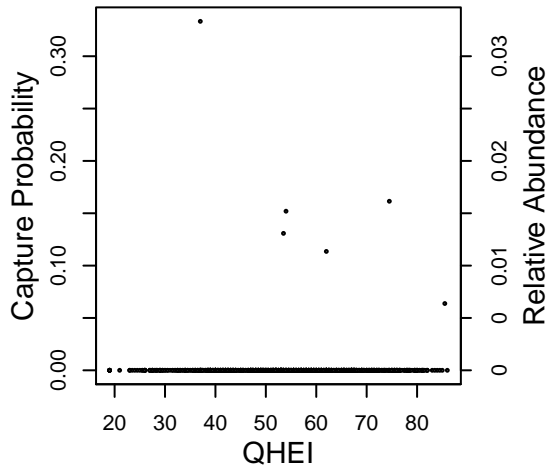
*Perlodidae*



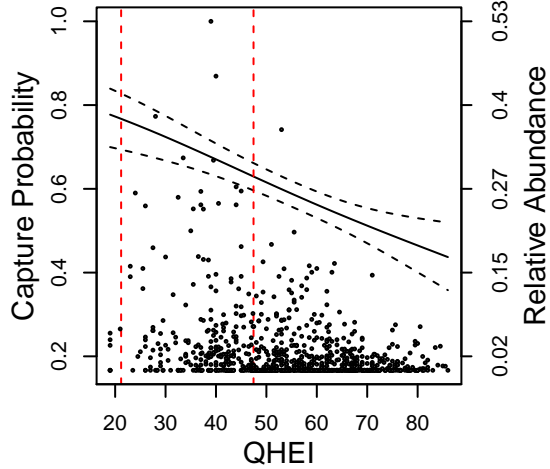
*Philopotamidae*



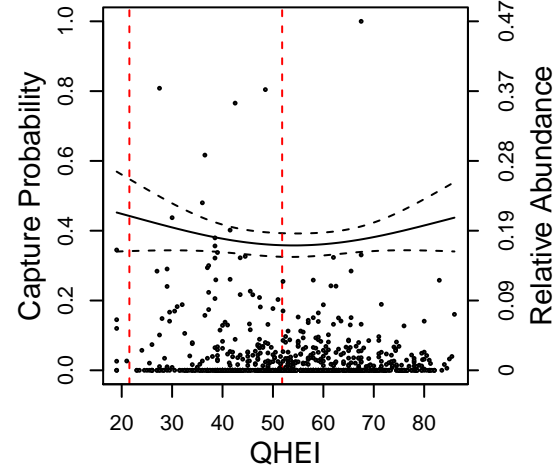
*Phryganeidae*



*Physidae*

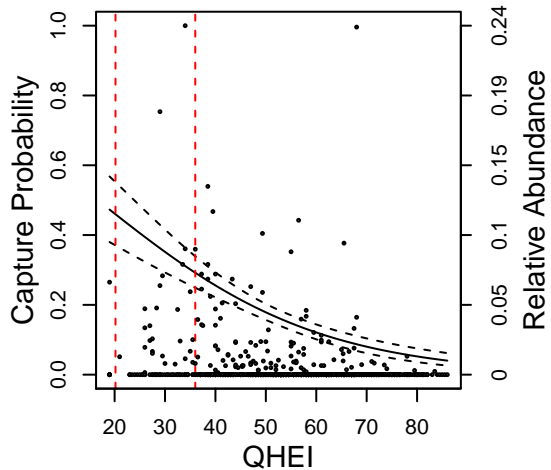


*Pisidiidae*

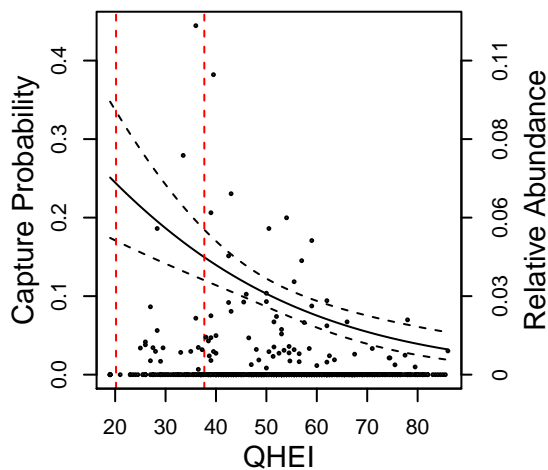


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

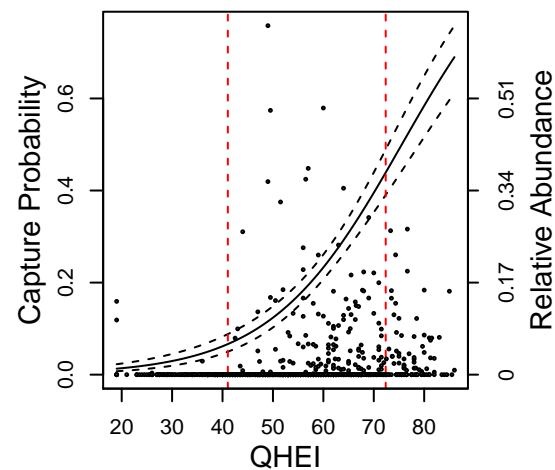
*Planorbidae*



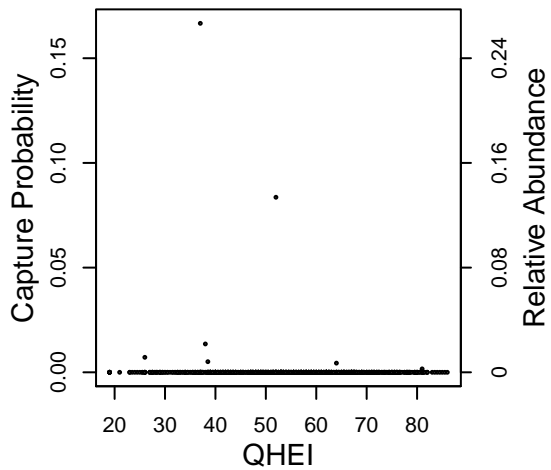
*Pleidae*



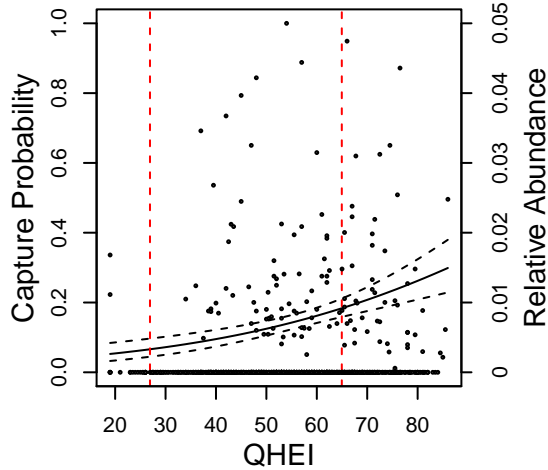
*Pleuroceridae*



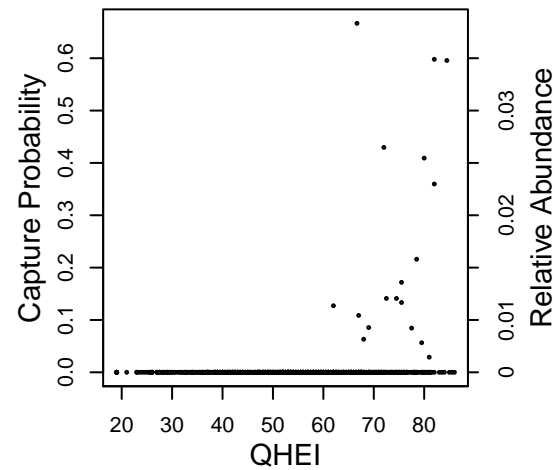
*Poduridae*



*Polycentropodidae*

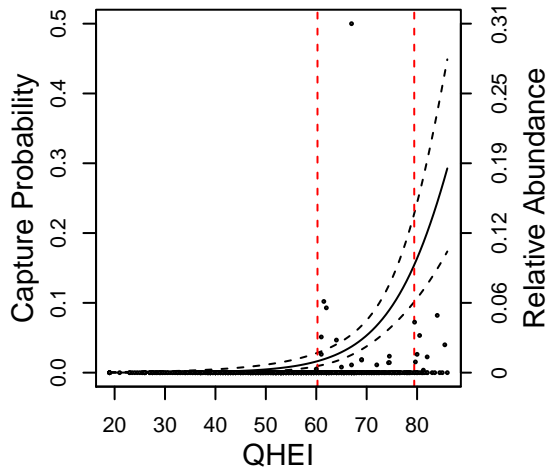


*Polymitarcyidae*

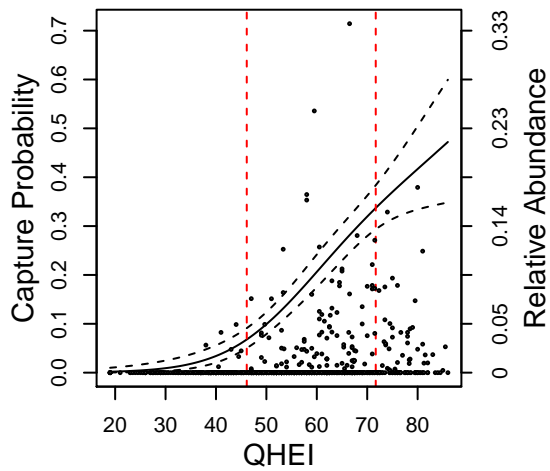


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

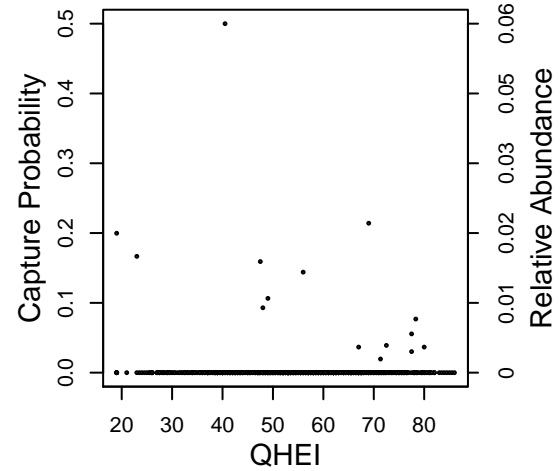
*Potamanthidae*



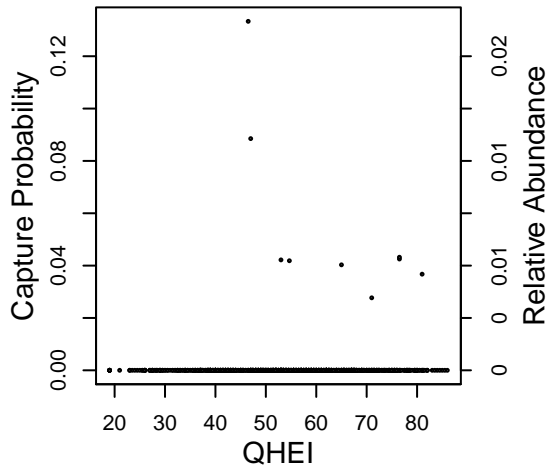
*Psephenidae*



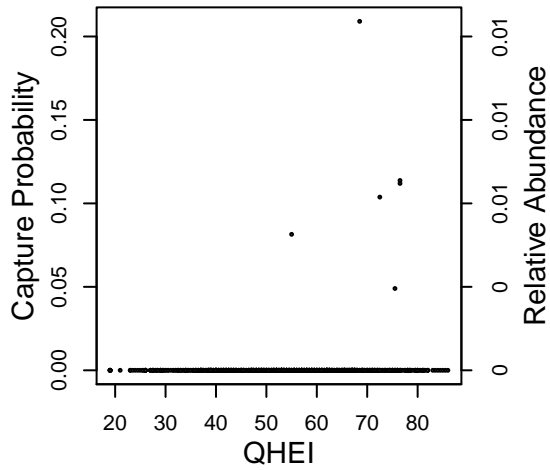
*Psychodidae*



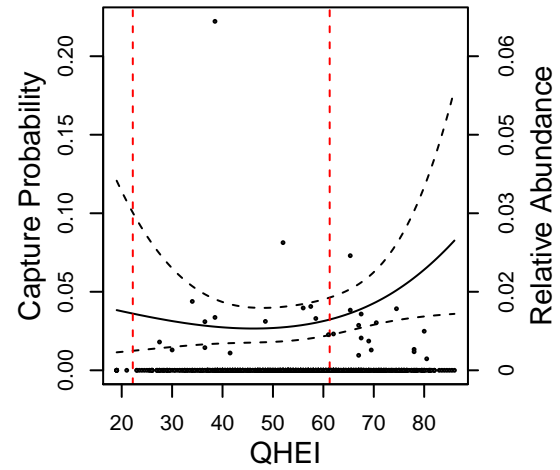
*Psychomyiidae*



*Pteronarcyidae*



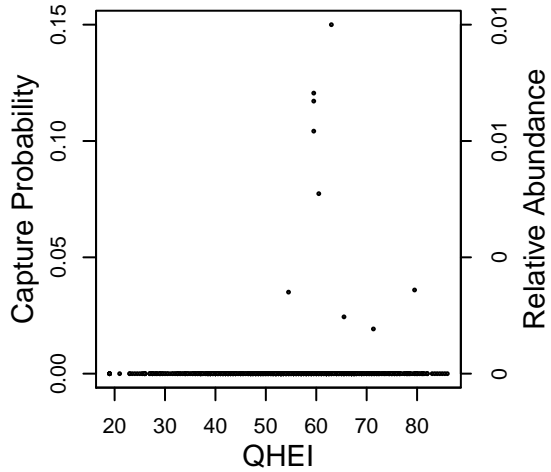
*Pyralidae*



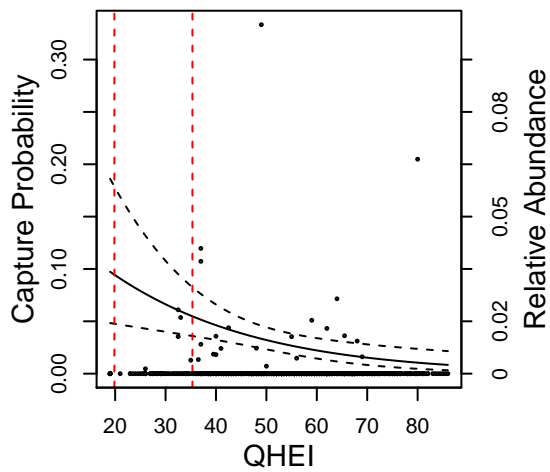


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

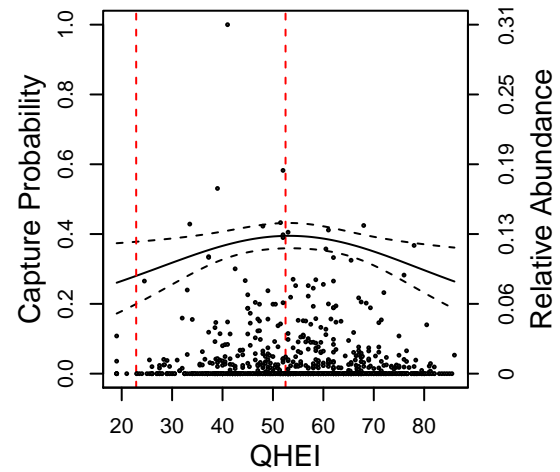
*Saldidae*



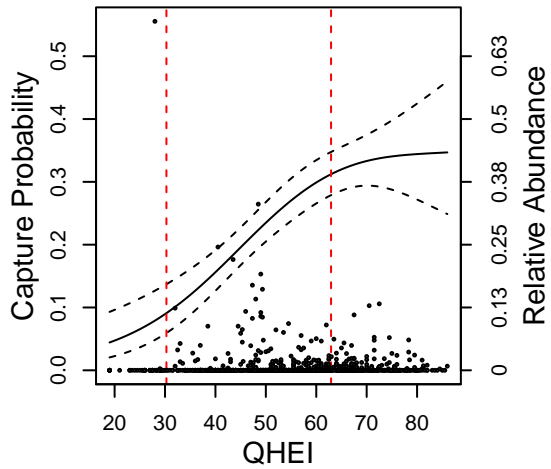
*Sciomyzidae*



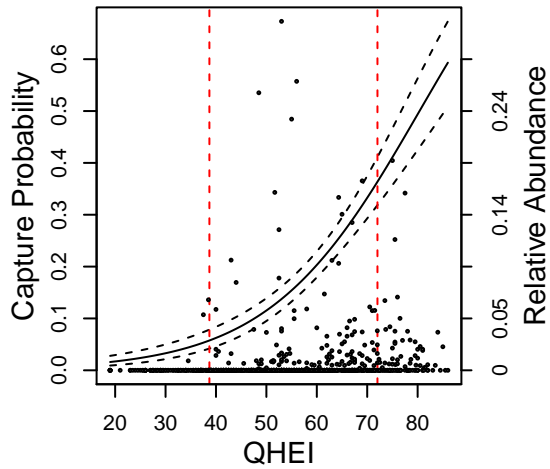
*Scirtidae*



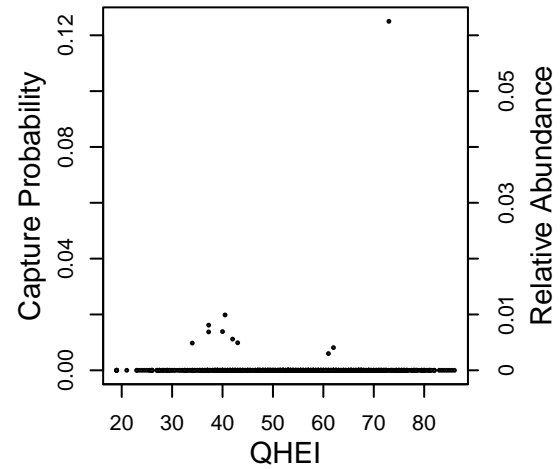
*Sialidae*



*Simuliidae*

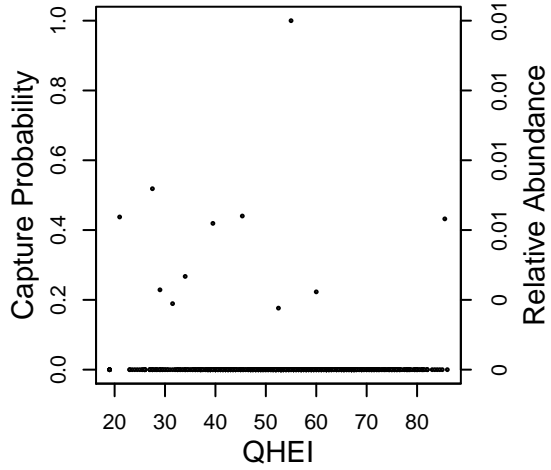


*Sisyridae*

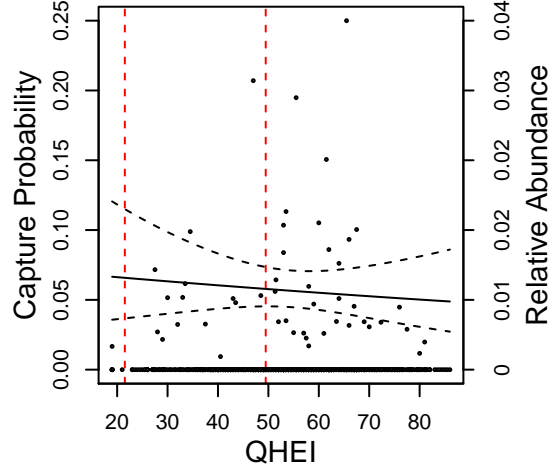


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

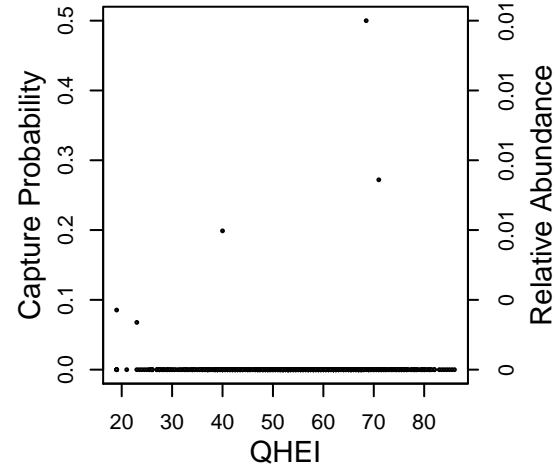
*Sminthuridae*



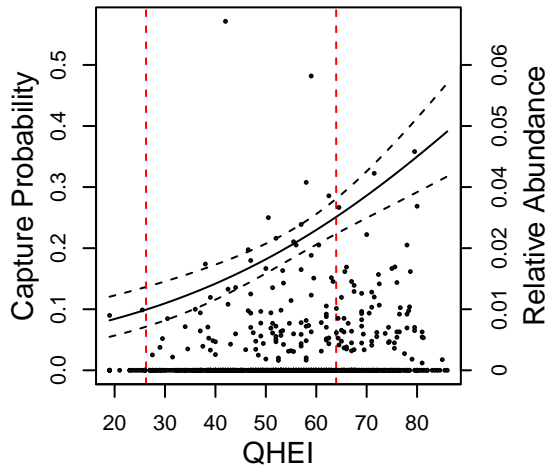
*Stratiomyidae*



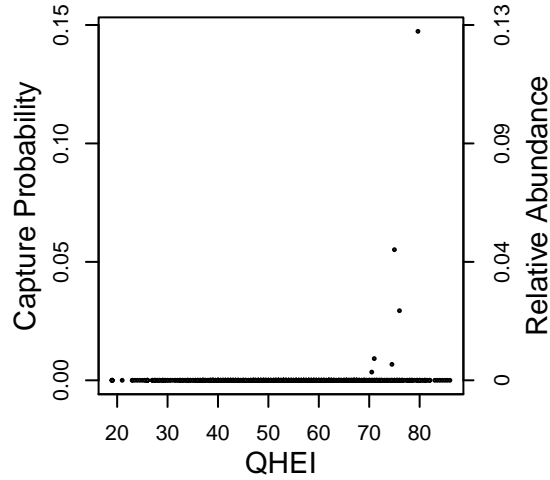
*Syrphidae*



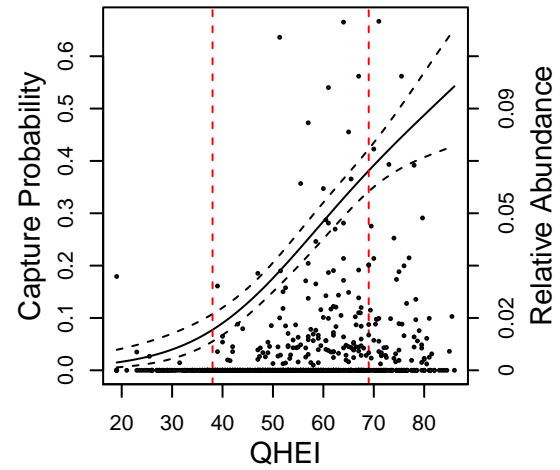
*Tabanidae*



*Taeniopterygidae*

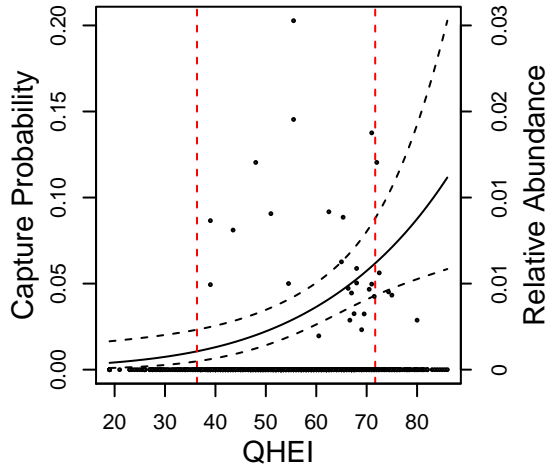


*Tipulidae*

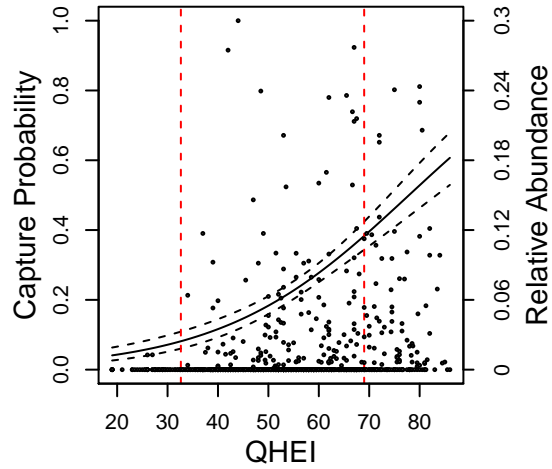


# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

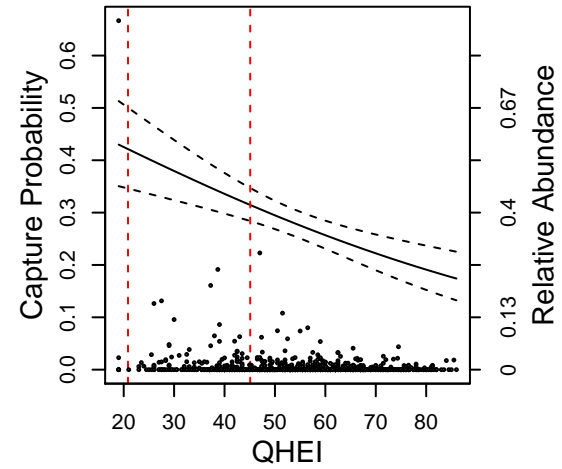
*Trichoptera*



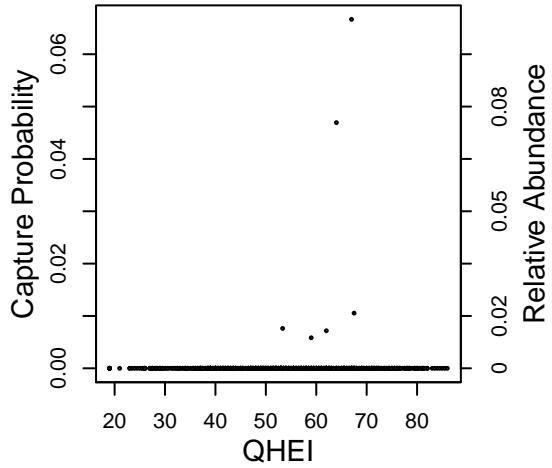
*Tricorythidae*



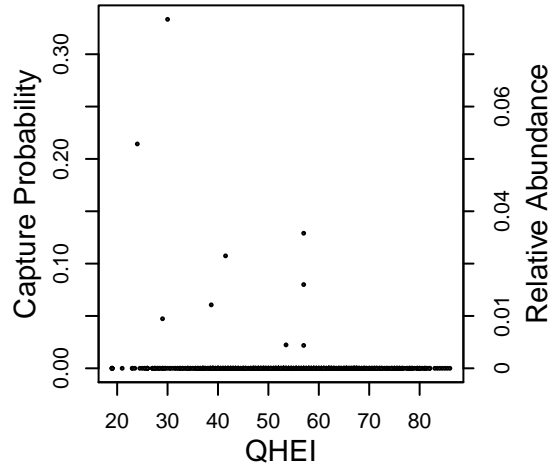
*Tubificidae*



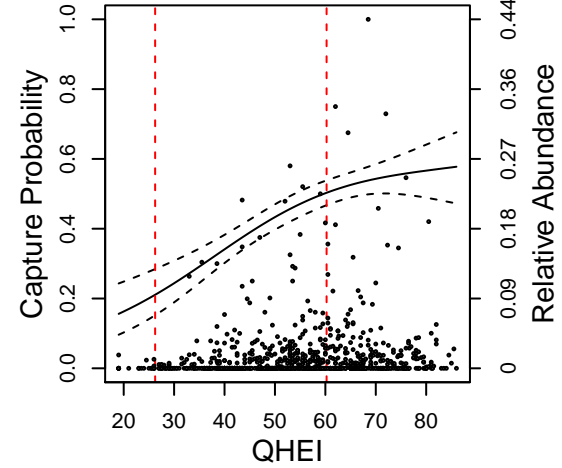
*Uenoidae*



*Valvatidae*

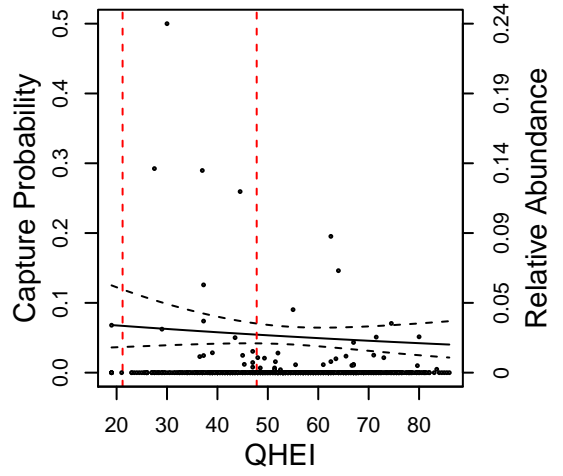


*Veliidae*



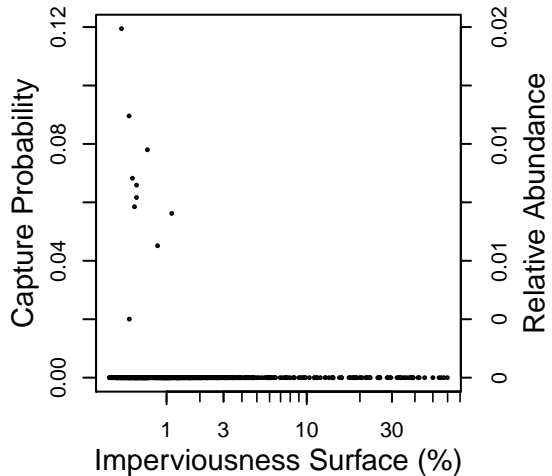
# Capture Probability of Macroinvertebrate Taxon Along Habitat Gradient

*Viviparidae*

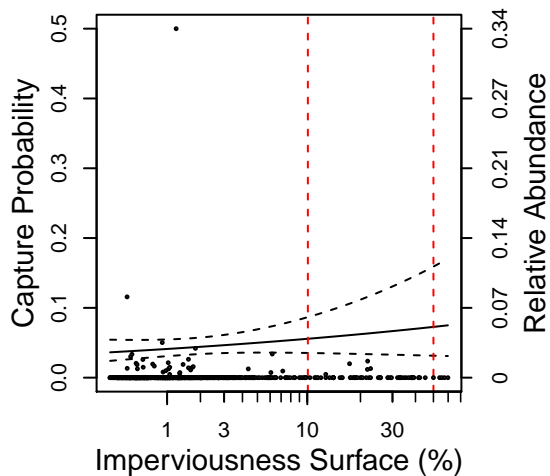


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

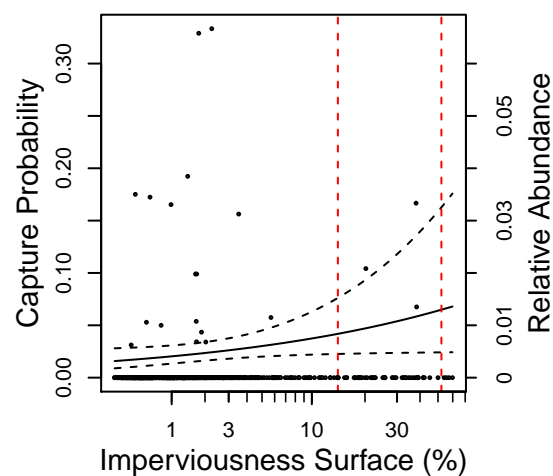
*Acerpenna pygmaea*



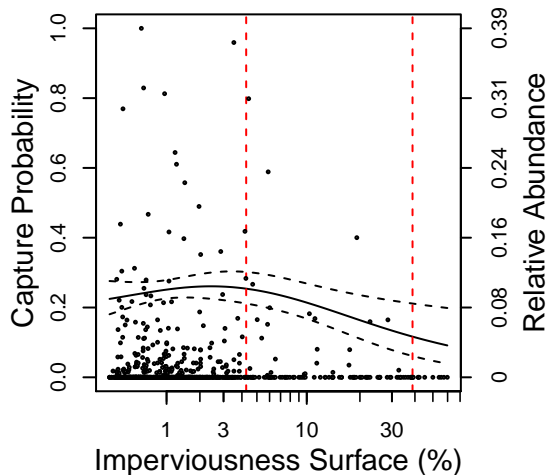
*Aeshna umbrosa*



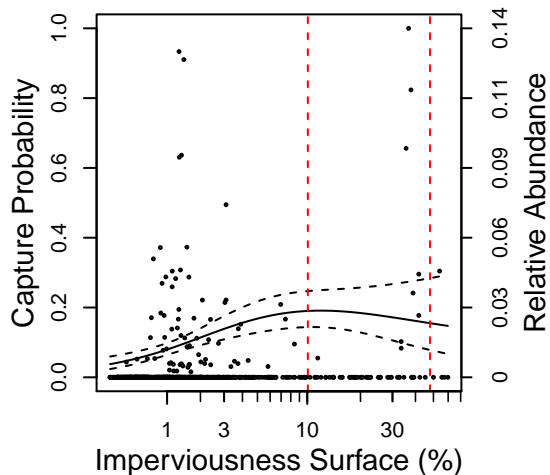
*Anax junius*



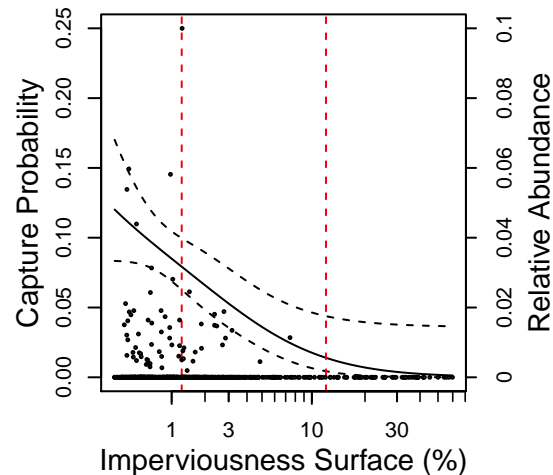
*Ancyronyx variegatus*



*Argia apicalis*

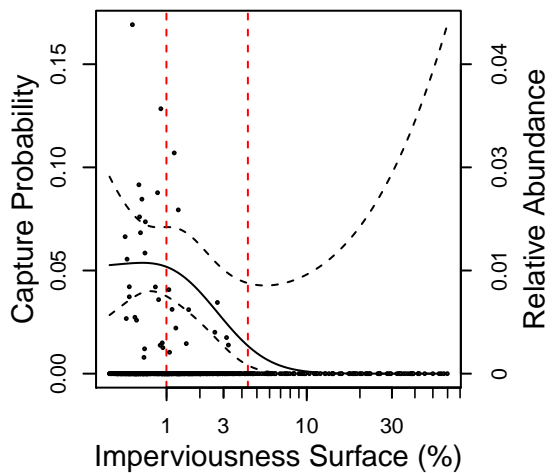


*Argia fumipennis violacea*

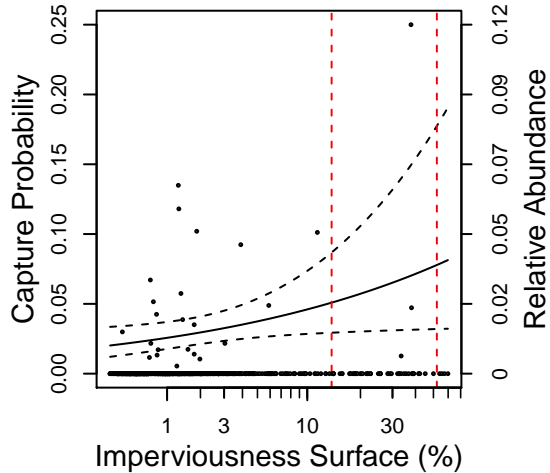


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

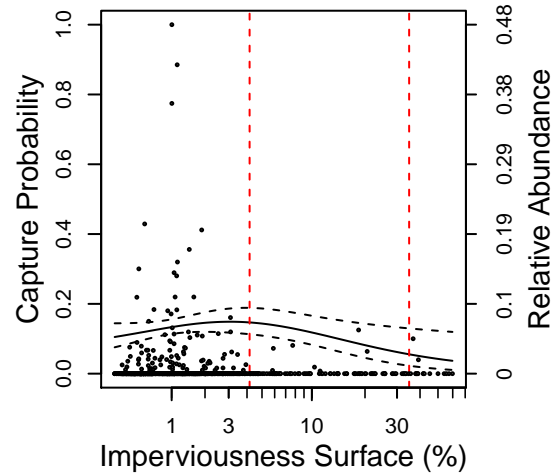
*Argia moesta*



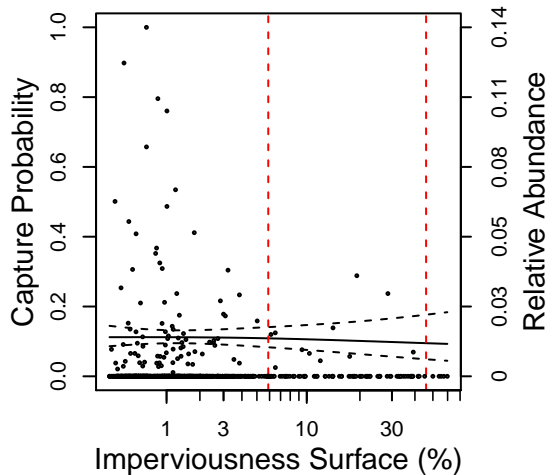
*Argia sedula*



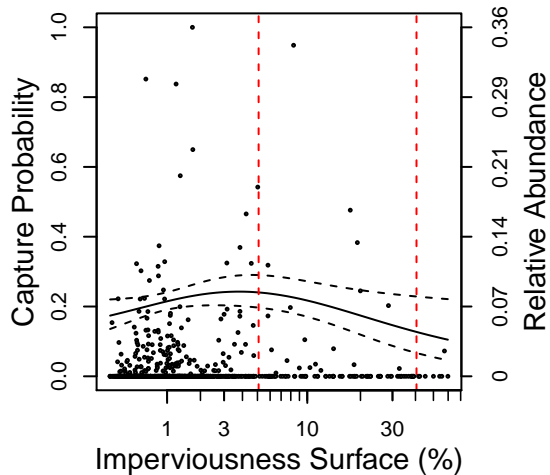
*Argia tibialis*



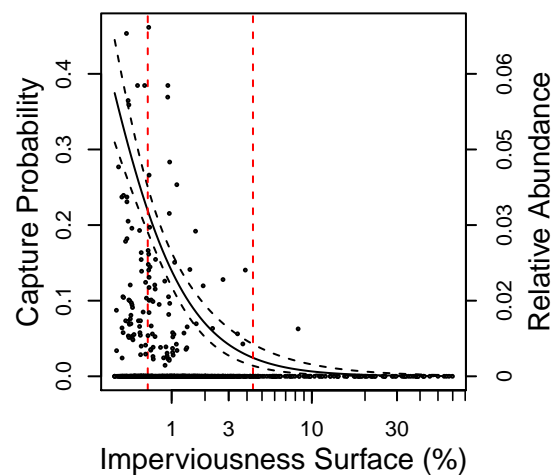
*Baetis flavistriga*



*Baetis intercalaris*

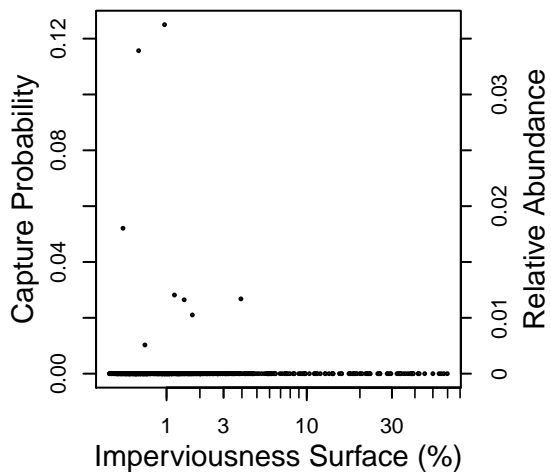


*Basiaeschna janata*

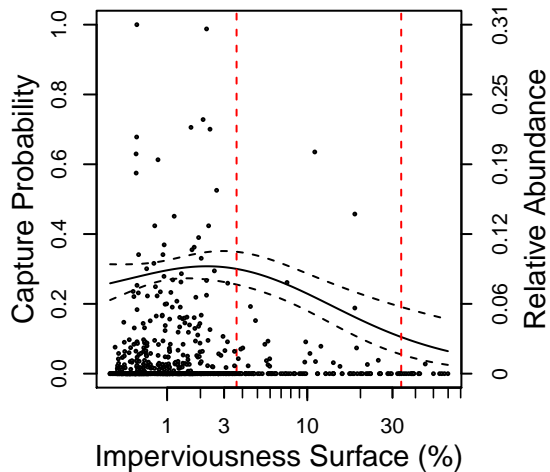


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

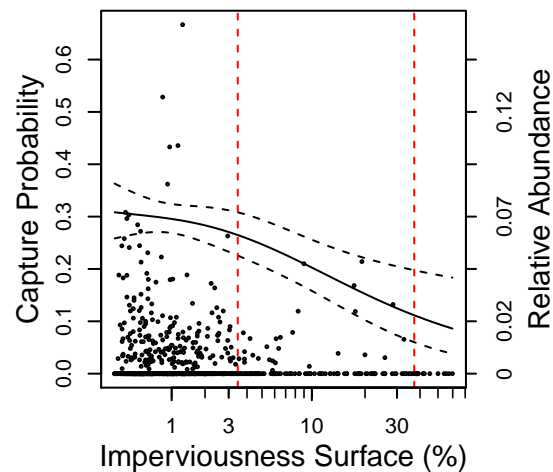
*Berosus infuscatus*



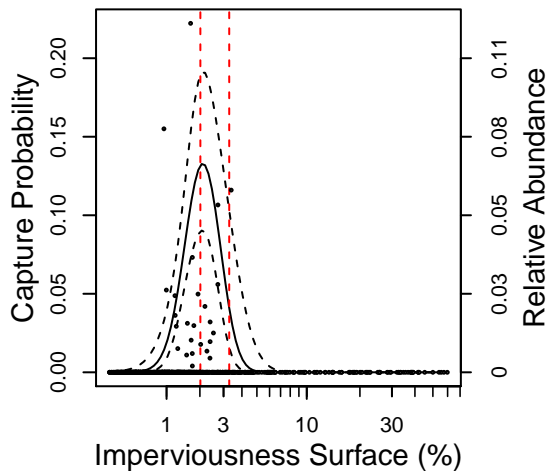
*Berosus peregrinus*



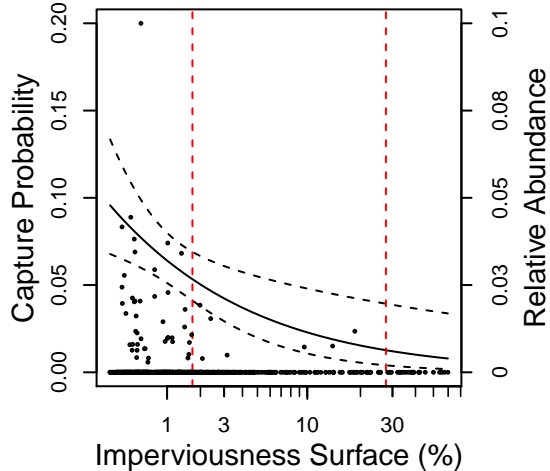
*Boyeria vinosa*



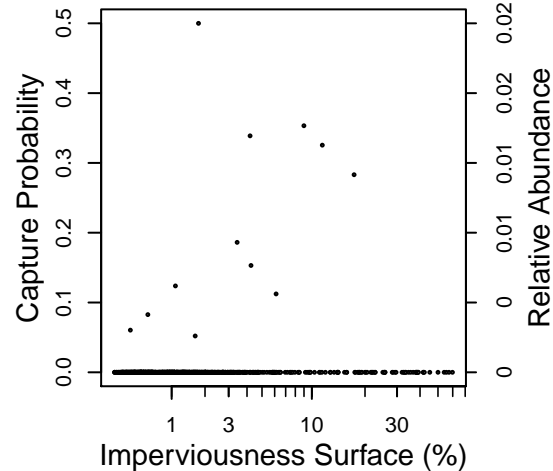
*Brachycentrus numerosus*



*Branchiura sowerbyi*

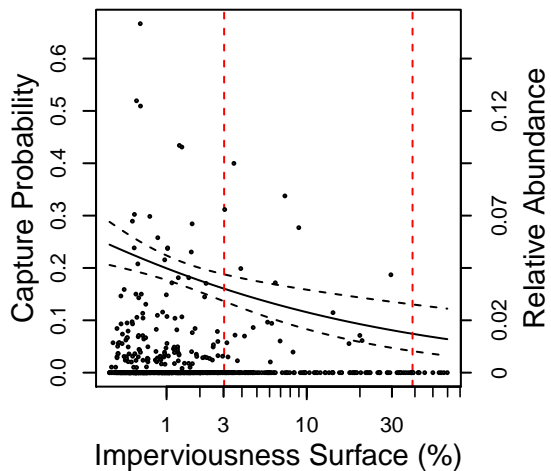


*Brillia flavifrons*

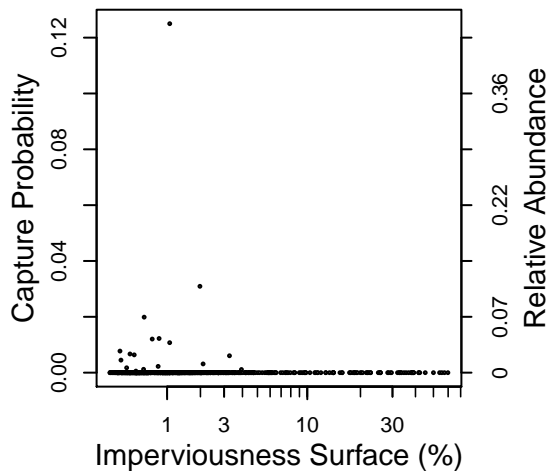


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

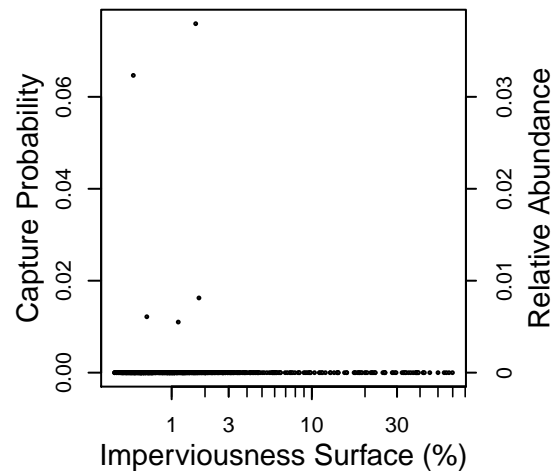
*Calopteryx maculata*



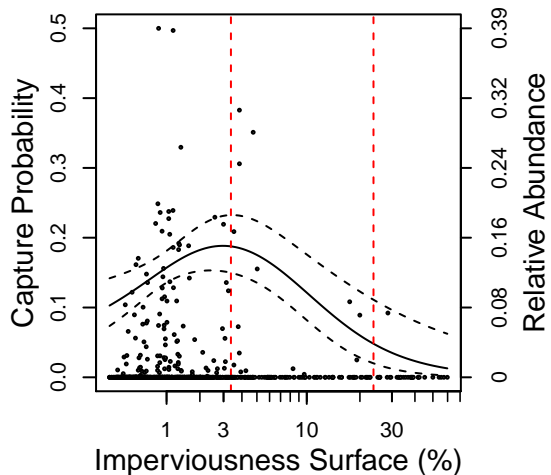
*Cambarus nebrascensis*



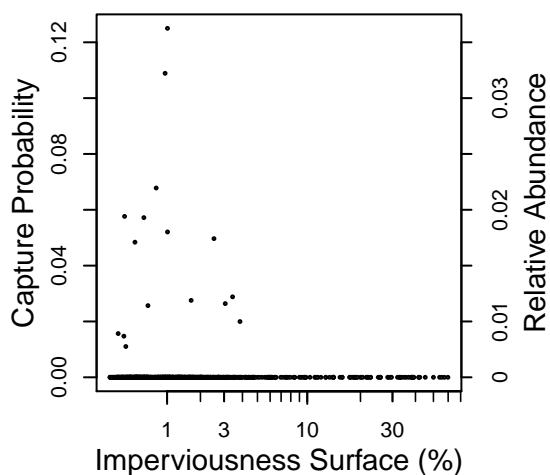
*Ceratopsyche alhedra*



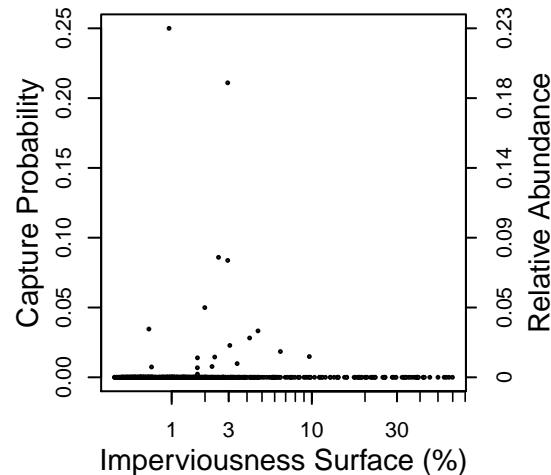
*Ceratopsyche checkerboard*



*Ceratopsyche slossonae*



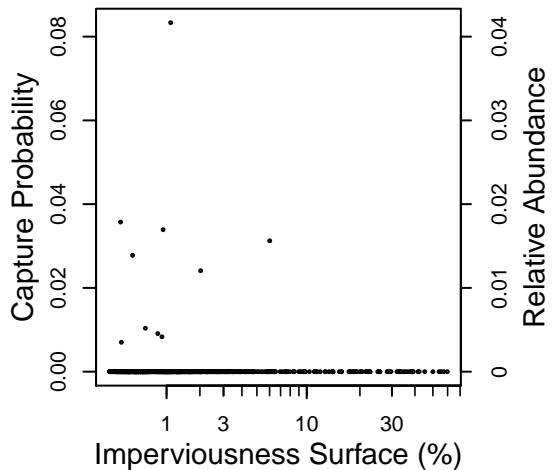
*Ceratopsyche sparna*



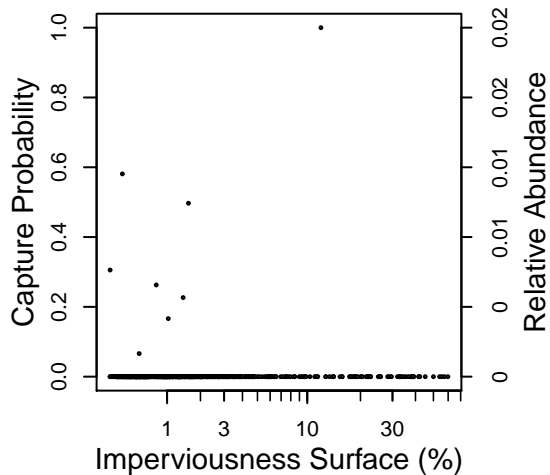


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

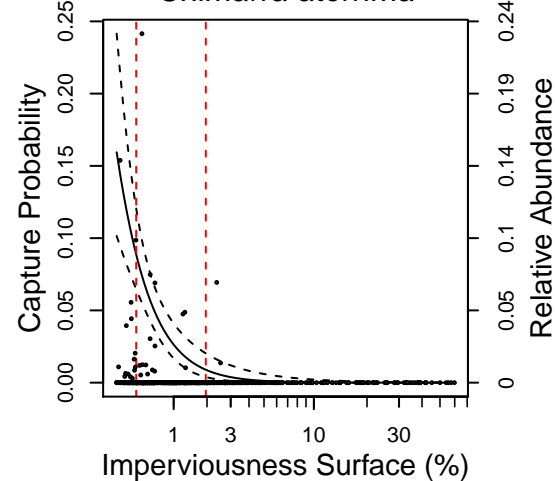
*Chauliodes pectinicornis*



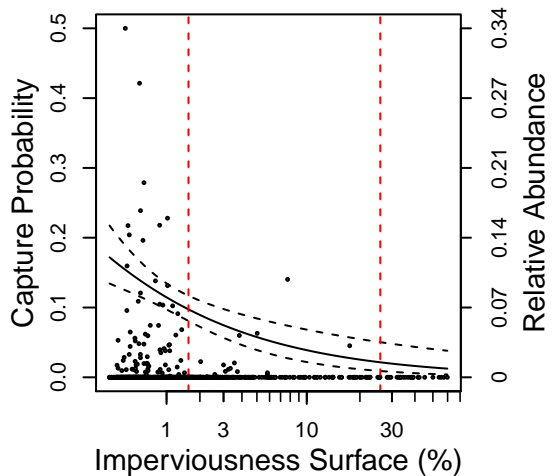
*Chauliodes rastricornis*



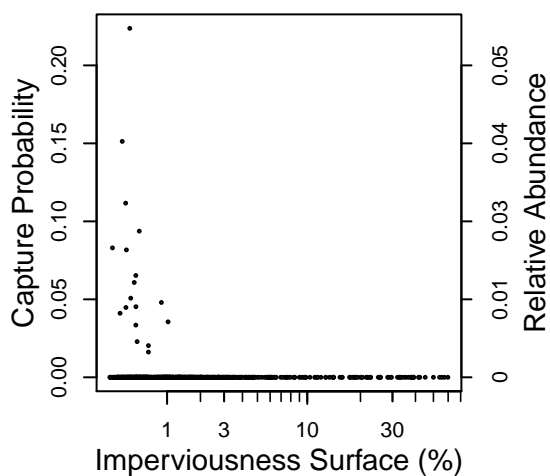
*Chimarra aterrima*



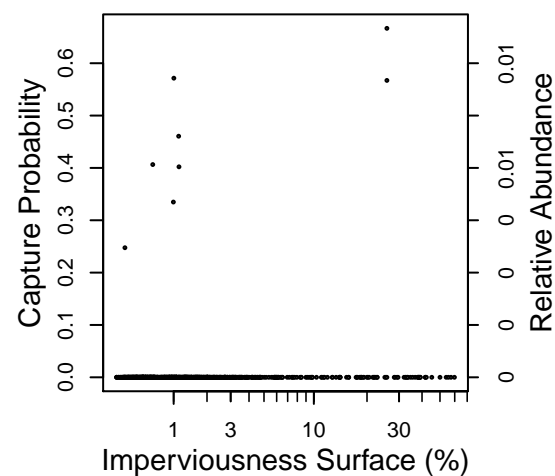
*Chimarra obscura*



*Choroterpes basalis*

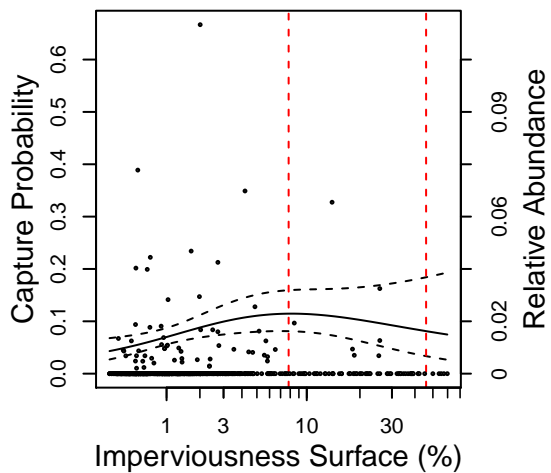


*Climacia areolaris*

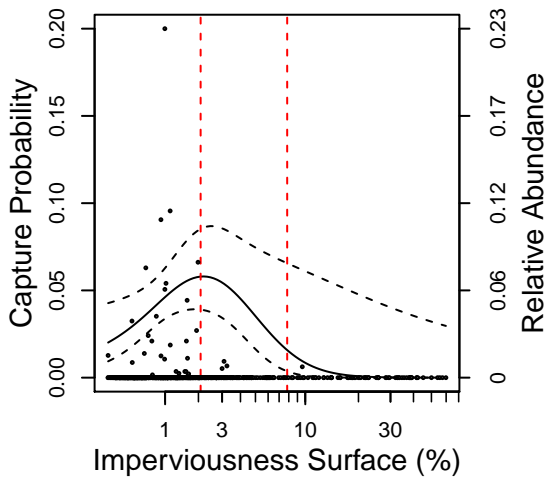


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

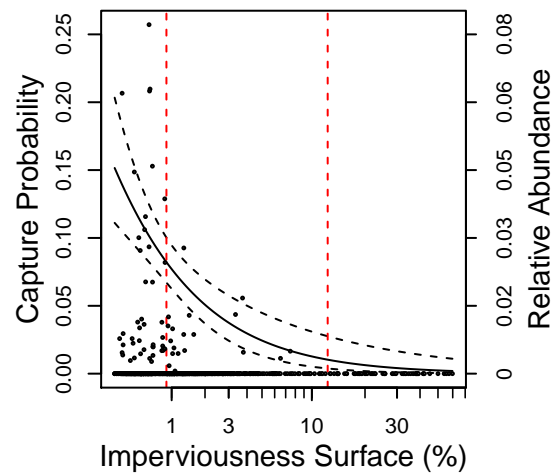
*Clinotanypus pinguis*



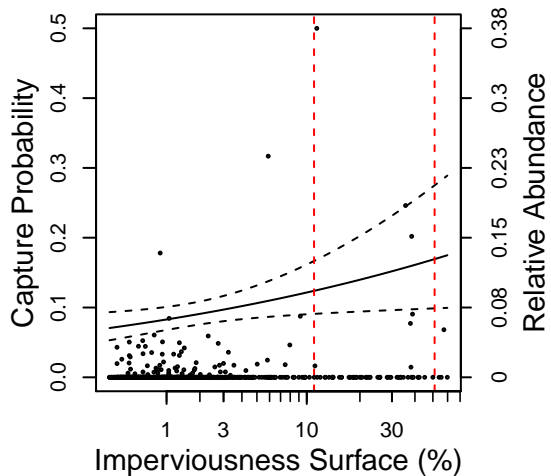
*Coptotomus loticus*



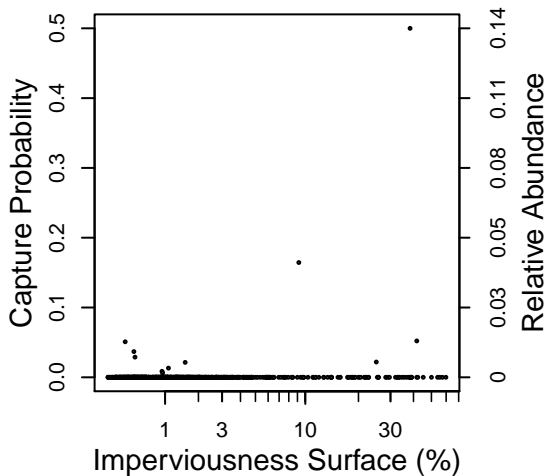
*Corydalus cornutus*



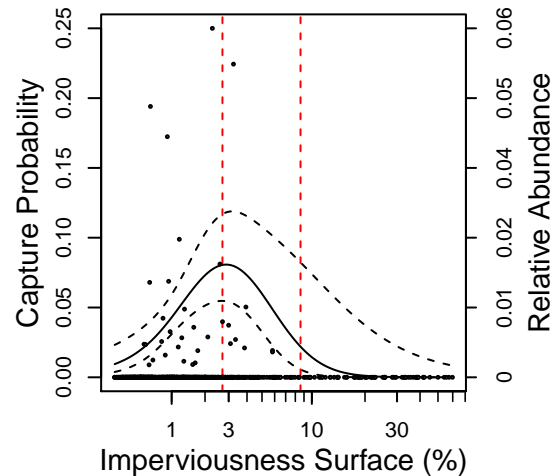
*Cricotopus (cricotopus)*



*Cricotopus sylvestris group*

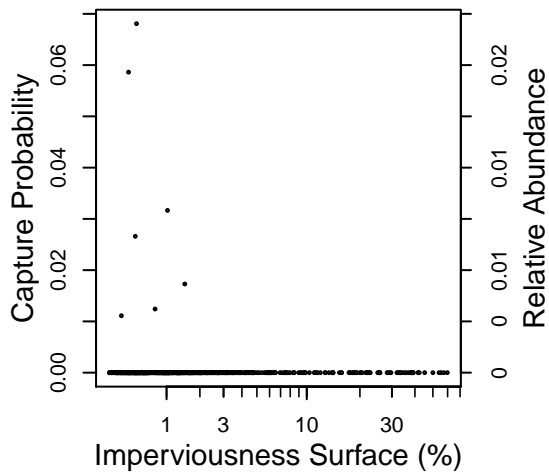


*Cricotopus trifascia*

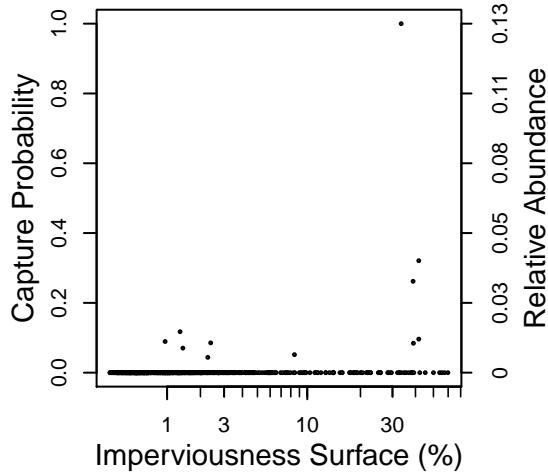


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

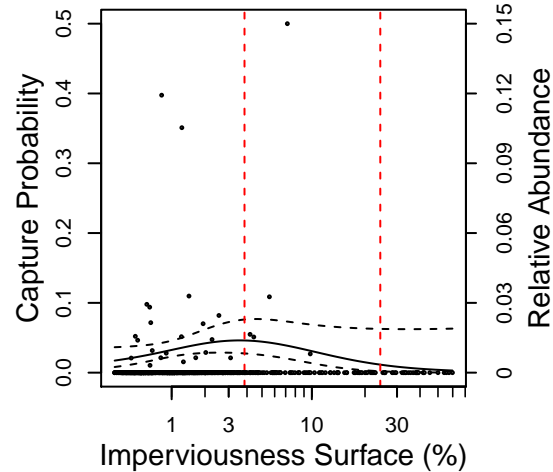
*Didymops transversa*



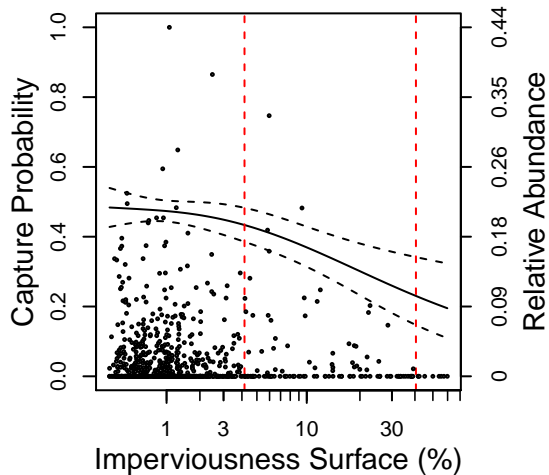
*Dreissena polymorpha*



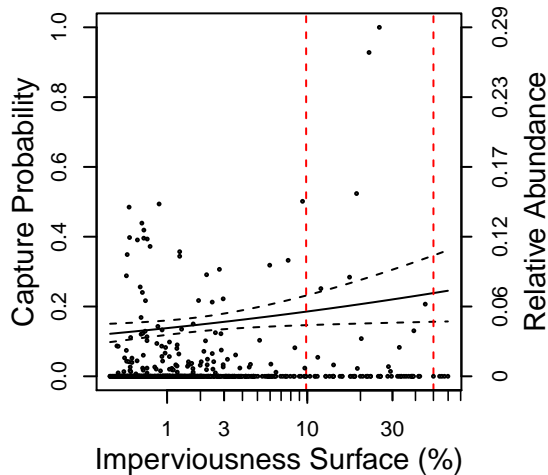
*Dubiraphia bivittata*



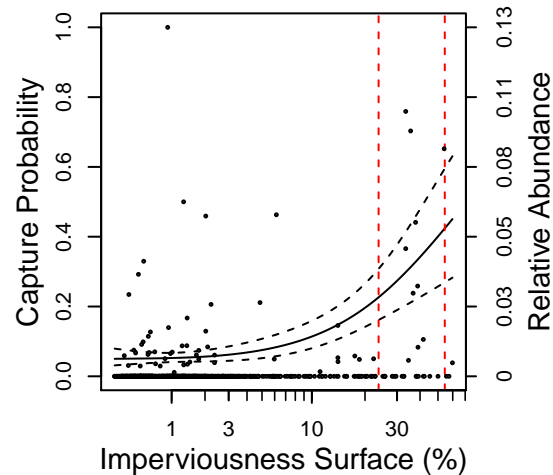
*Dubiraphia minima group*



*Dubiraphia quadrinotata*

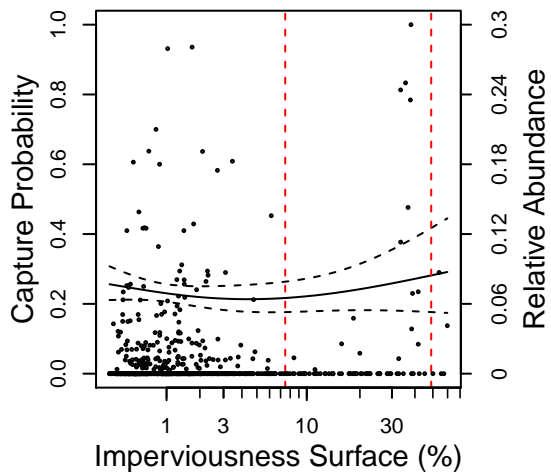


*Enallagma basidens*

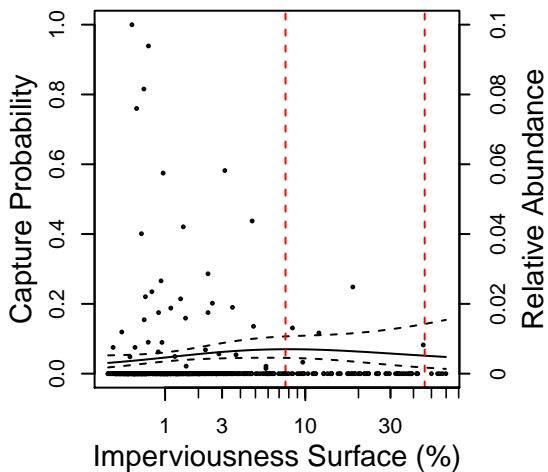


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

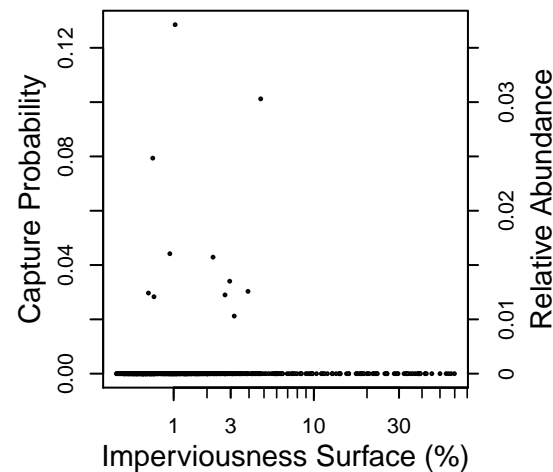
*Enallagma divagans*



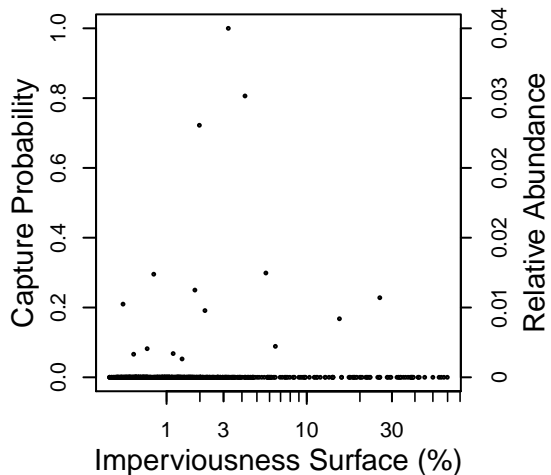
*Enallagma exsulans*



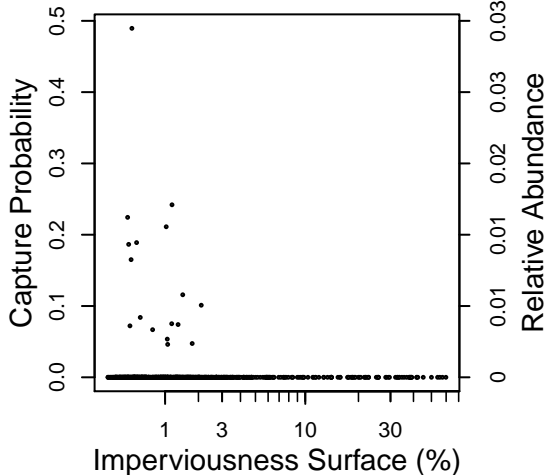
*Enallagma signatum*



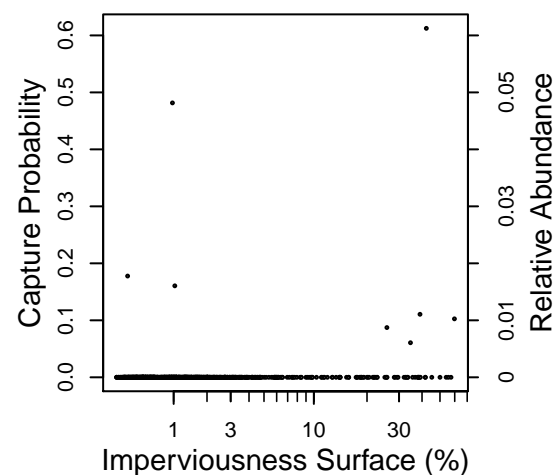
*Enochrus ochraceus*



*Enochrus pygmaeus*

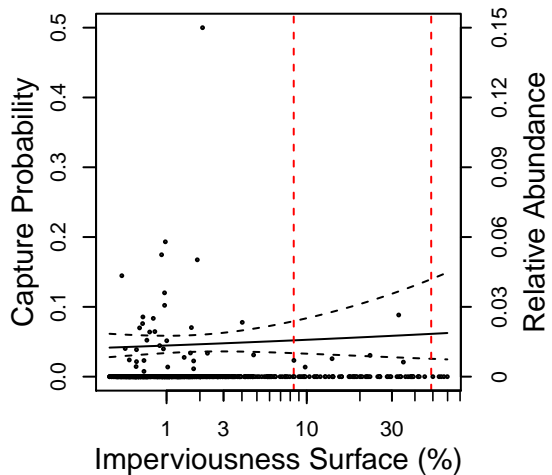


*Epitheca (tetragoneuria)*

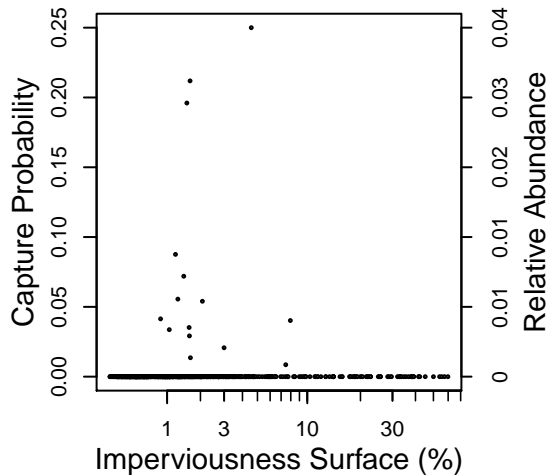


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

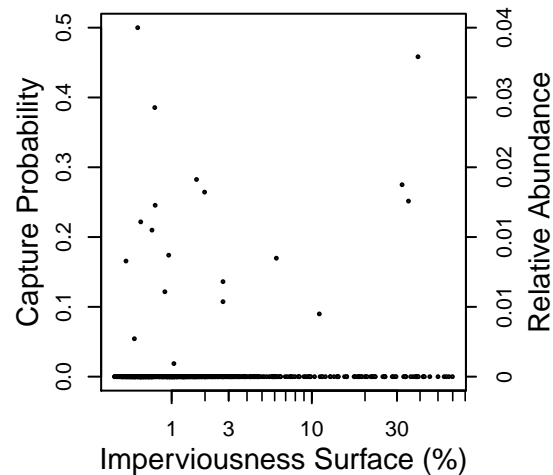
*Epitheca princeps*



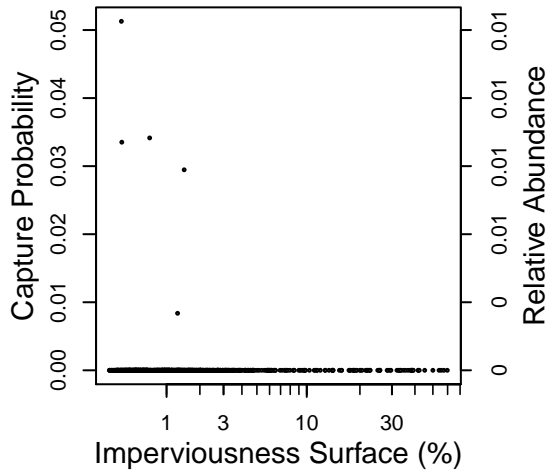
*Erpetogomphus designatus*



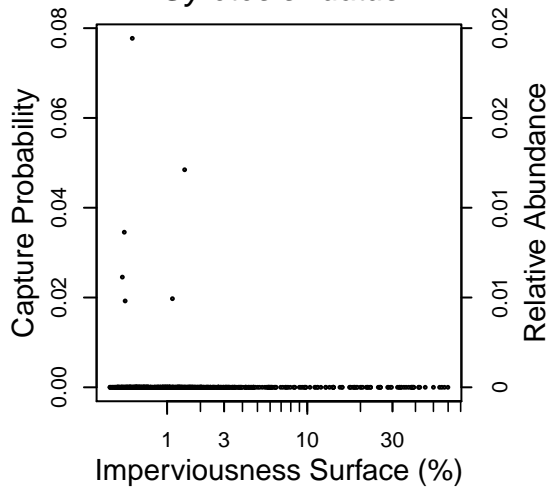
*Erythemis simplicicollis*



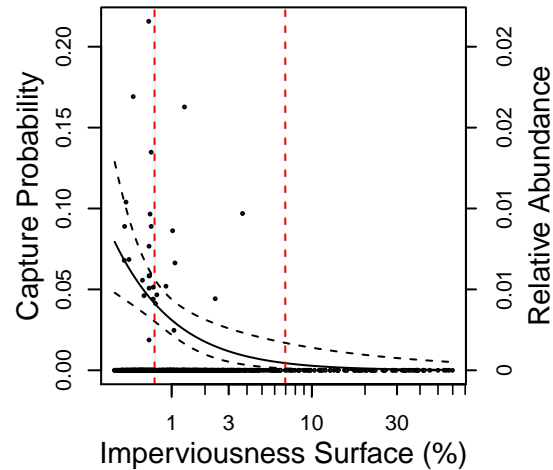
*Gelastocoris oculatus*



*Gyretes sinuatus*

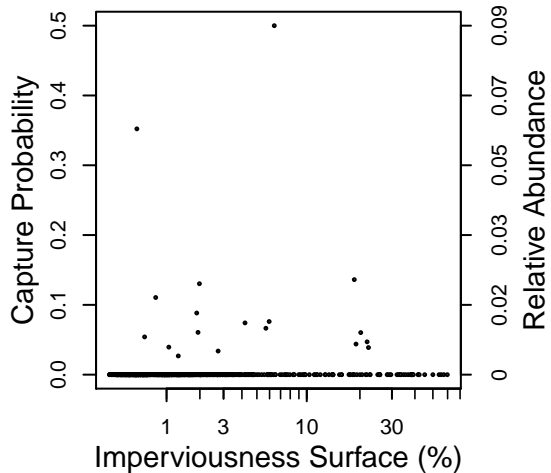


*Hagenius brevistylus*

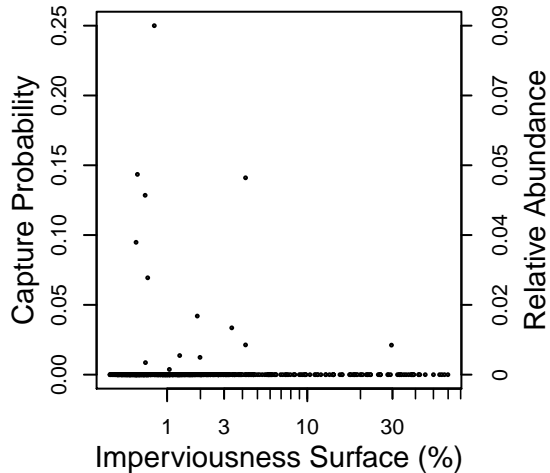


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

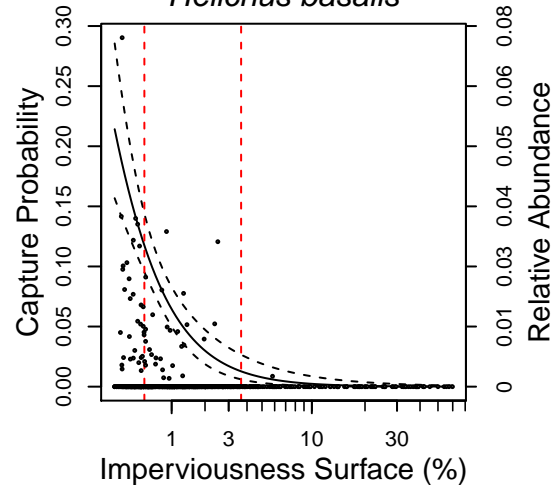
*Haliplus borealis*



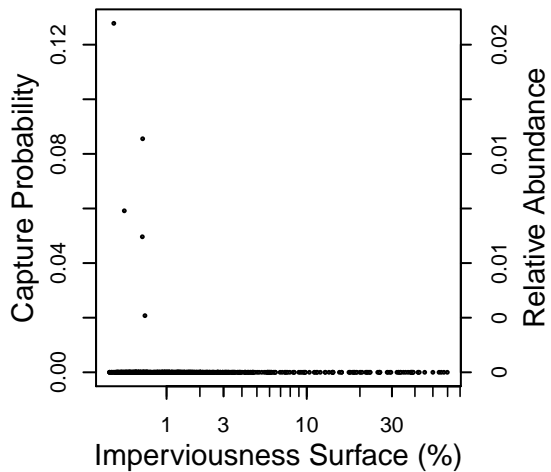
*Haliplus immaculicollis*



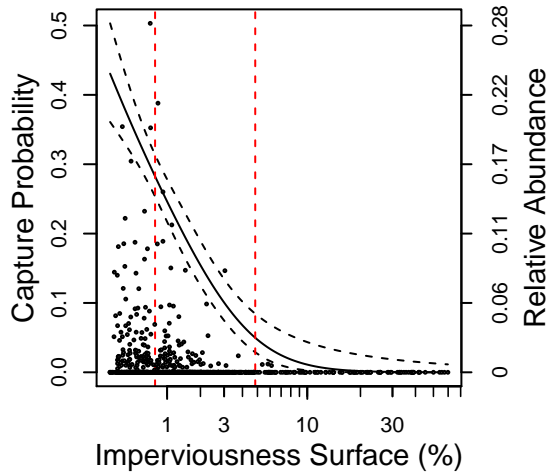
*Helichus basalis*



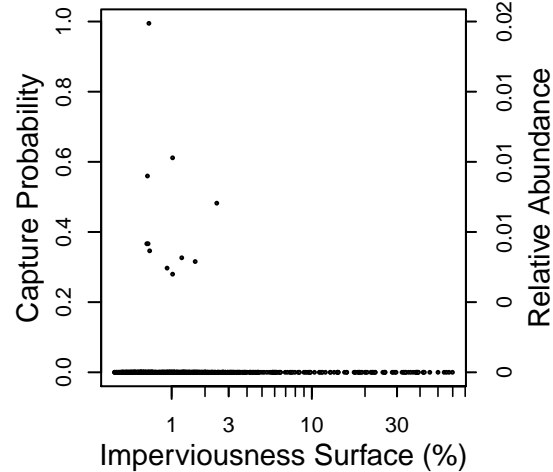
*Helichus fastigiatus*



*Helichus lithophilus*

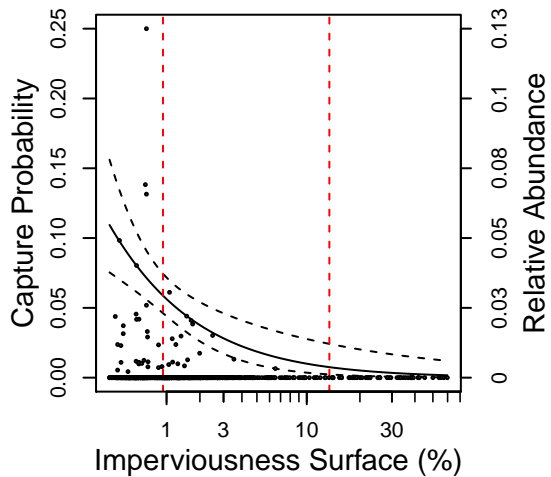


*Helichus striatus*

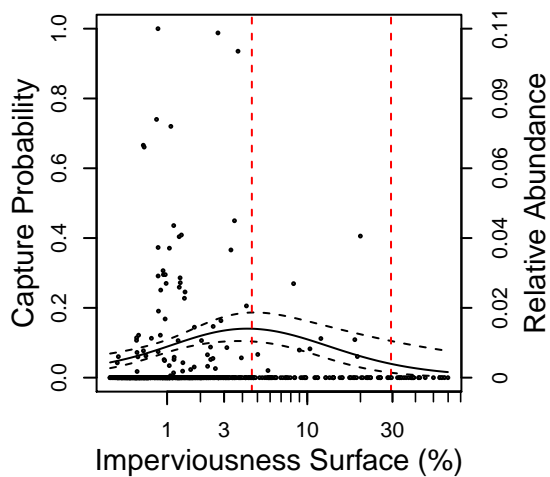


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

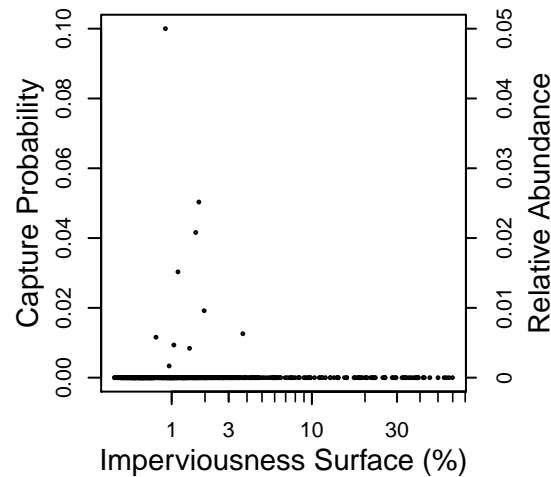
*Helicopsyche borealis*



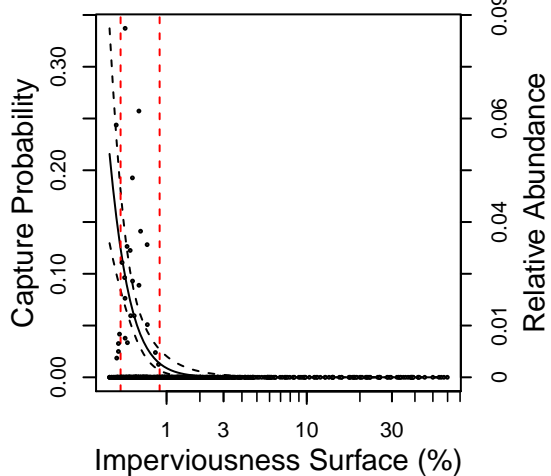
*Hetaerina americana*



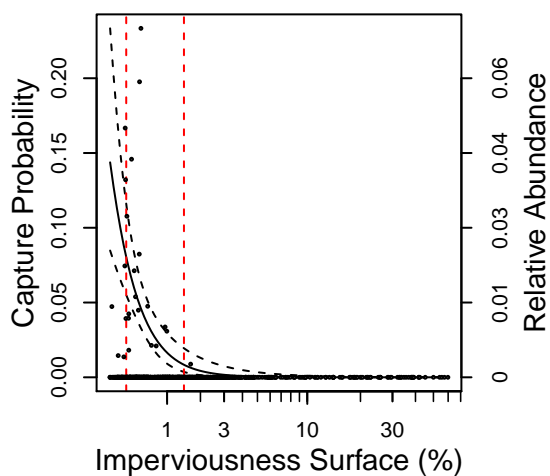
*Hetaerina titia*



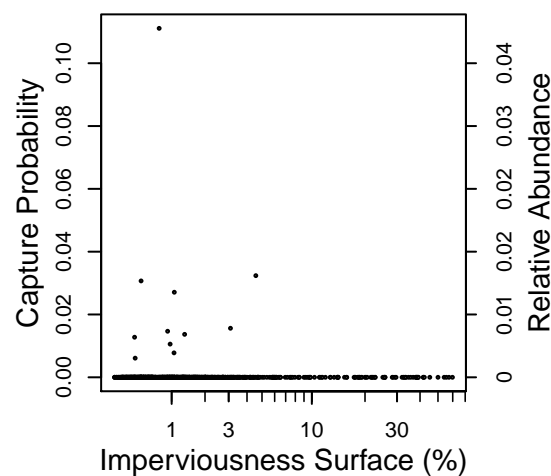
*Heterosternuta ohionis*



*Heterosternuta pulcher*

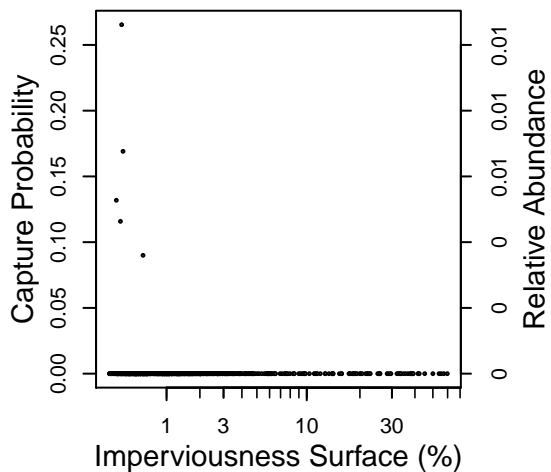


*Heterosternuta wickhami*

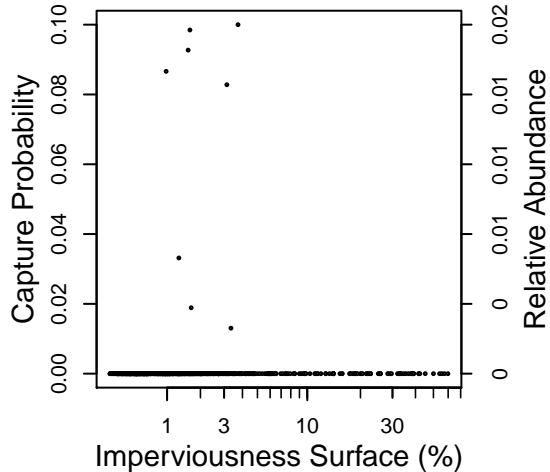


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

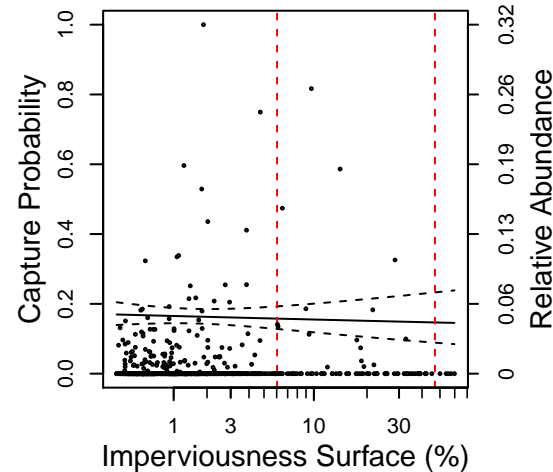
*Hydrometra martini*



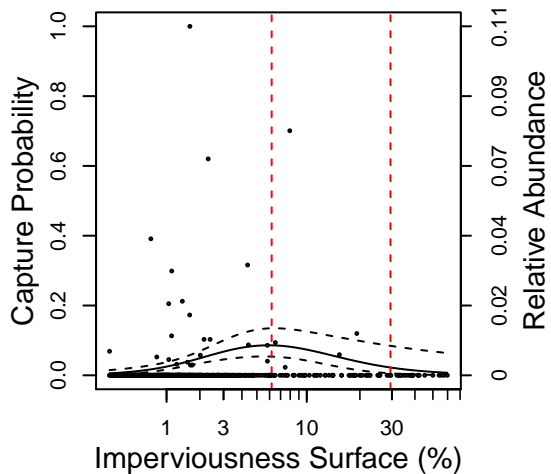
*Hydropsyche aerata*



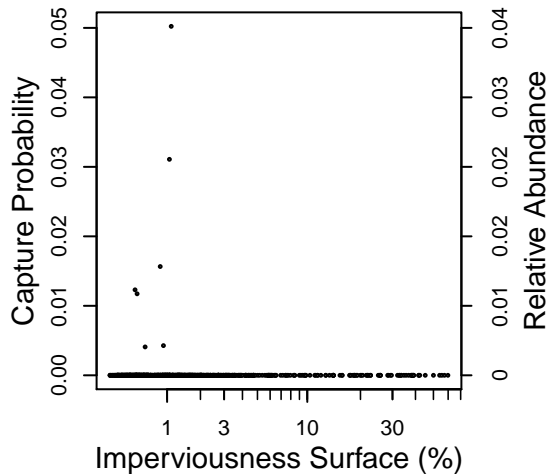
*Hydropsyche betteni* group



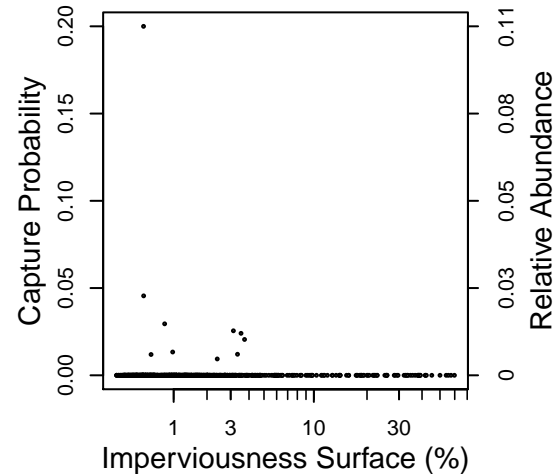
*Hydropsyche bidens*



*Hydropsyche cuanis*



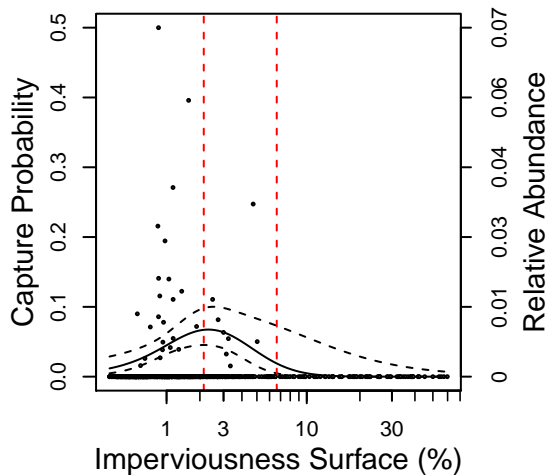
*Hydropsyche demora*



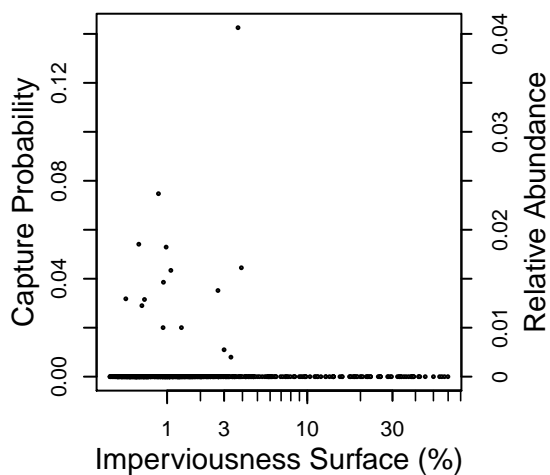


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

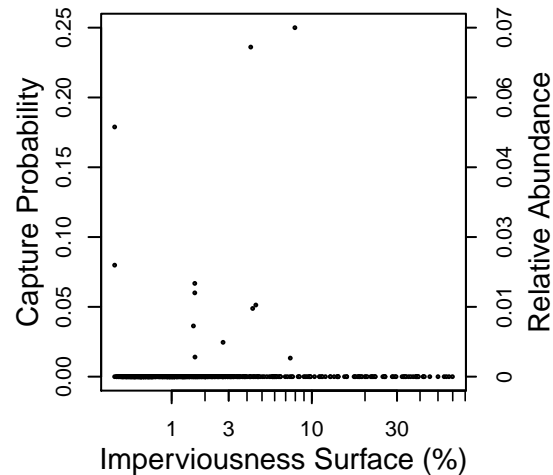
*Hydropsyche dicantha*



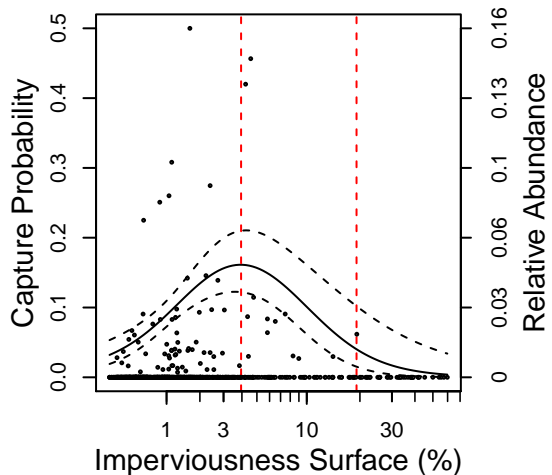
*Hydropsyche frisoni*



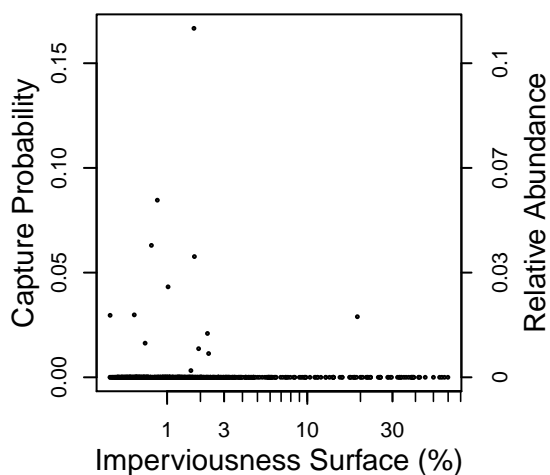
*Hydropsyche orris*



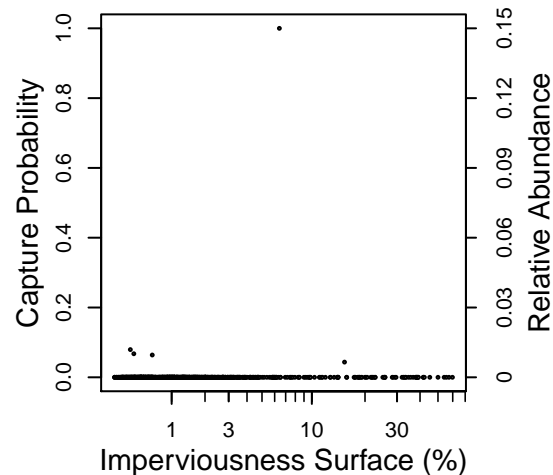
*Hydropsyche simulans*



*Hydropsyche venularis*

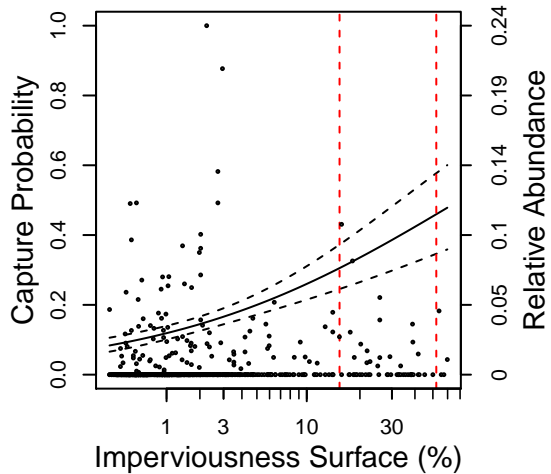


*Hydrovatus pustulatus*

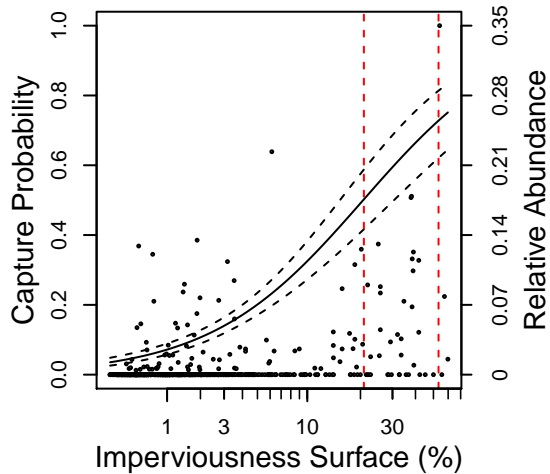


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

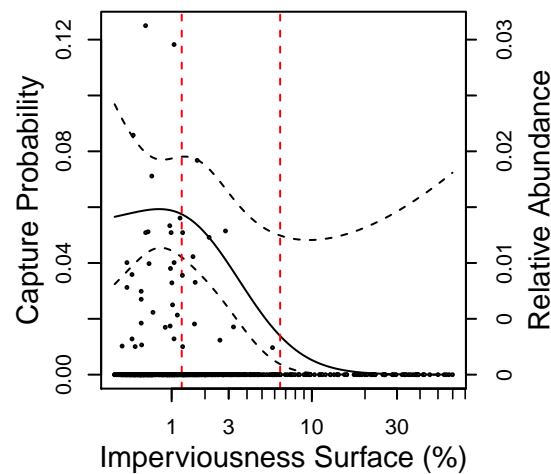
*Ischnura posita*



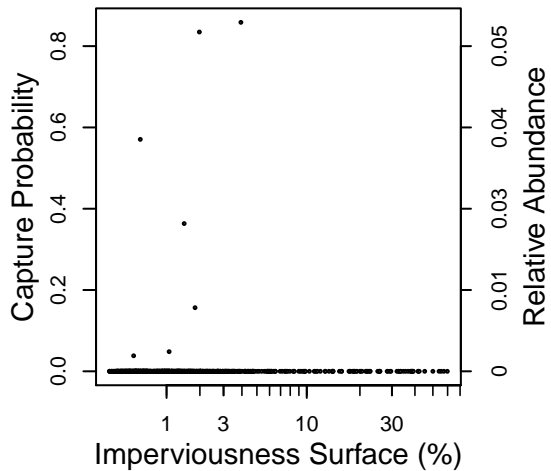
*Ischnura verticalis*



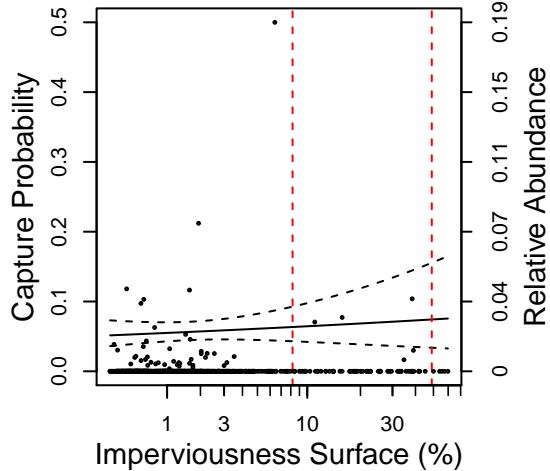
*Labrundinia pilosella*



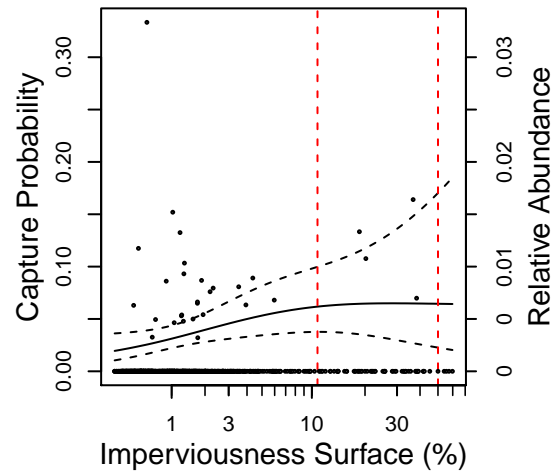
*Laccophilus fasciatus*



*Laccophilus maculosus*

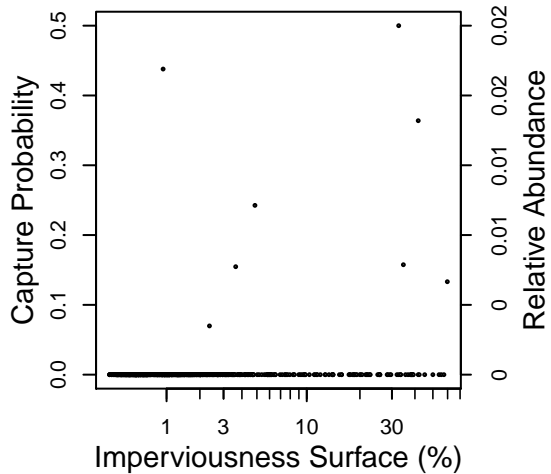


*Liodessus affinis complex*

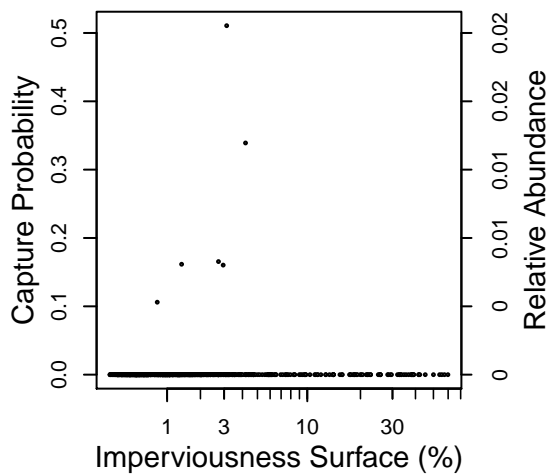


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

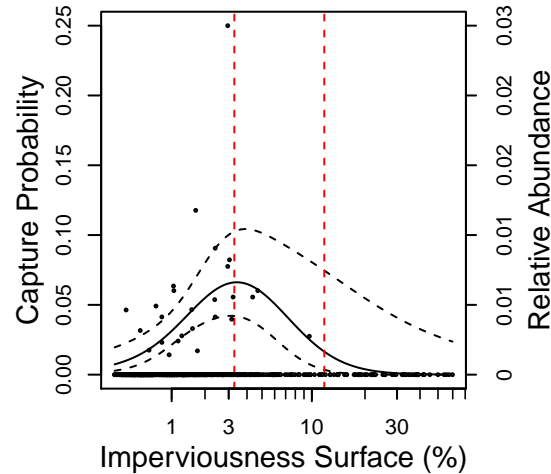
*Liodessus flavicollis*



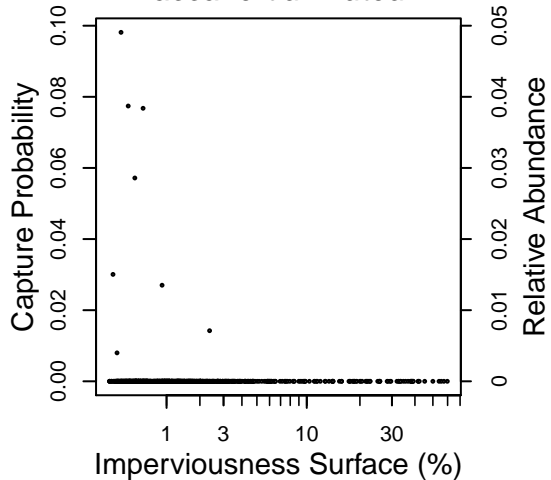
*Lype diversa*



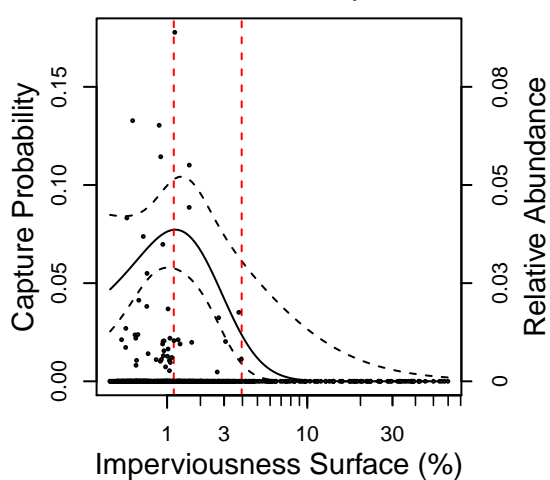
*Maccaffertium exiguum*



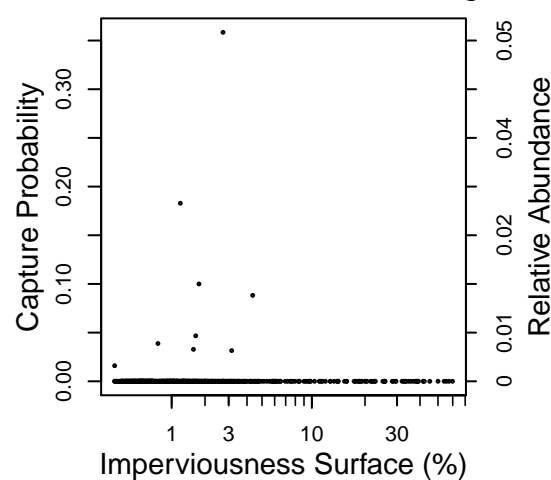
*Maccaffertium luteum*



*Maccaffertium mediopunctatum*

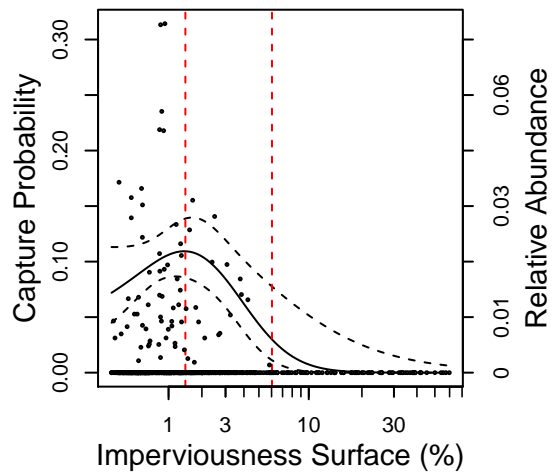


*Maccaffertium mexicanum integrum*

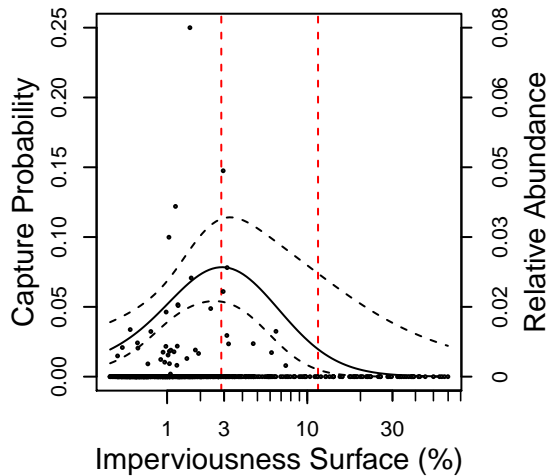


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

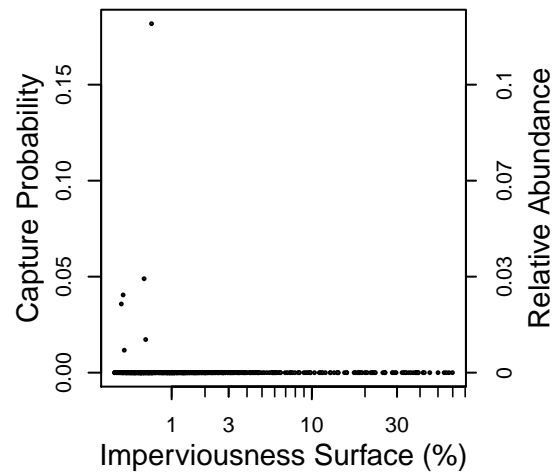
*Maccaffertium pulchellum*



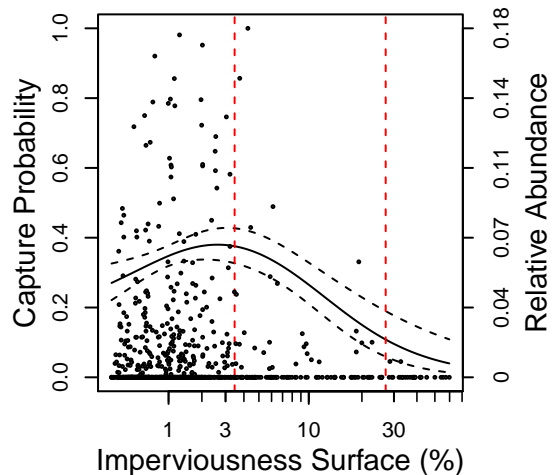
*Maccaffertium terminatum*



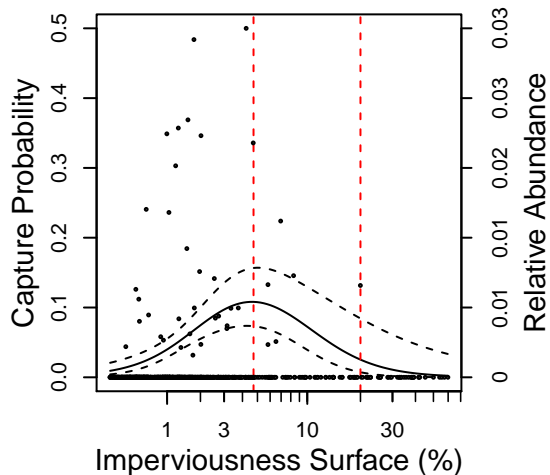
*Maccaffertium vicarium*



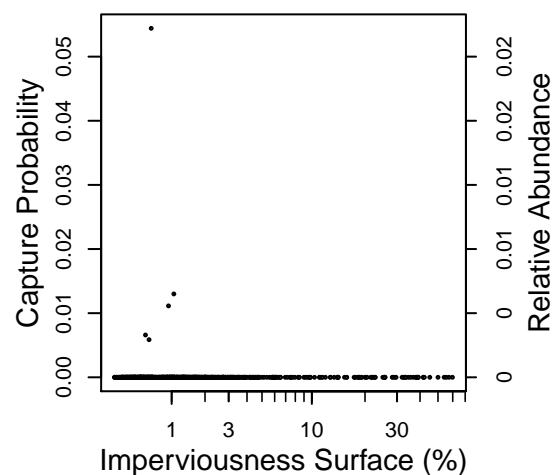
*Macronychus glabratus*



*Metrobates hesperius*

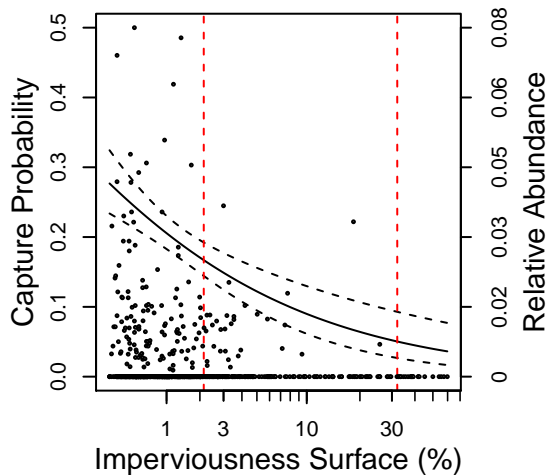


*Microcylloepus pusillus*

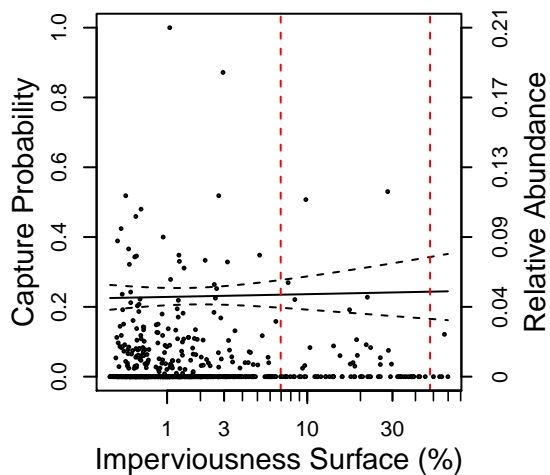


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

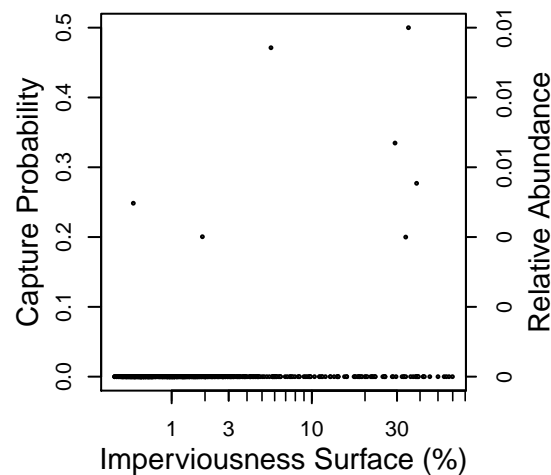
*Microtendipes pedellus* group



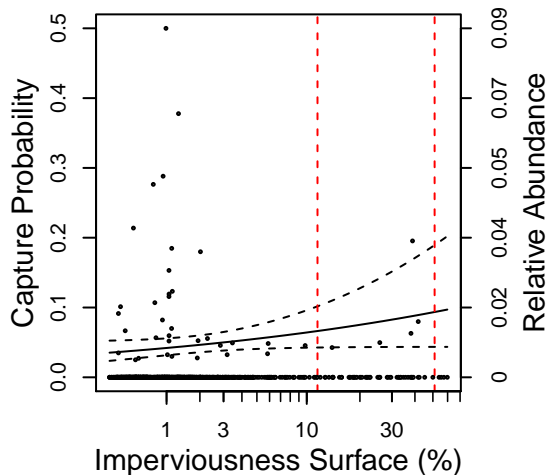
*Microvelia americana*



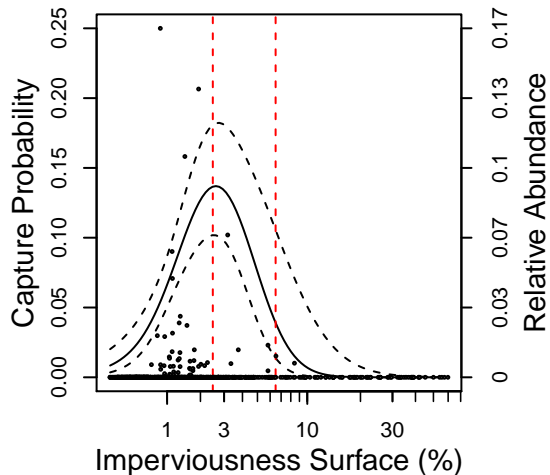
*Microvelia pulchella*



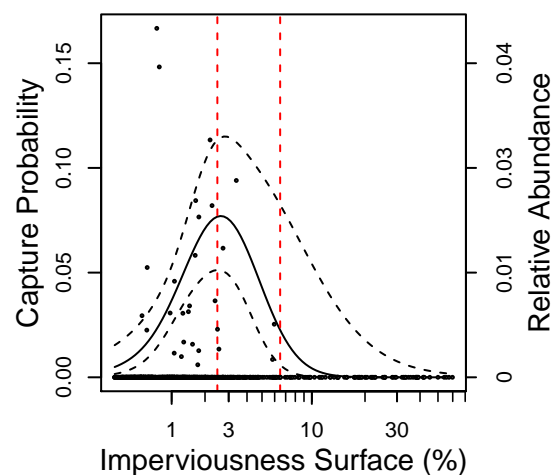
*Nasiaeschna pentacantha*



*Nectopsyche candida/exquisita*

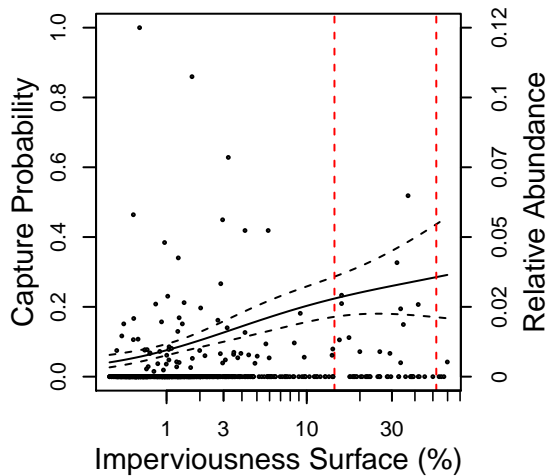


*Nectopsyche diarina*

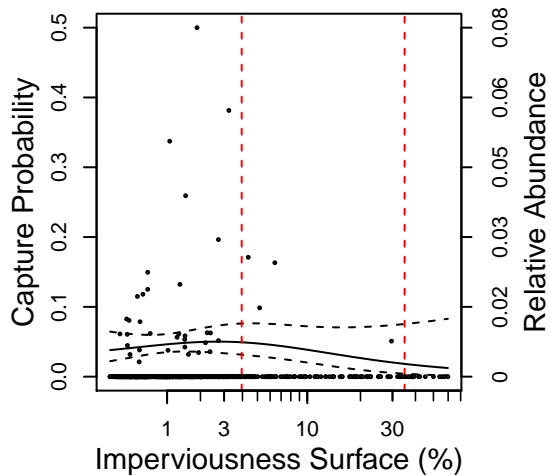


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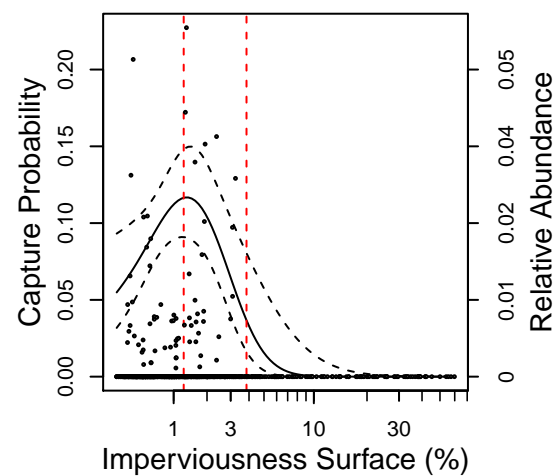
*Neoplea striola*



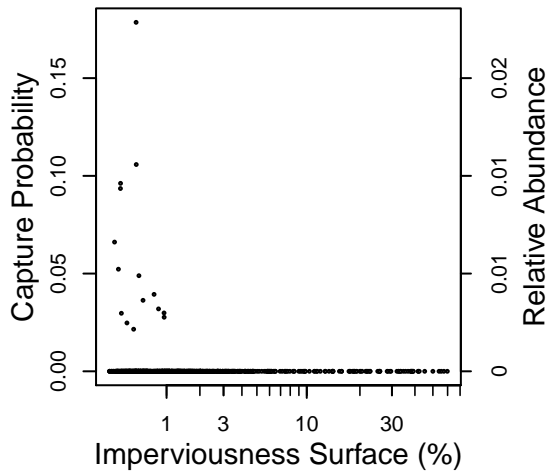
*Neoporus clypealis*



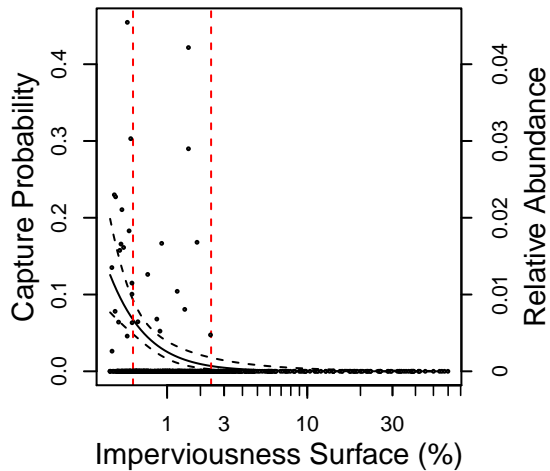
*Neoporus dimidiatus*



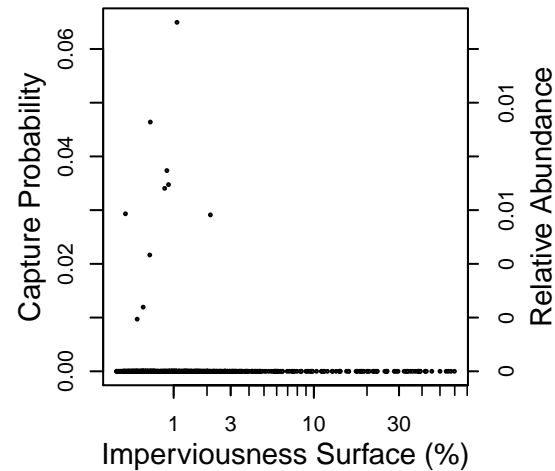
*Neoporus striatopunctatus*



*Neoporus tennetum*

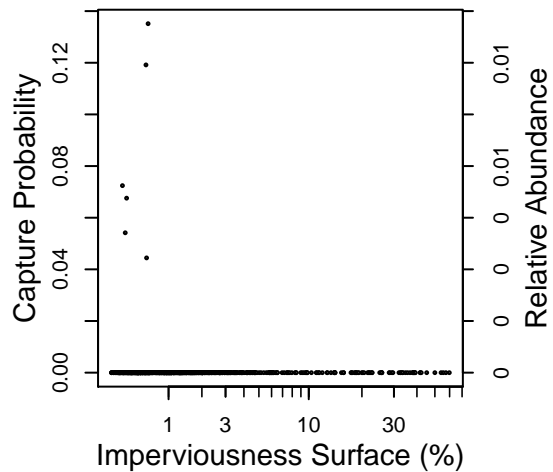


*Nepa apiculata*

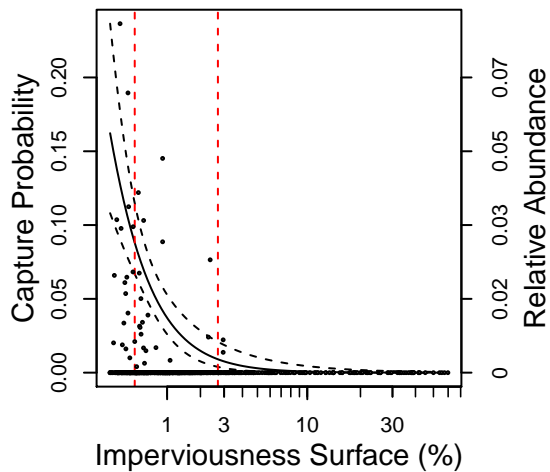


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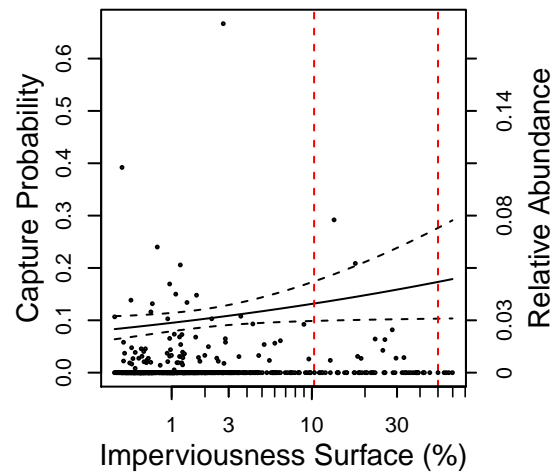
*Neurocordulia yamaskanensis*



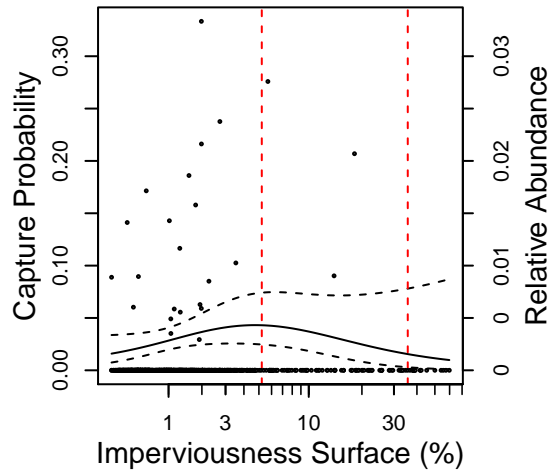
*Nigronia serricornis*



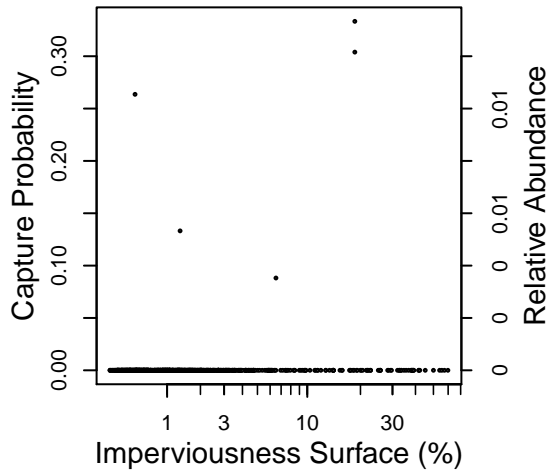
*Notonecta irrorata*



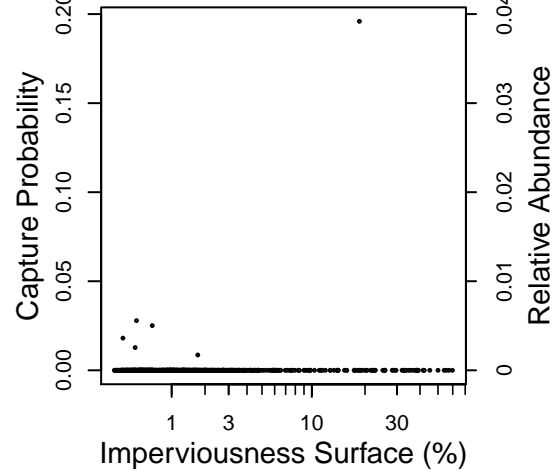
*Notonecta lunata*



*Oecetis avara*

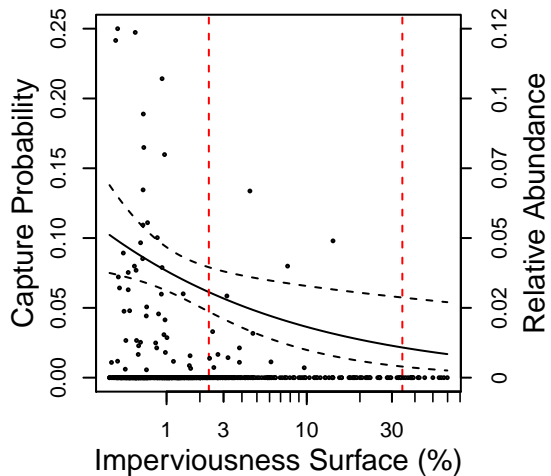


*Oecetis nocturna*

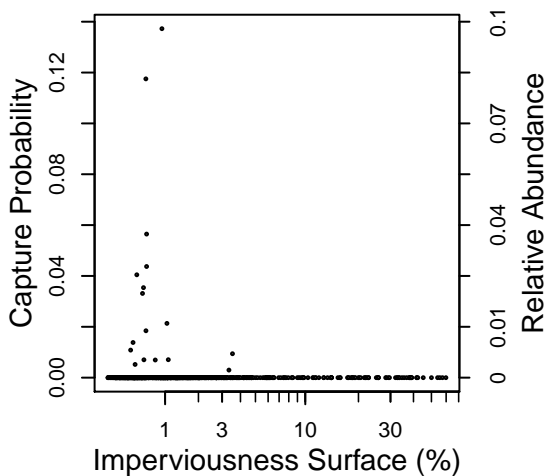


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

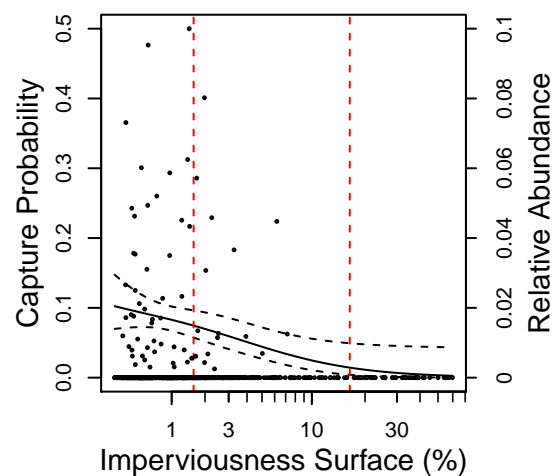
*Optioservus fastiditus*



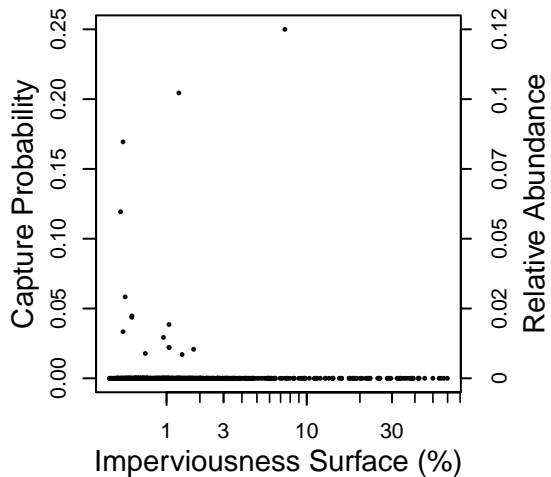
*Optioservus trivittatus*



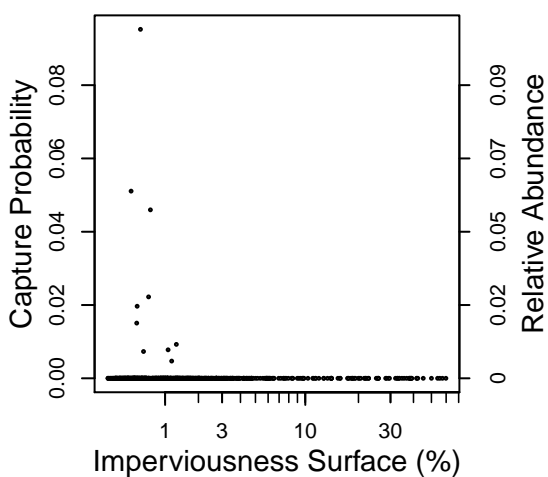
*Orconectes immunis*



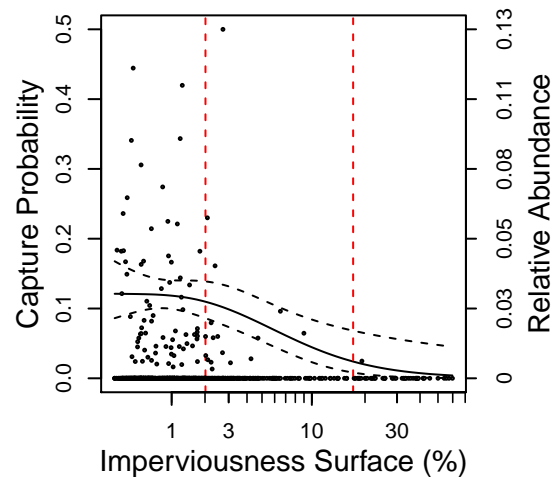
*Orconectes indianensis*



*Orconectes juvenilis*



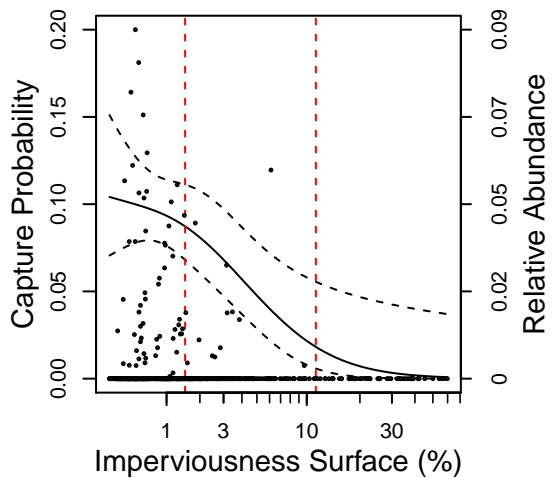
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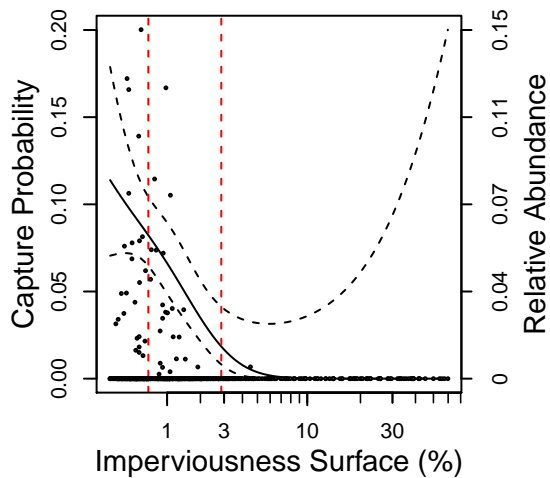


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

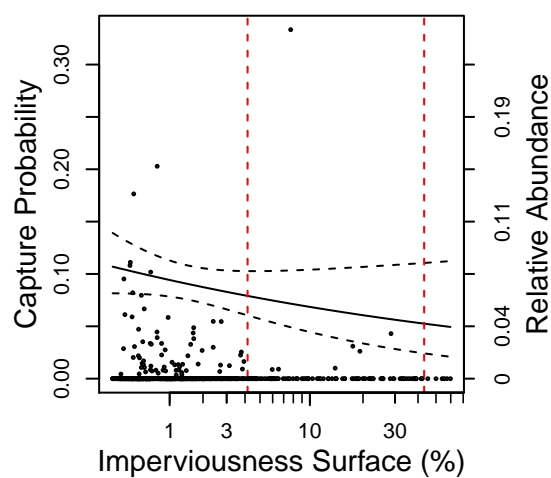
*Orconectes rusticus*



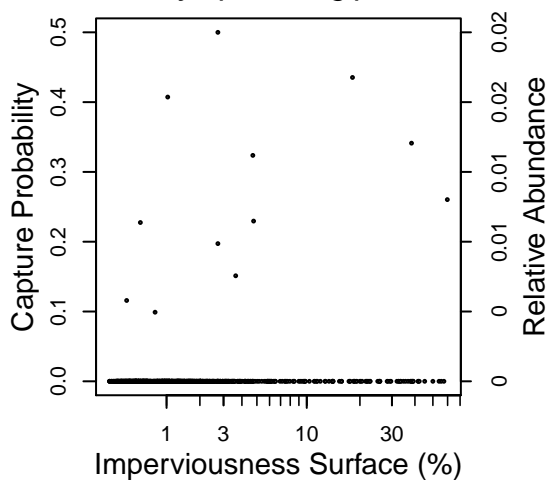
*Orconectes sloanii*



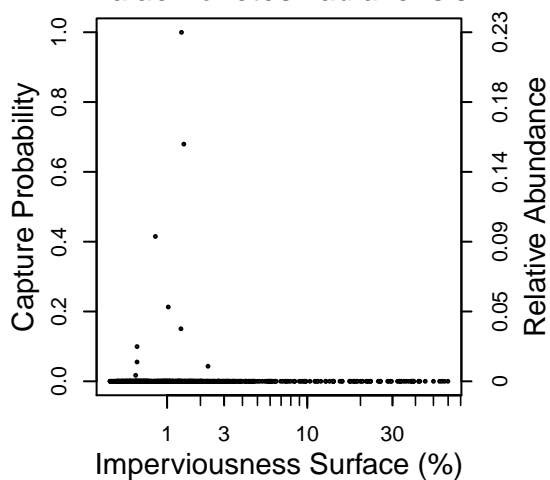
*Orconectes virilis*



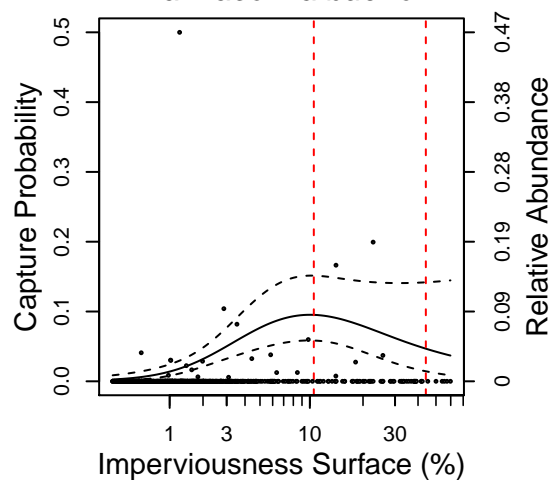
*Pachydiplax longipennis*



*Palaemonetes kadiakensis*

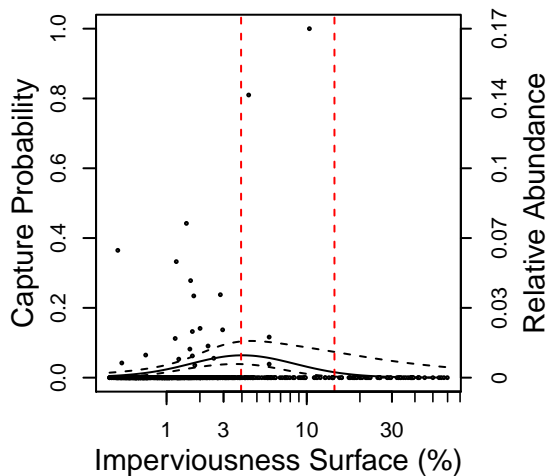


*Palmarcorixa buenoi*

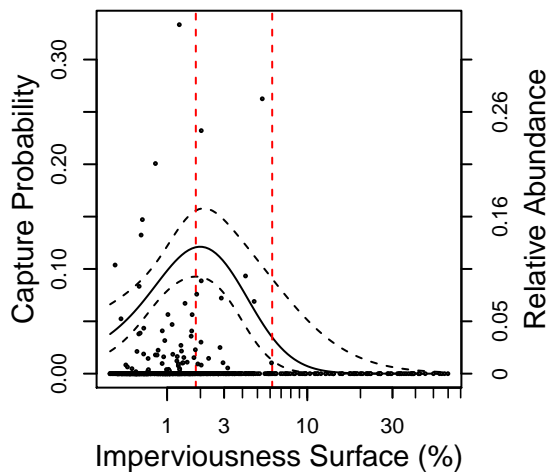


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

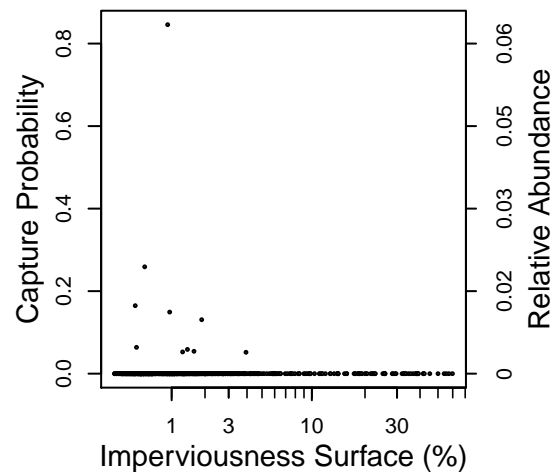
*Palmacorixa gillettei*



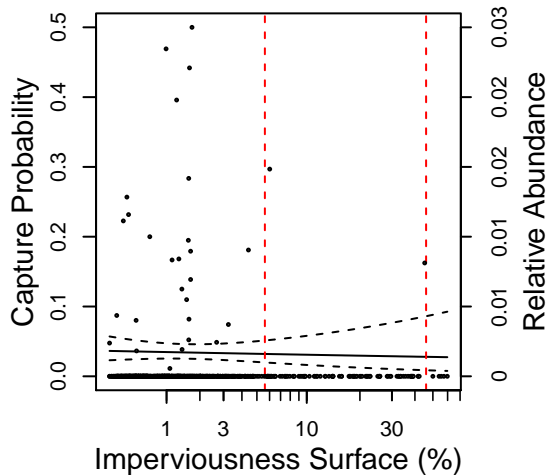
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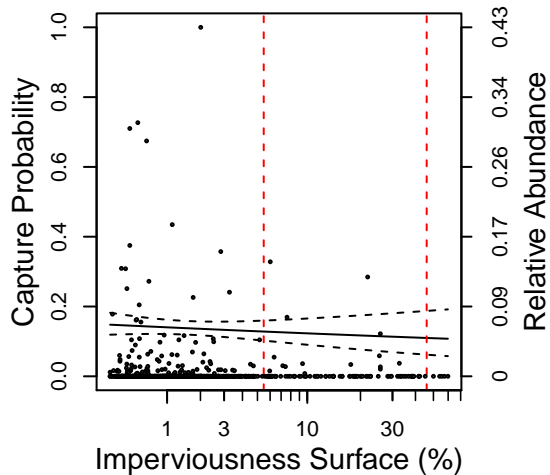
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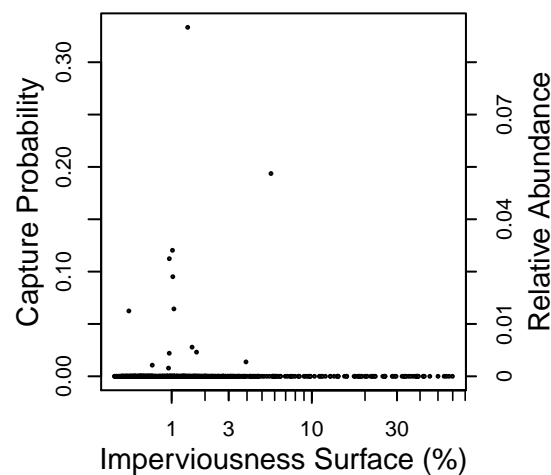
*Paralauterborniella nigrohalterale*



*Paratendipes albimanus*

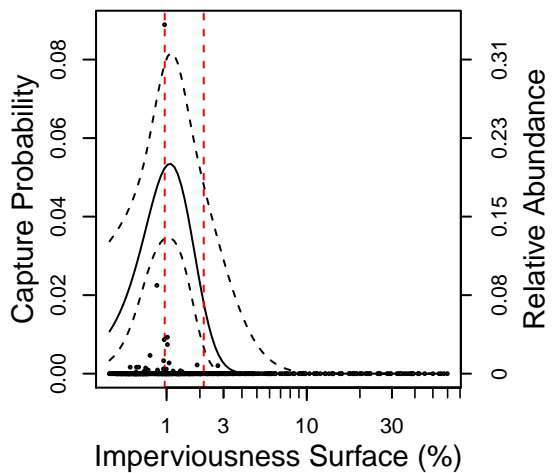


*Pelocoris femoratus*

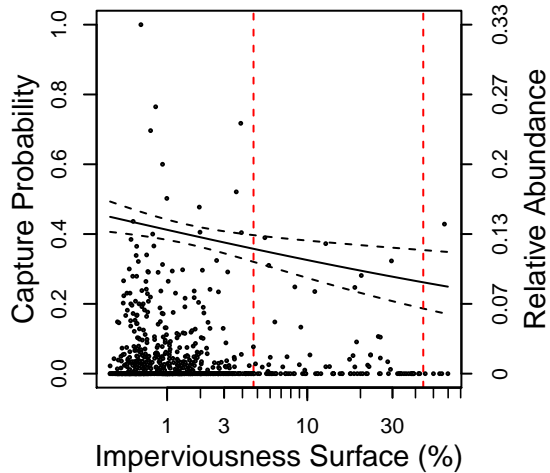


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

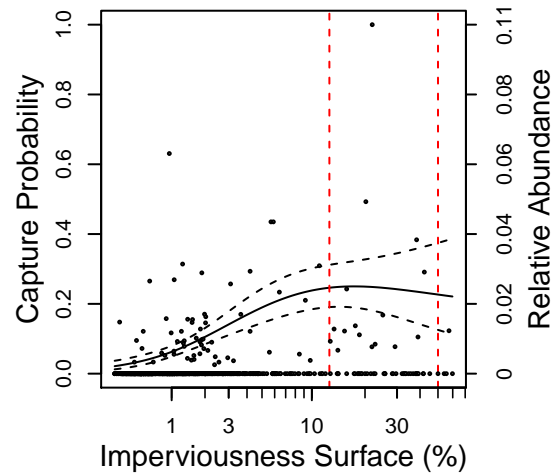
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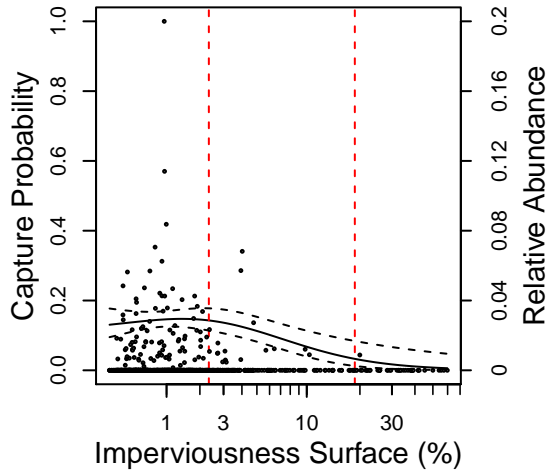
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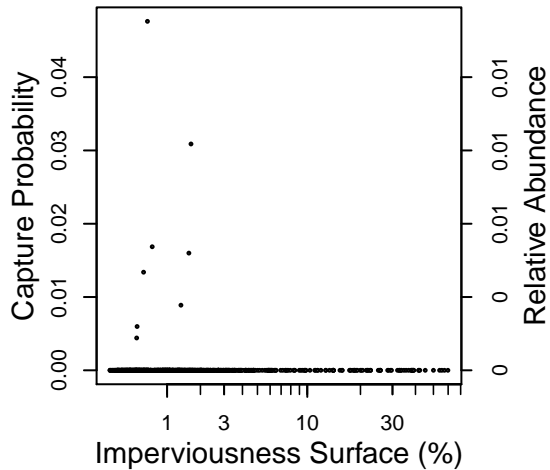
*Peltodytes edentulus*



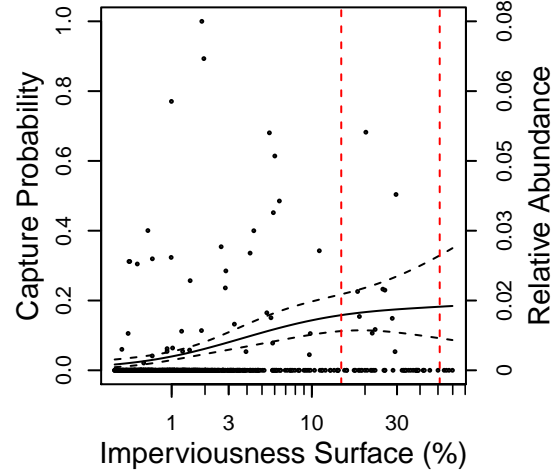
*Peltodytes lengi*



*Peltodytes litoralis*

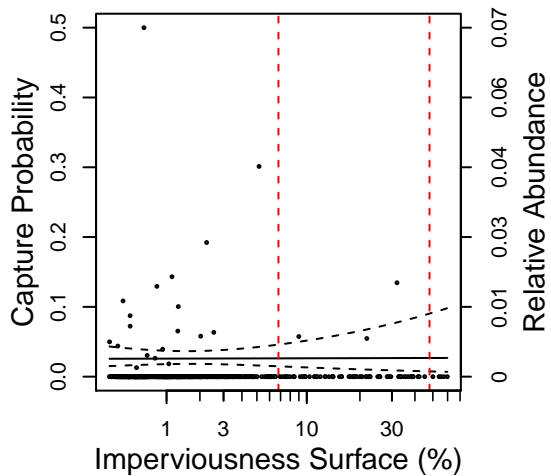


*Peltodytes muticus*

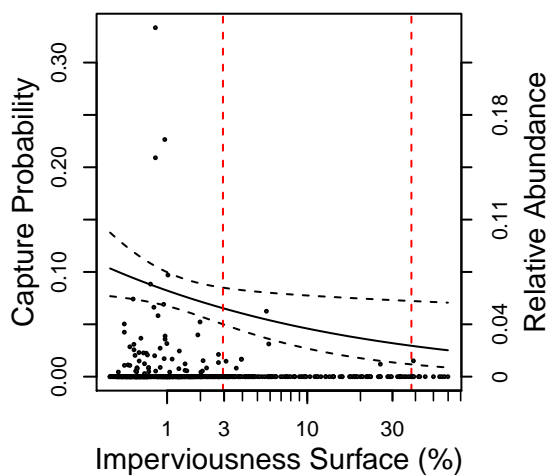


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

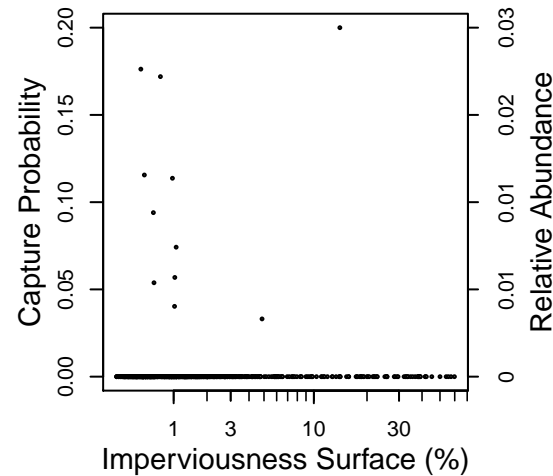
*Peltodytes pedunculatus*



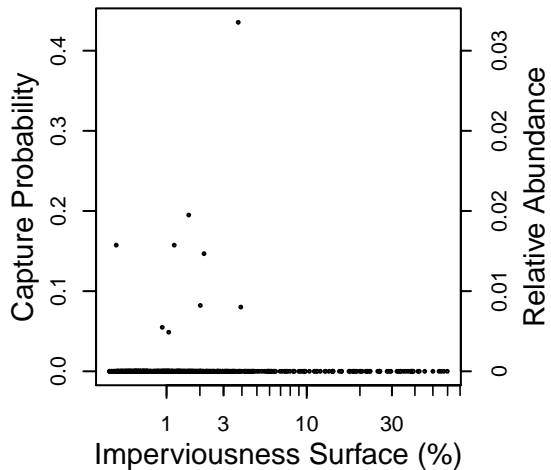
*Peltodytes sexmaculatus*



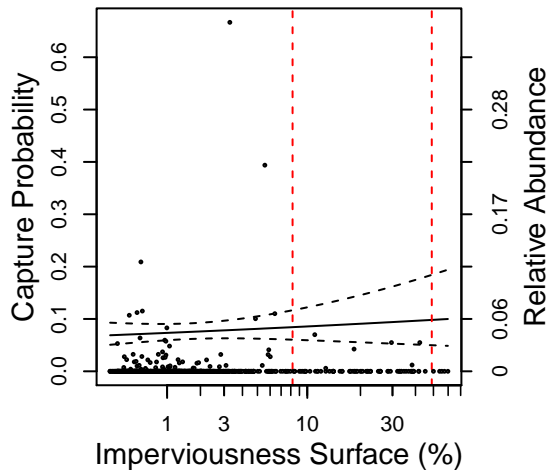
*Perithemis tenera*



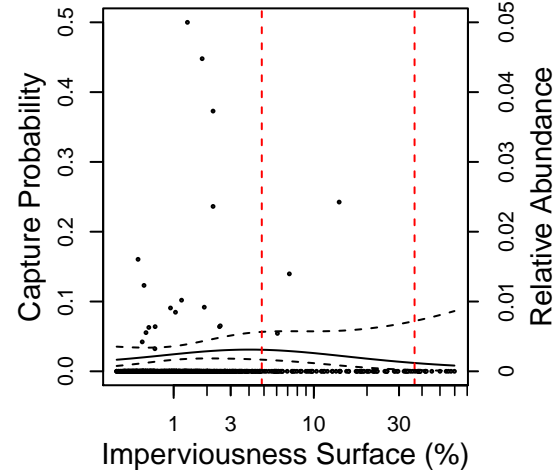
*Perlinella drymo*



*Plathemis lydia*

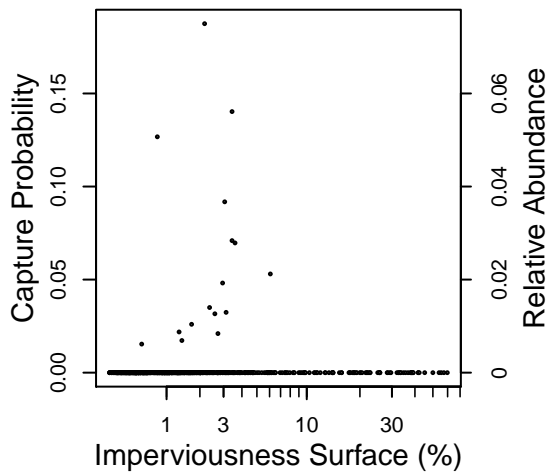


*Polypedilum (tripodura)*

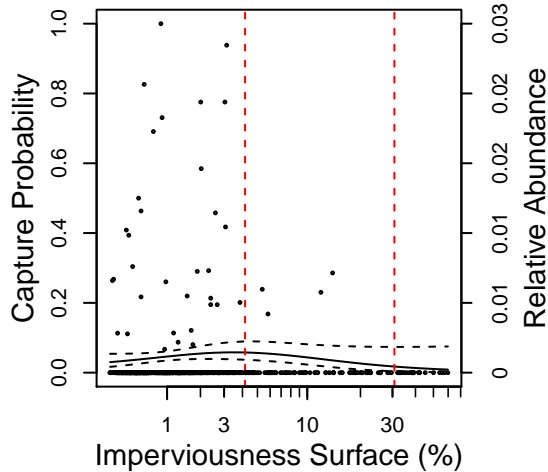


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

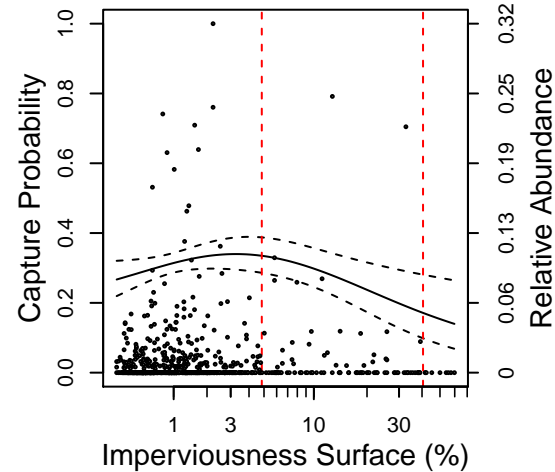
*Polypedilum aviceps*



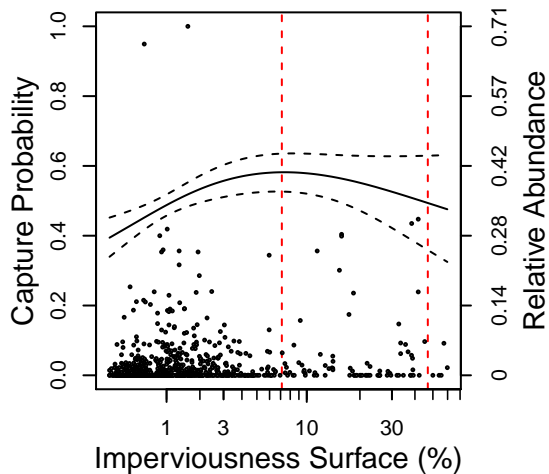
*Polypedilum fallax* group



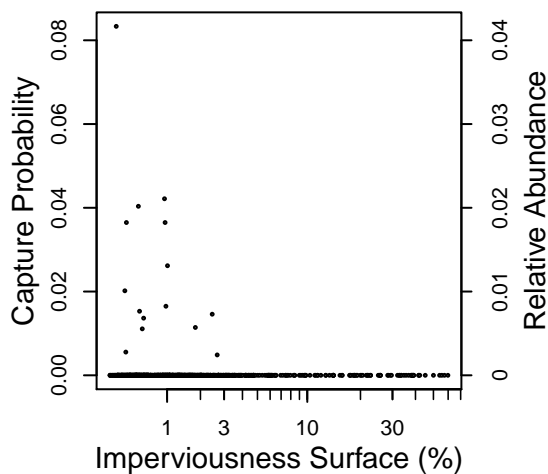
*Polypedilum flavum*



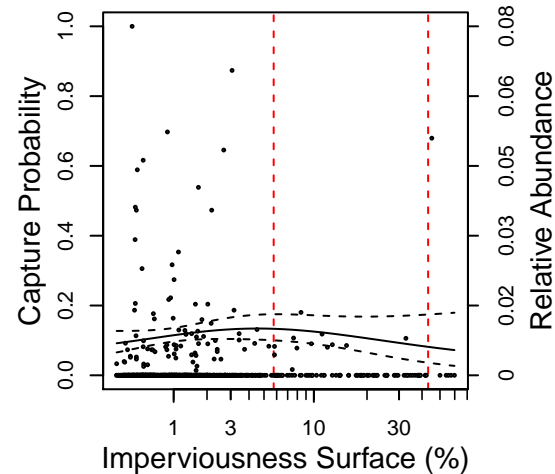
*Polypedilum illinoense* group



*Polypedilum laetum* group

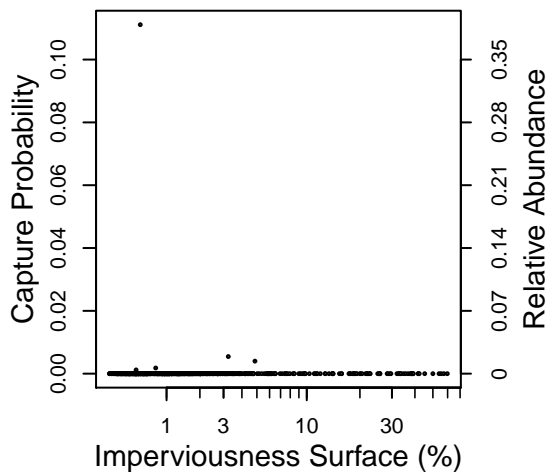


*Polypedilum scalaenum* group

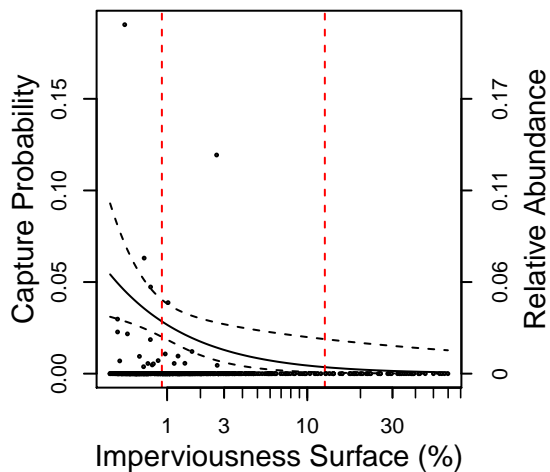


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

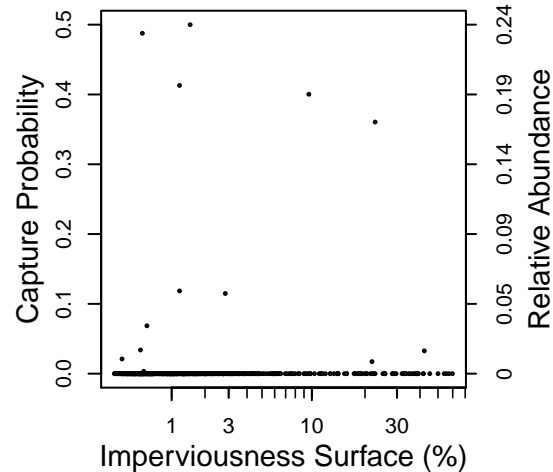
*Polypedilum tritum*



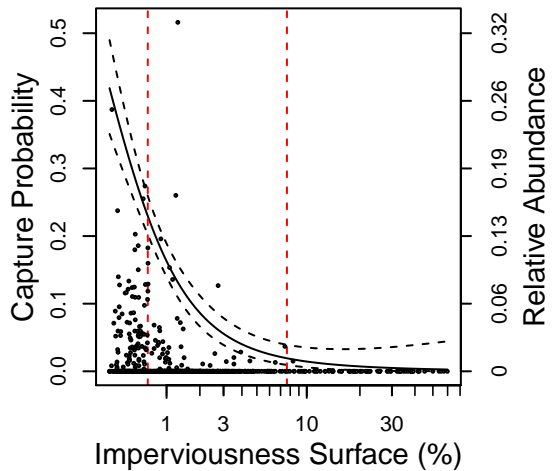
*Progomphus obscurus*



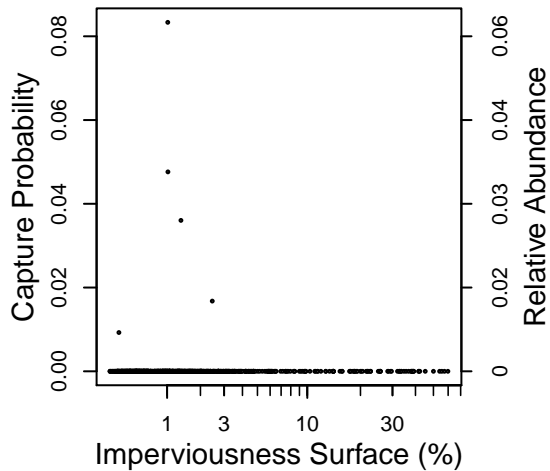
*Psectrotanypus dyari*



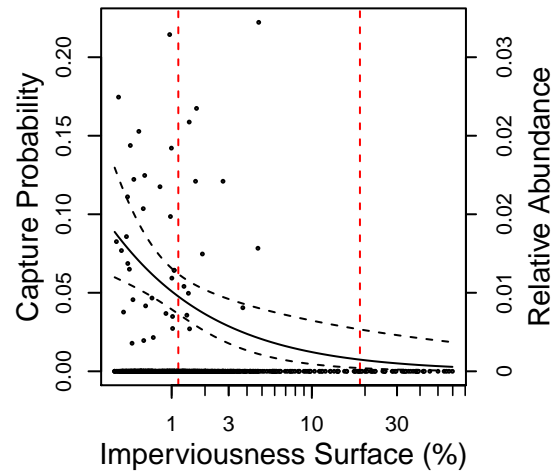
*Psephenus herricki*



*Ranatra australis*

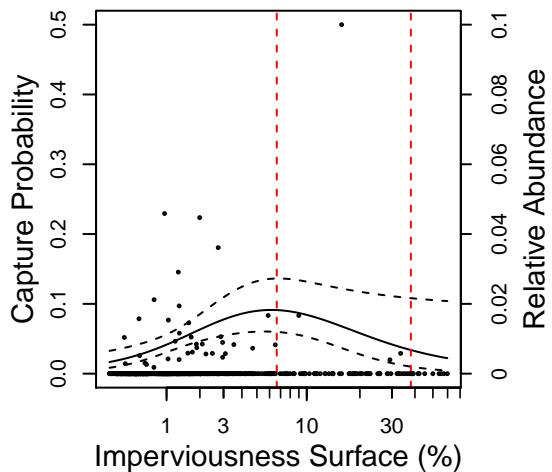


*Ranatra buenoi*

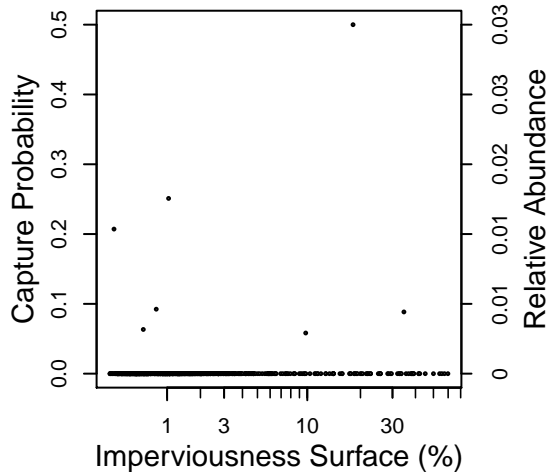


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

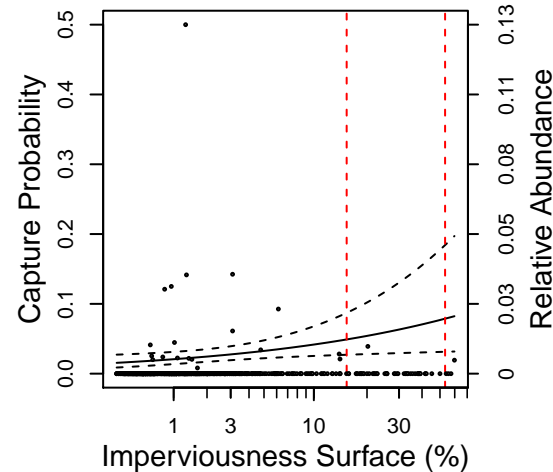
*Ranatra fusca*



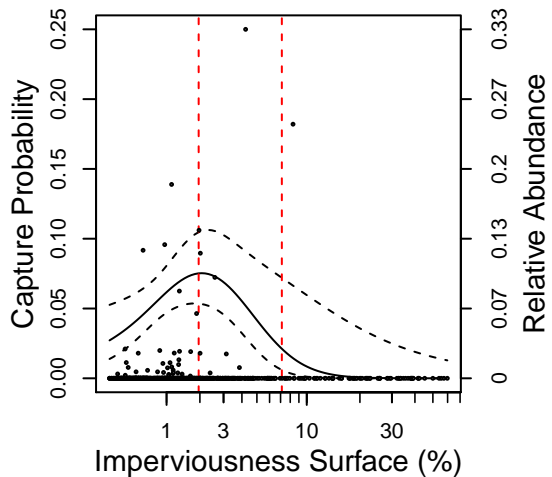
*Ranatra kirkaldyi*



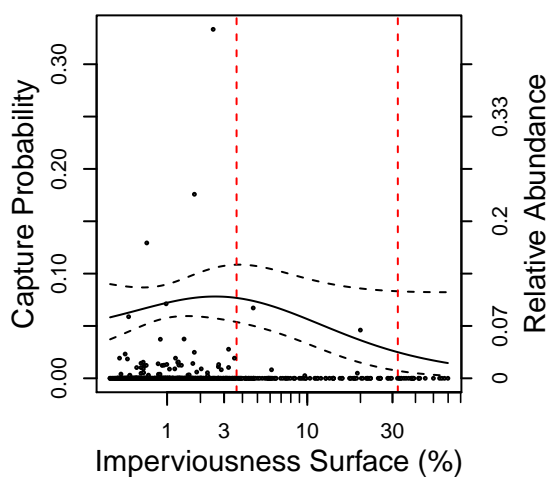
*Ranatra nigra*



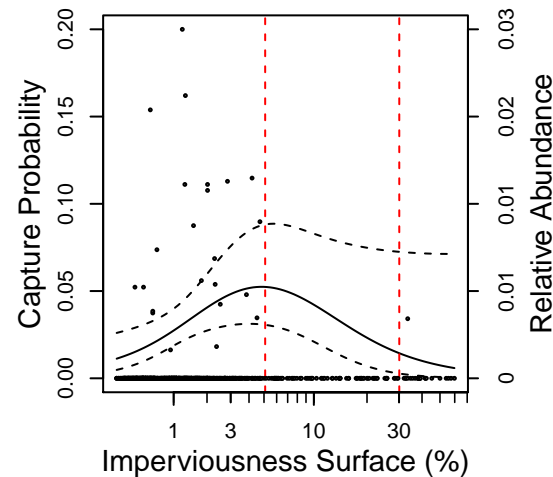
*Rhagovelia obesa*



*Rhagovelia oriander*

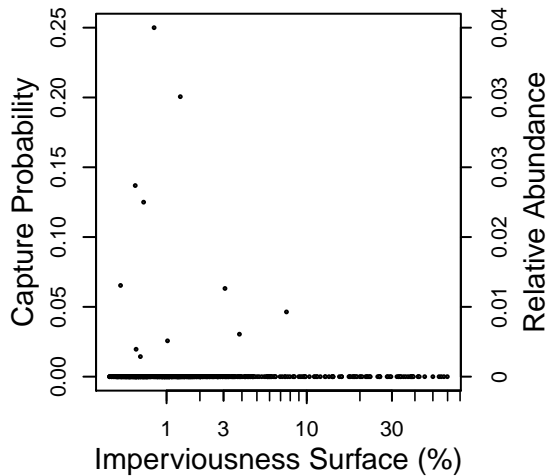


*Rheumatobates palosi*

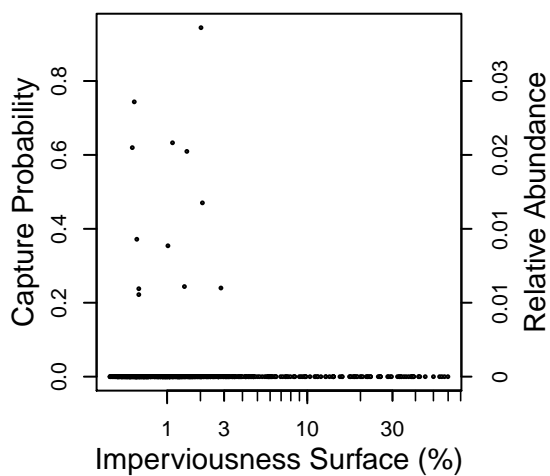


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

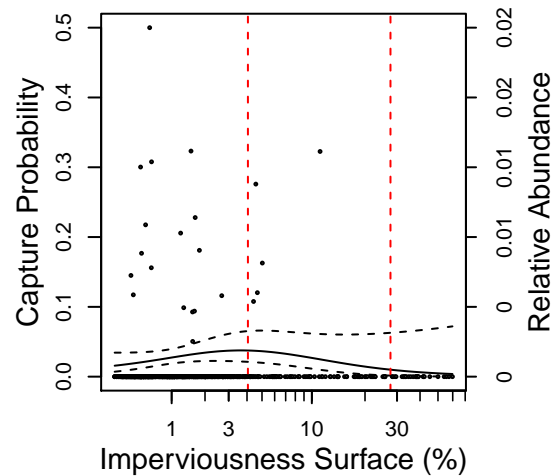
*Rheumatobates rileyi*



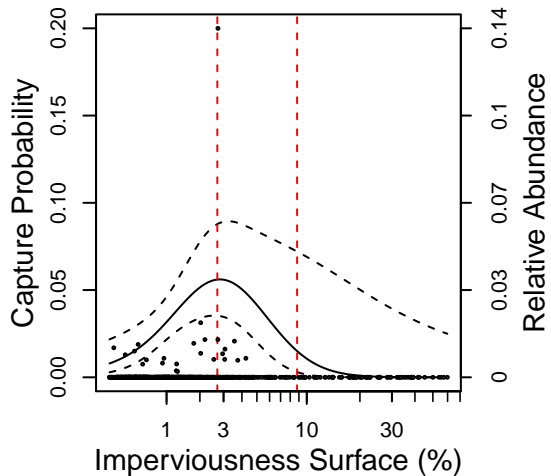
*Rheumatobates tenuipes*



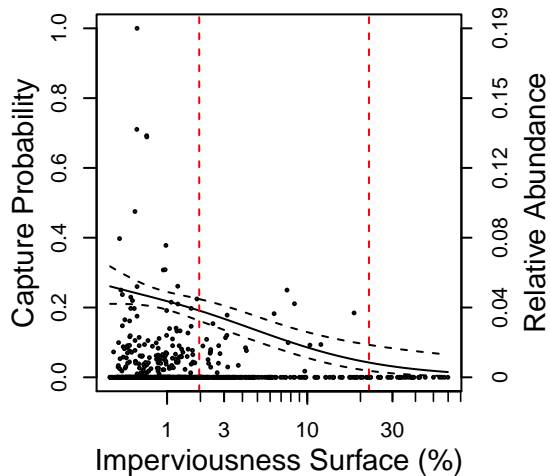
*Saetheria tylus*



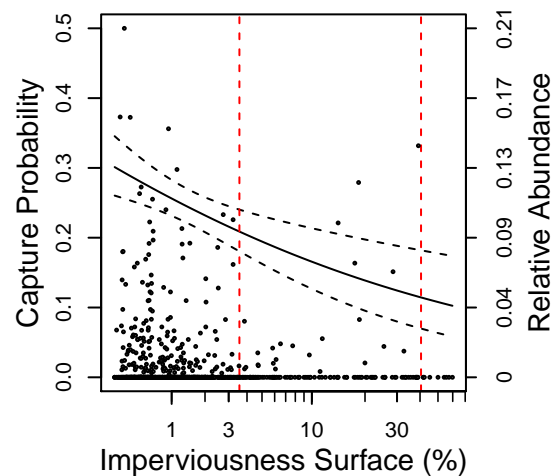
*Sperchopsis tessellata*



*Stenacron interpunctatum*

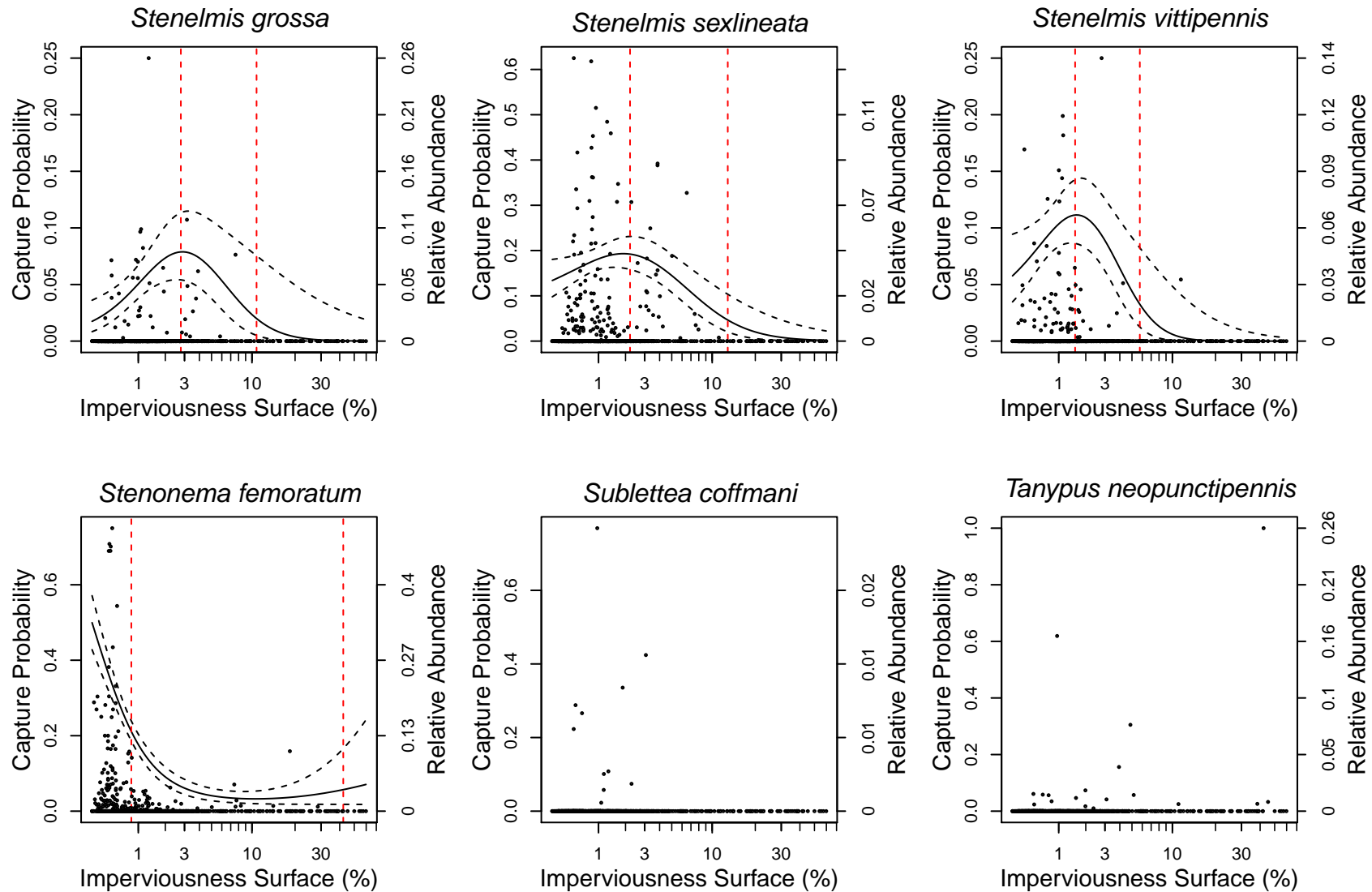


*Stenelmis crenata*



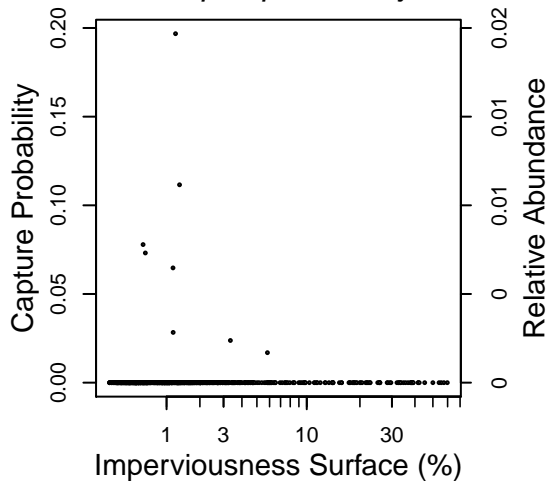


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

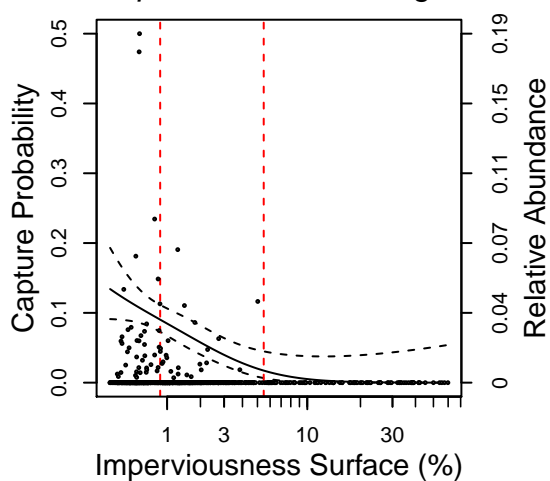


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

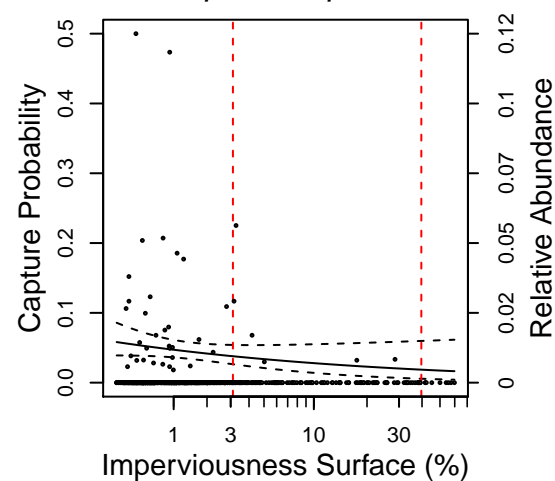
*Telopelopia okoboji*



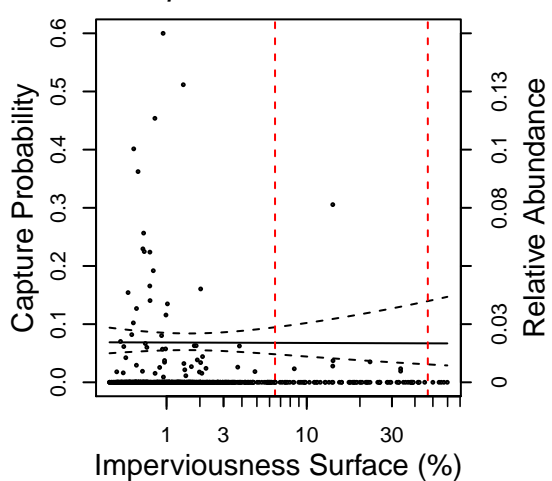
*Trepobates inermis/knighti*



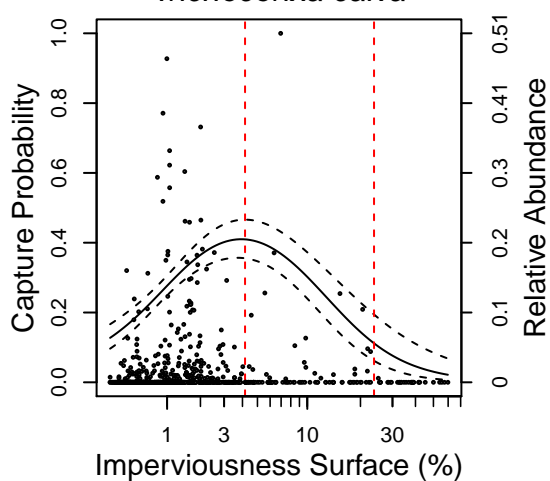
*Trepobates pictus*



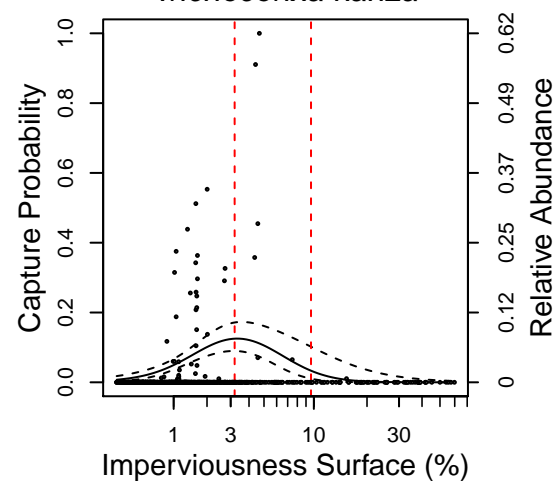
*Trepobates subnitidus*



*Trichocorixa calva*

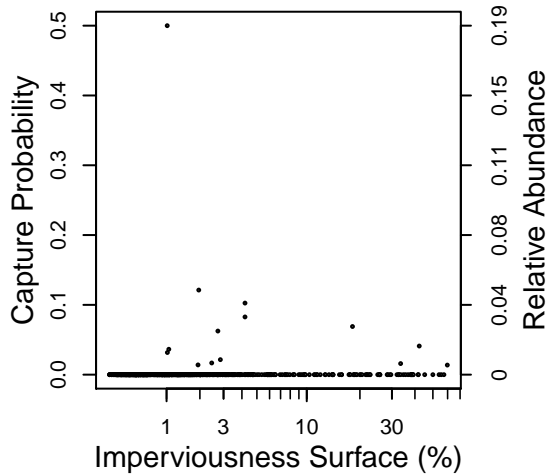


*Trichocorixa kanza*

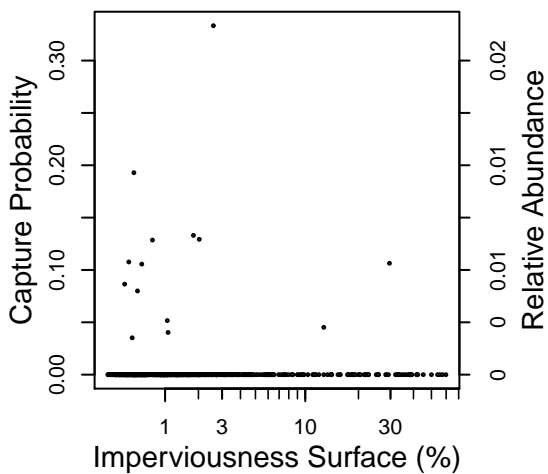


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

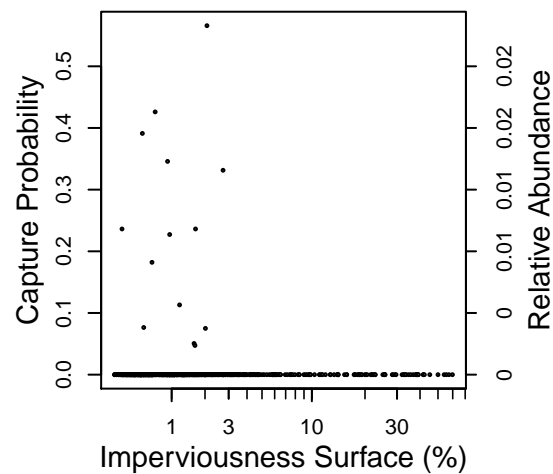
*Trichocorixa sexcincta*



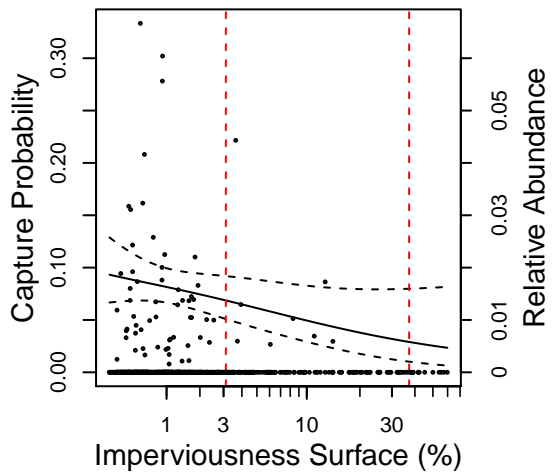
*Tropisternus affinis*



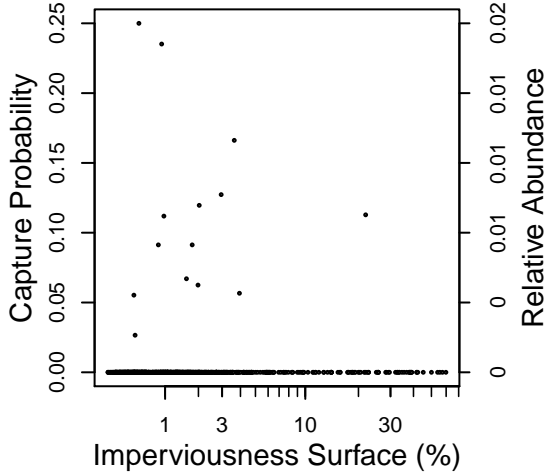
*Tropisternus collaris*



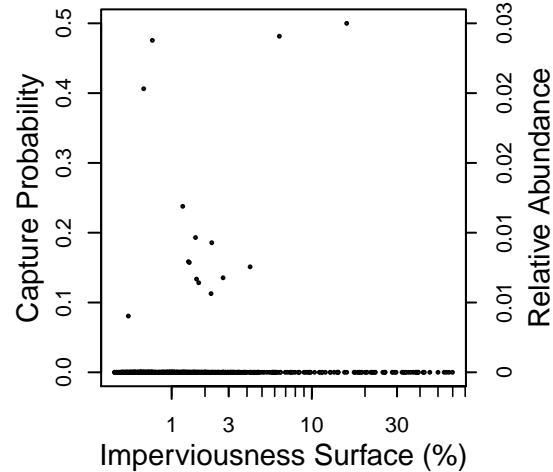
*Tropisternus glaber*



*Tropisternus lateralis*

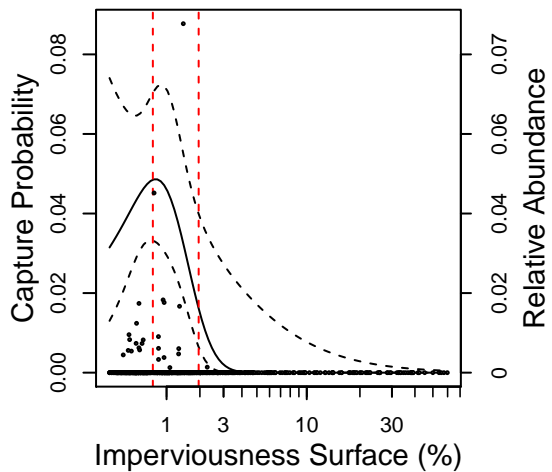


*Tropisternus mixtus*

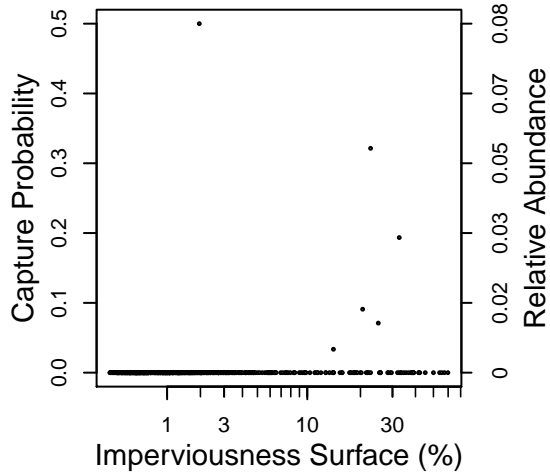


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

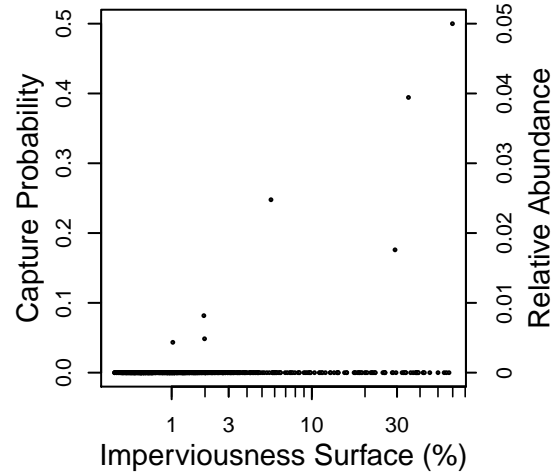
*Tropisternus natator*



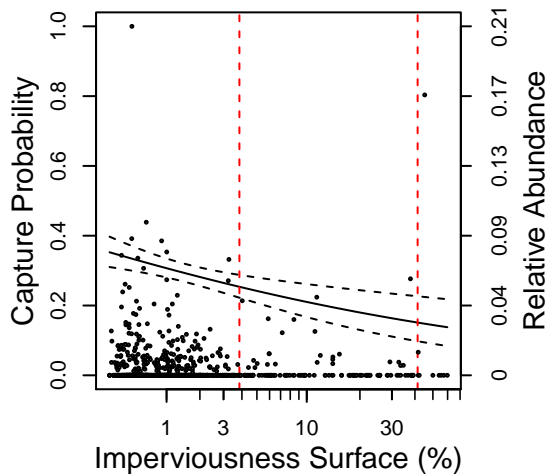
*Valvata bicarinata*



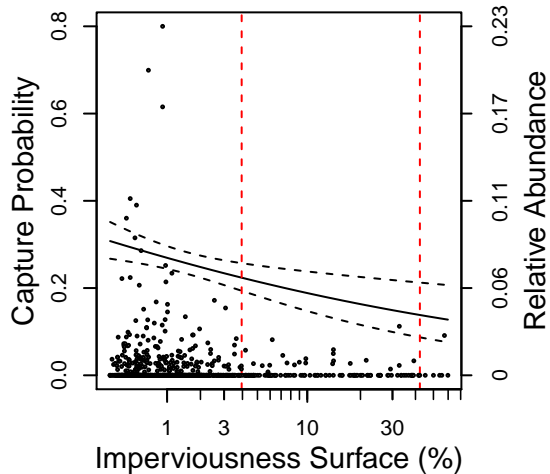
*Zavreliella marmorata*



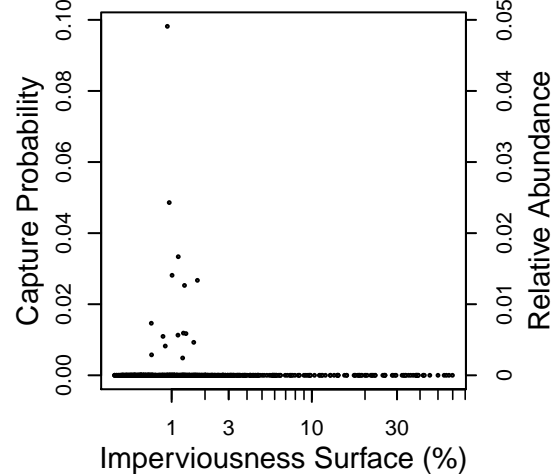
*Ablabesmyia*



*Acari*

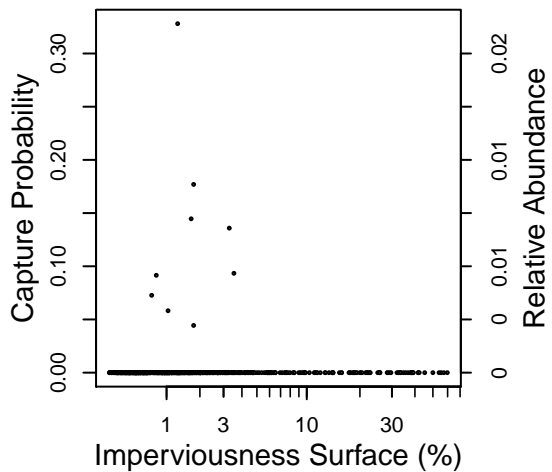


*Acentrella*

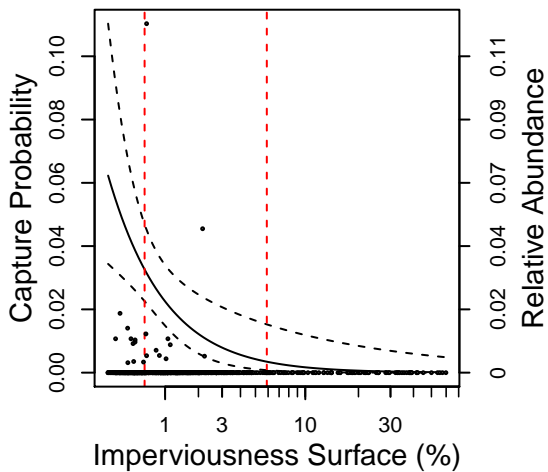


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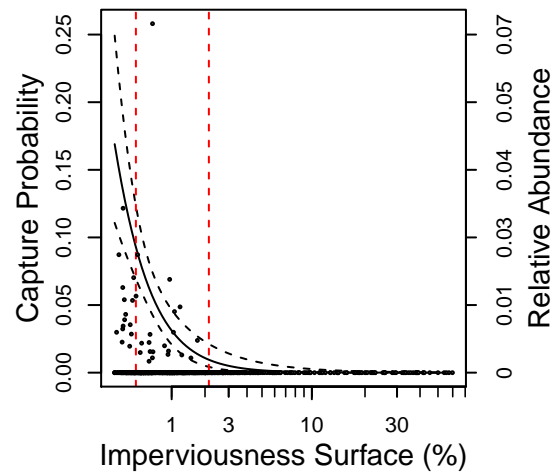
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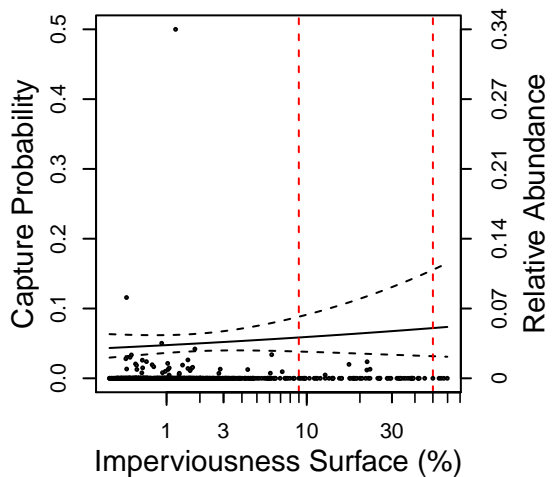
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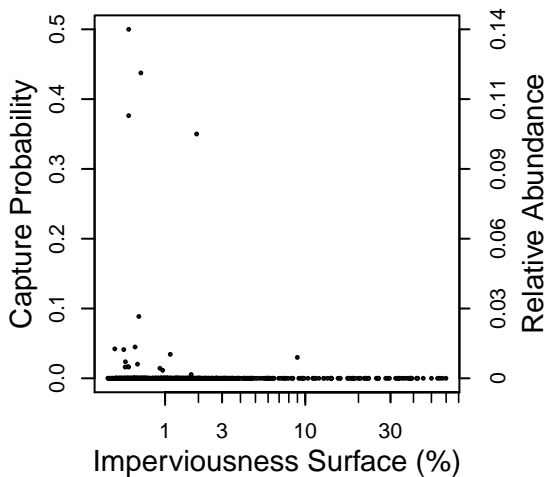
*Acroneuria*



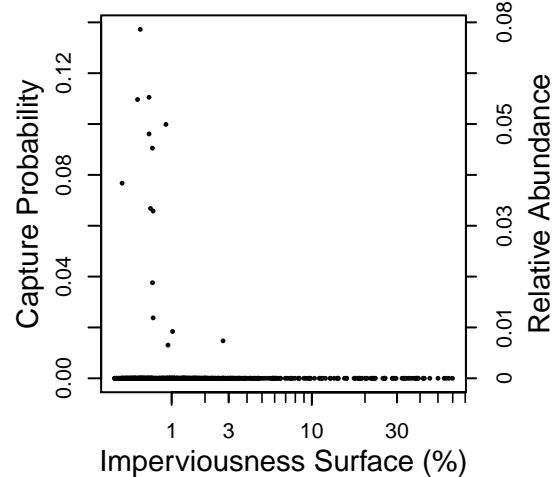
*Aeshna*



*Agabus*

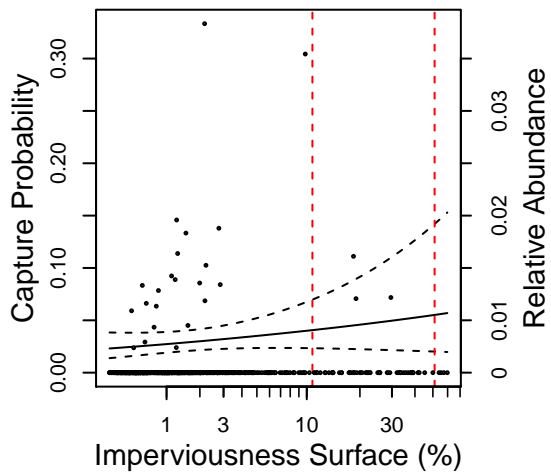


*Agnatina*

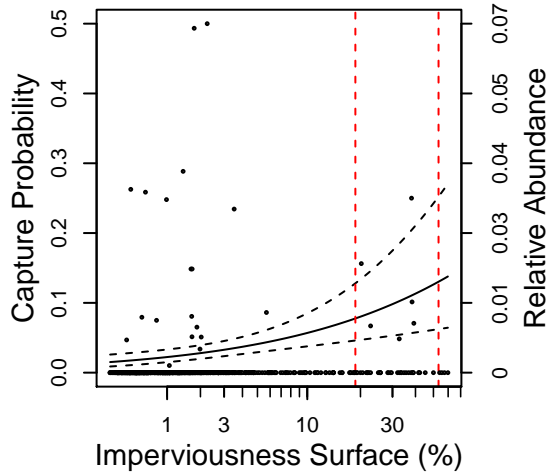


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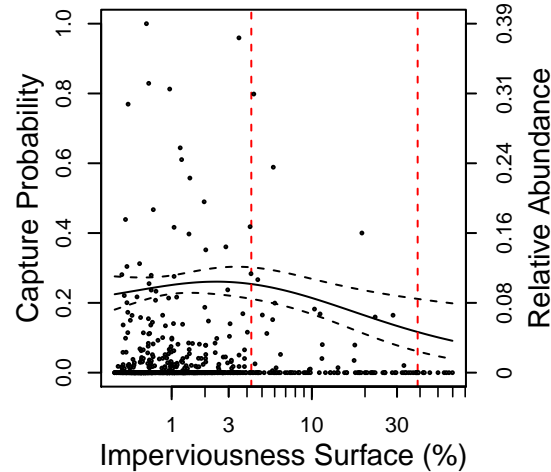
*ANACAENA*



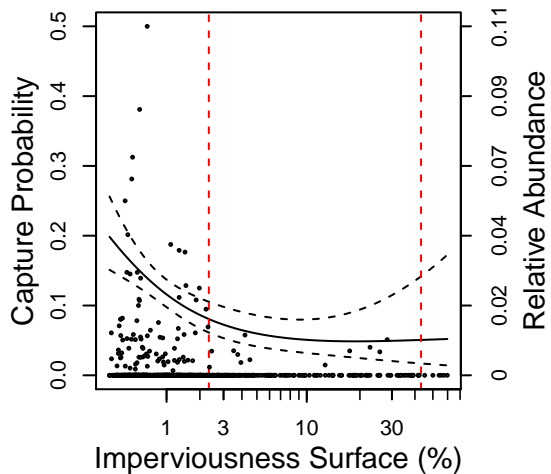
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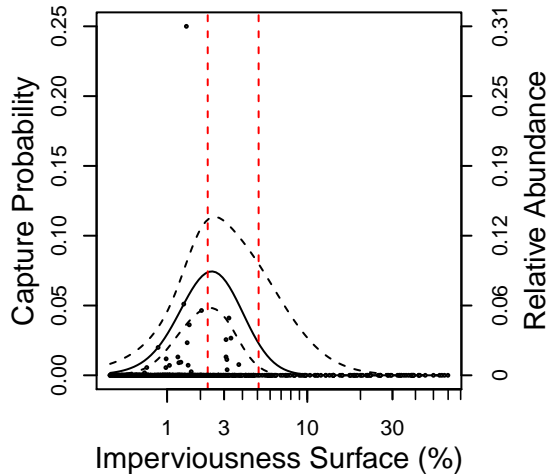
*Ancyronyx*



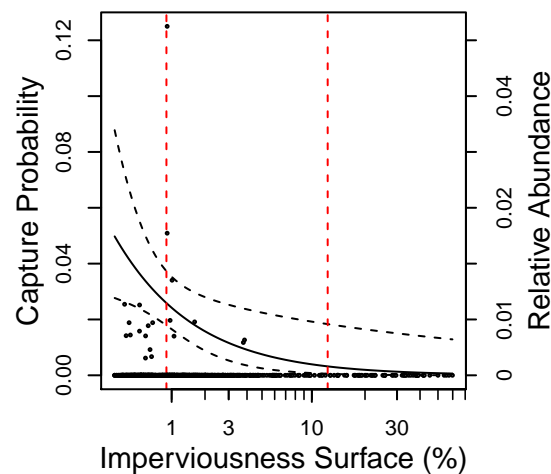
*Anopheles*



*Anthopotamus*

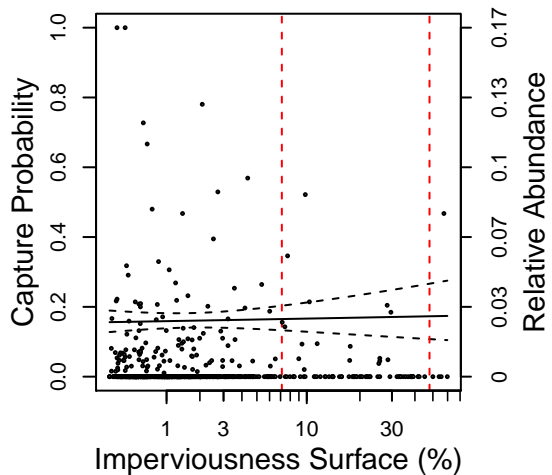


*Antocha*

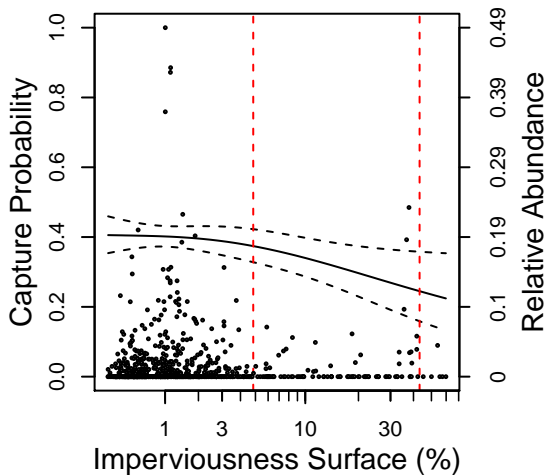


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

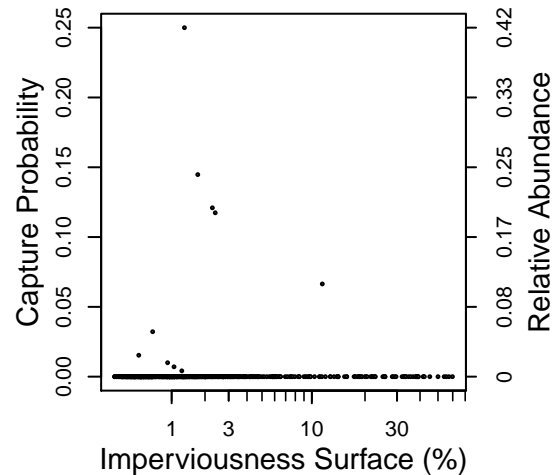
*Aquarius*



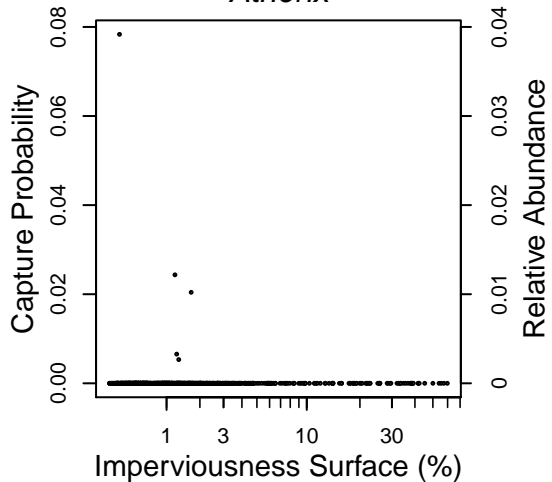
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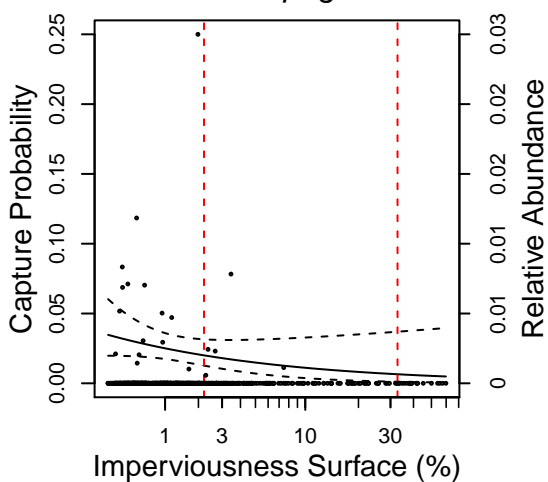
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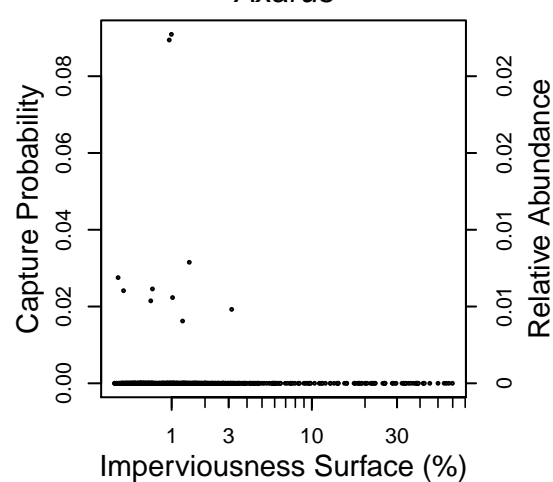
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*Atrichopogon*

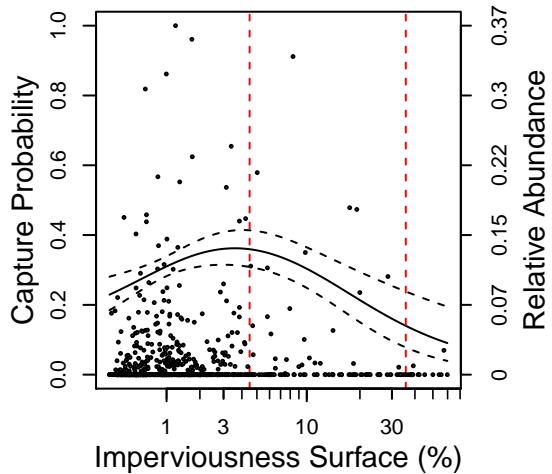


*Axarus*

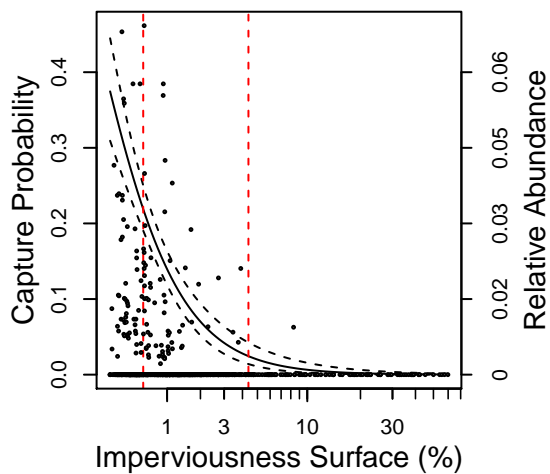


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

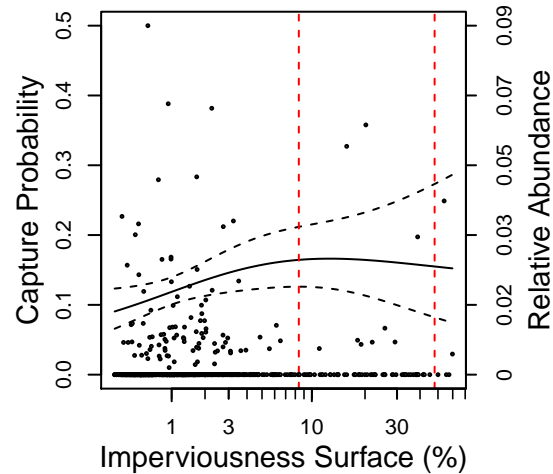
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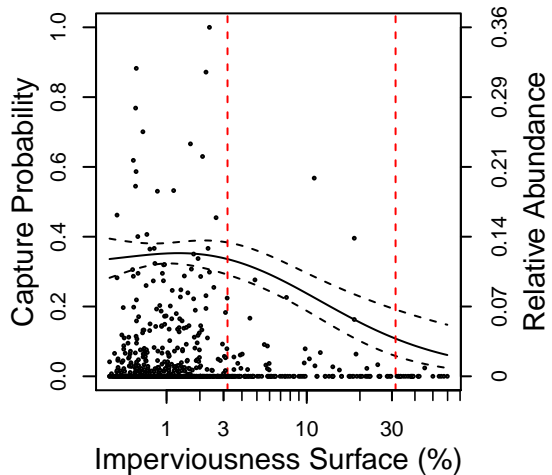
*Basiaeschna*



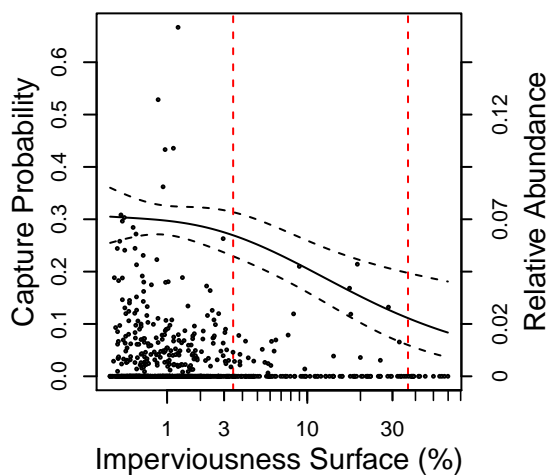
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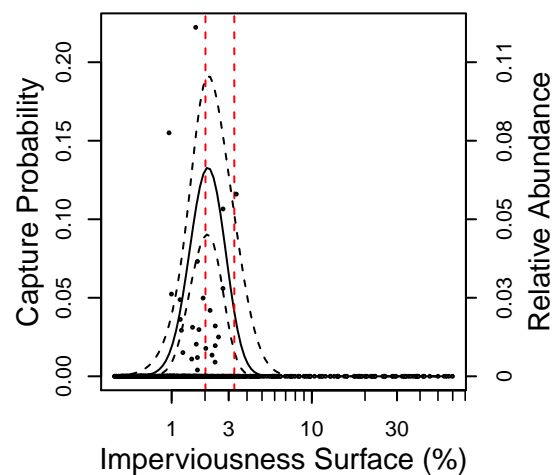
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*Boyeria*



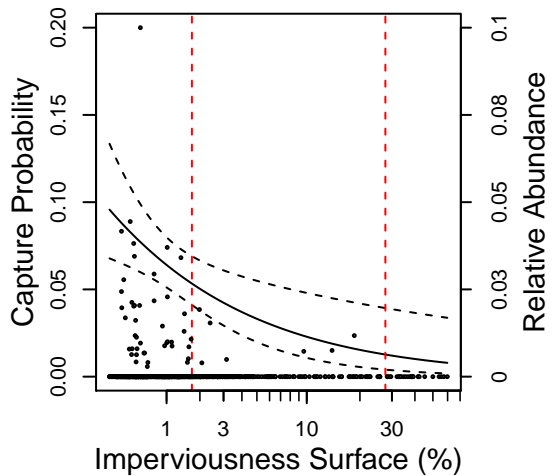
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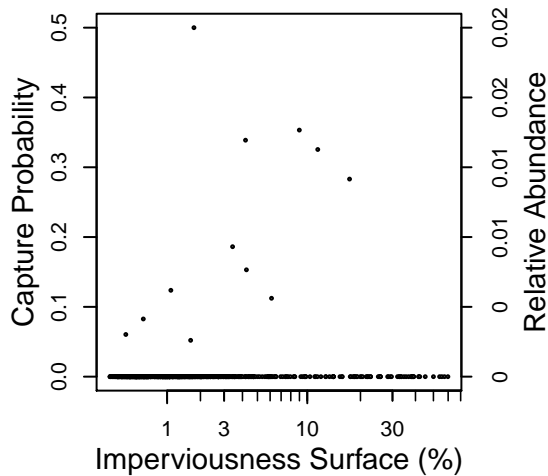


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

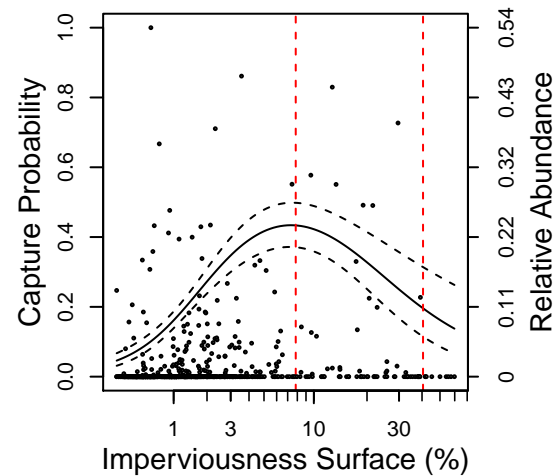
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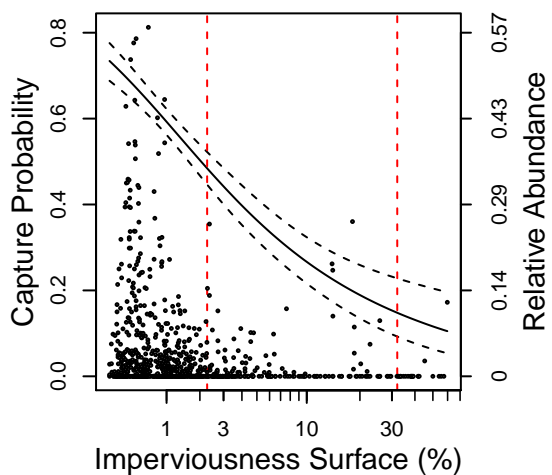
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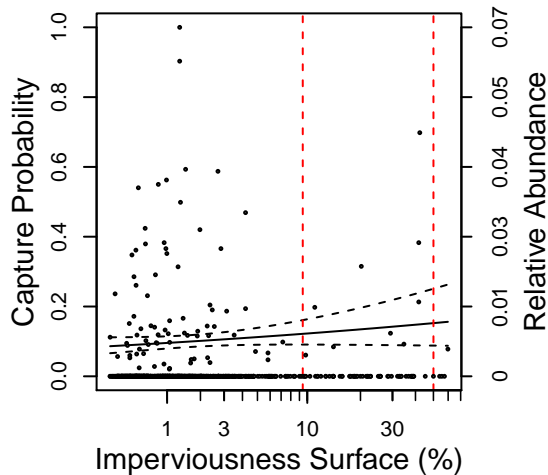
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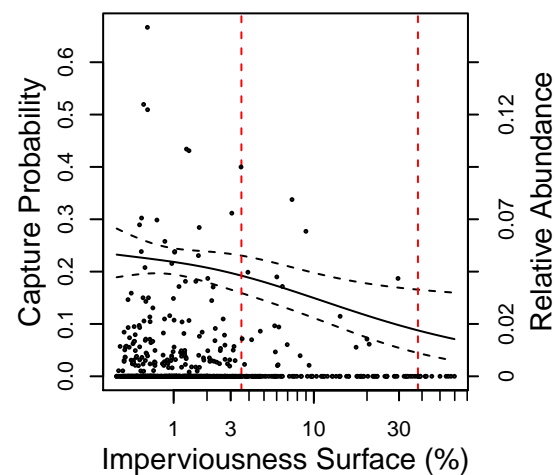
*Caenis*



*Callibaetis*

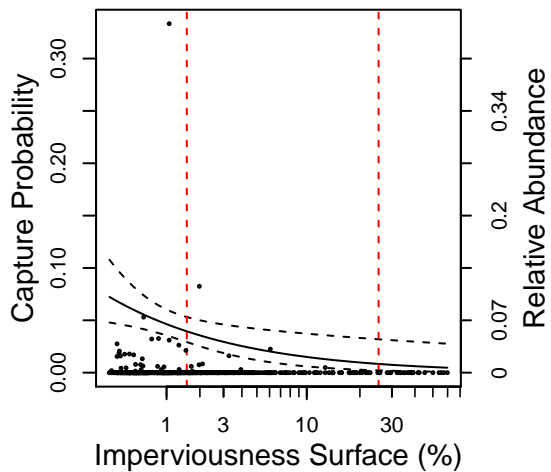


*Calopteryx*

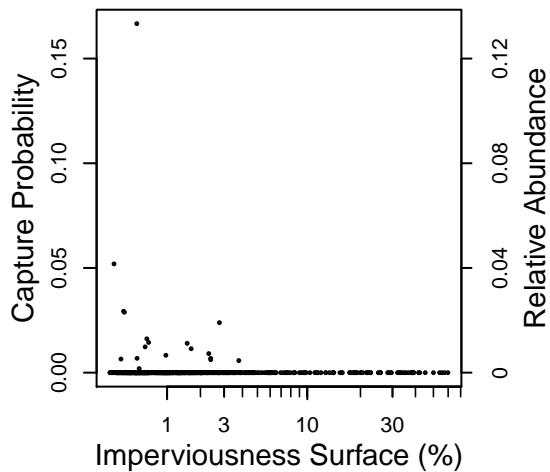


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

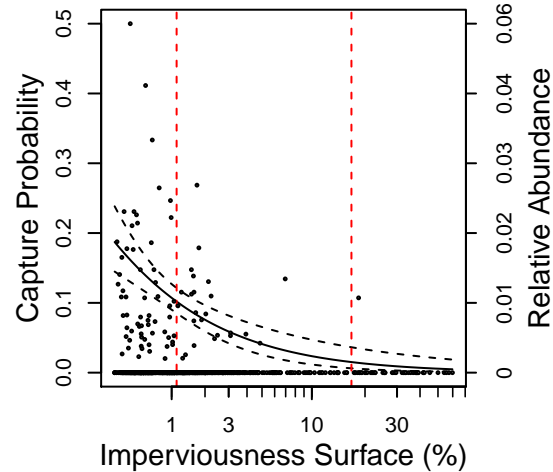
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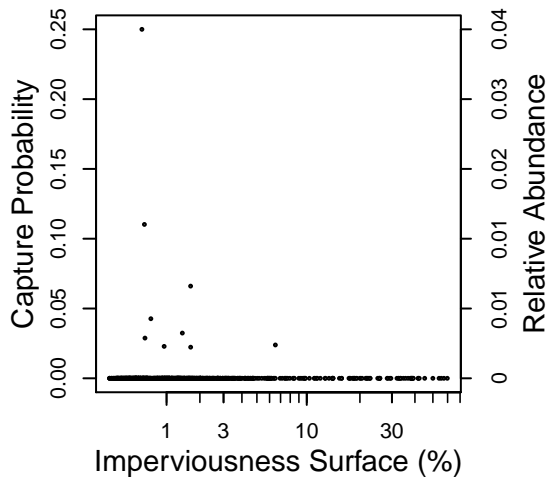
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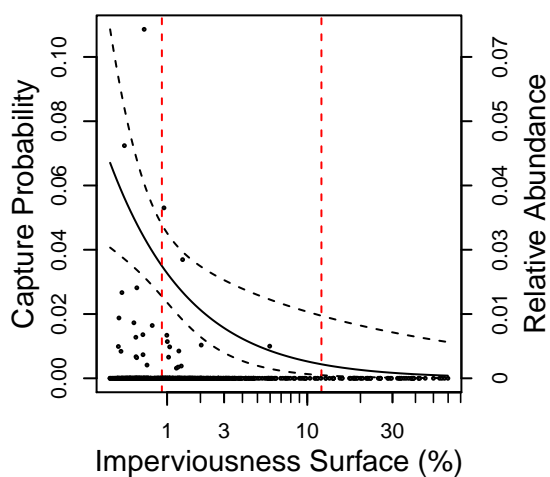
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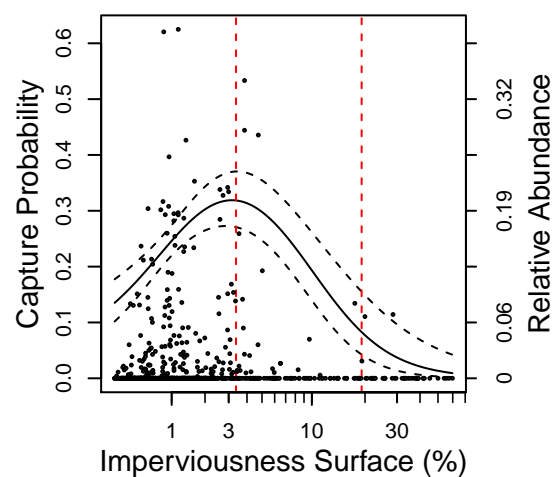
*Ceraclea*



*Ceratopogon*

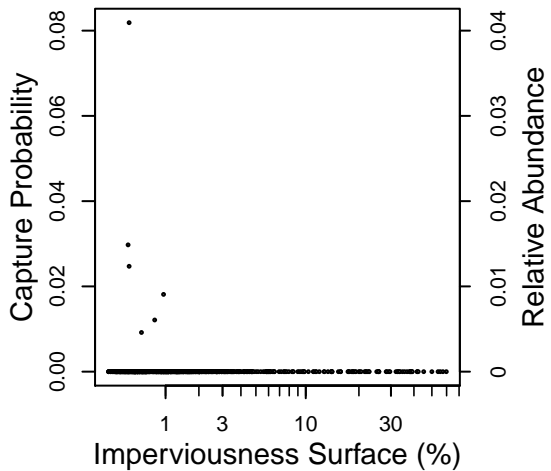


*Ceratopsyche*

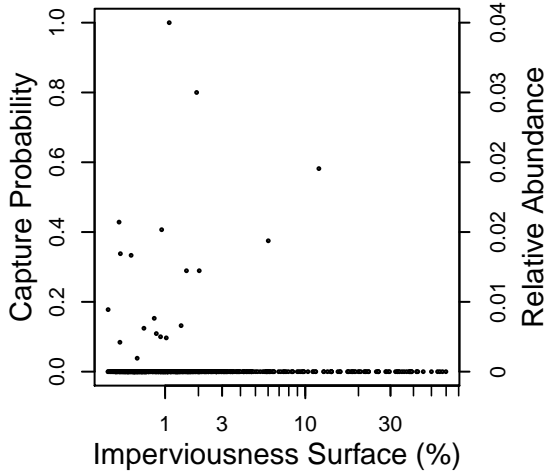


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

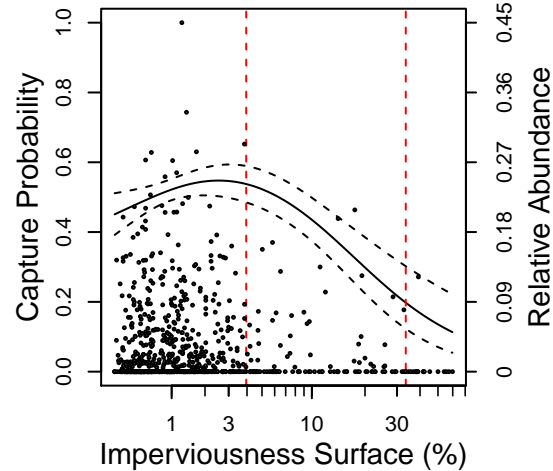
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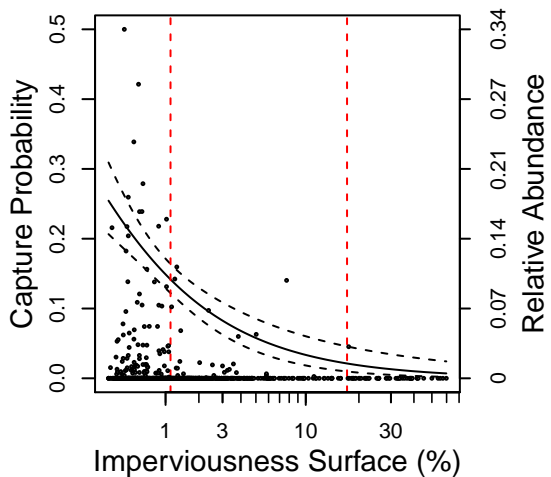
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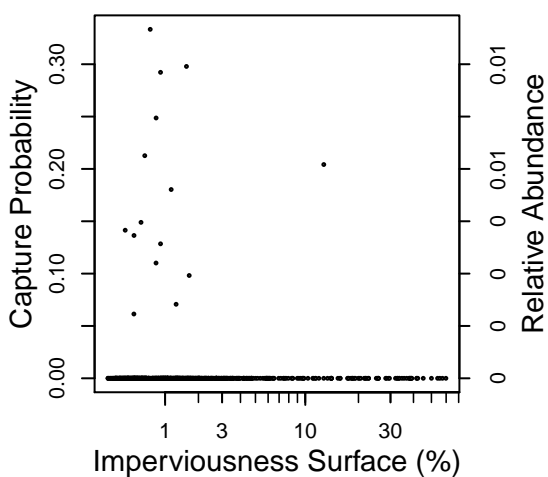
*Cheumatopsyche*



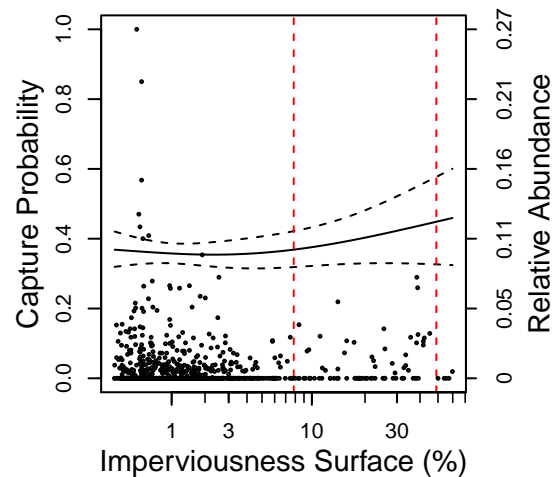
*Chimarra*



*Chironominae*

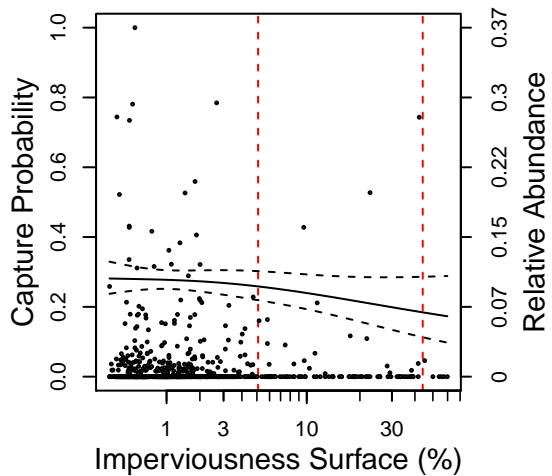


*Chironomini*

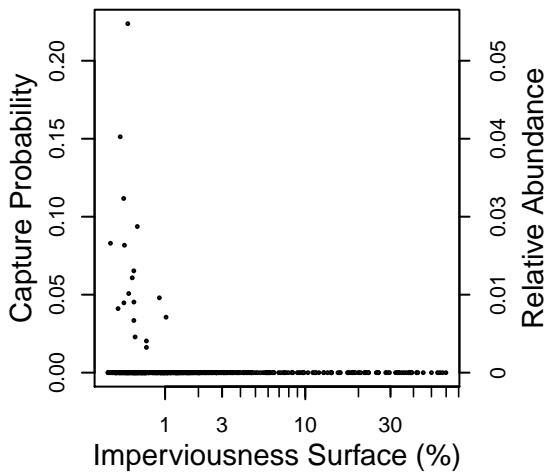


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

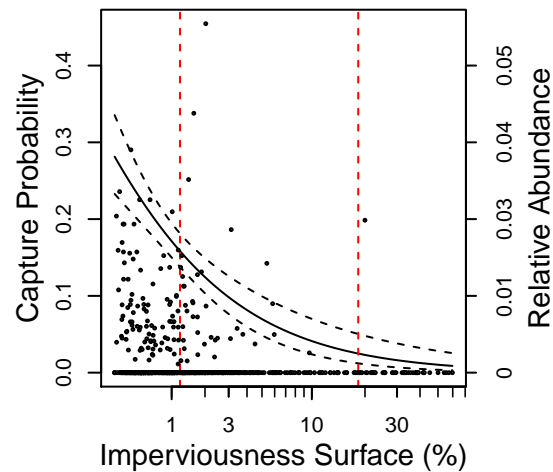
*Chironomus*



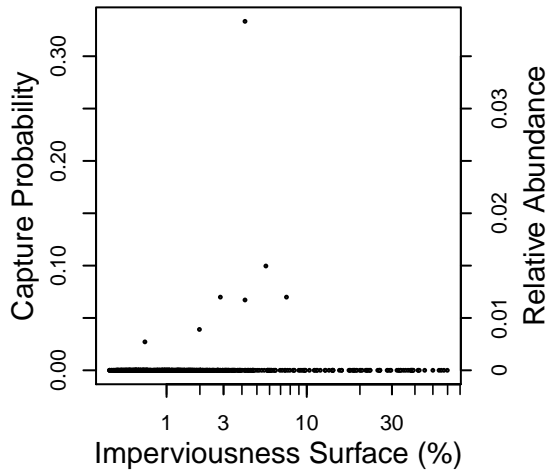
*Choroterpes*



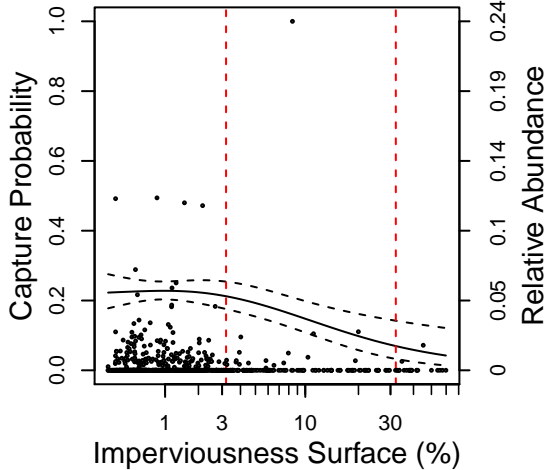
*Chrysops*



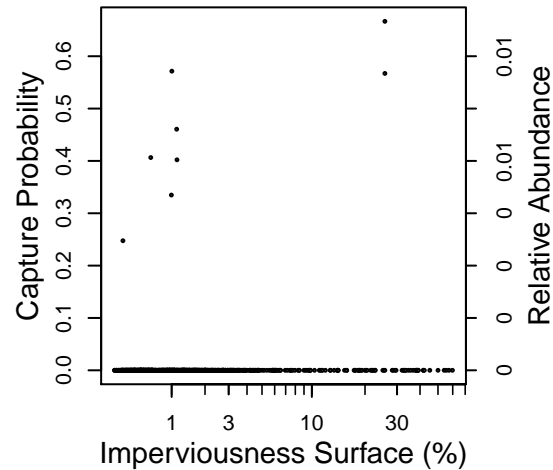
*Cladopelma*



*Cladotanytarsus*

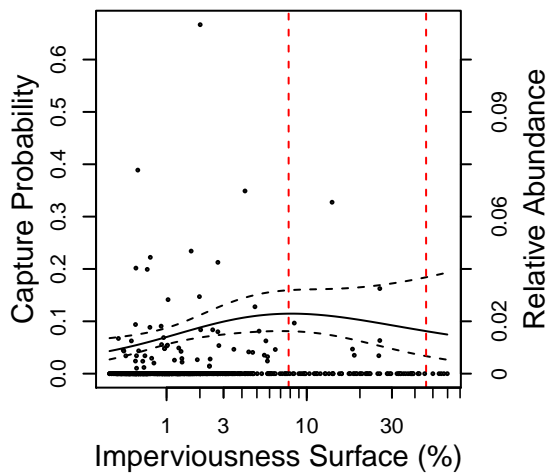


*Climacia*

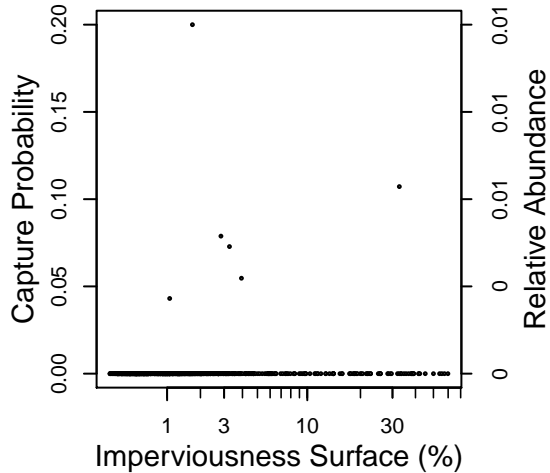


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

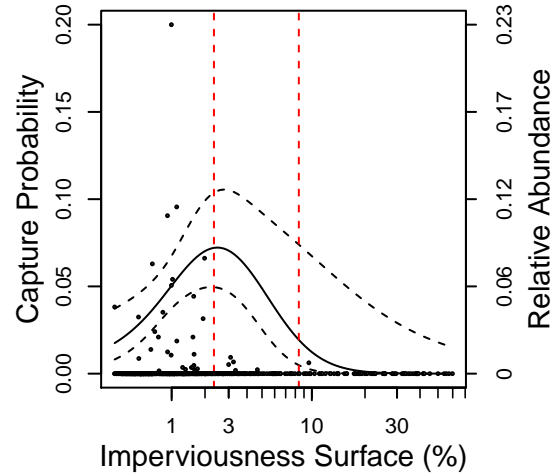
*Clinotanytus*



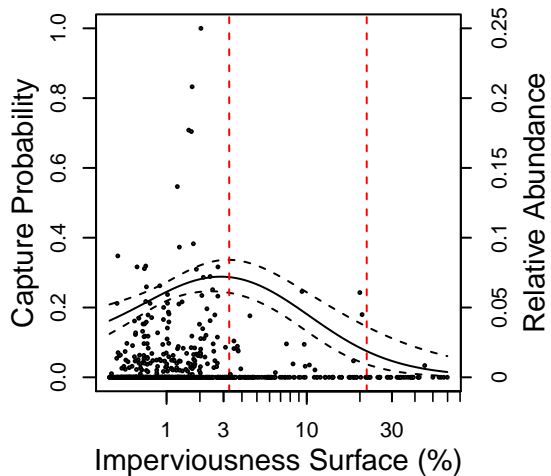
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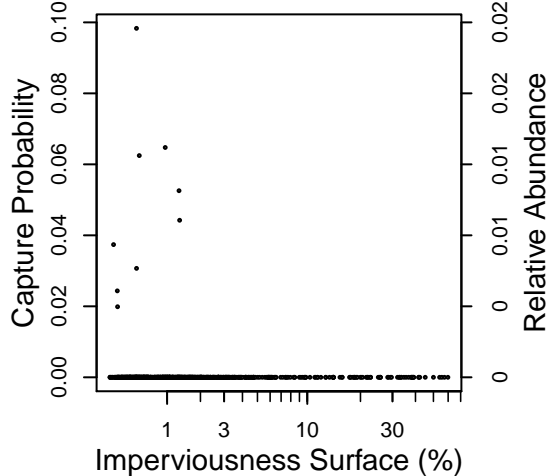
*Coptotomus*



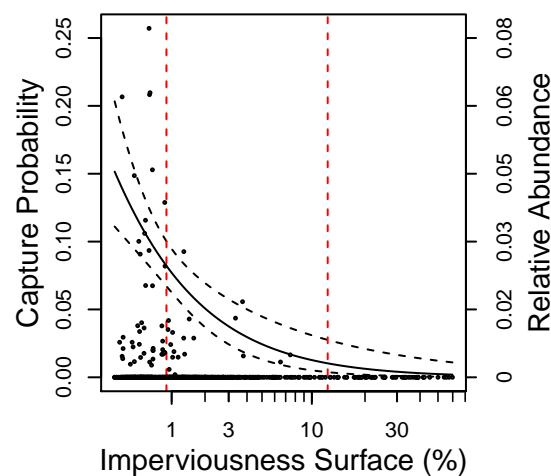
*Corbicula*



*Cordulegaster*

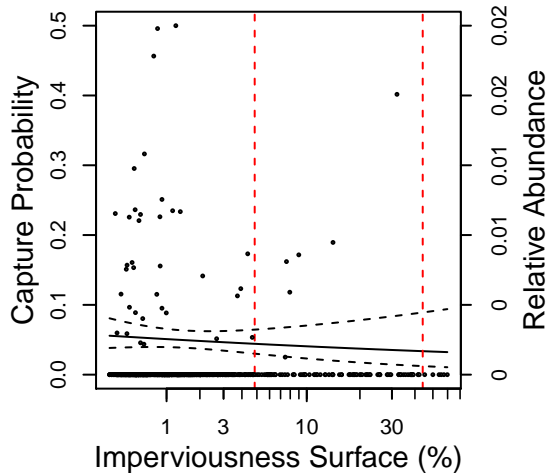


*Corydalus*

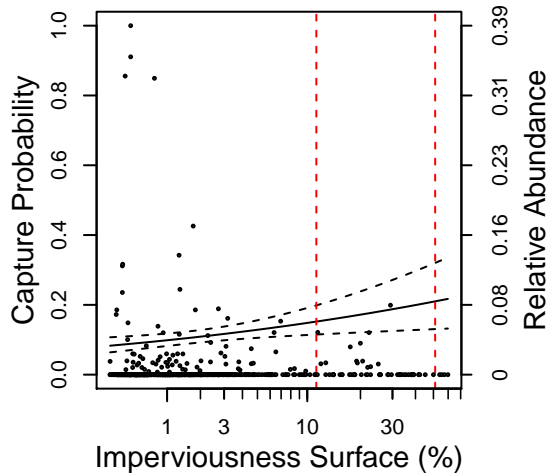


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

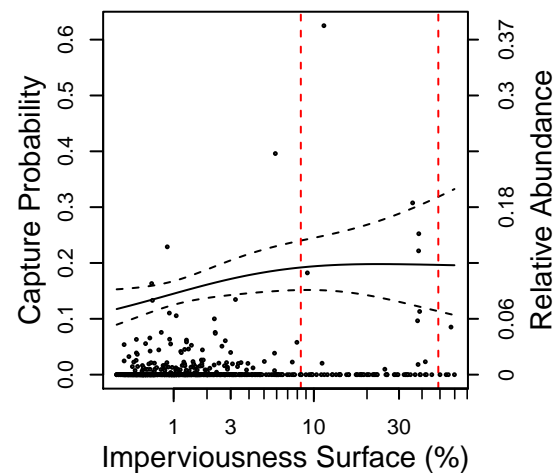
*Corynoneura*



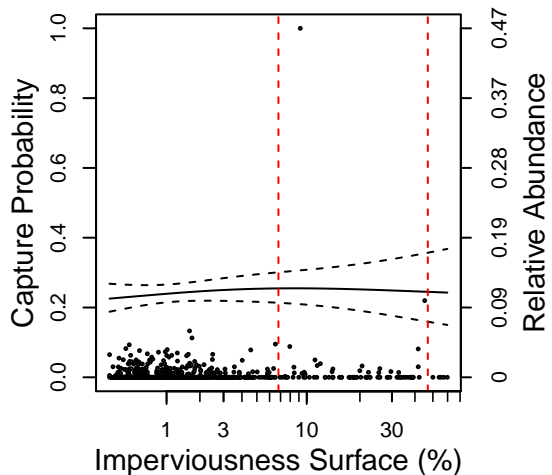
*Crangonyx*



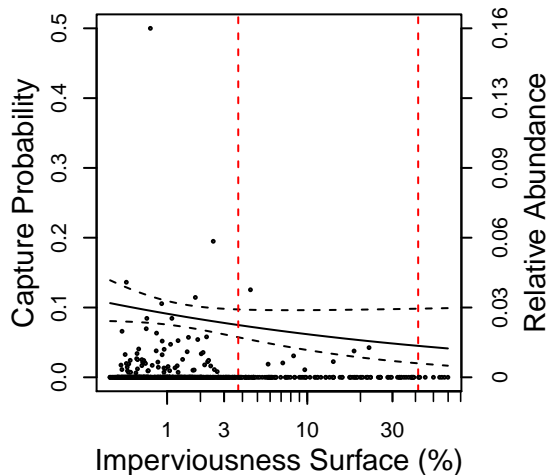
*Cricotopus*



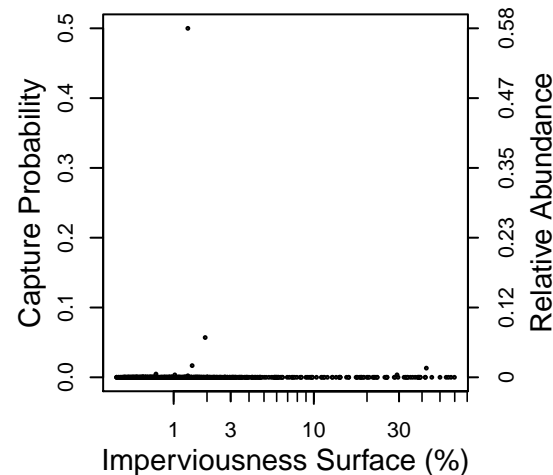
*Cryptochironomus*



*Cryptotendipes*

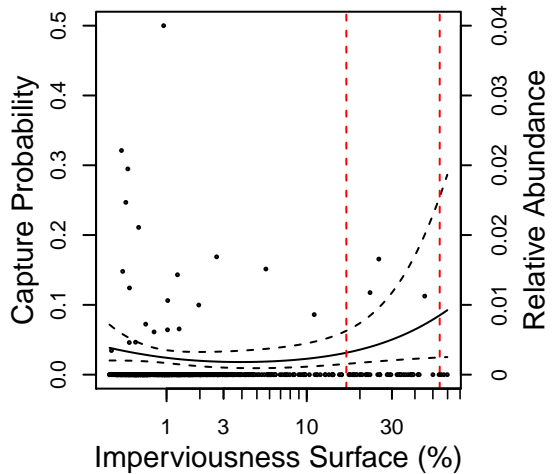


*Culex*

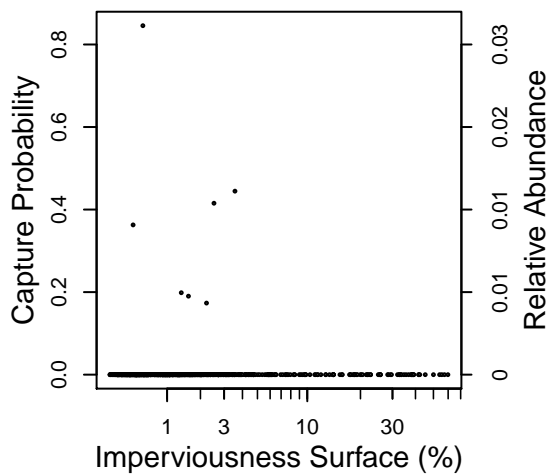


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

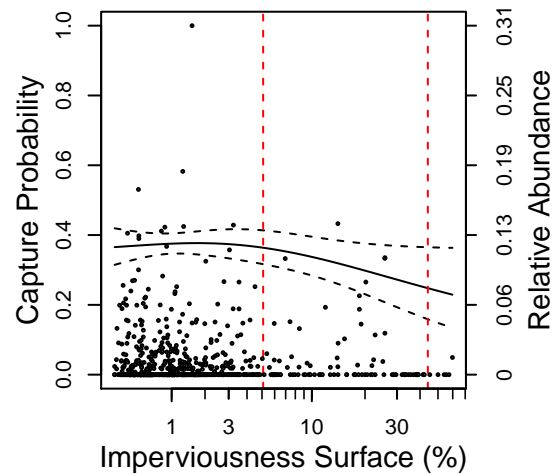
*Culicoides*



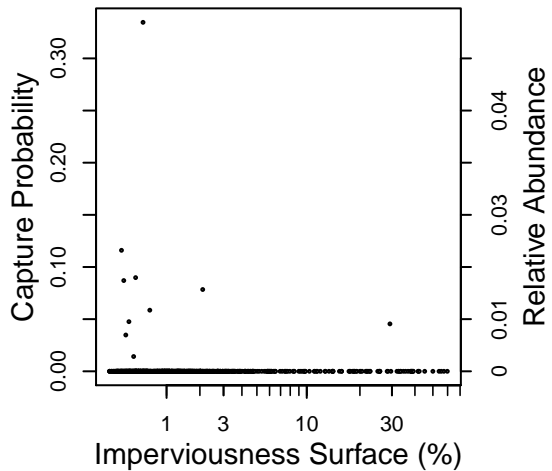
*Cymbiodyta*



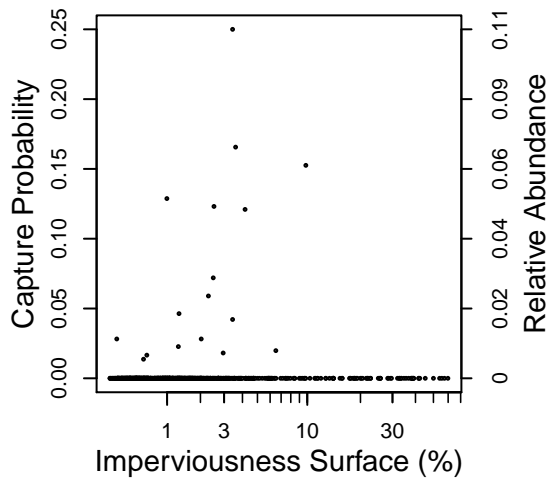
*Cyphon*



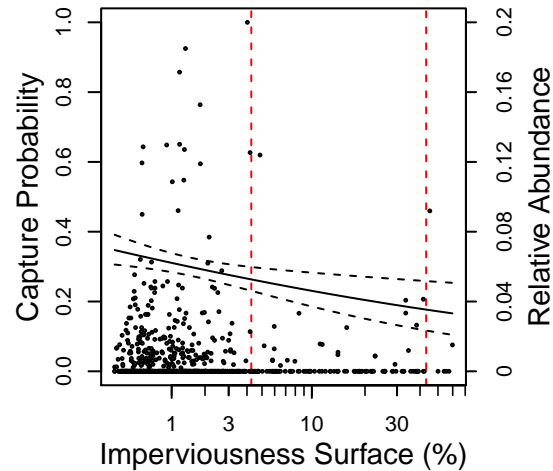
*Dasyhelea*



*Dicranota*

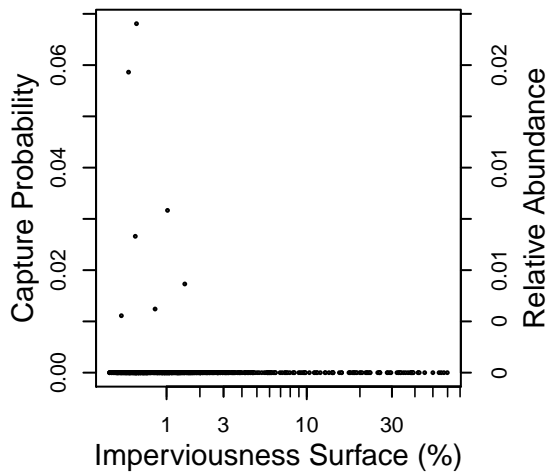


*Dicrotendipes*

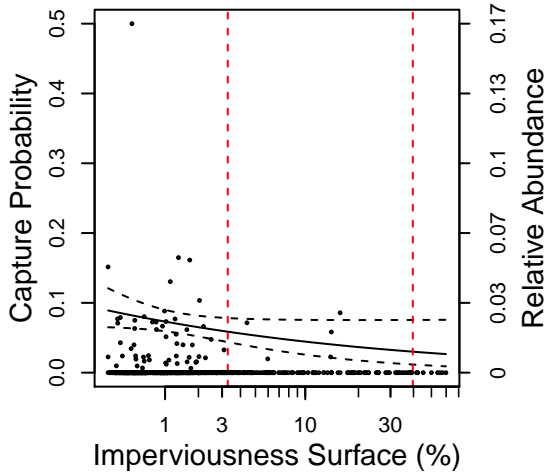


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

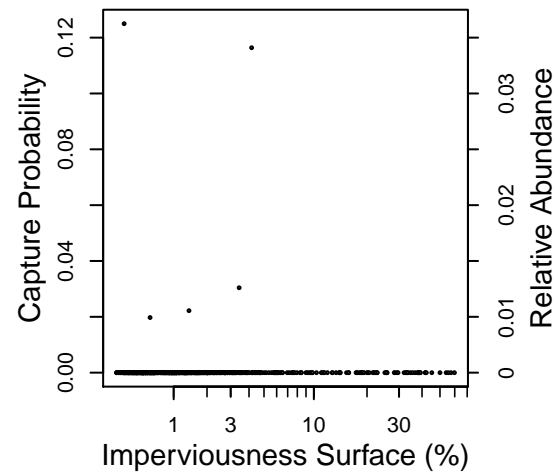
*Didymops*



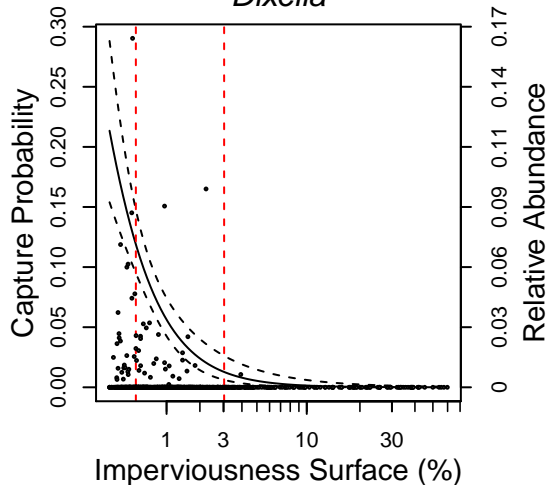
*Dineutus*



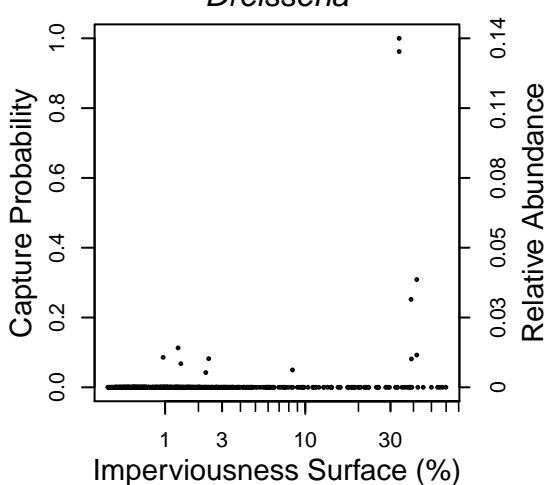
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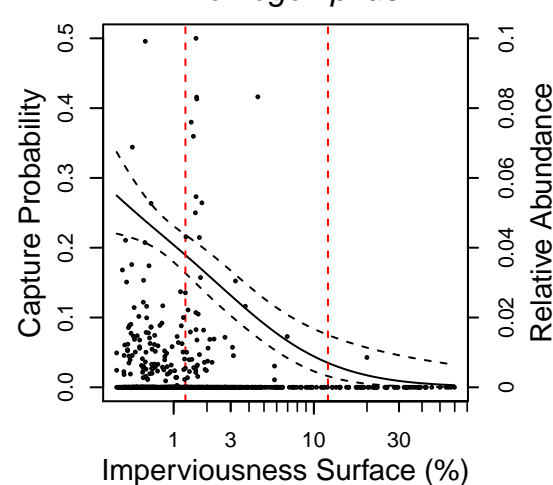
*Dixella*



*Dreissena*



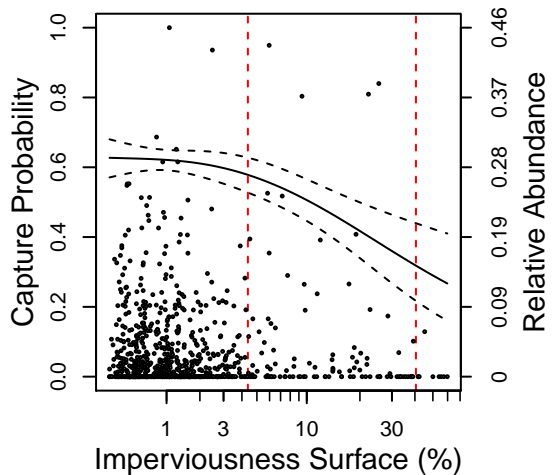
*Dromogomphus*



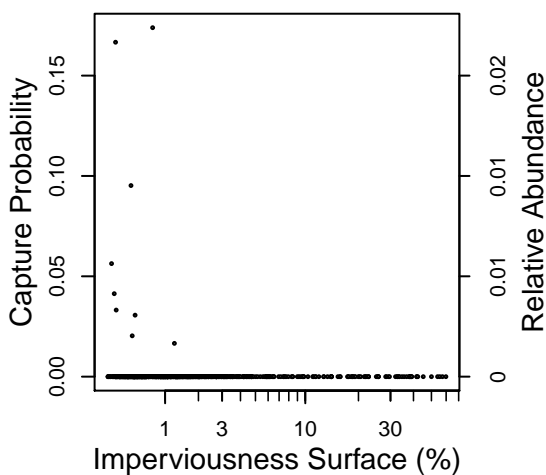


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

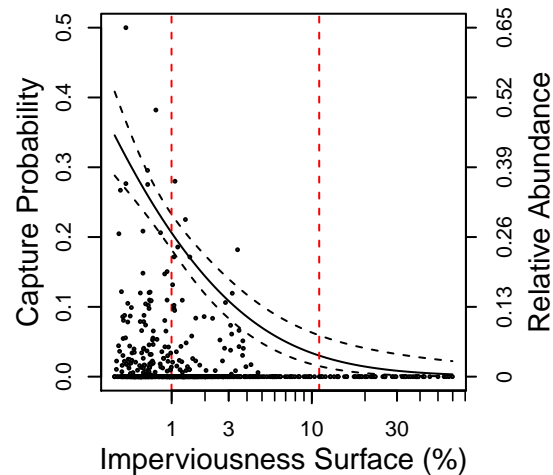
*Dubiraphia*



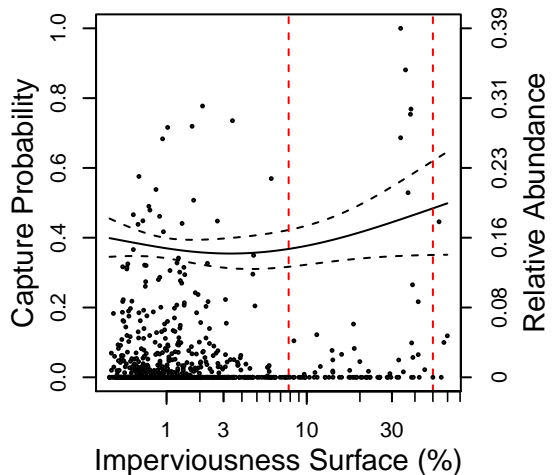
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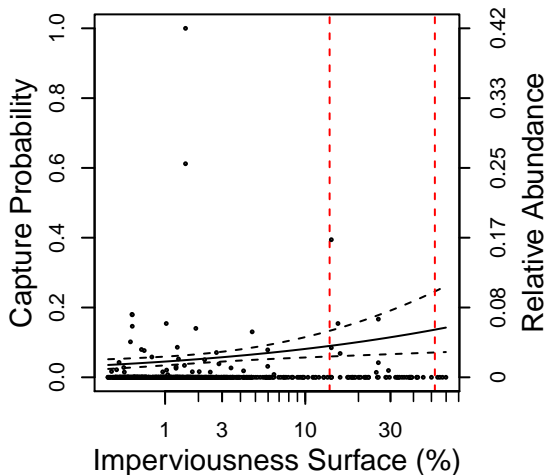
*Elimia*



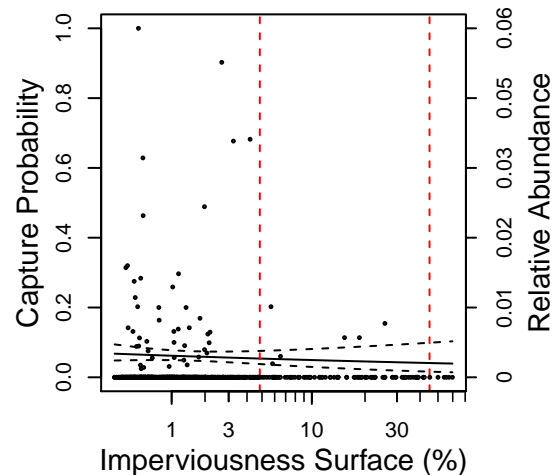
*Enallagma*



*Endochironomus*

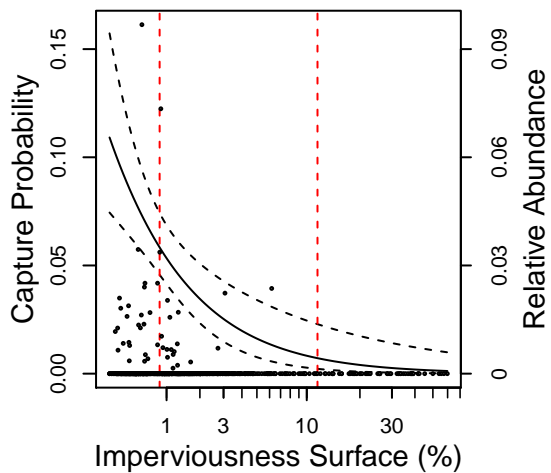


*Enochrus*

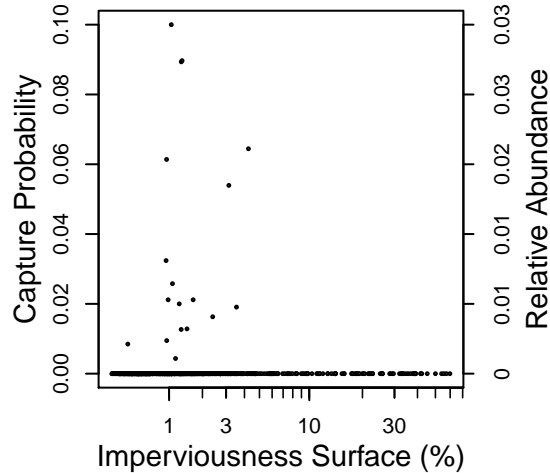


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

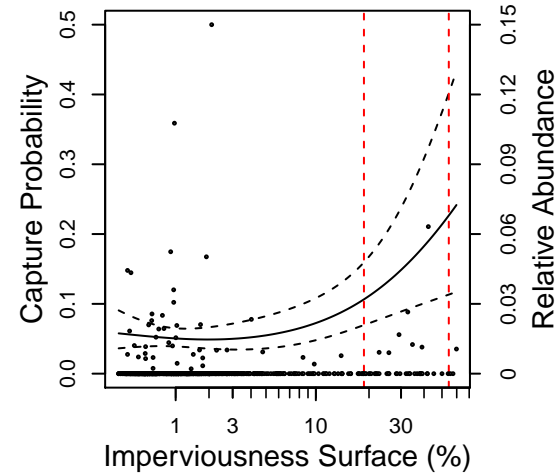
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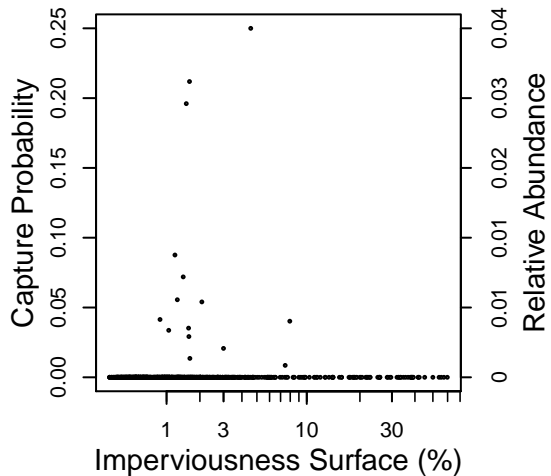
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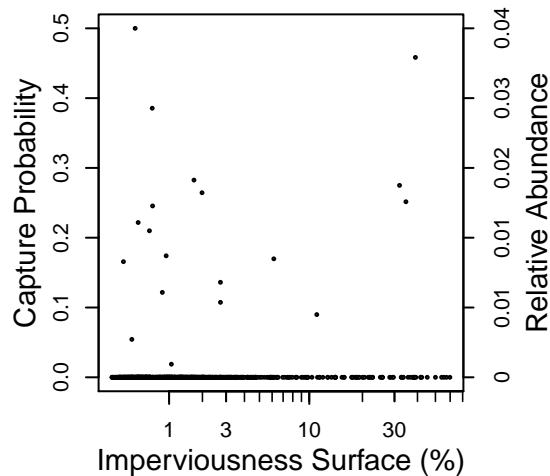
*Epitheca*



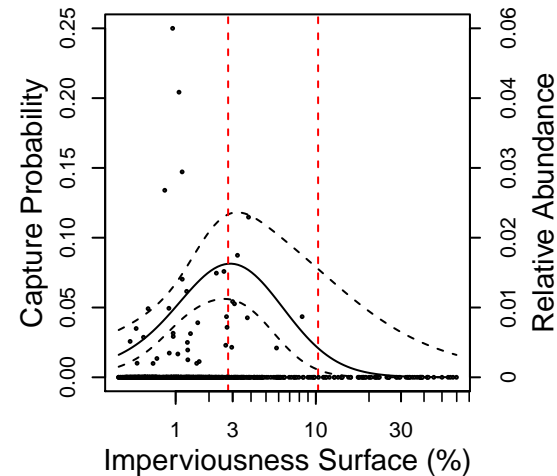
*Erpetogomphus*



*Erythemis*

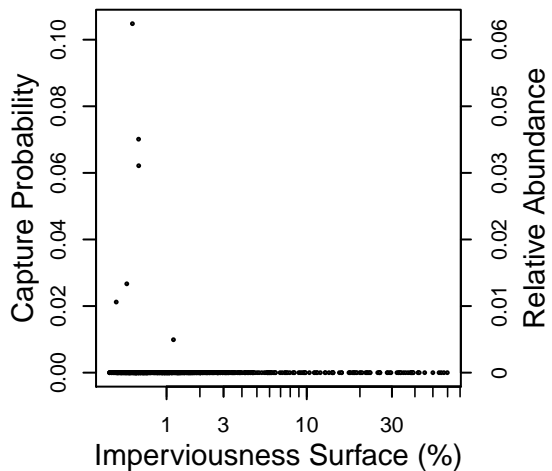


*Eukiefferiella*

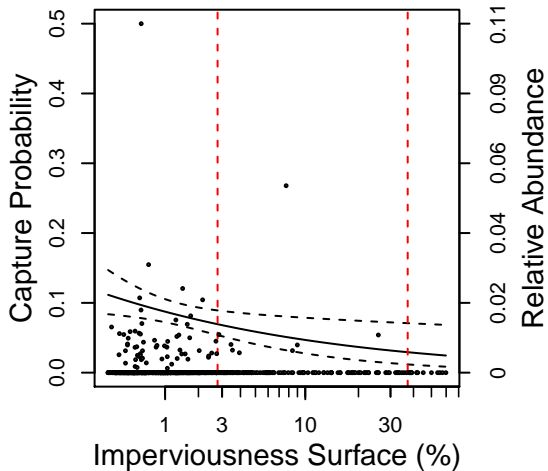


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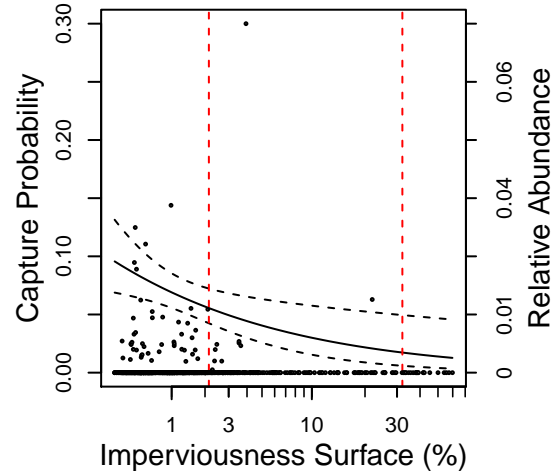
*Eurylophella*



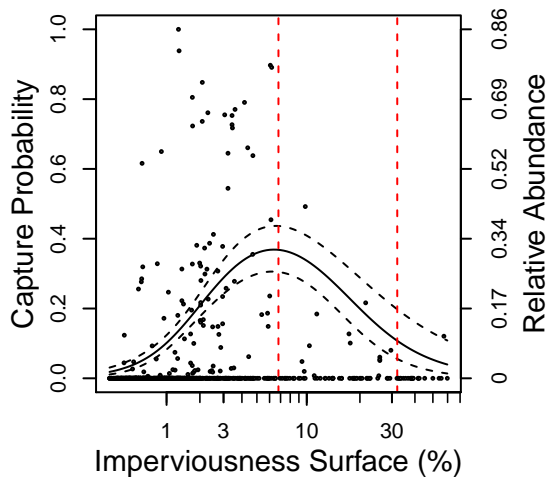
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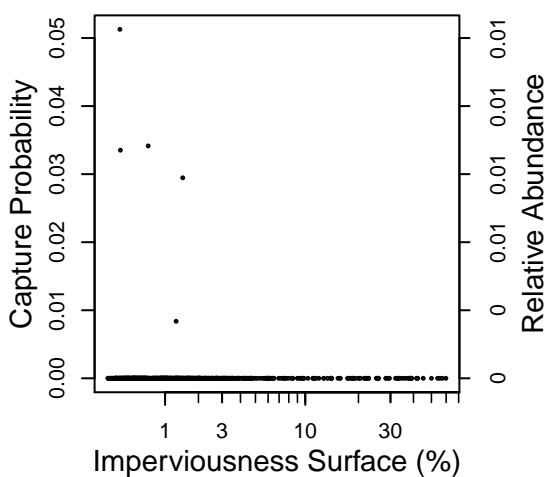
*Fossaria*



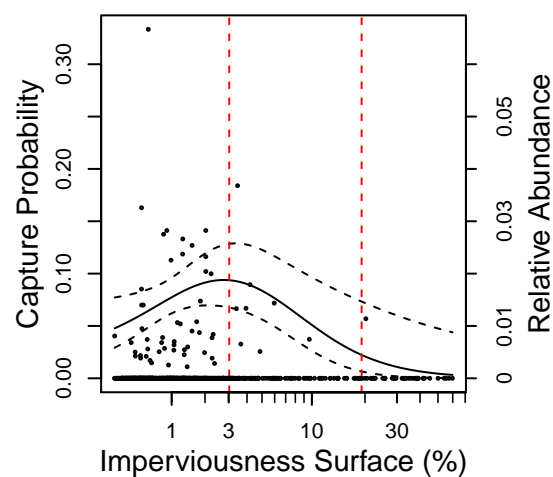
*Gammarus*



*Gelastocoris*

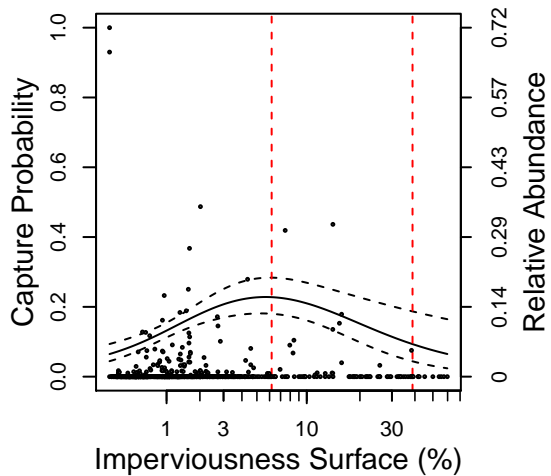


*Gerris*

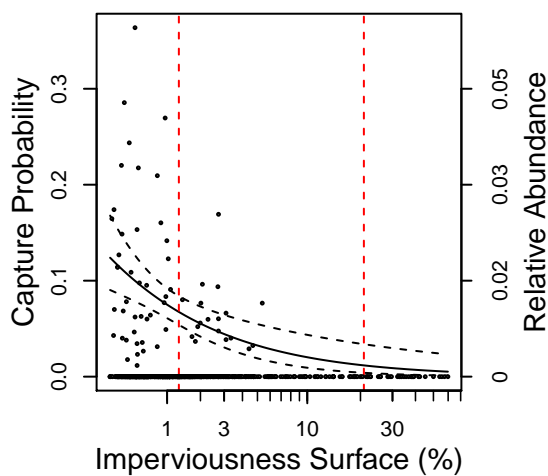


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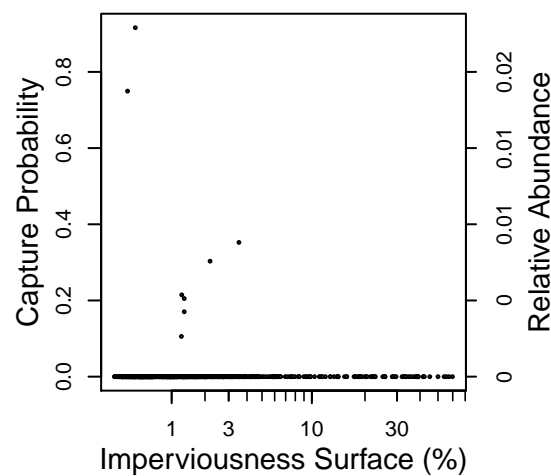
*Glyptotendipes*



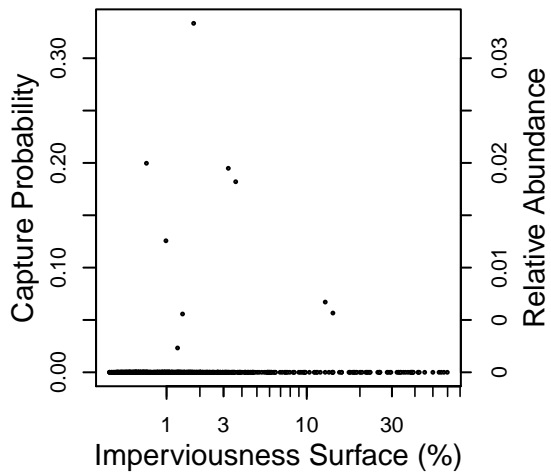
*Gomphus*



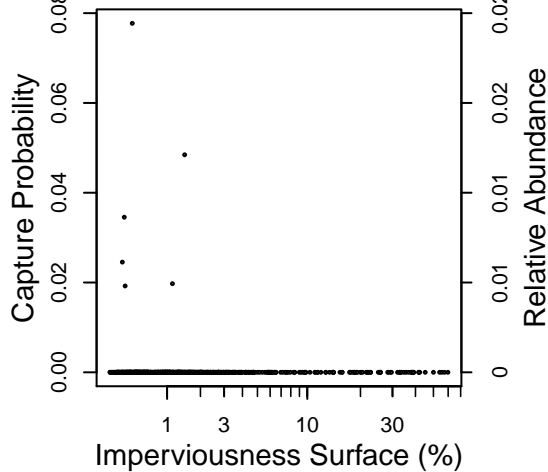
*Gymnochthebius*



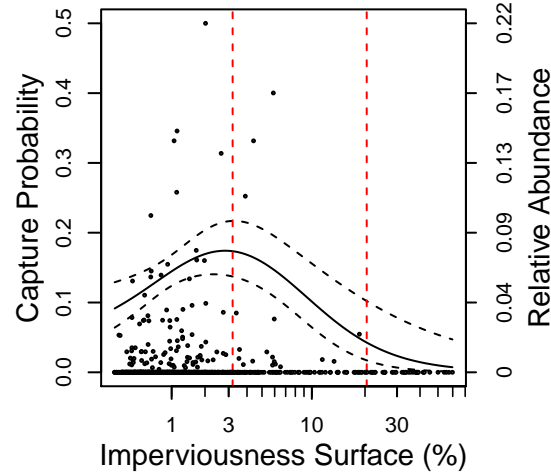
*Gyraulus*



*Gyretes*

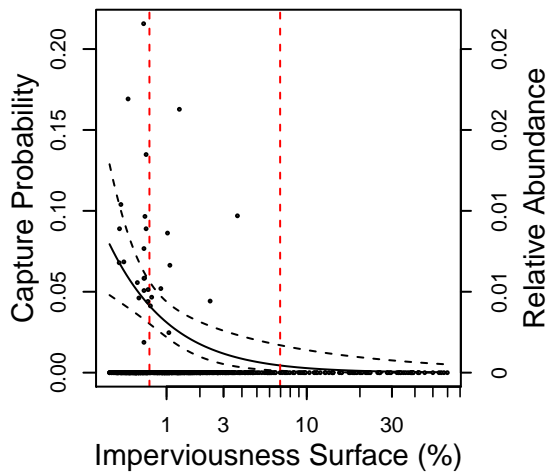


*Gyrinus*

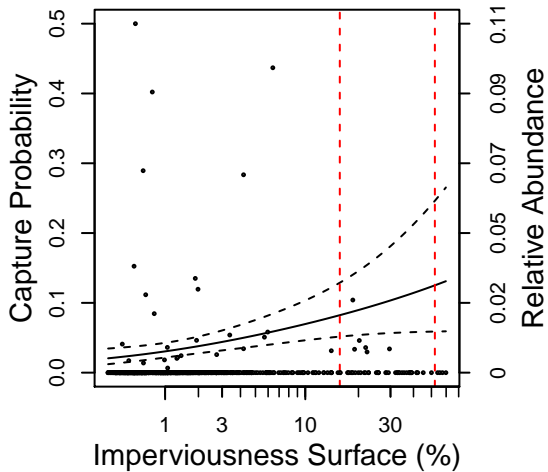


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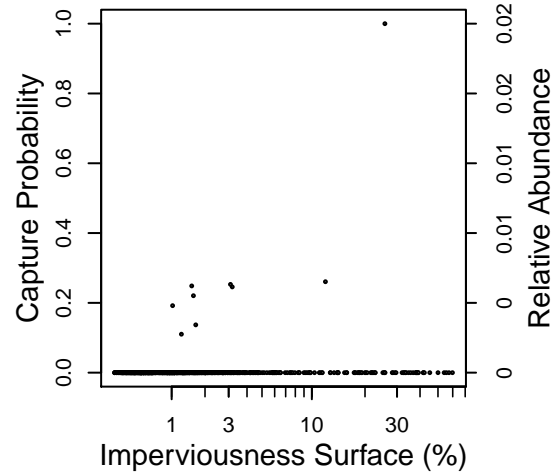
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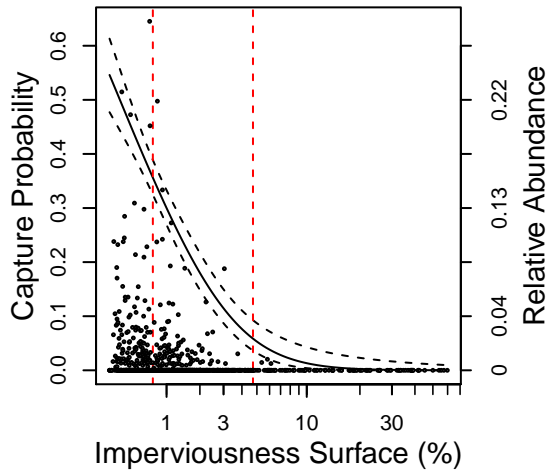
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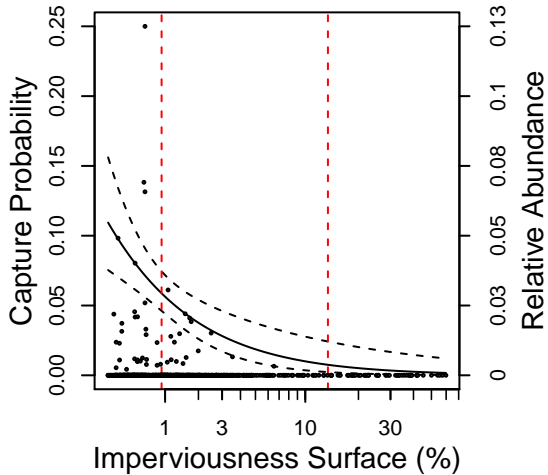
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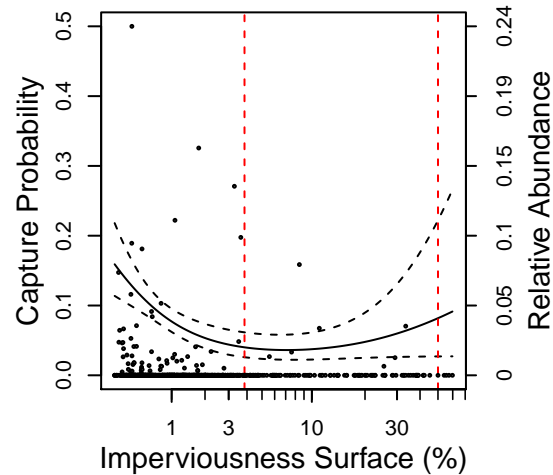
*Helichus*



*Helicopsyche*

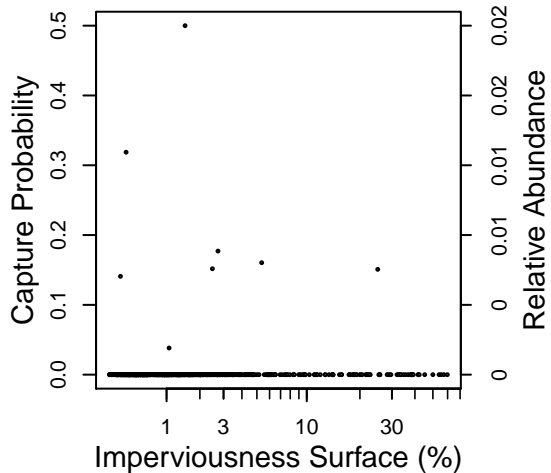


*Helisoma*

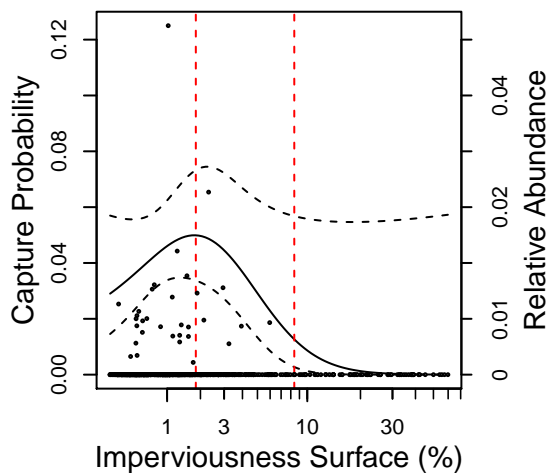


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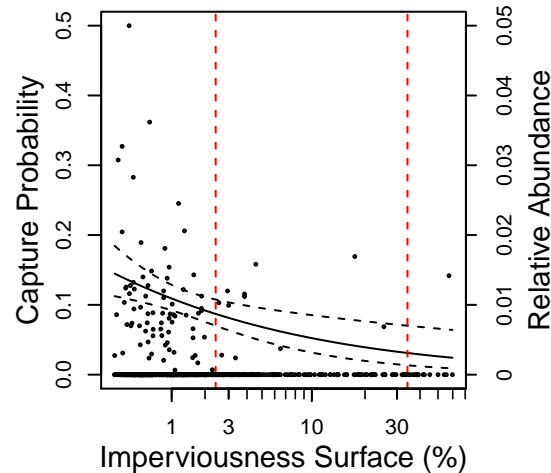
*Helochaeres*



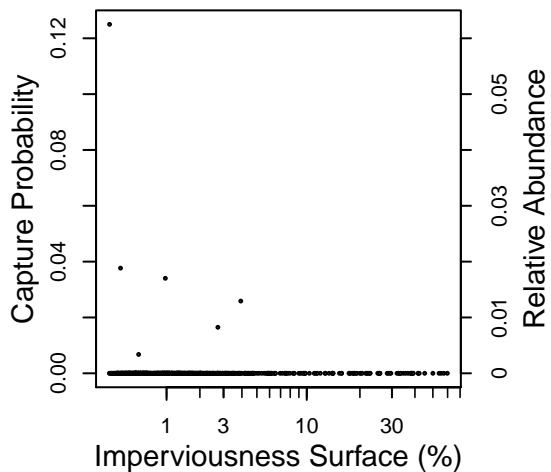
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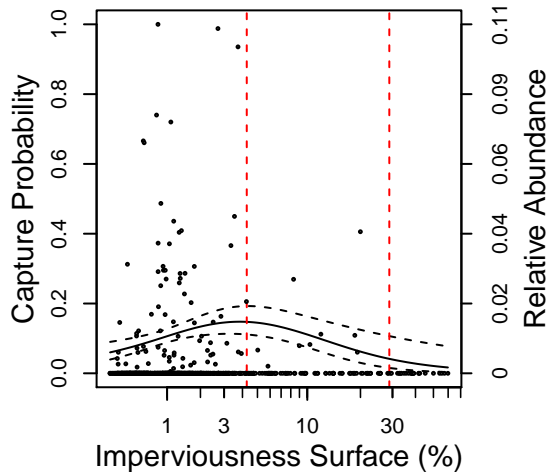
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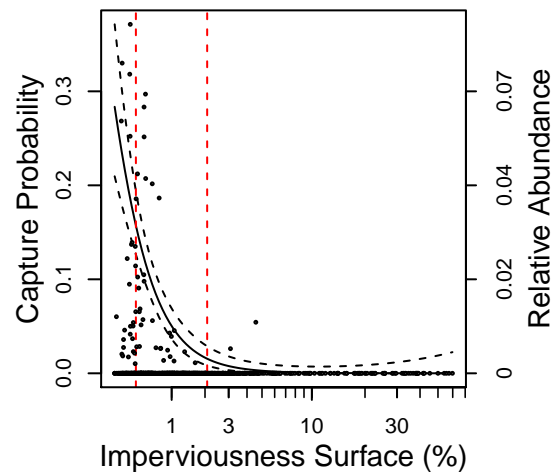
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*Hetaerina*

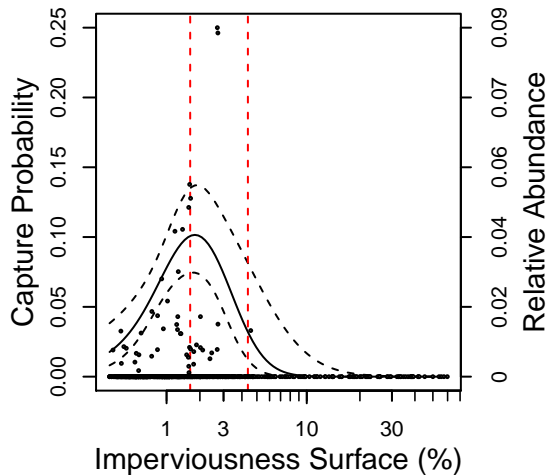


*Heterosternuta*

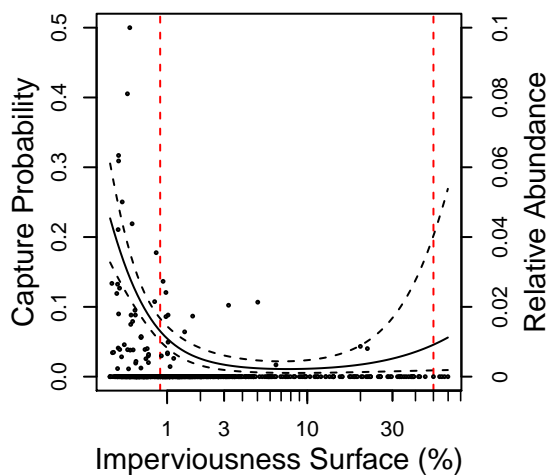


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

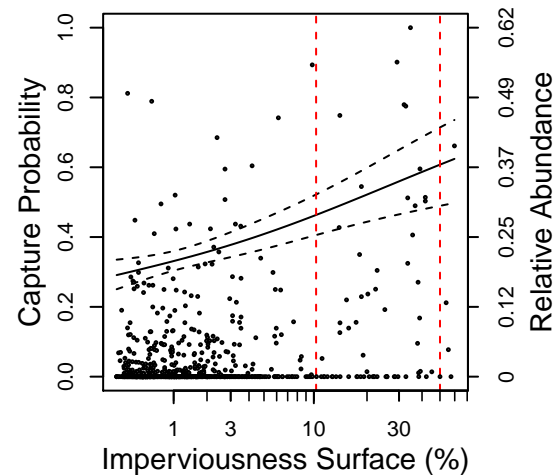
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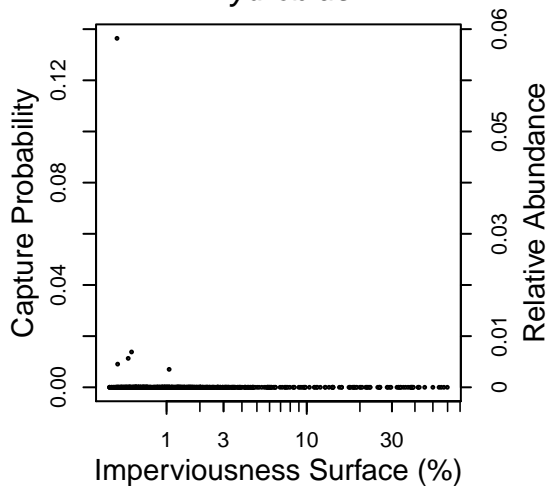
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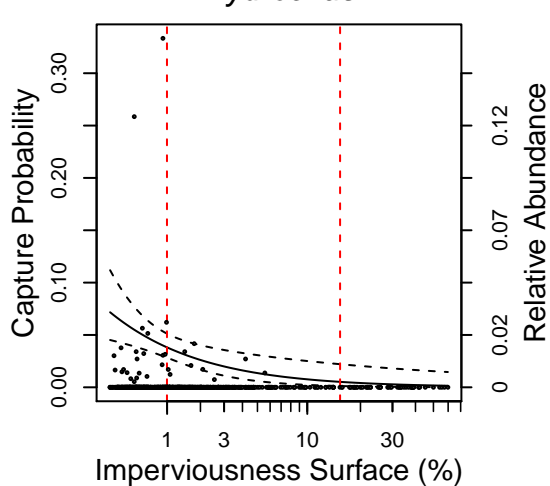
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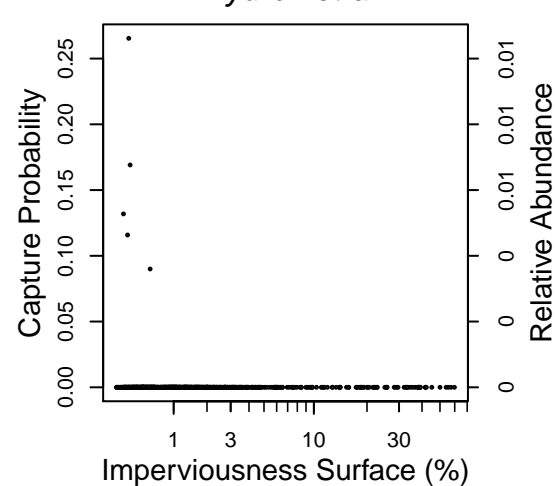
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*Hydrochus*

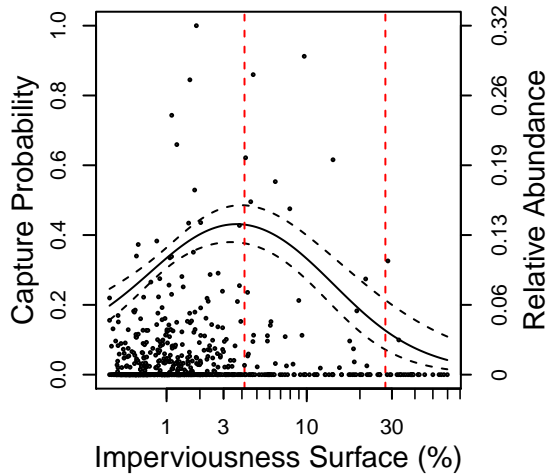


*Hydrometra*

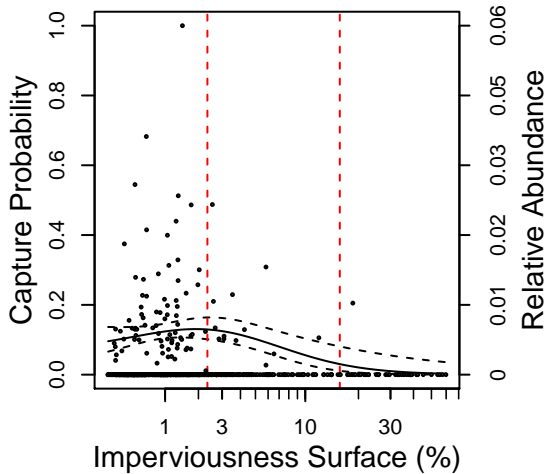


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

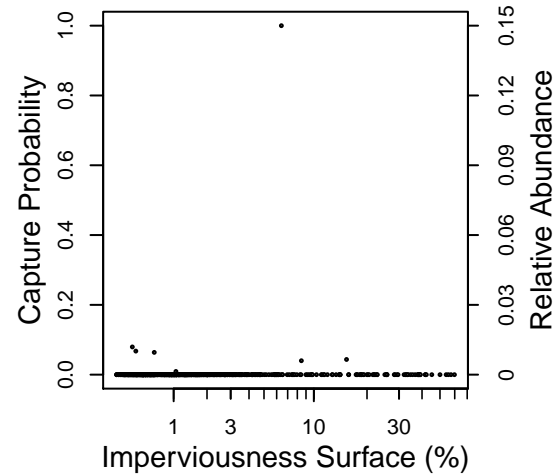
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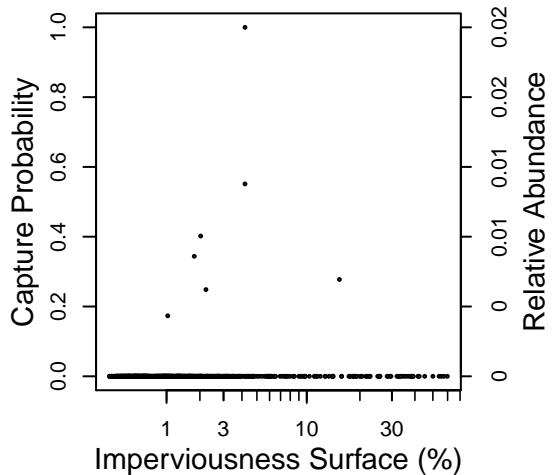
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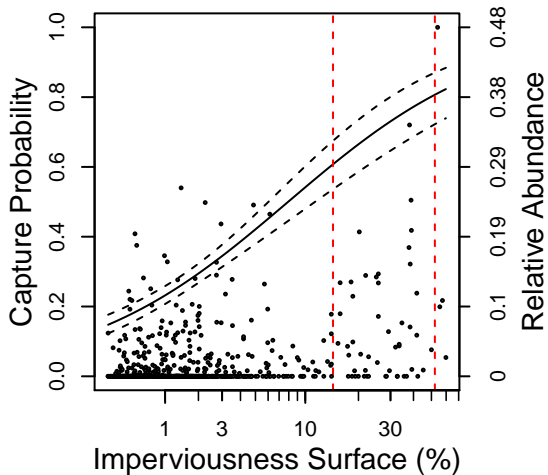
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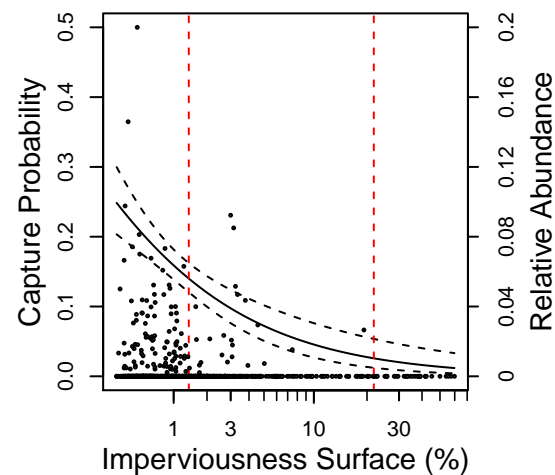
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*Ischnura*



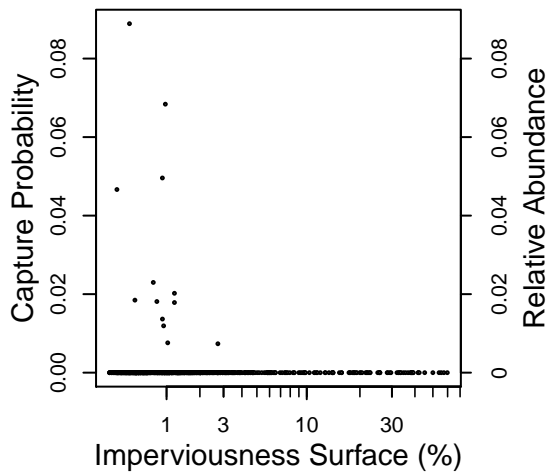
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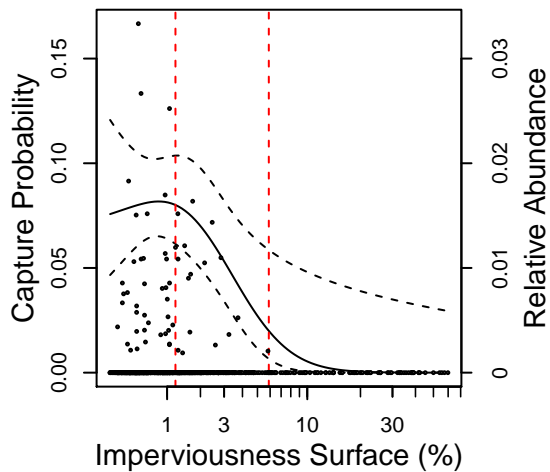


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

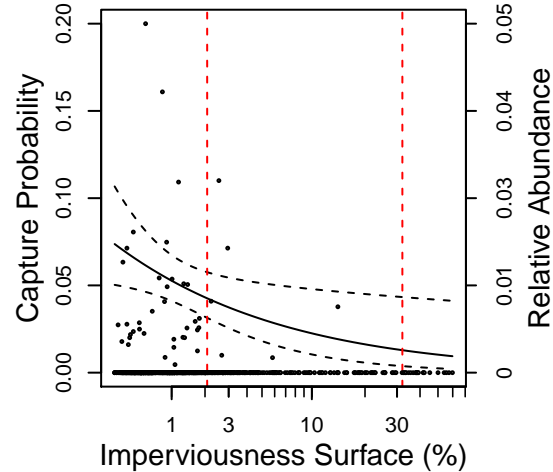
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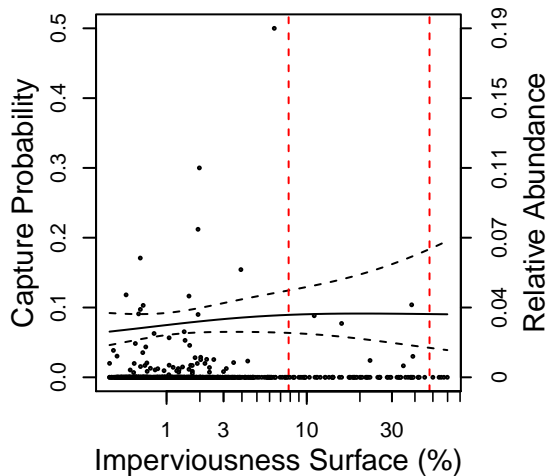
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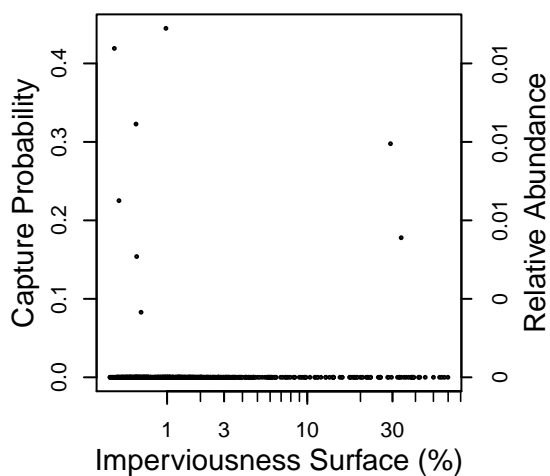
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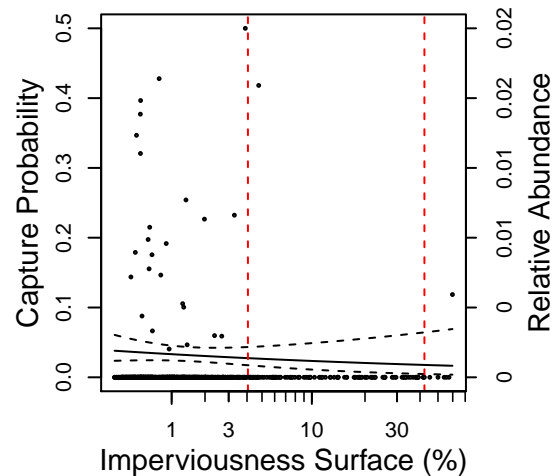
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*Laevapex*

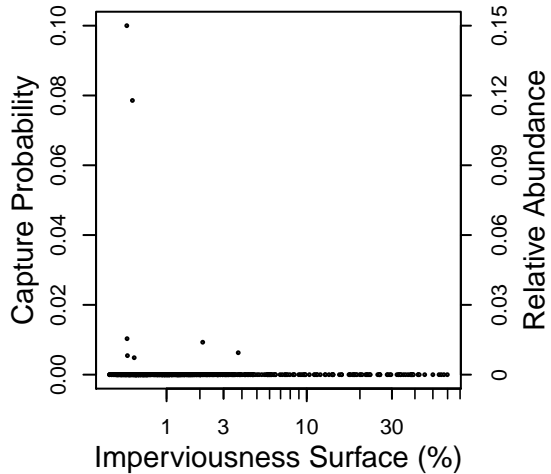


*Larsia*

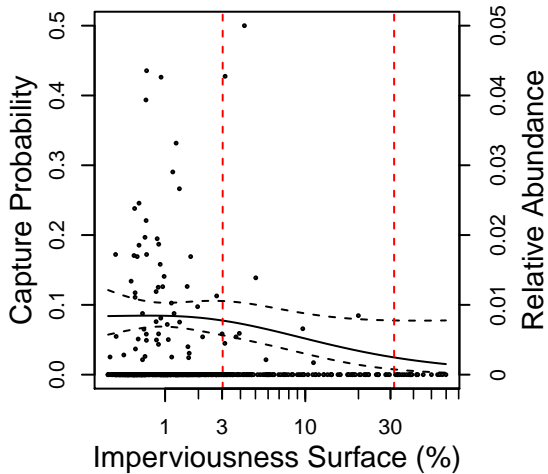


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

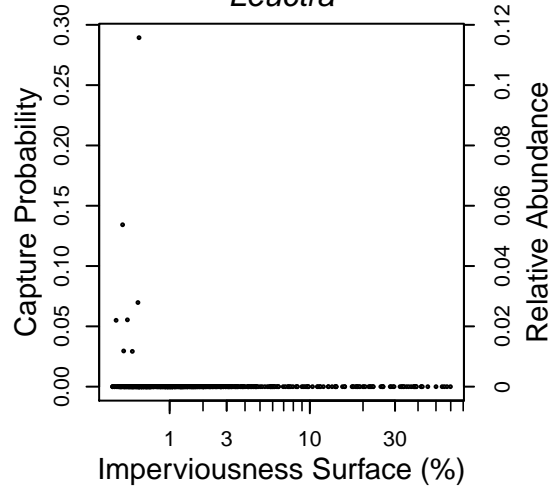
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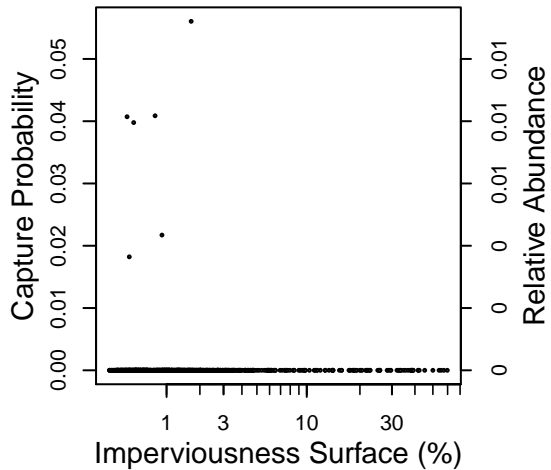
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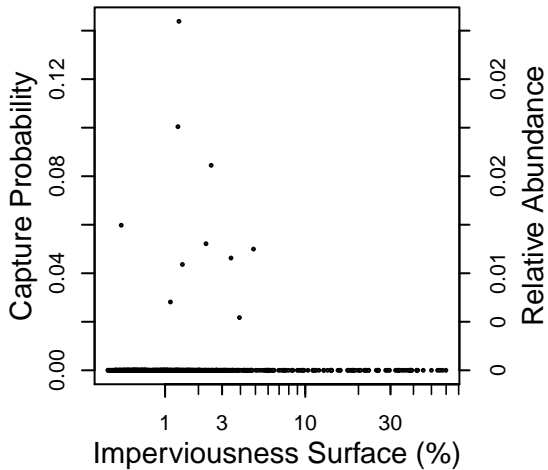
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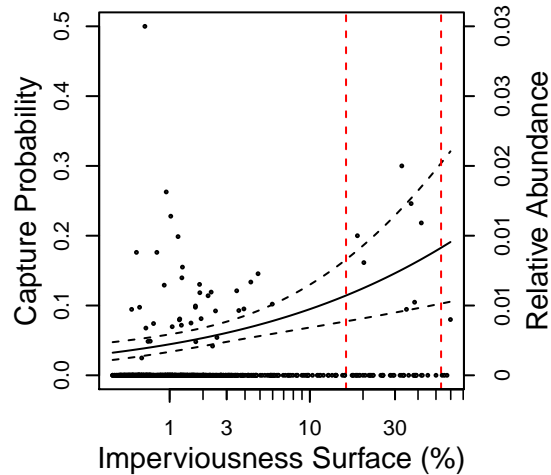
*Libellula*



*Limnoporus*

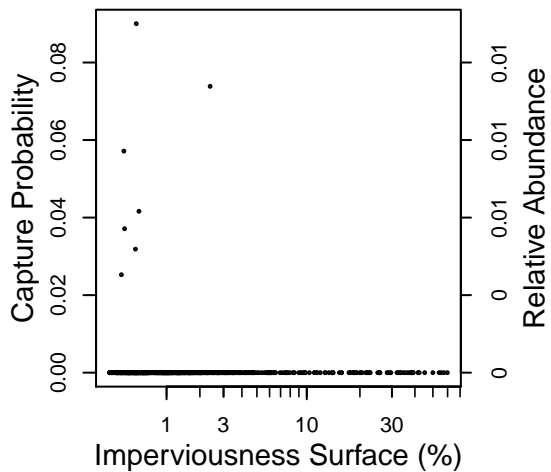


*Liodessus*

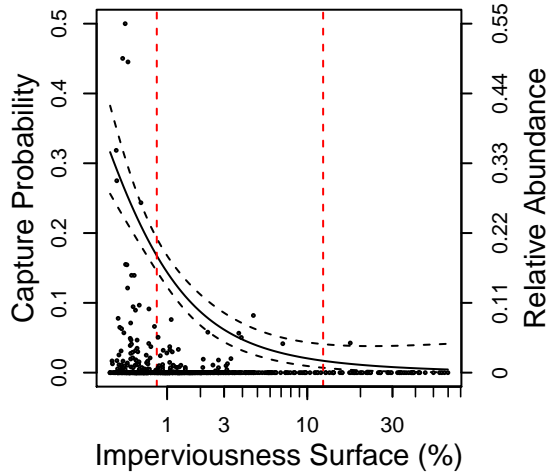


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

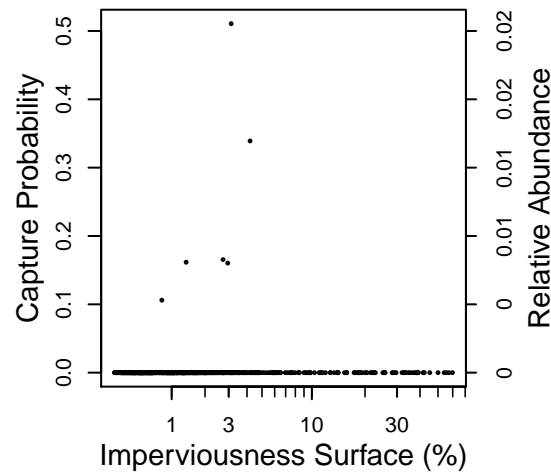
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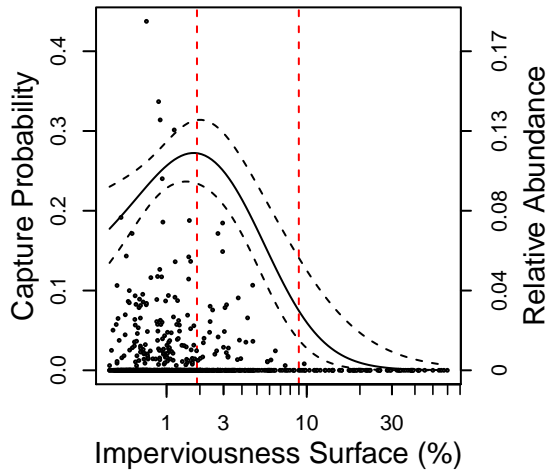
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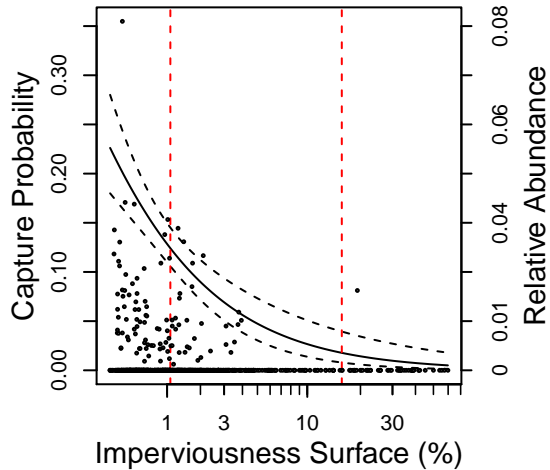
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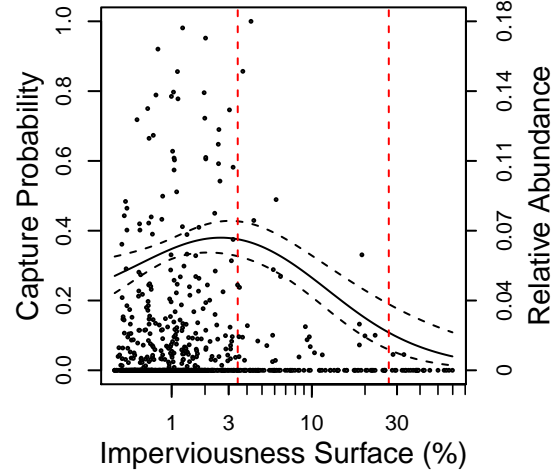
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*Macromia*

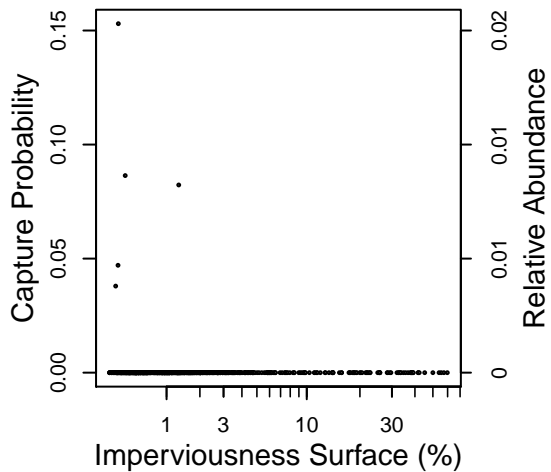


*Macronychus*

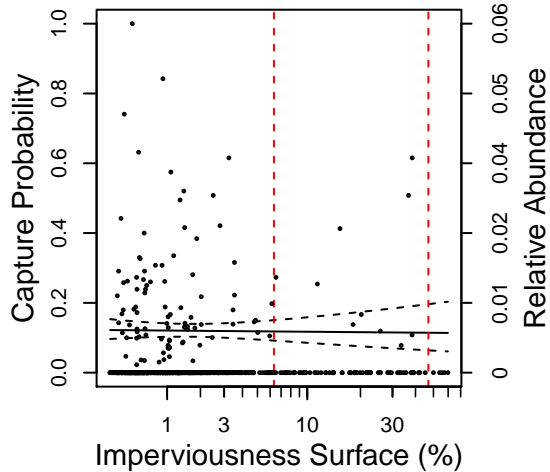


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

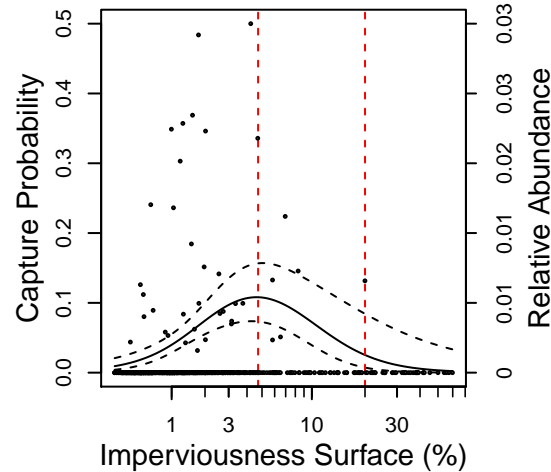
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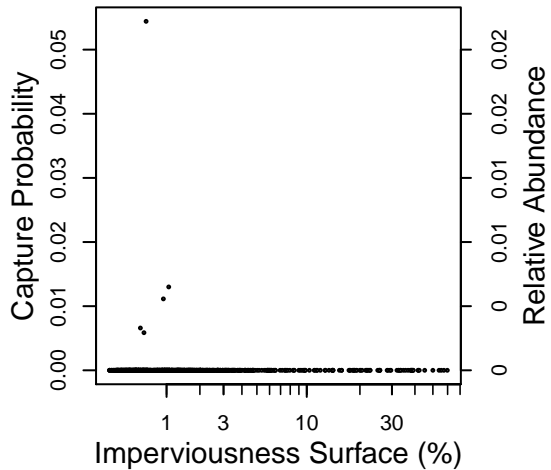
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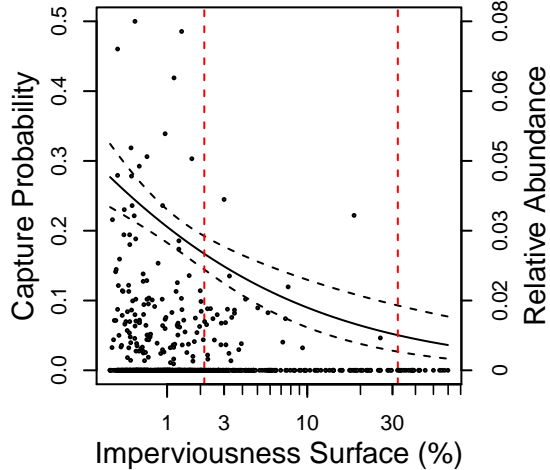
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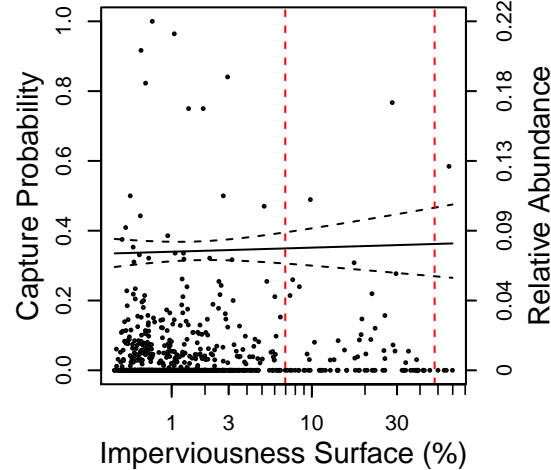
*Microcyloopus*



*Microtendipes*

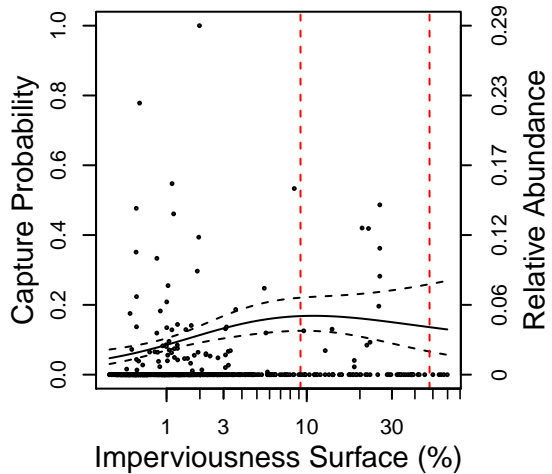


*Microvelia*

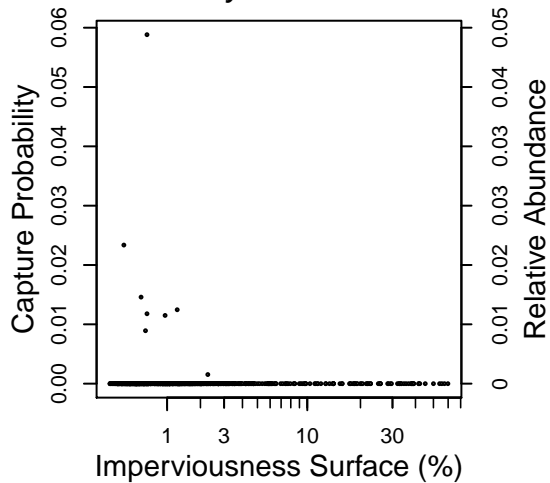


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

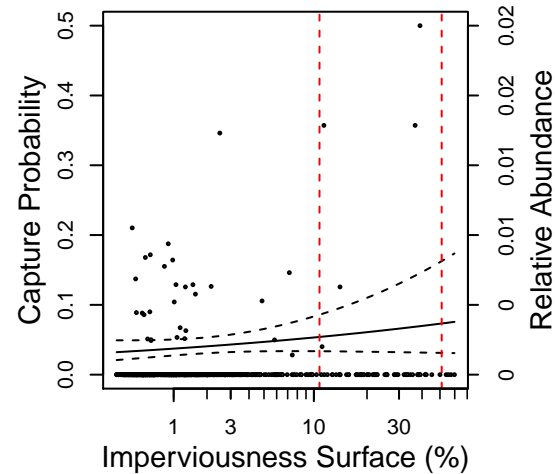
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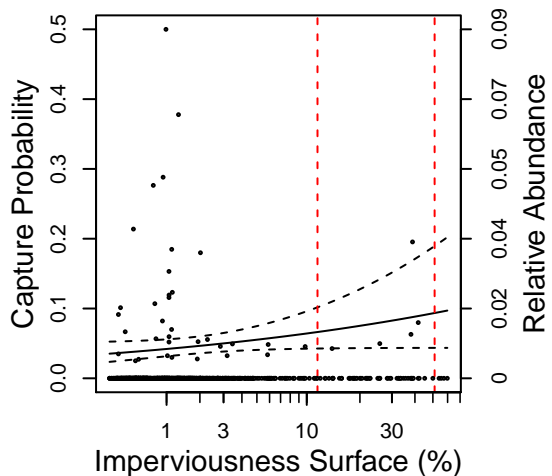
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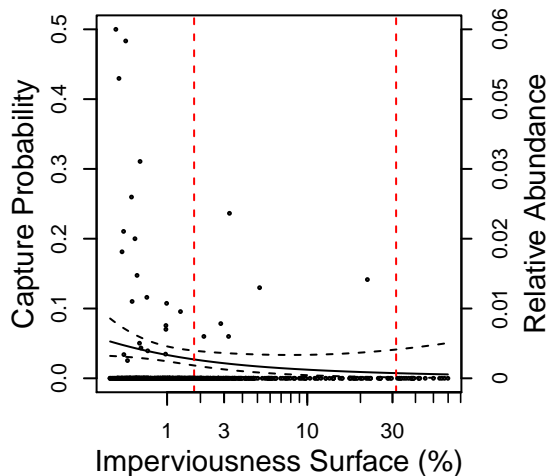
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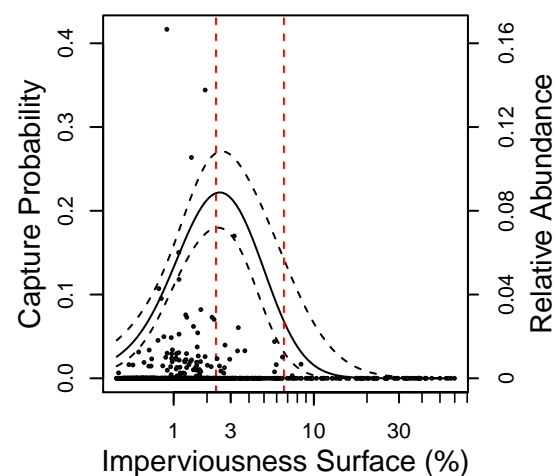
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*Natarsia*

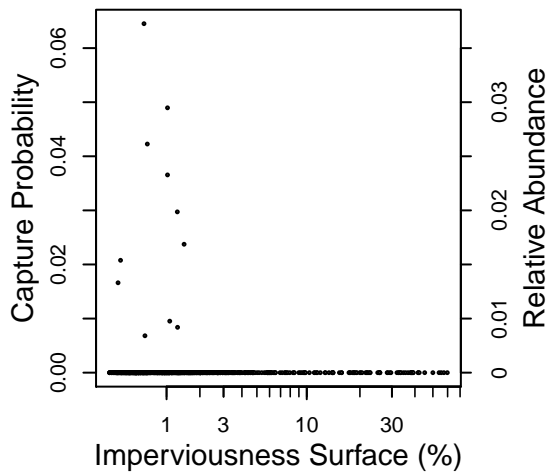


*Nectopsyche*

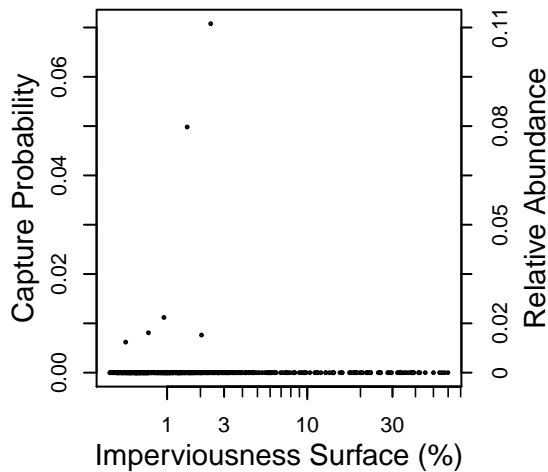


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

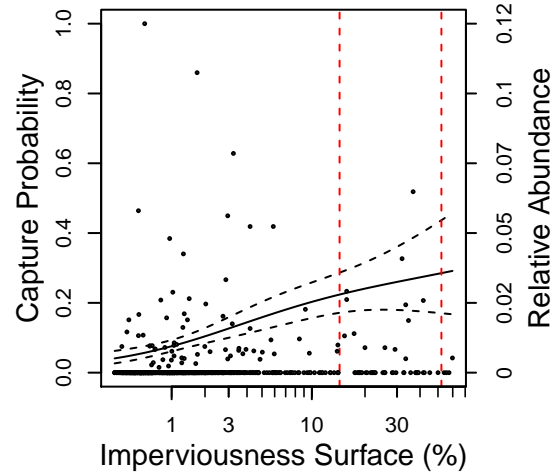
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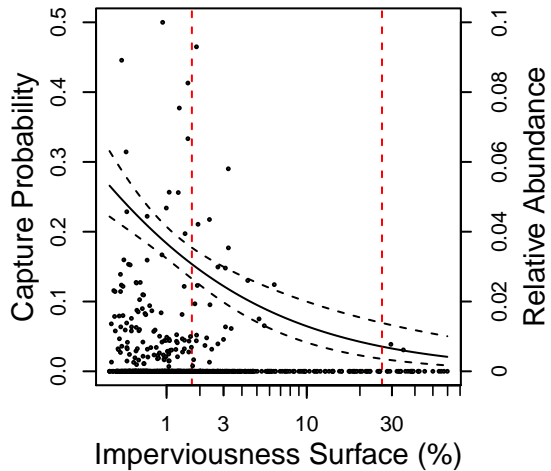
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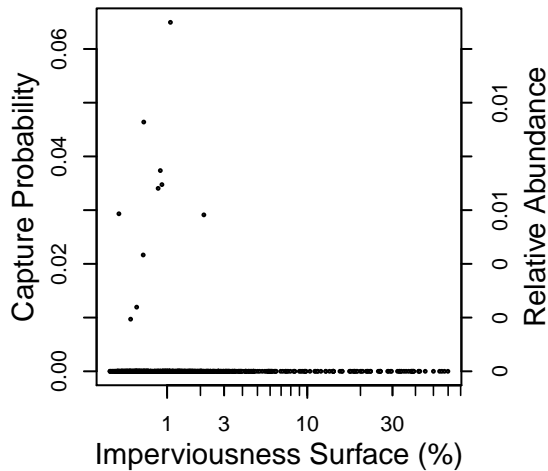
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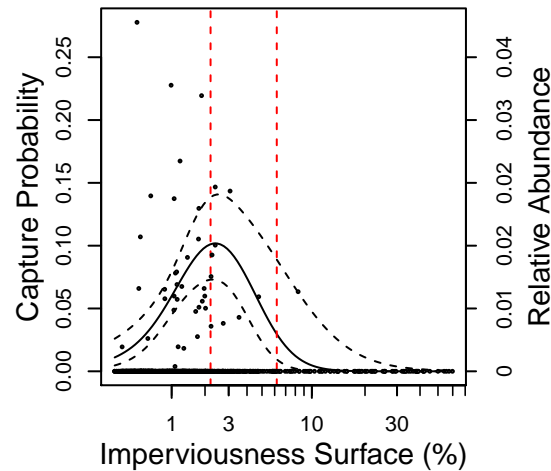
*Neoporus*



*Nepa*

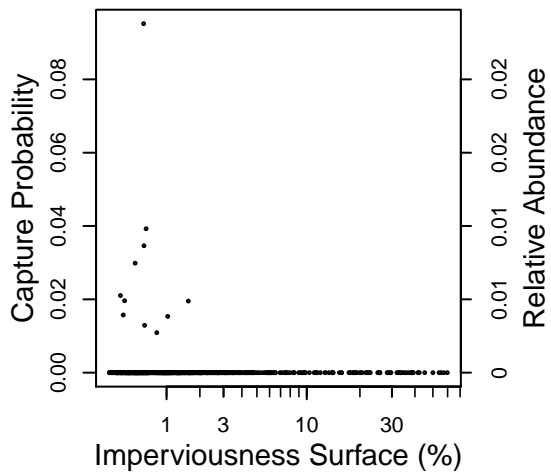


*Neureclipsis*

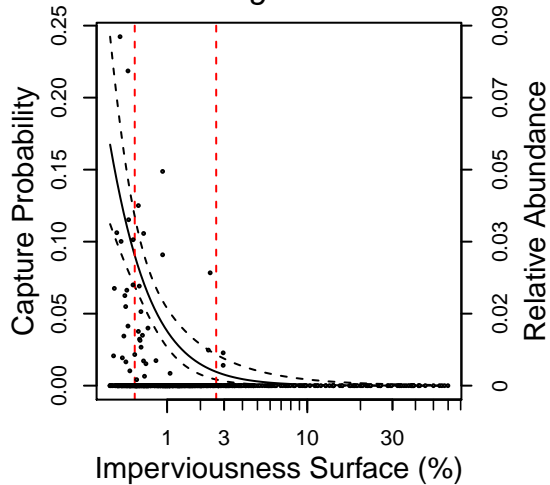


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

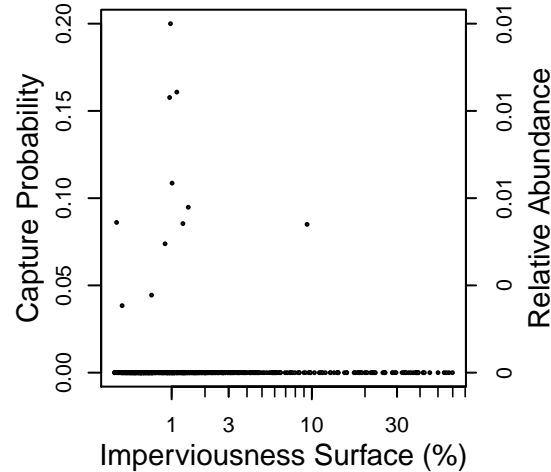
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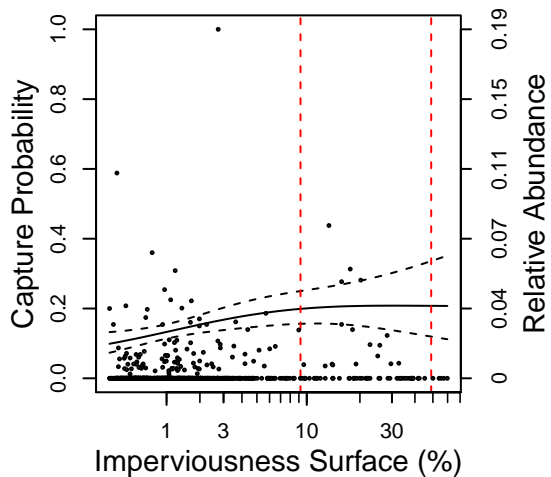
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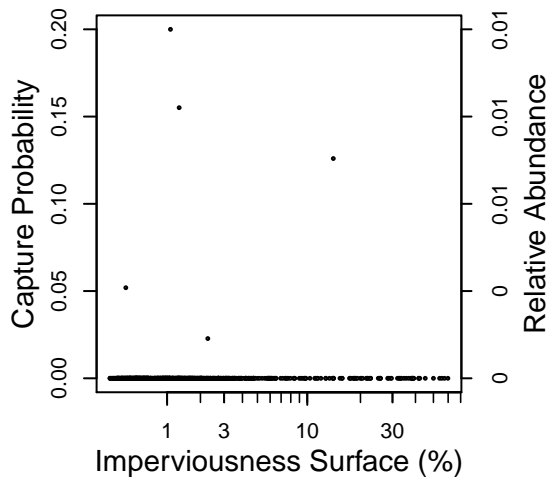
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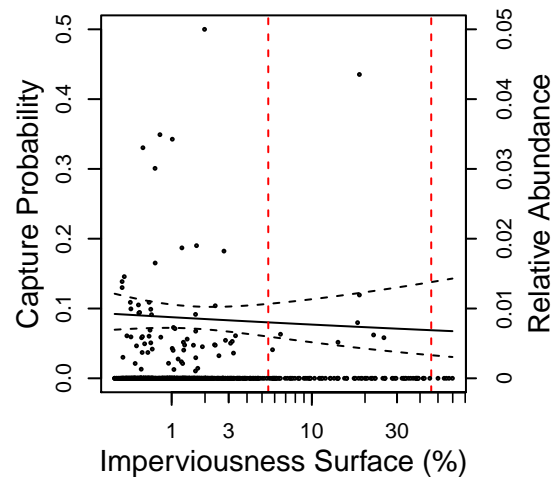
*Notonecta*



*Ochrotrichia*

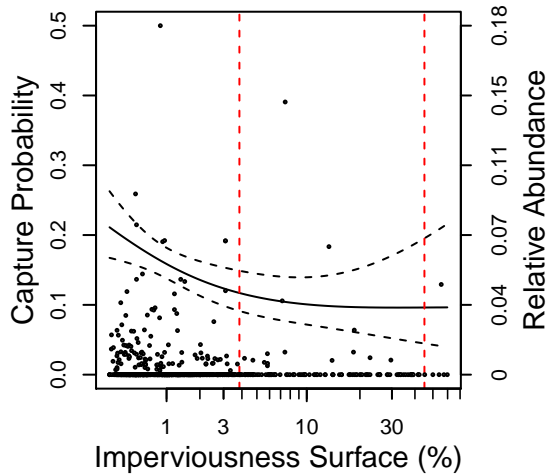


*Oecetis*

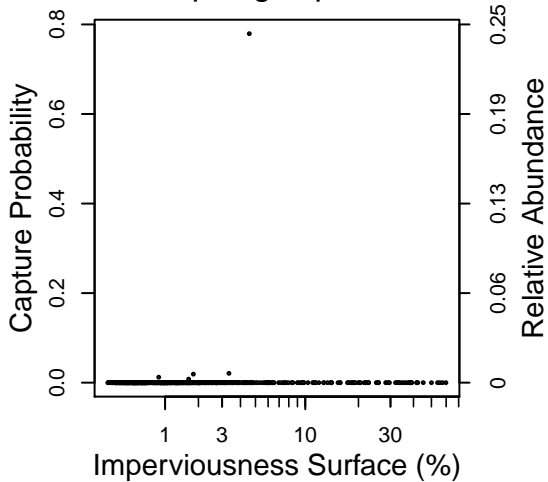


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

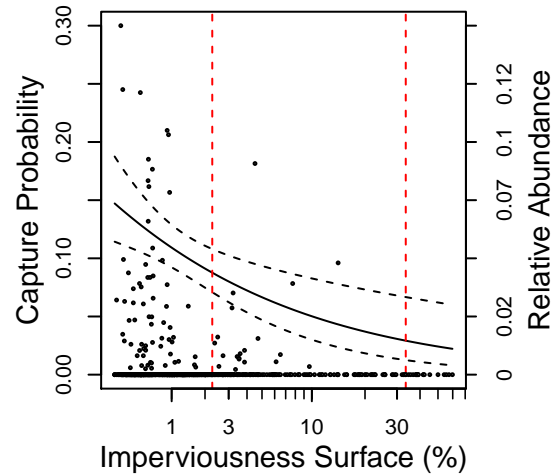
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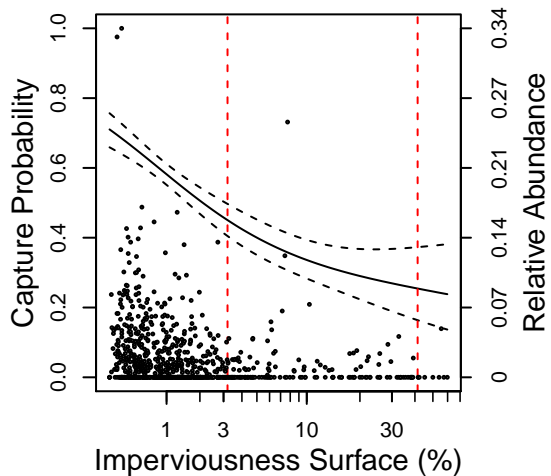
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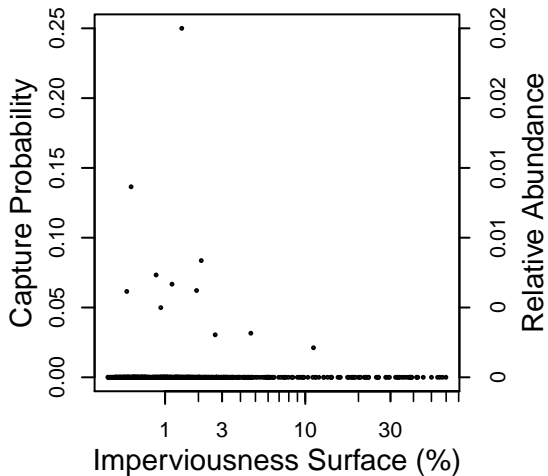
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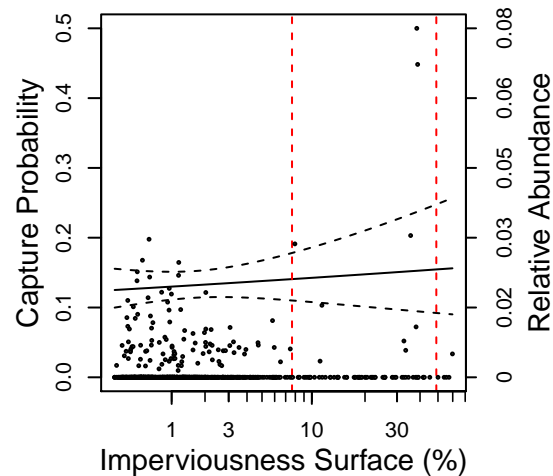
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*Ormosia*



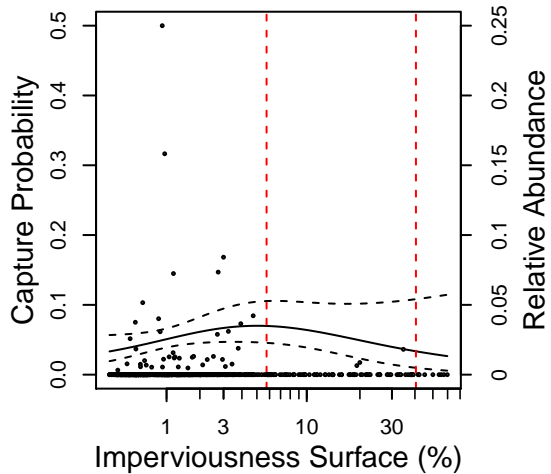
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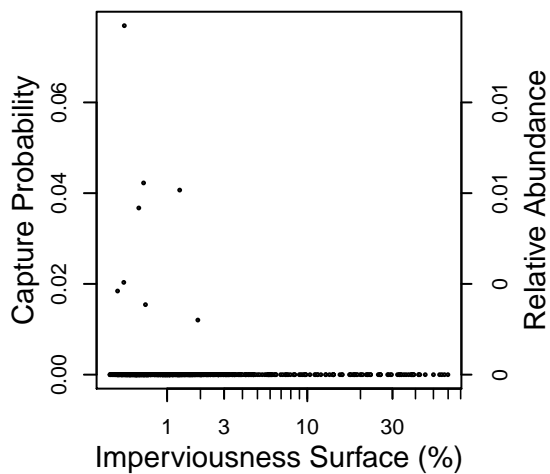


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

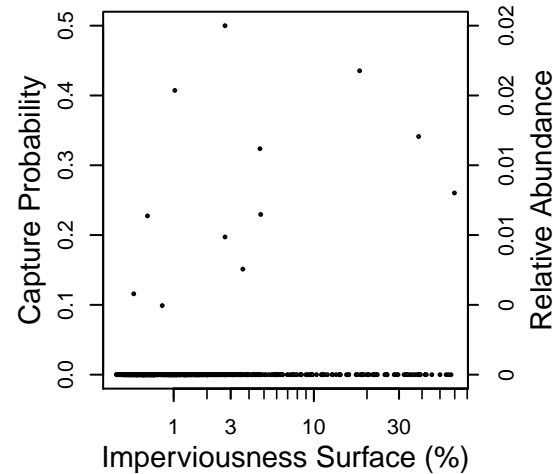
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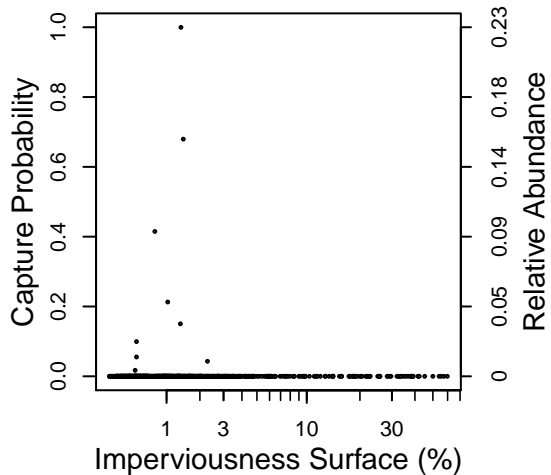
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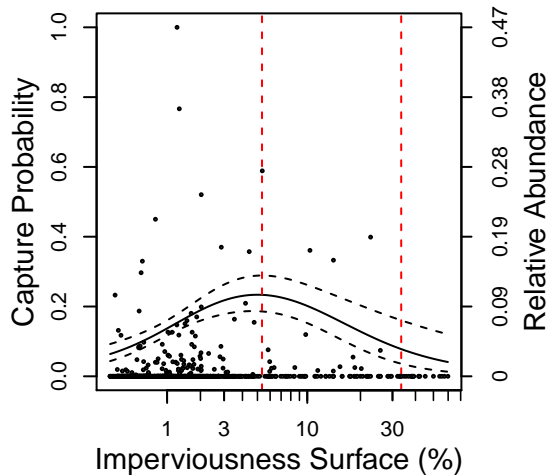
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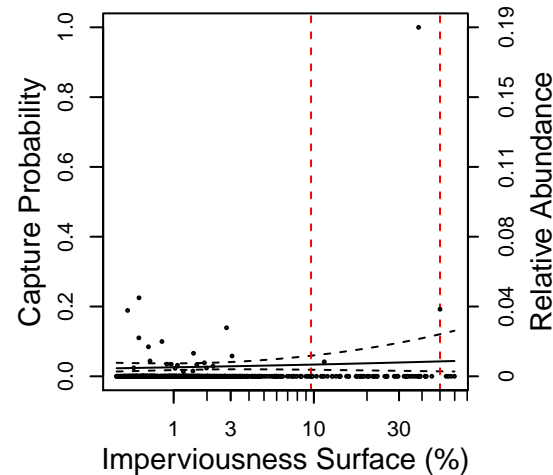
*Palaemonetes*



*Palmarcorixa*

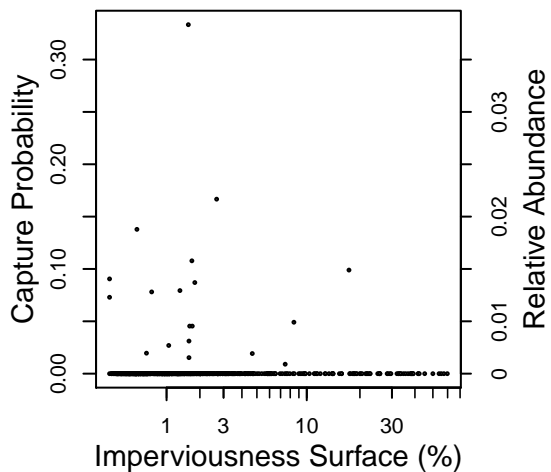


*Parachironomus*

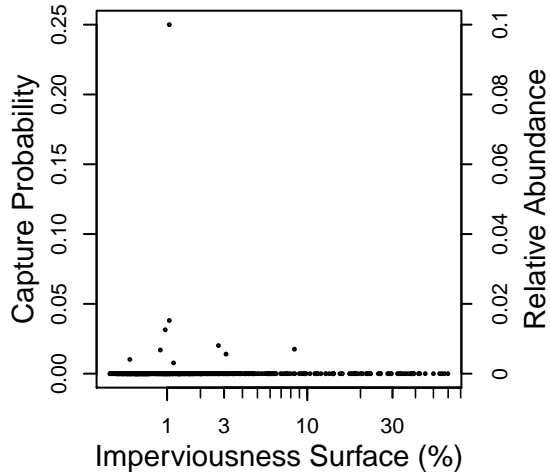


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

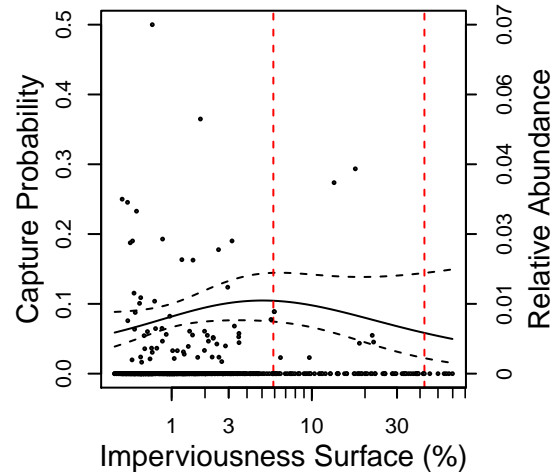
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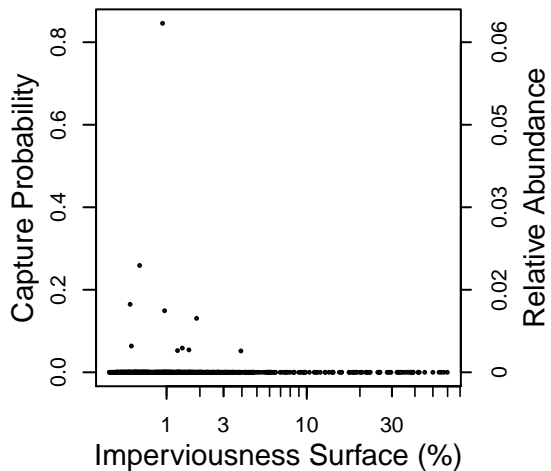
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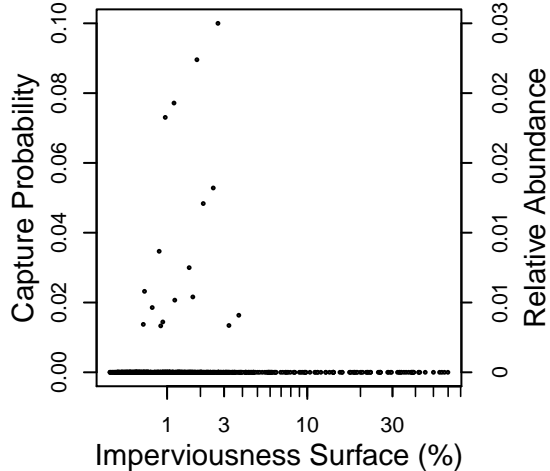
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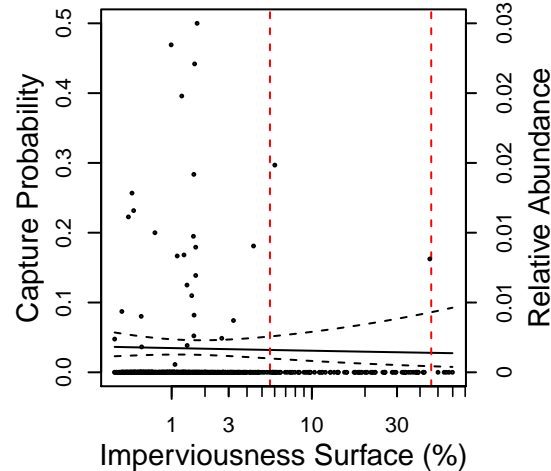
*Paragordius*



*Parakiefferiella*

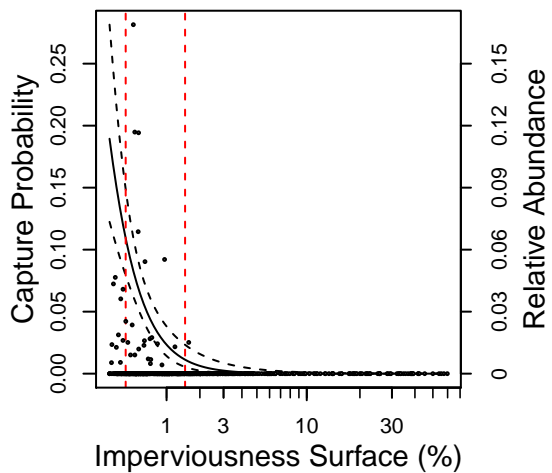


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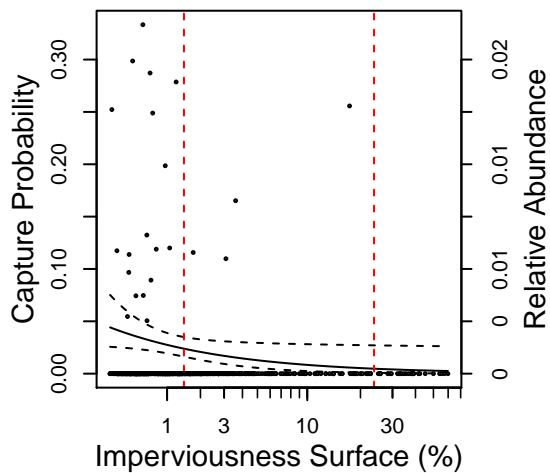


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

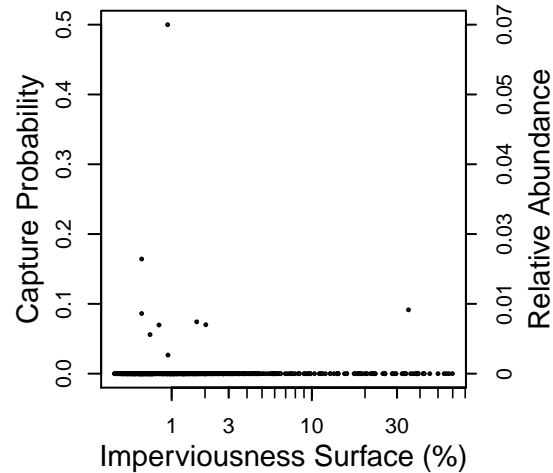
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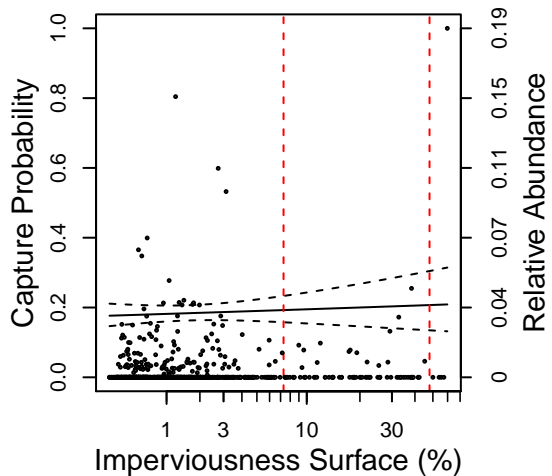
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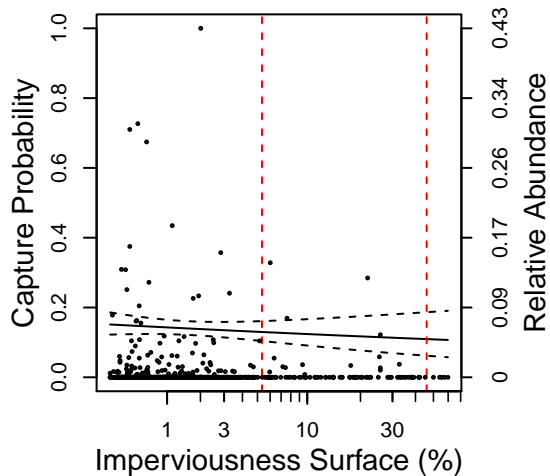
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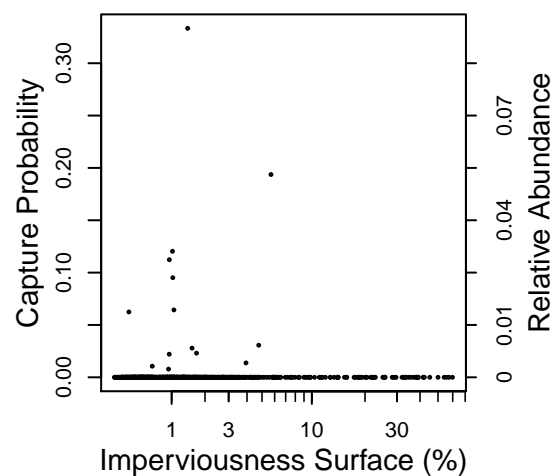
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*Paratendipes*

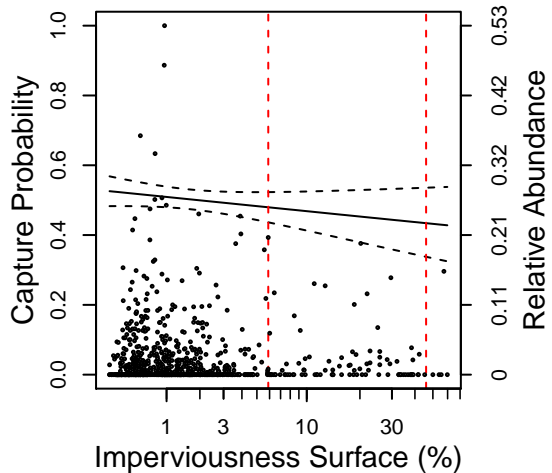


*Pelocoris*

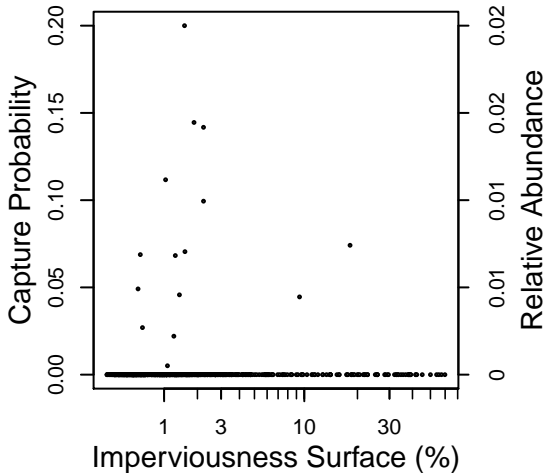


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

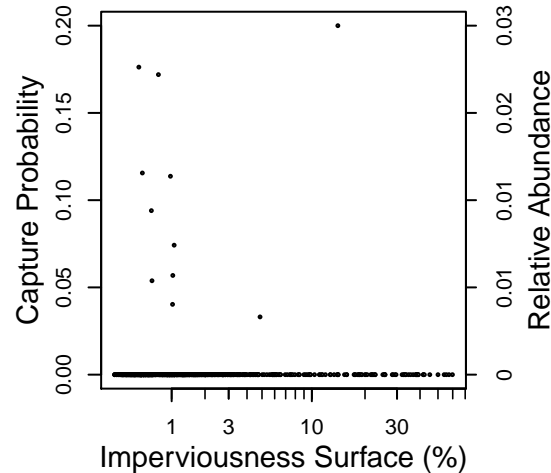
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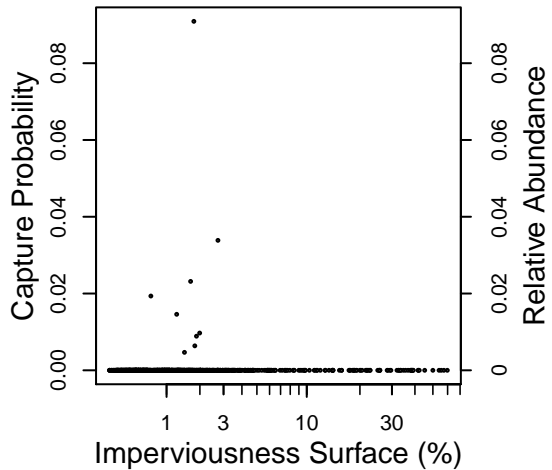
*Pentaneura*



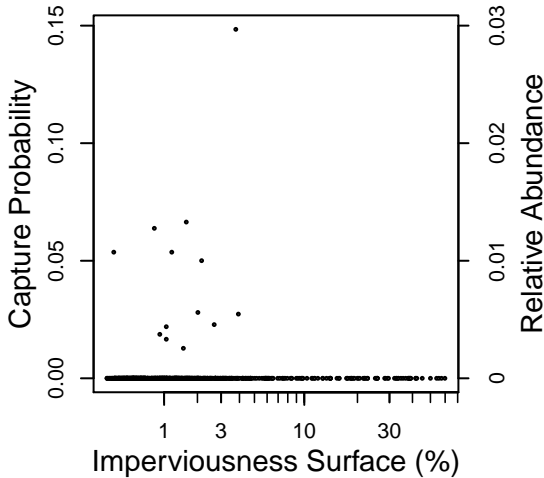
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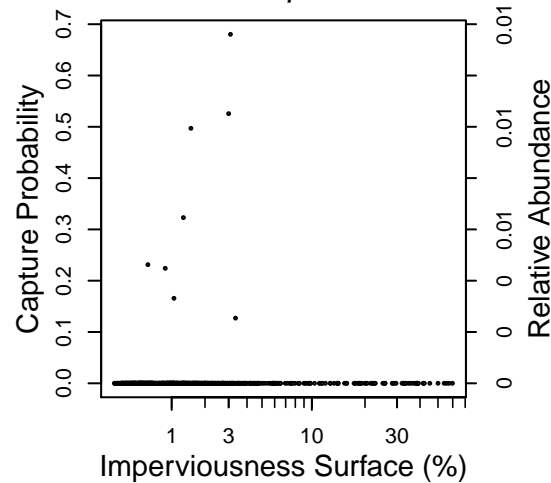
*Perlesta*



*Perlinella*

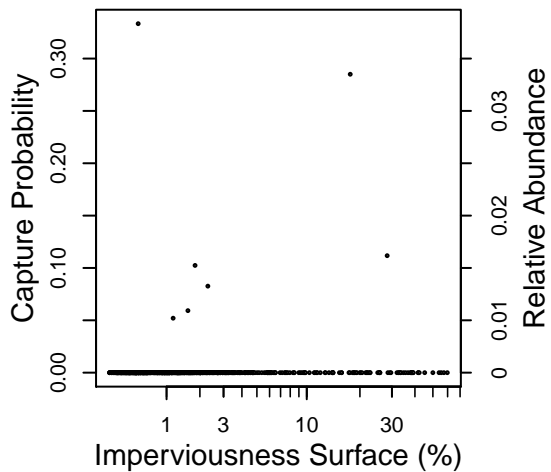


*Petrophila*

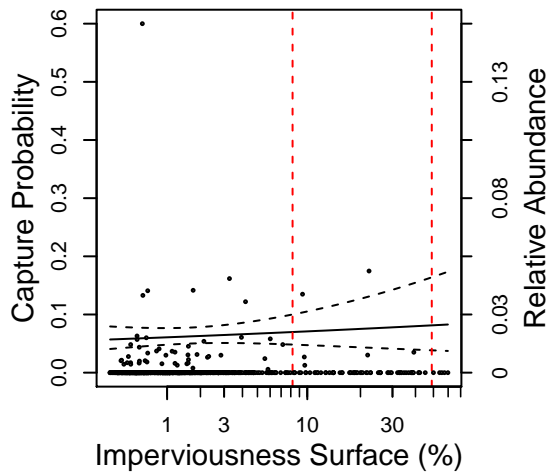


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

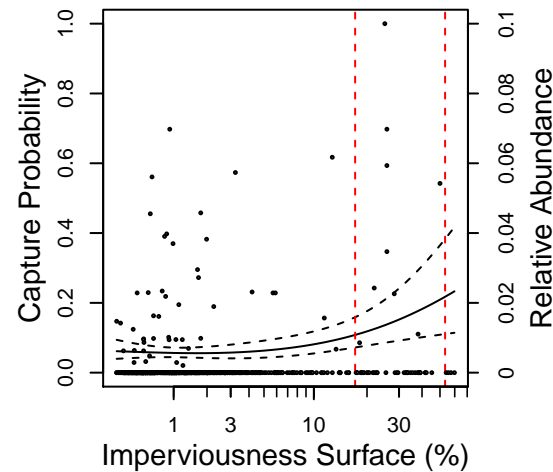
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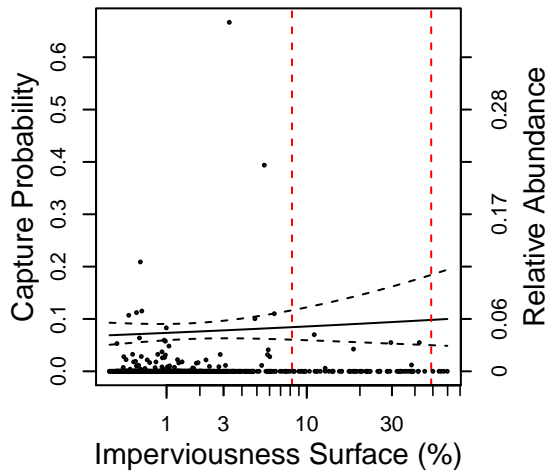
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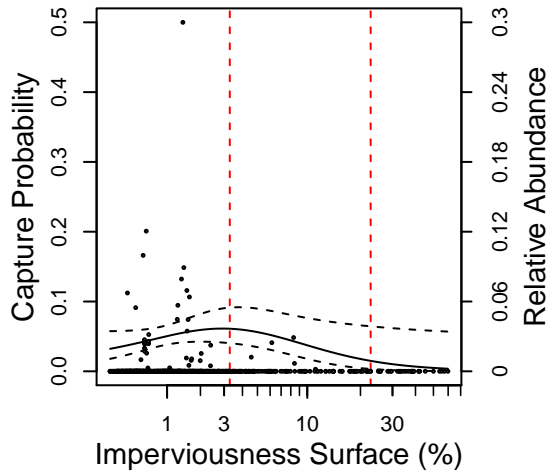
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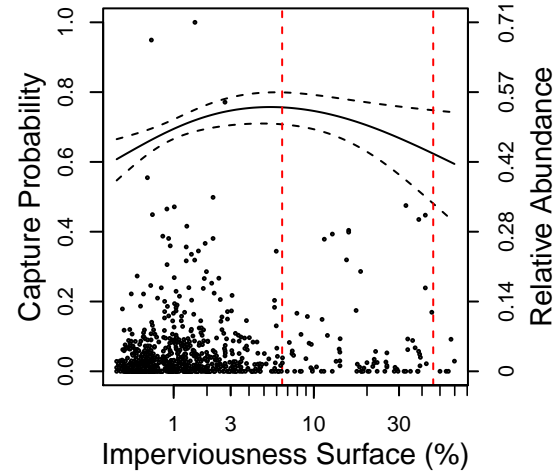
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*Pleurocera*

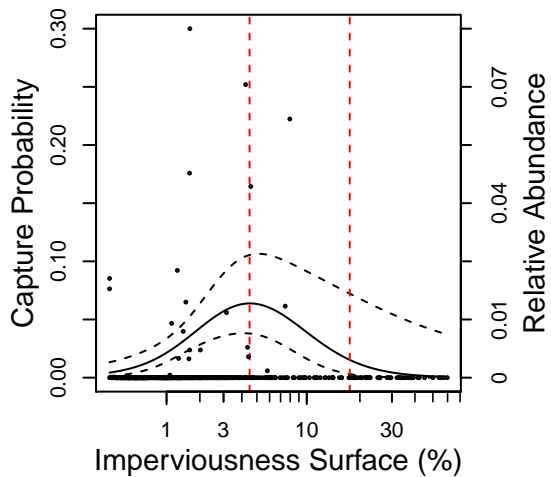


*Polypedilum*

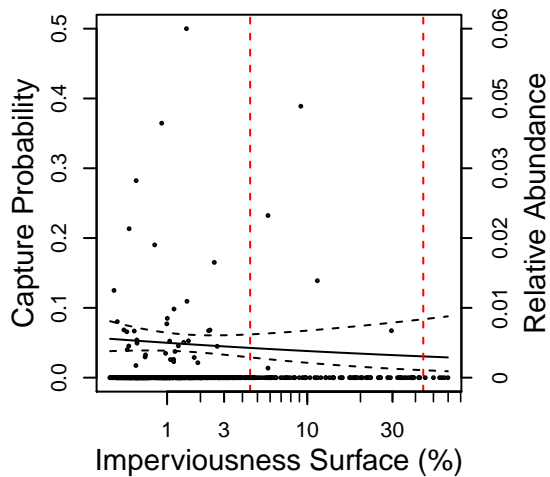


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

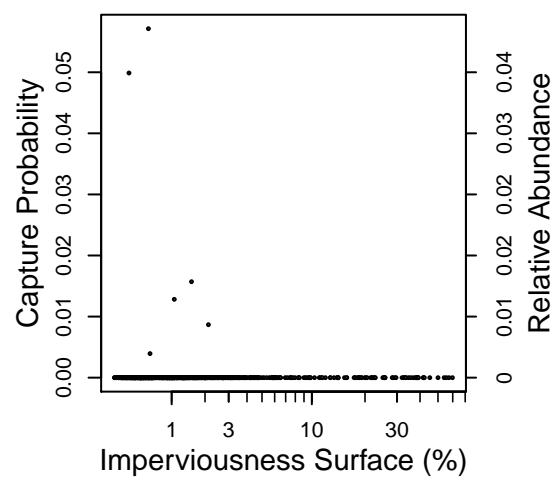
*Potamyia*



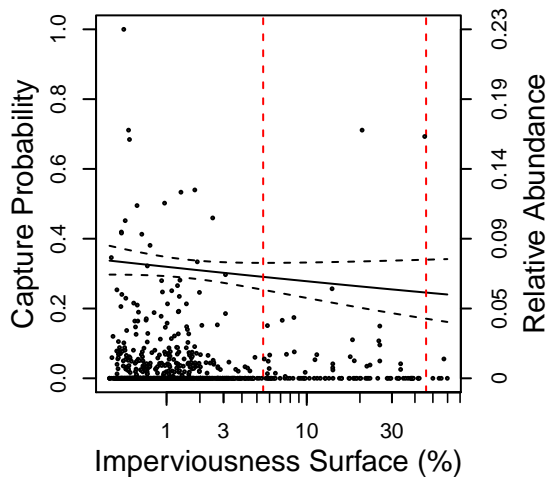
*Probezzia*



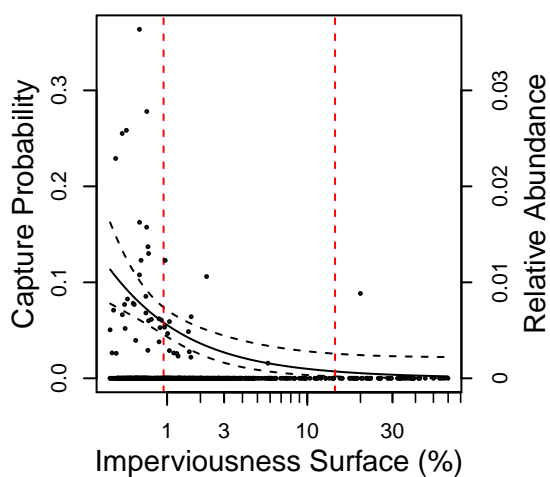
*Procambarus*



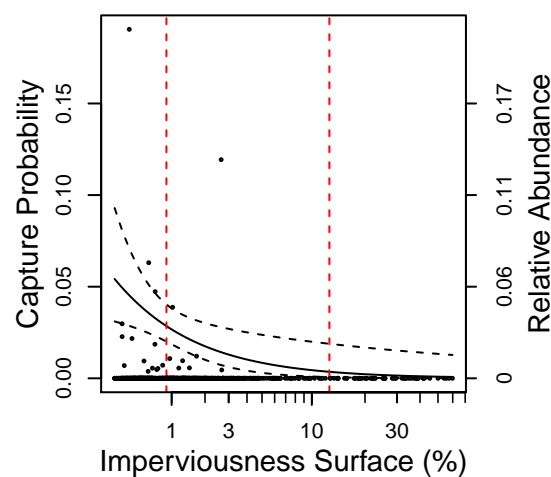
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*Procloeon*

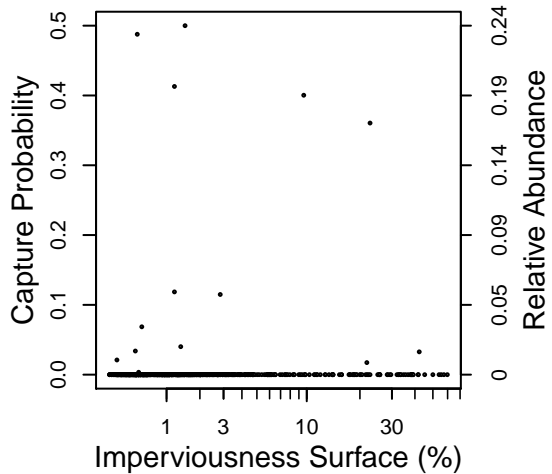


*Progomphus*

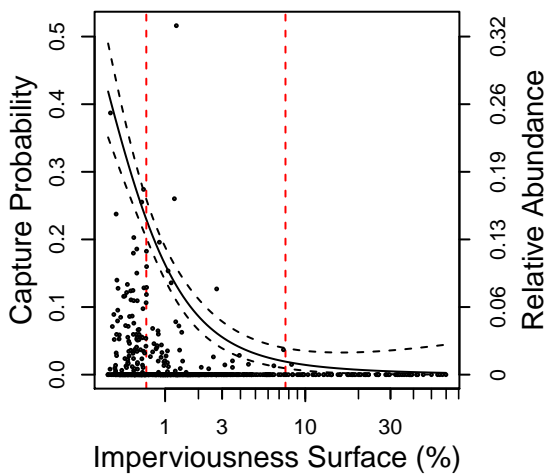


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

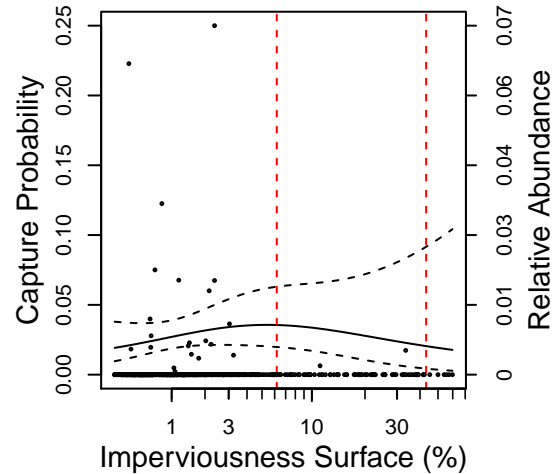
*Psectrotanypus*



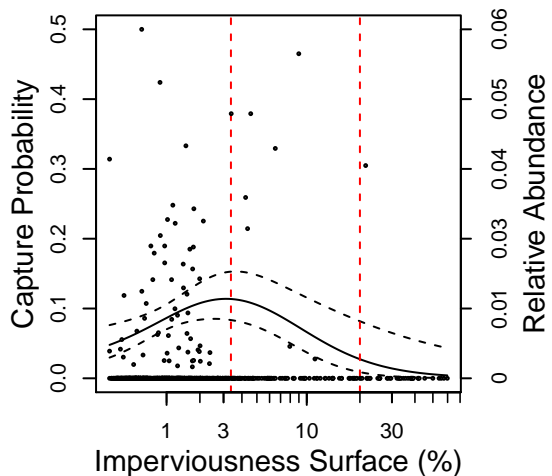
*Psephenus*



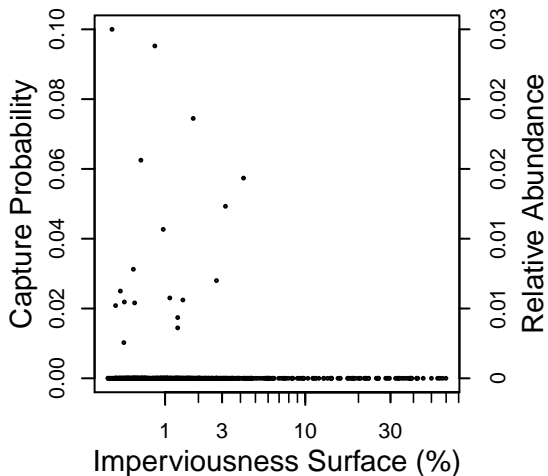
*Pseudochironomus*



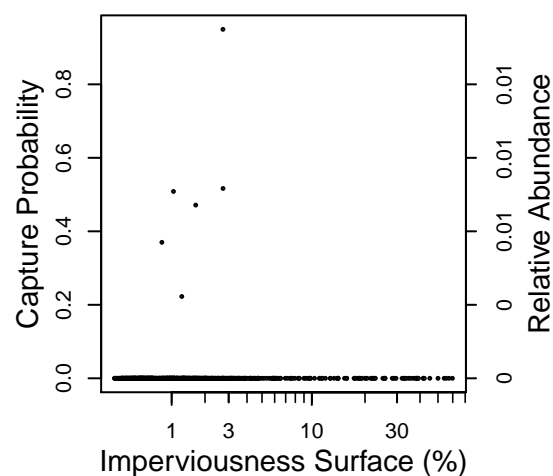
*Pseudocloeon*



*Pseudosuccinea*

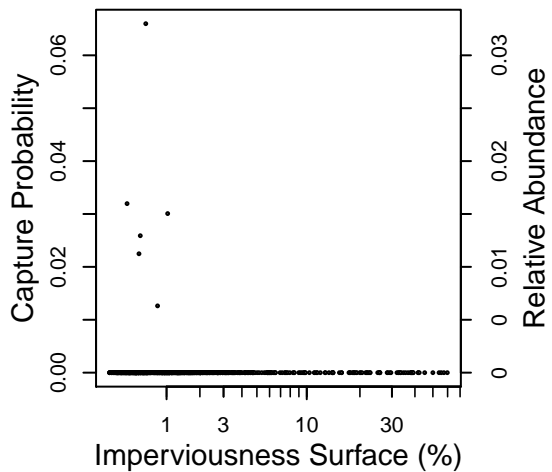


*Pteronarcys*

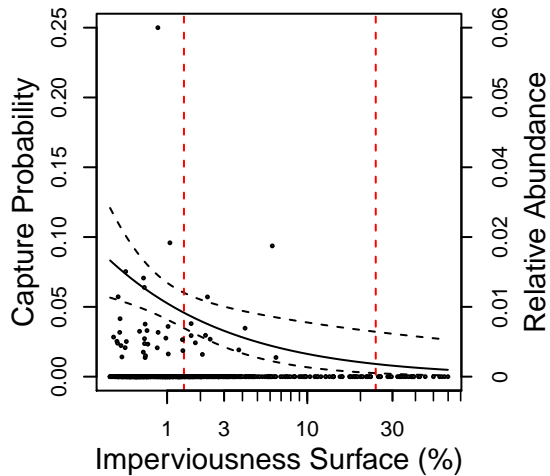


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

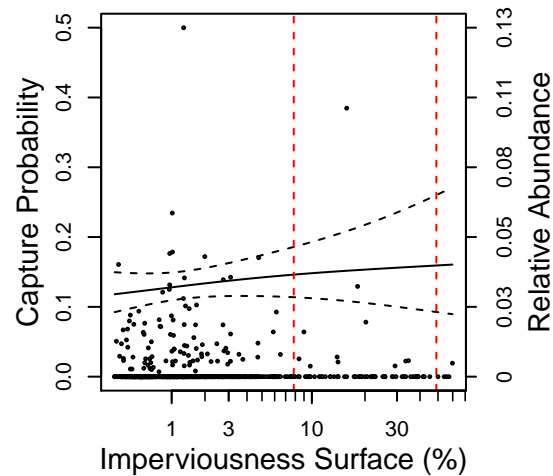
*Ptilostomis*



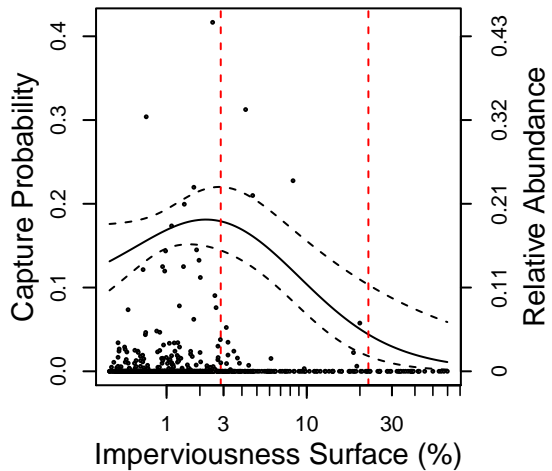
*Pycnopsyche*



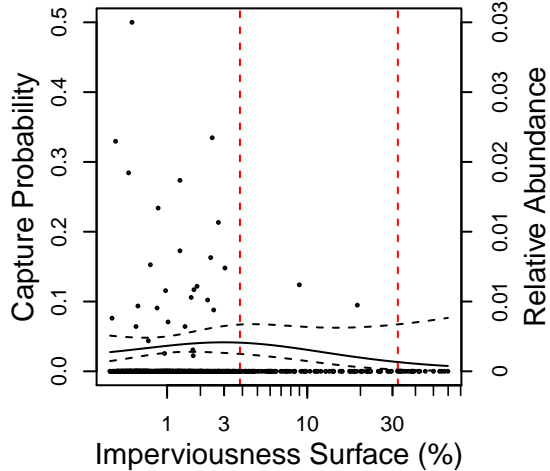
*Ranatra*



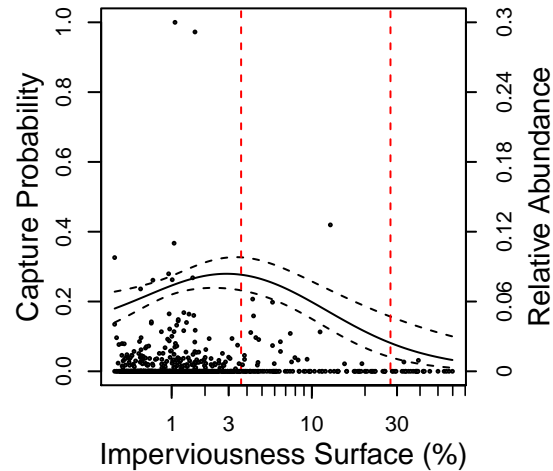
*Rhagovelia*



*Rheocricotopus*



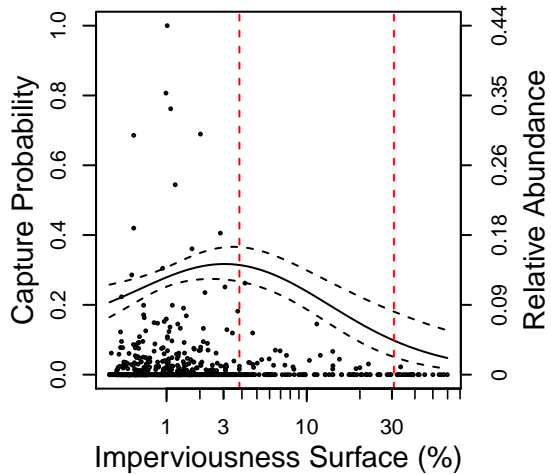
*Rheotanytarsus*



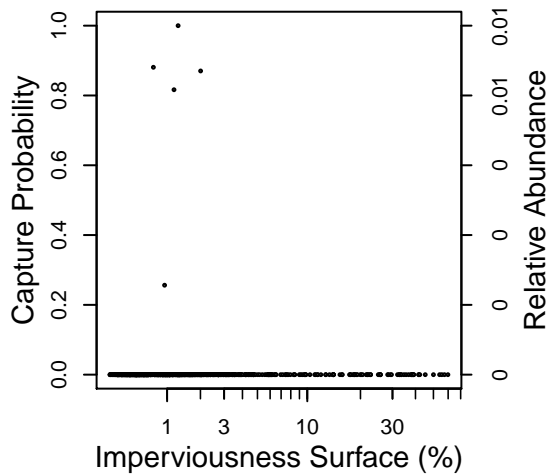


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

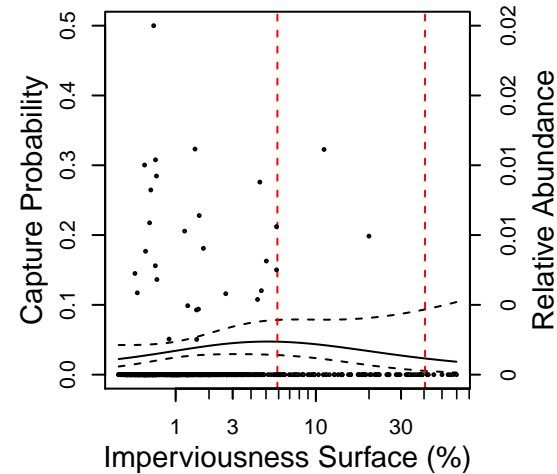
*Rheumatobates*



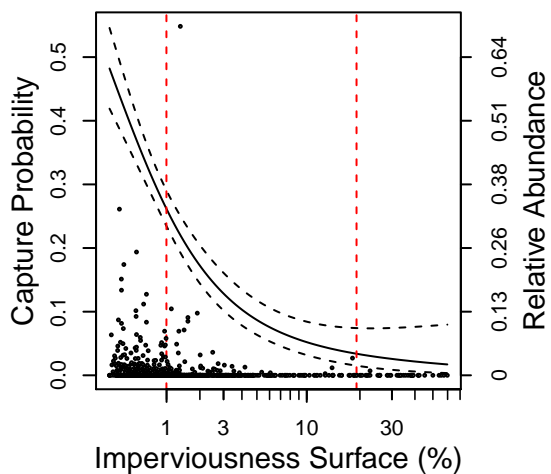
*Robackia*



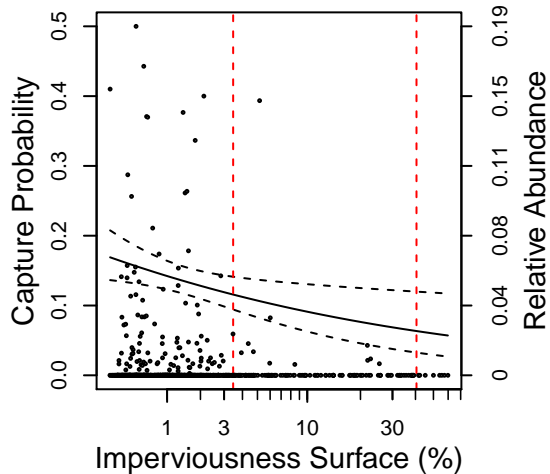
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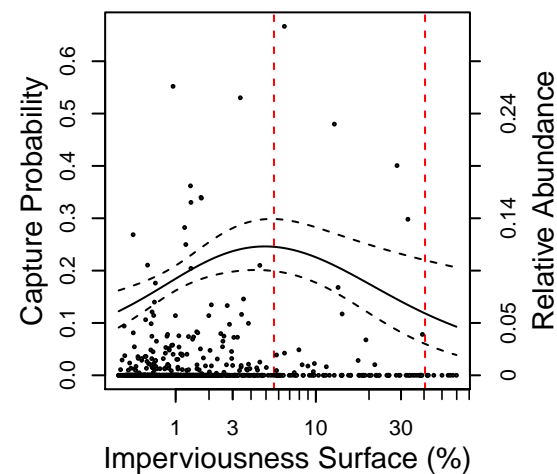
*Sialis*



*Sigara*

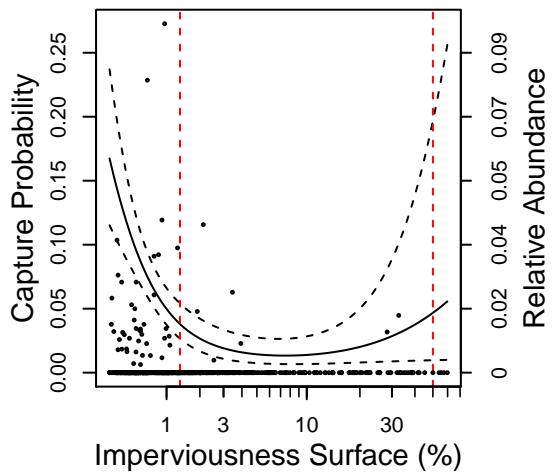


*Simulium*

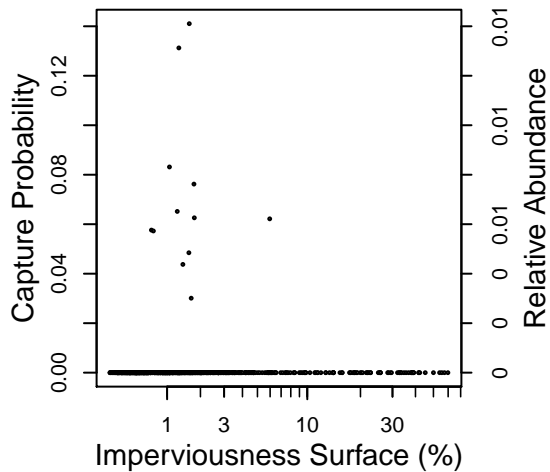


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

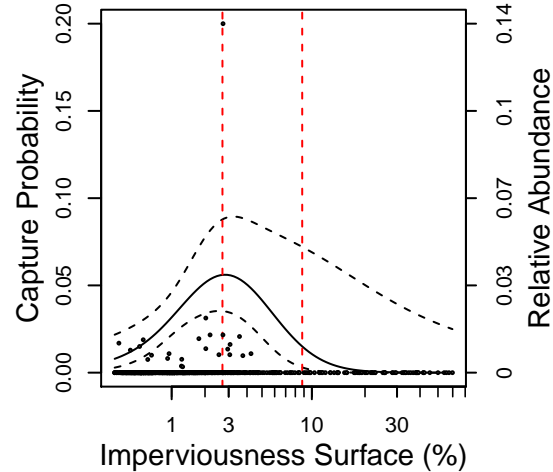
*Somatochlora*



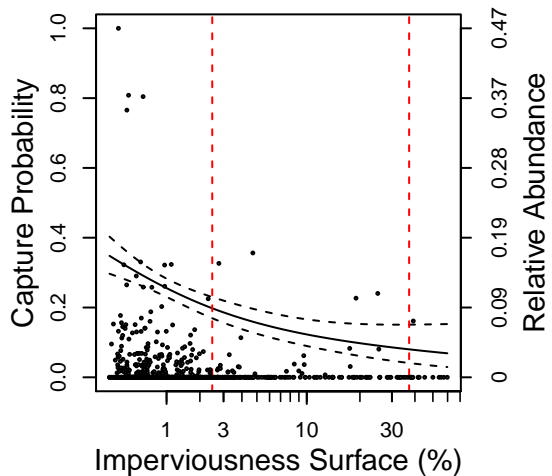
*Sparbarus*



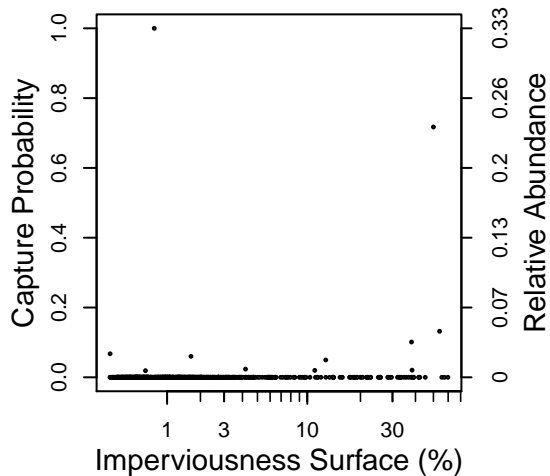
*Sperchopsis*



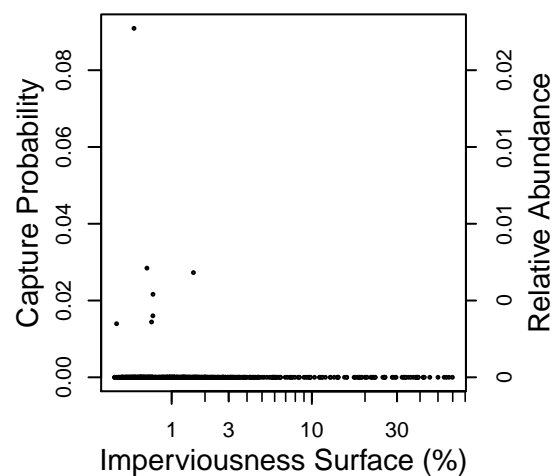
*Sphaerium*



*Stagnicola*

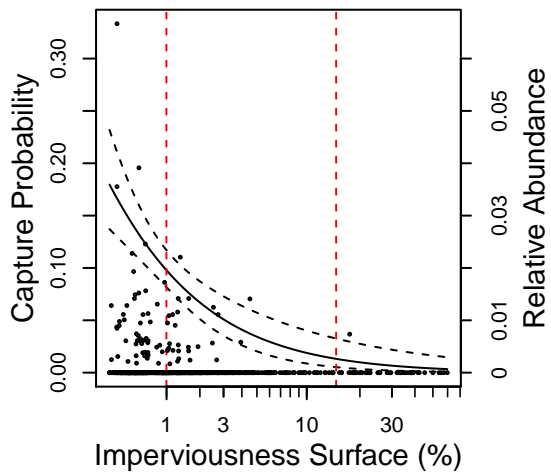


*Stempellina*

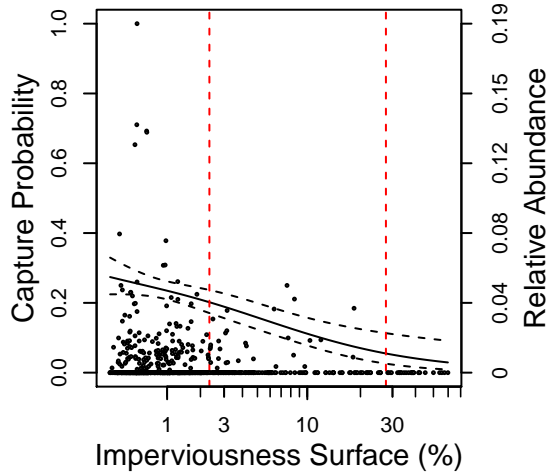


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

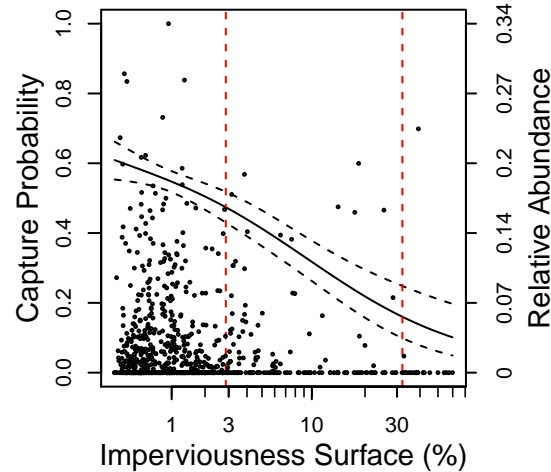
*Stempellinella*



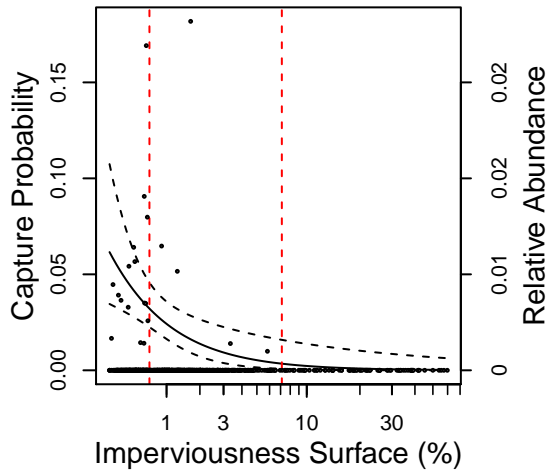
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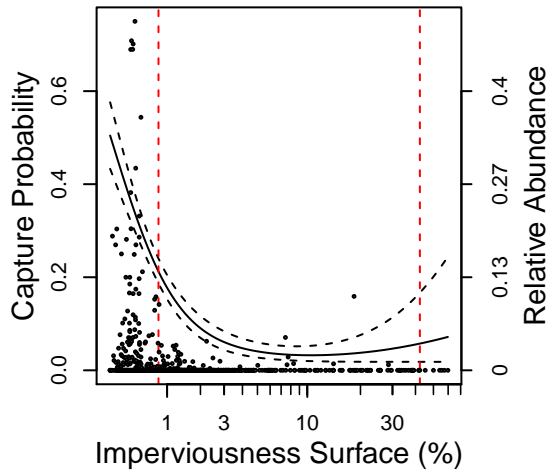
*Stenelmis*



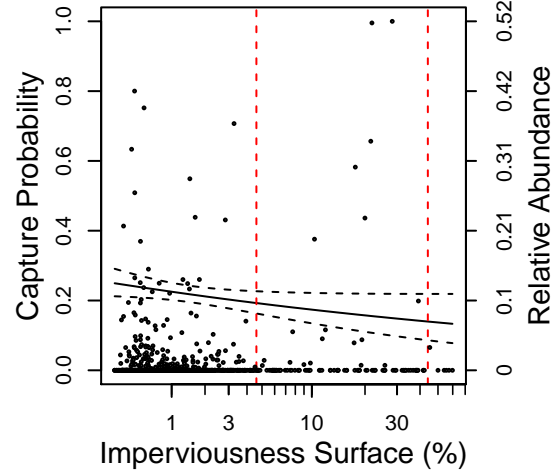
*Stenochironomus*



*Stenonema*

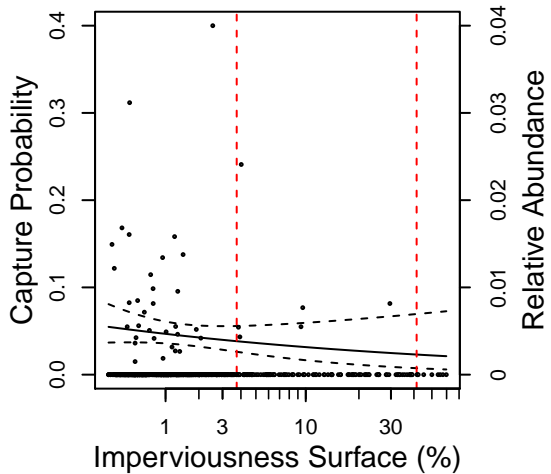


*Stictochironomus*

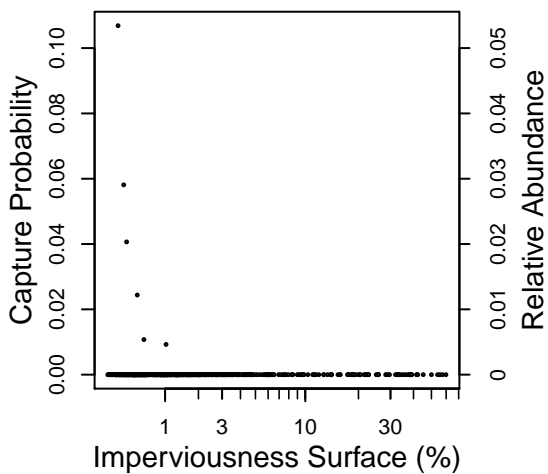


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

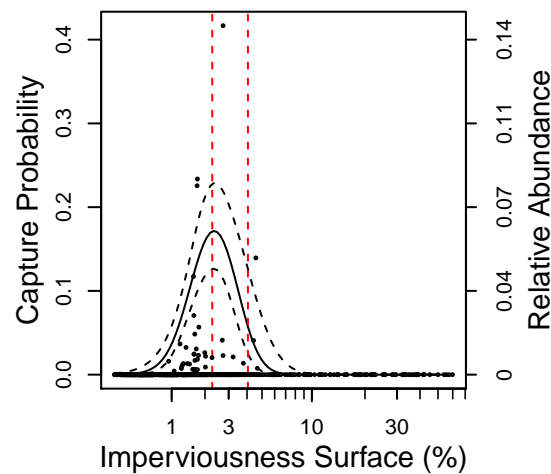
*Stratiomys*



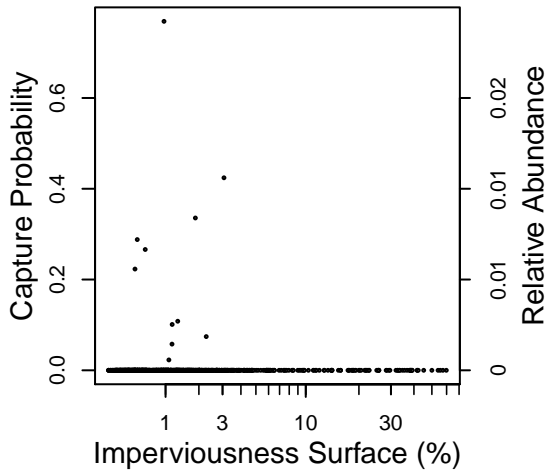
*Stylogomphus*



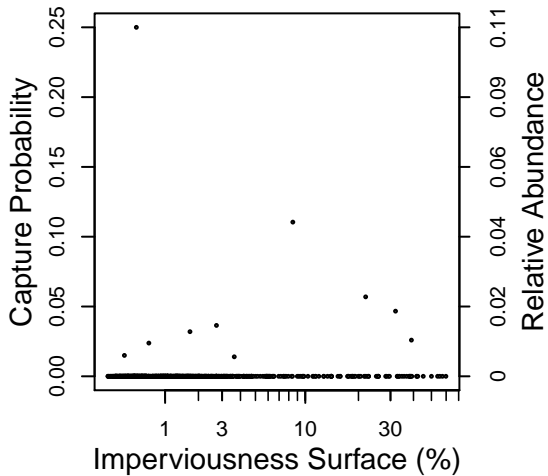
*Stylurus*



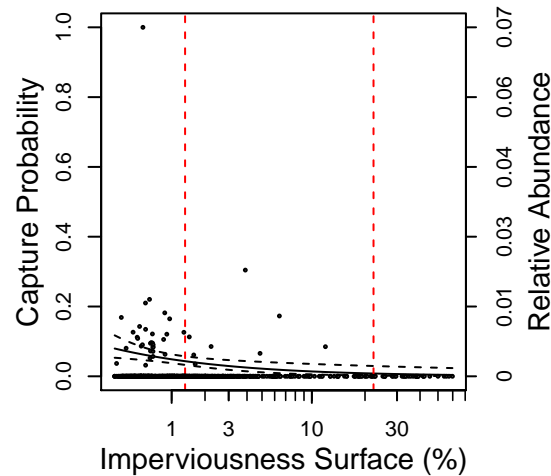
*Sublettea*



*Sympetrum*

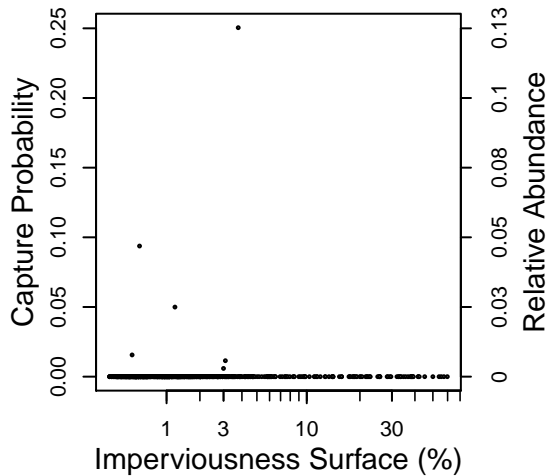


*Tabanus*

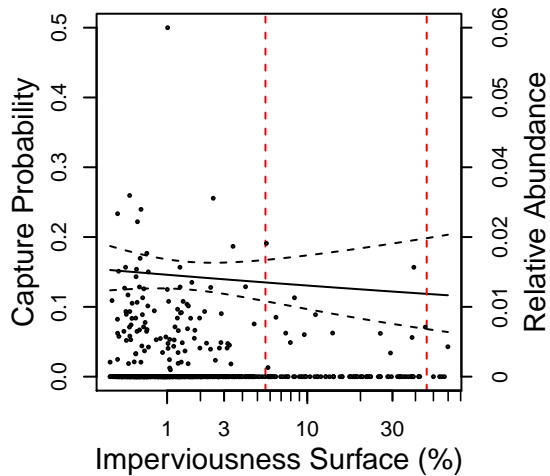


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

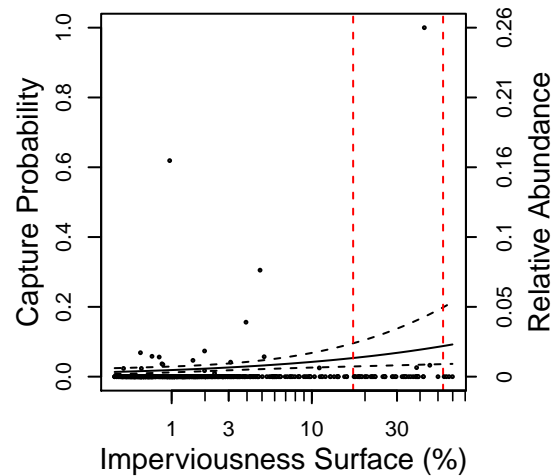
*Taeniopteryx*



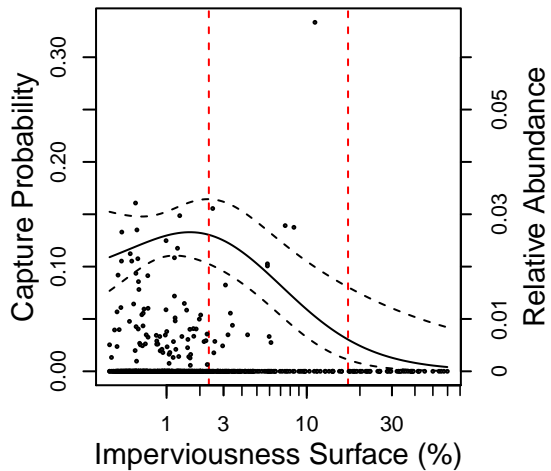
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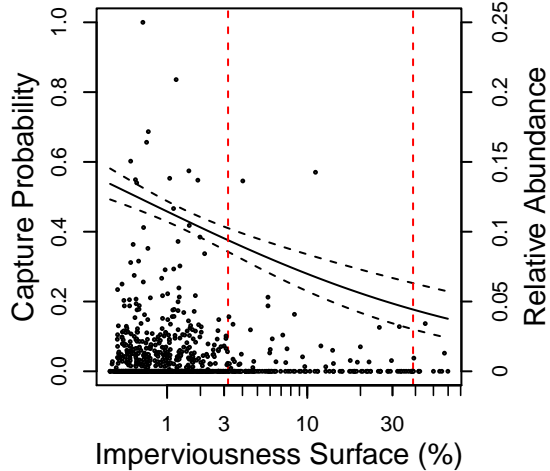
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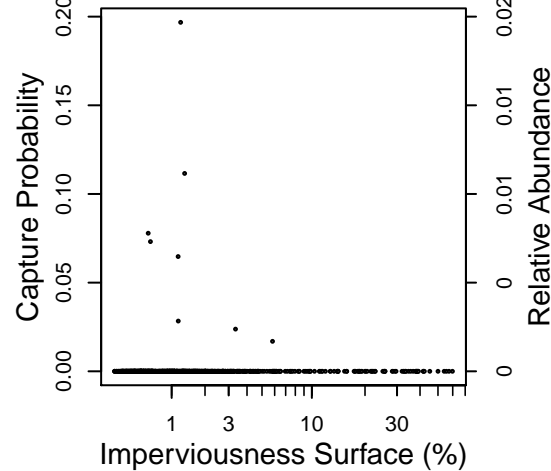
*Tanytarsini*



*Tanytarsus*

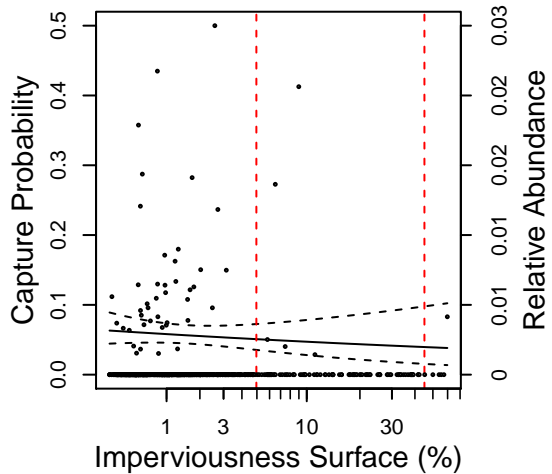


*Telopelopia*

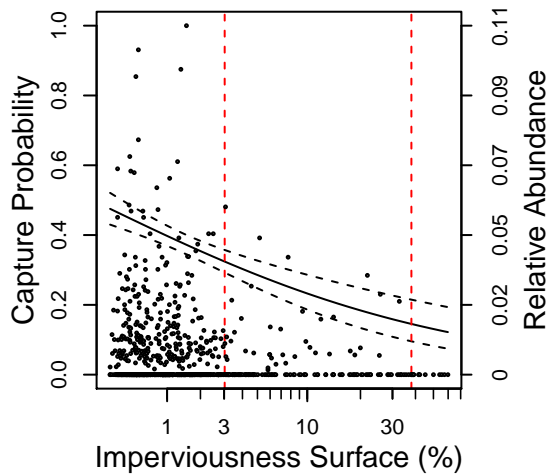


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

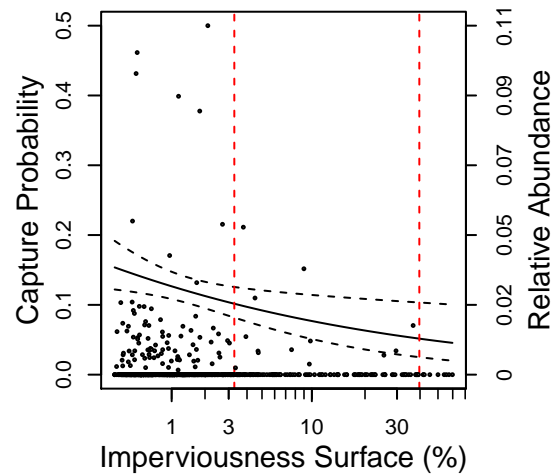
*Thienemanniella*



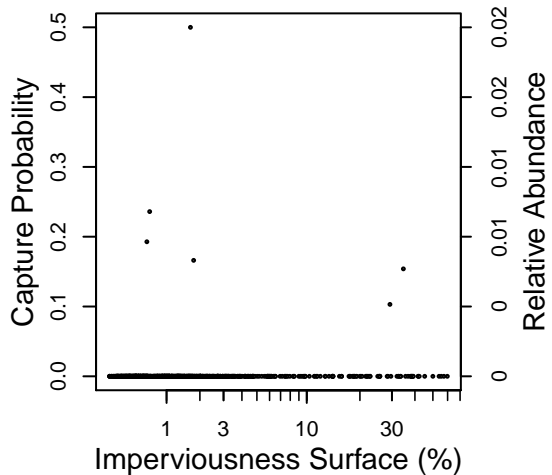
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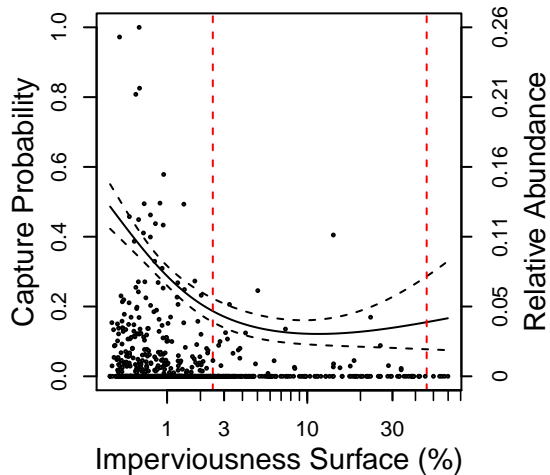
*Tipula*



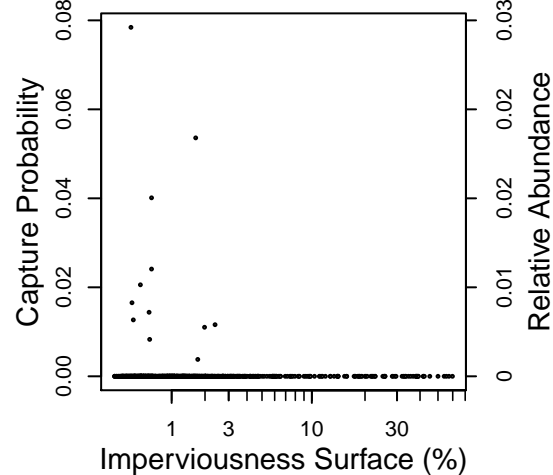
*Tramea*



*Trepobates*

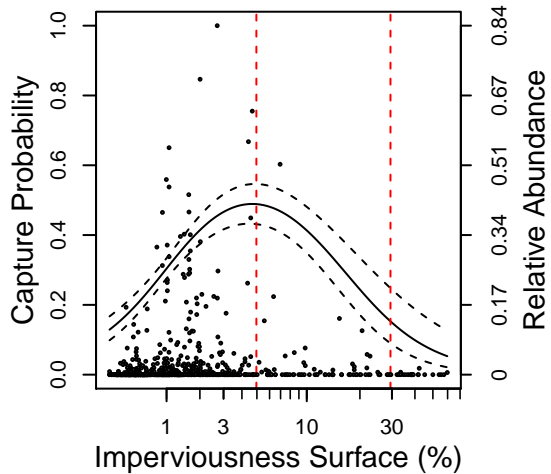


*Triaenodes*

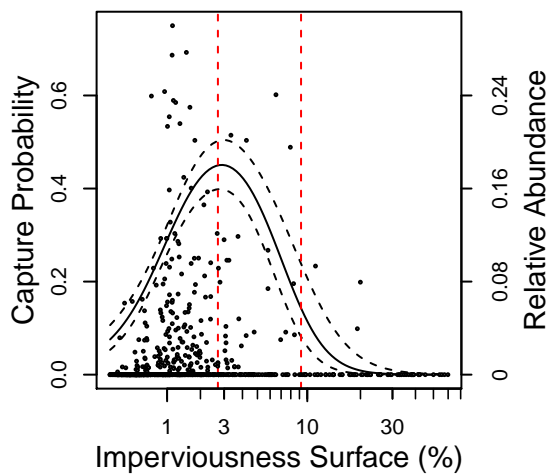


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

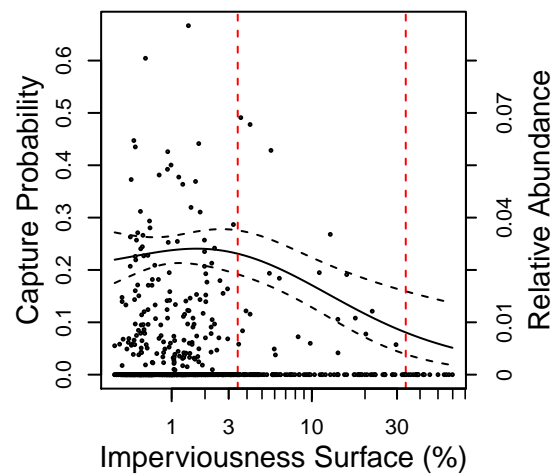
*Trichocorixa*



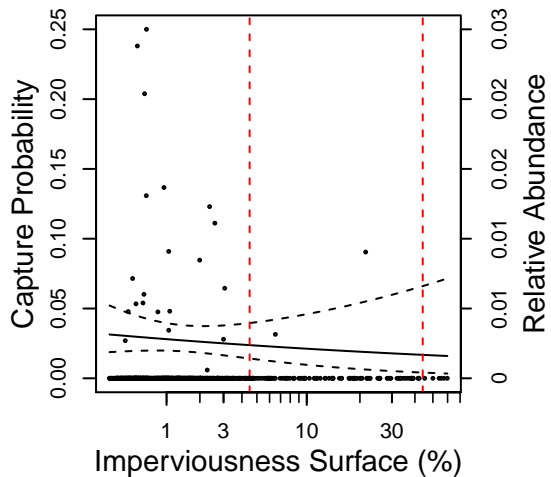
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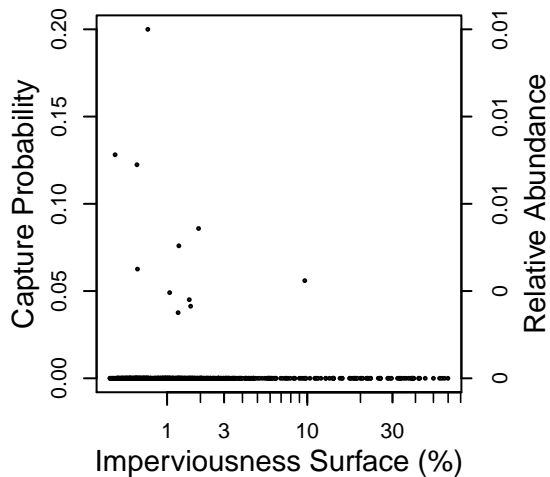
*Tropisternus*



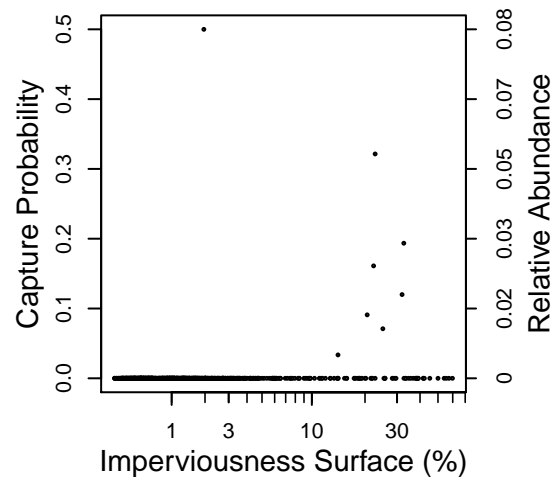
*Tvetenia*



*Uvarus*

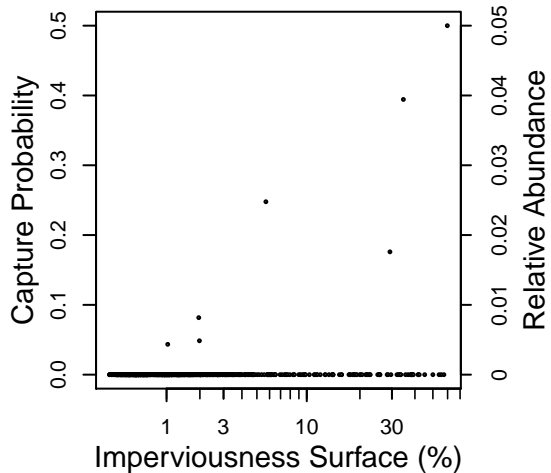


*Valvata*

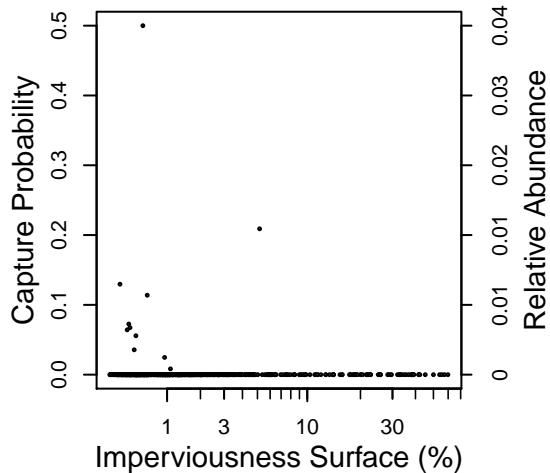


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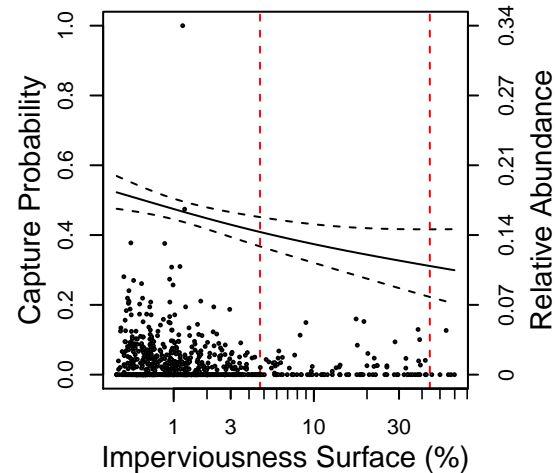
*Zavreliella*



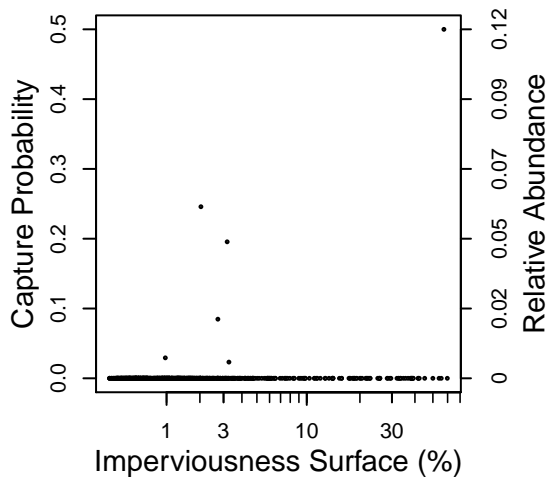
*Zavreliomyia*



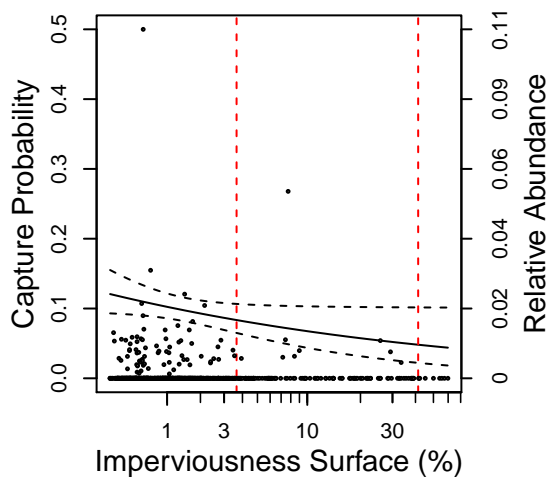
*Aeshnidae*



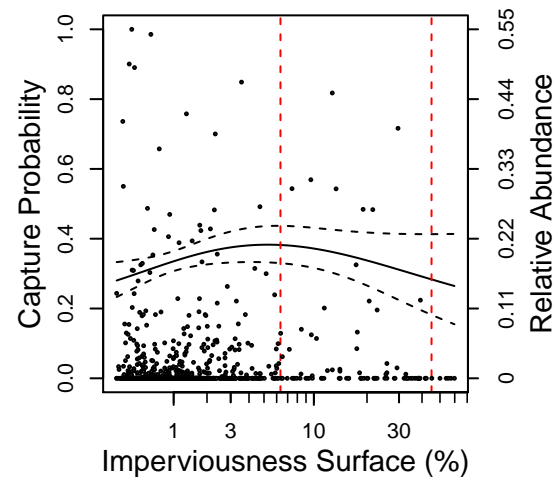
*Amphipoda*



*Ancylidae*



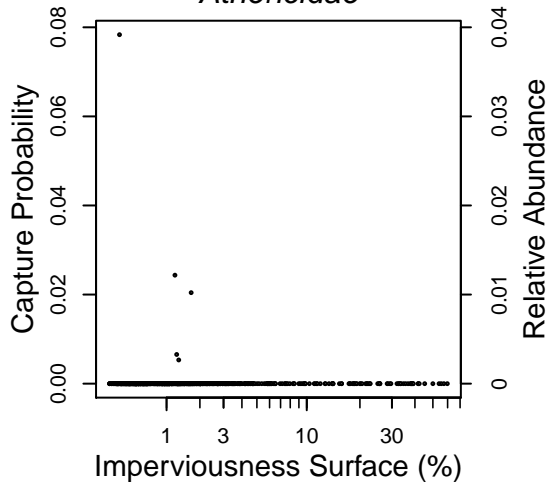
*Asellidae*



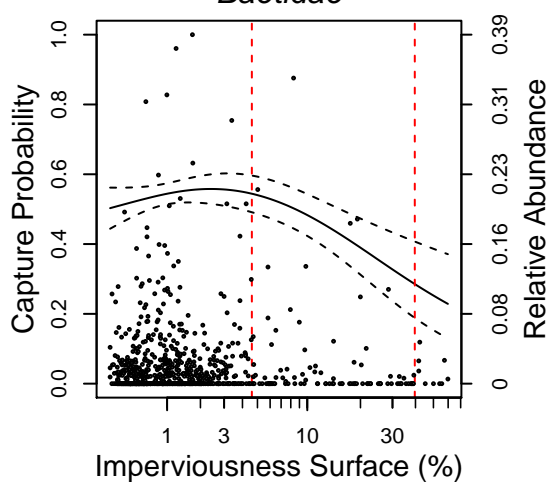


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

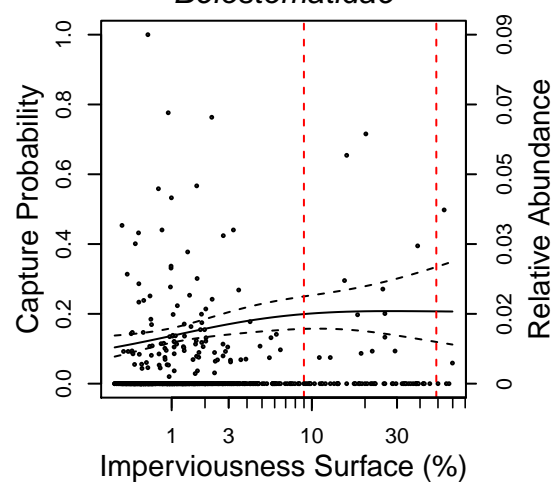
*Athericidae*



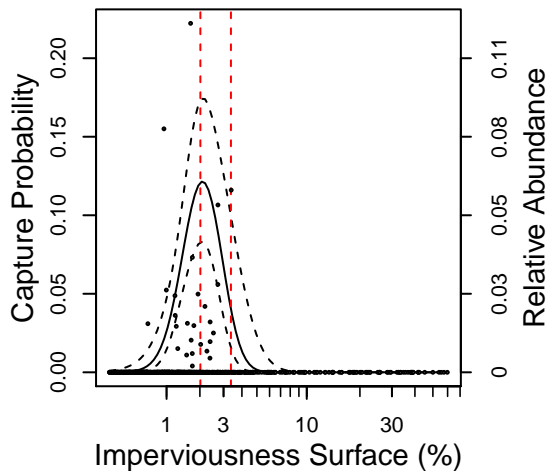
*Baetidae*



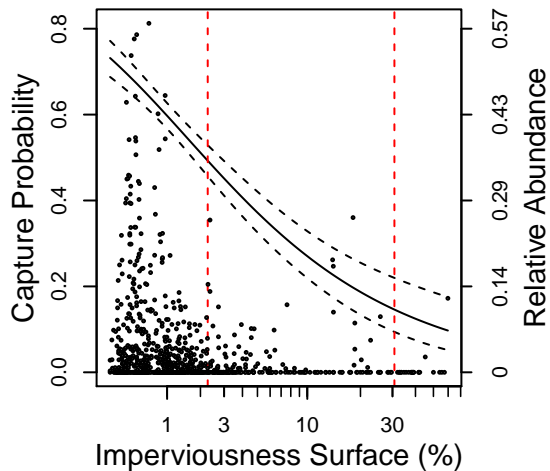
*Belostomatidae*



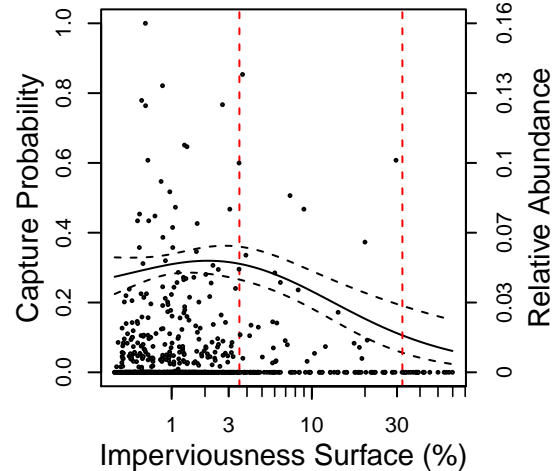
*Brachycentridae*



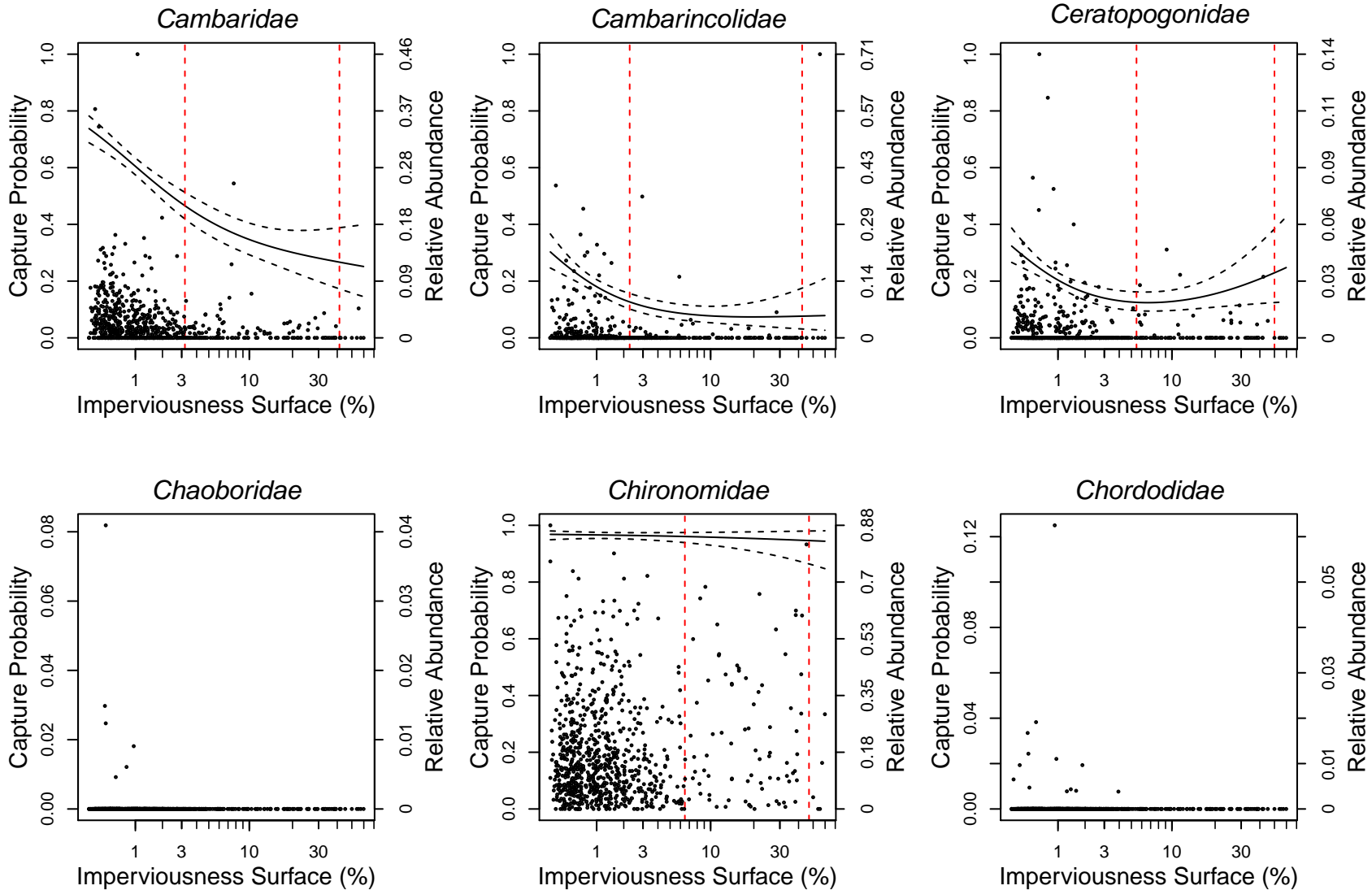
*Caenidae*



*Calopterygidae*

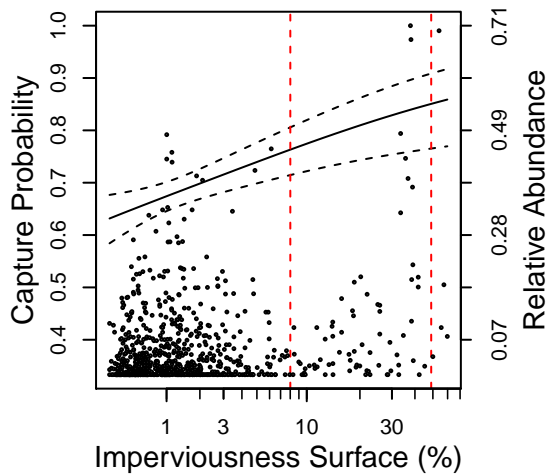


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

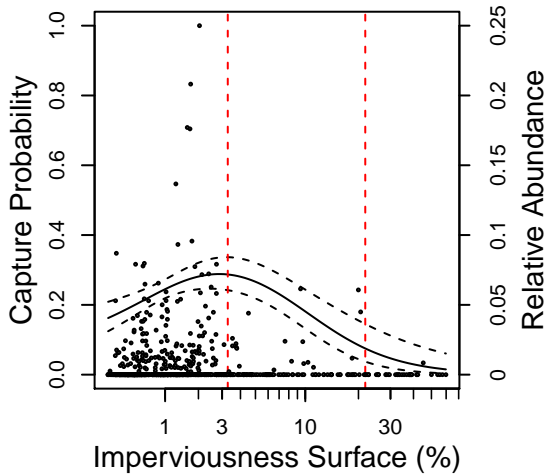


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

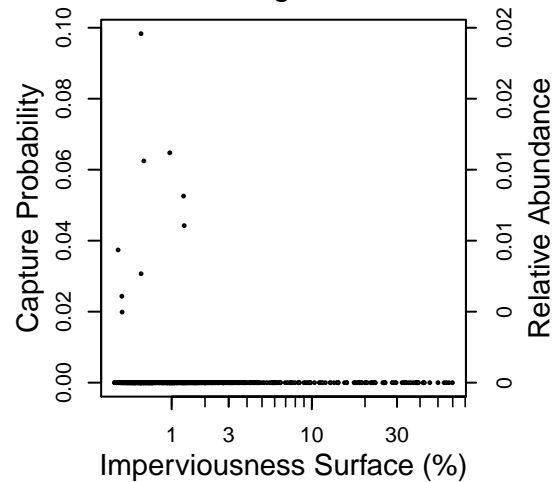
## *Coenagrionidae*



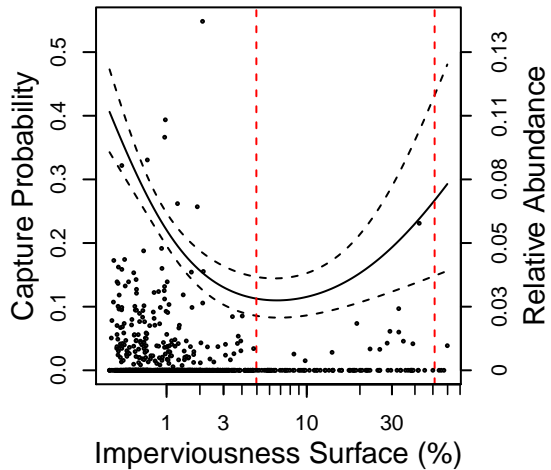
## *Corbiculidae*



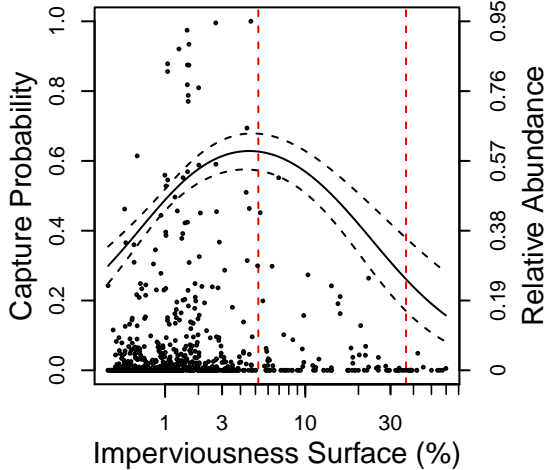
## *Cordulegastridae*



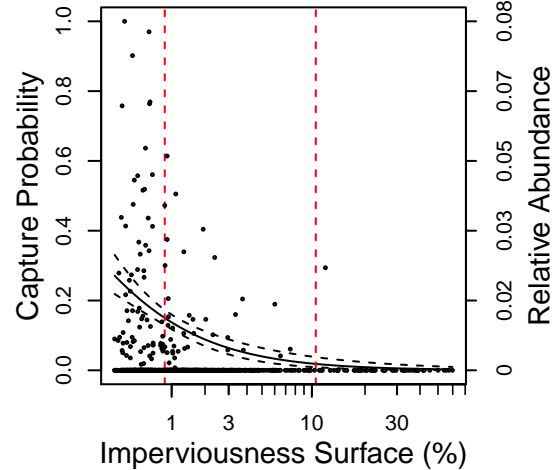
## *Corduliidae*



## *Corixidae*

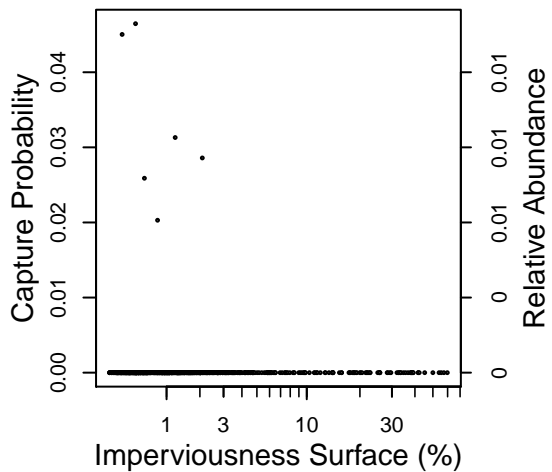


## *Corydalidae*

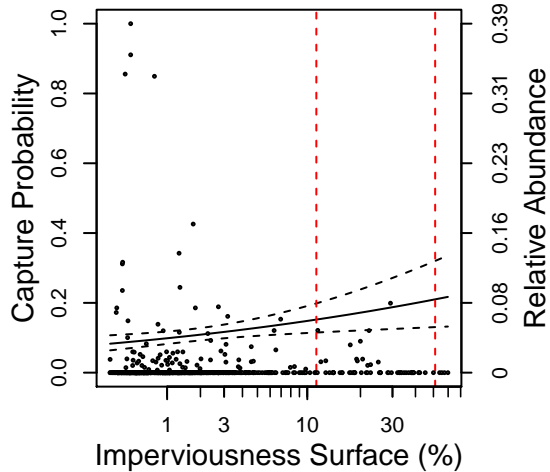


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

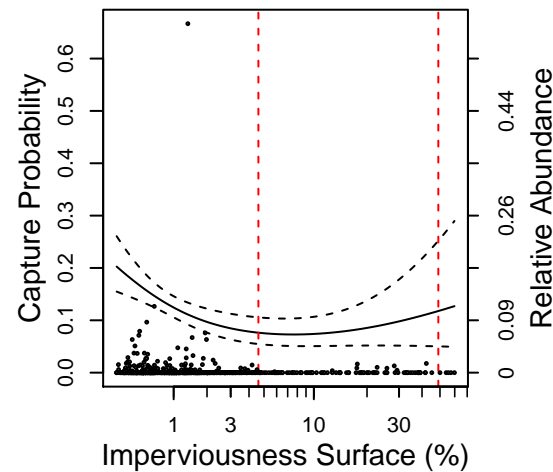
*Crambidae*



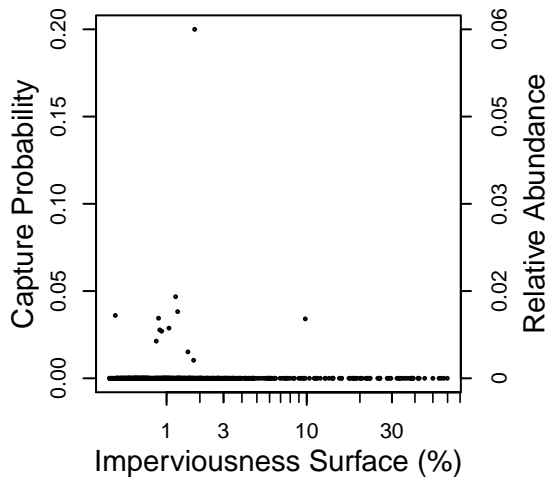
*Crangonyctidae*



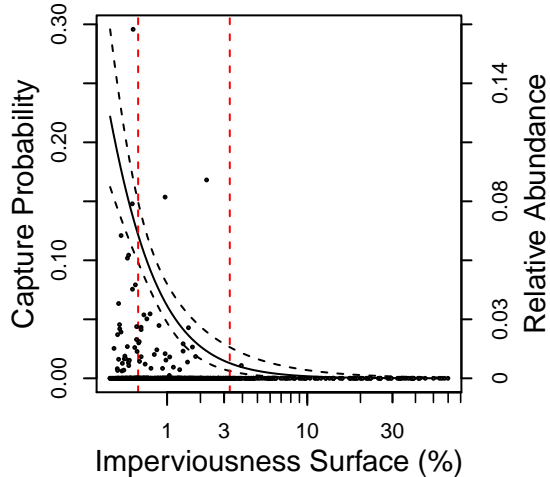
*Culicidae*



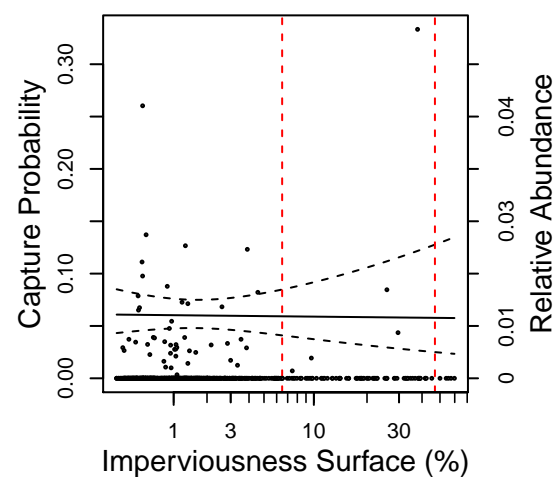
*Curculionidae*



*Dixidae*

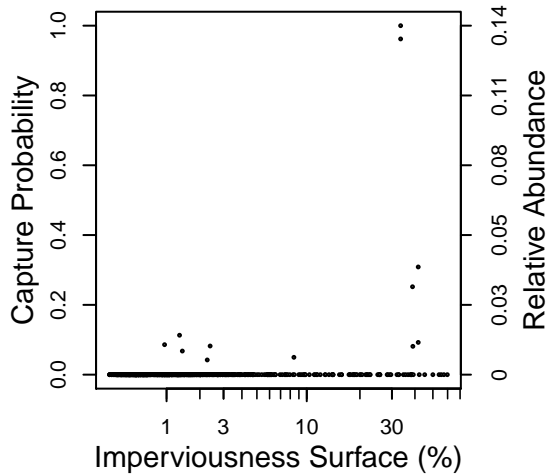


*Dorylaimidae*

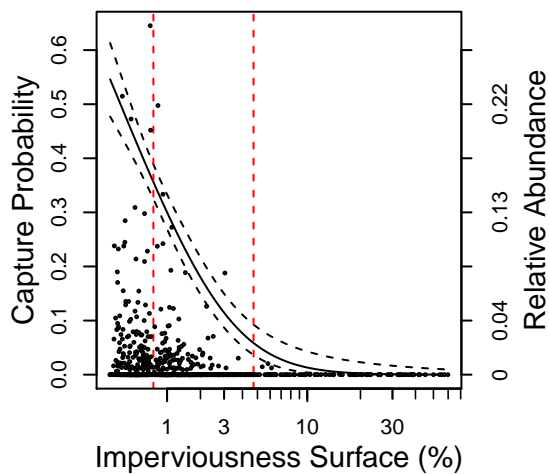


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

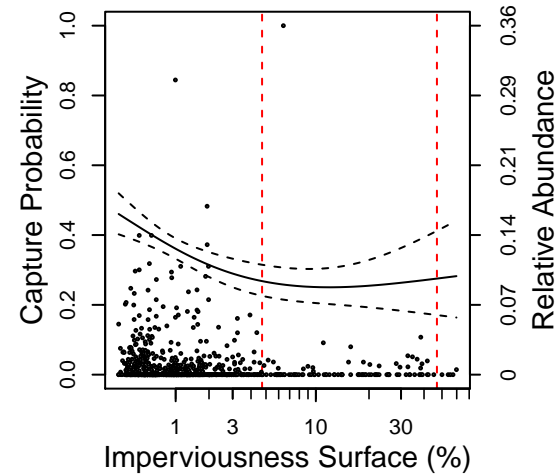
*Dreissenidae*



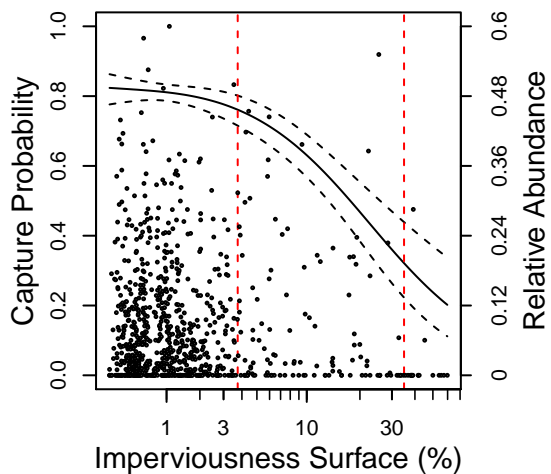
*Dryopidae*



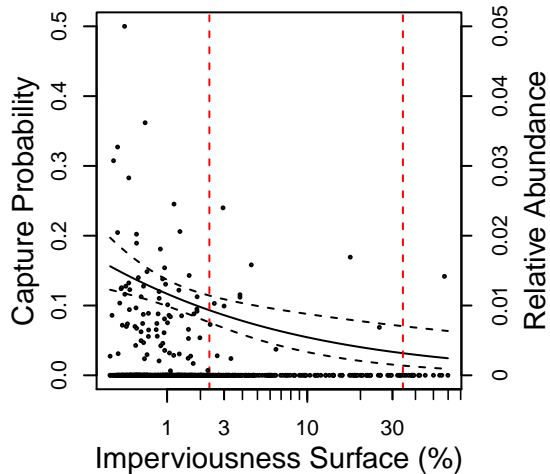
*Dytiscidae*



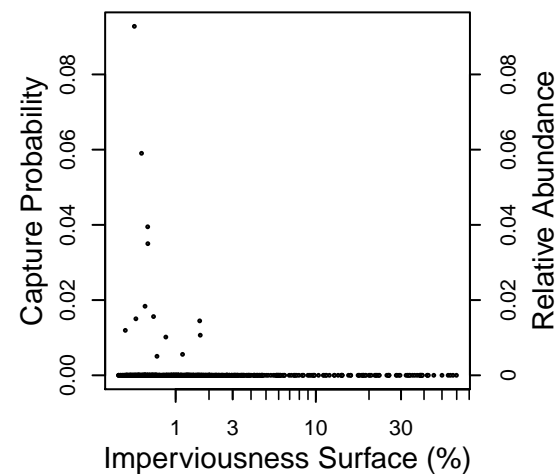
*Elmidae*



*Empididae*

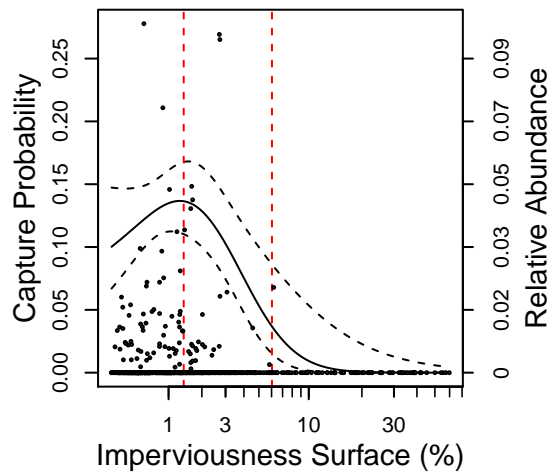


*Ephemerellidae*

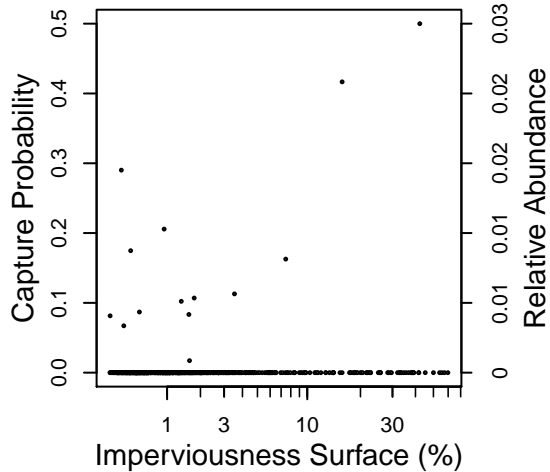


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

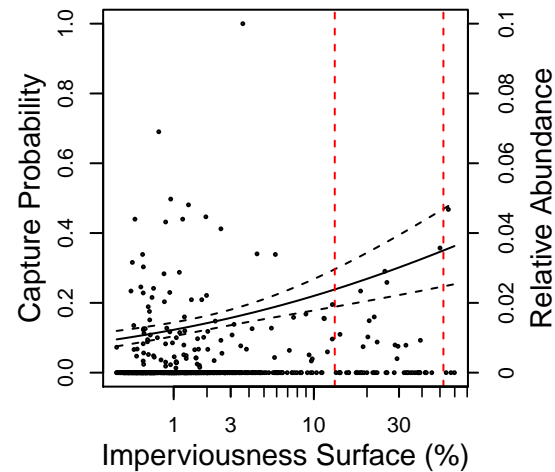
*Ephemeridae*



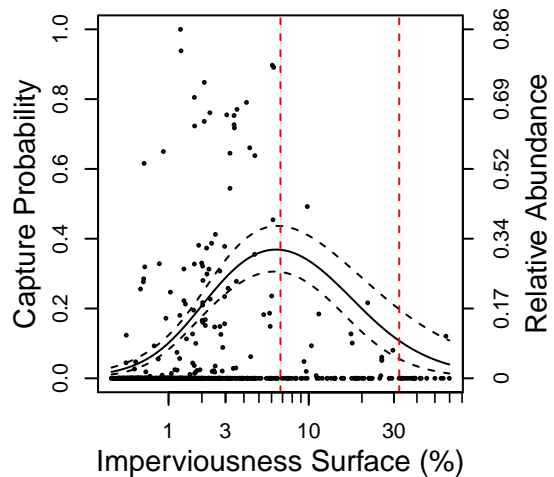
*Ephydriidae*



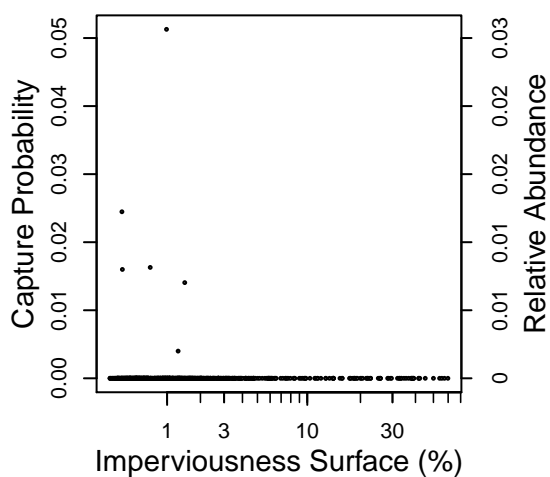
*Erpobdellidae*



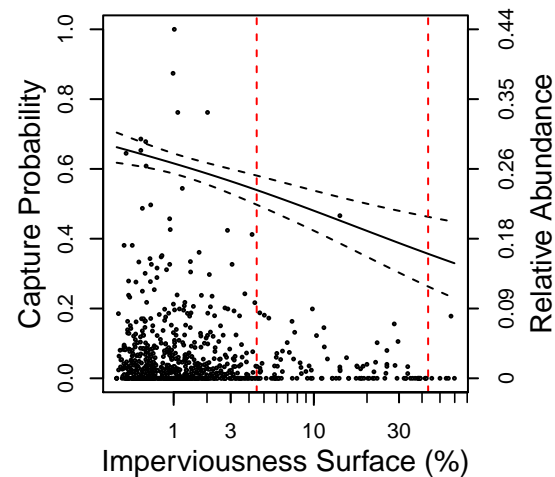
*Gammaridae*



*Gelastocoridae*

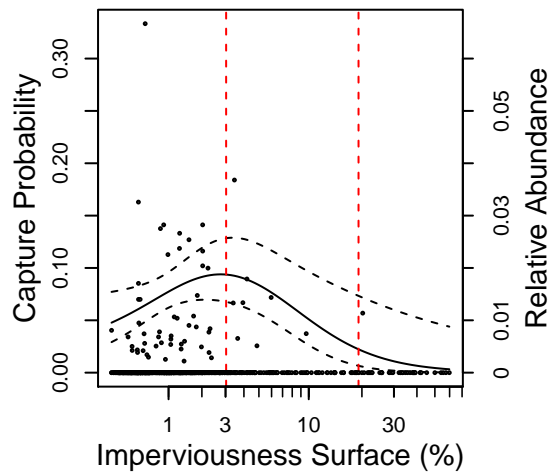


*Gerridae*

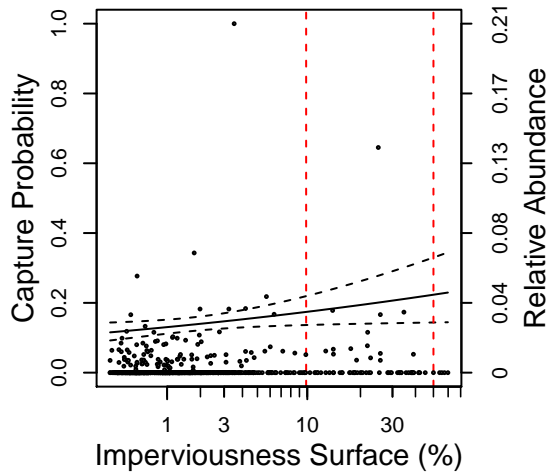


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

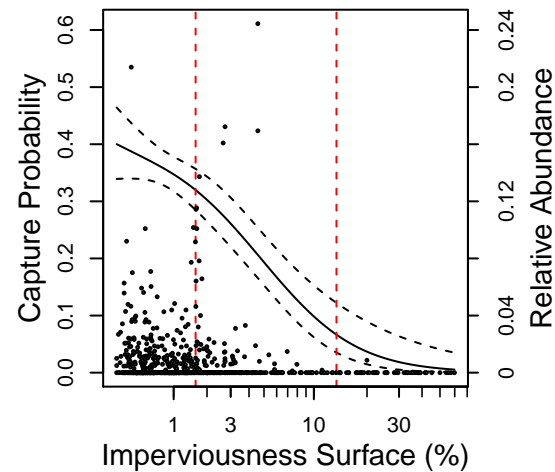
## *GERRIDAE*



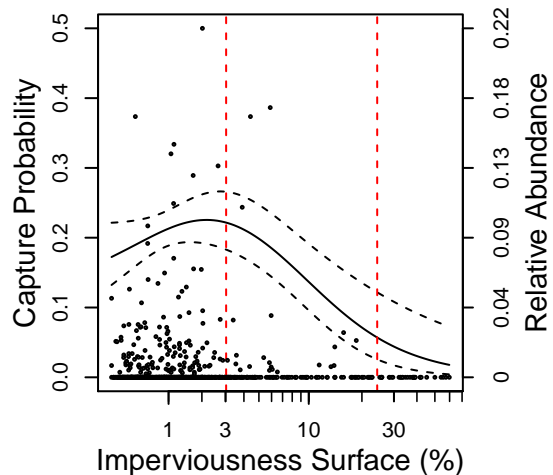
## *Glossiphoniidae*



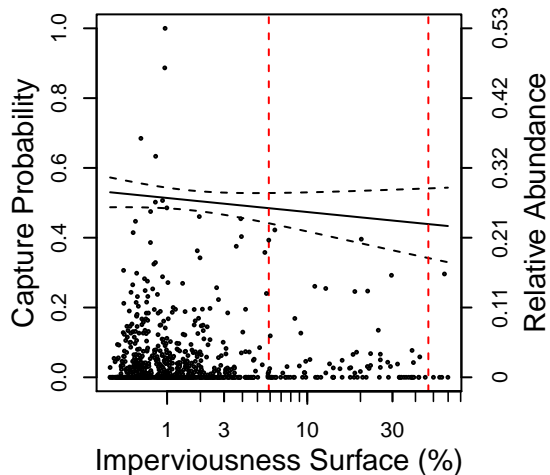
## *Gomphidae*



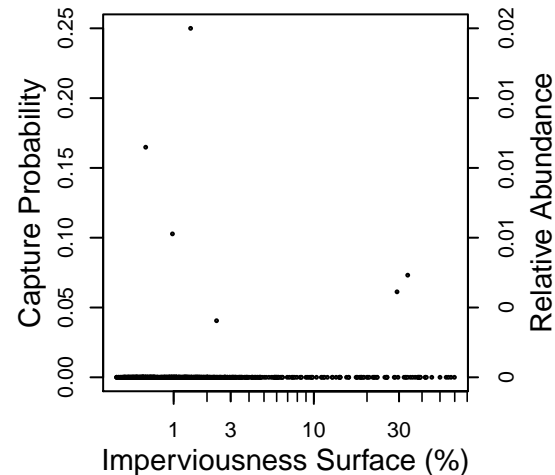
## *Gyrinidae*



## *Haliplidae*

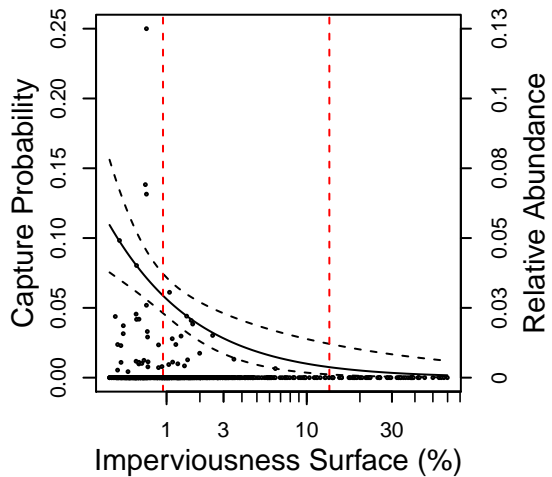


## *Hebridae*

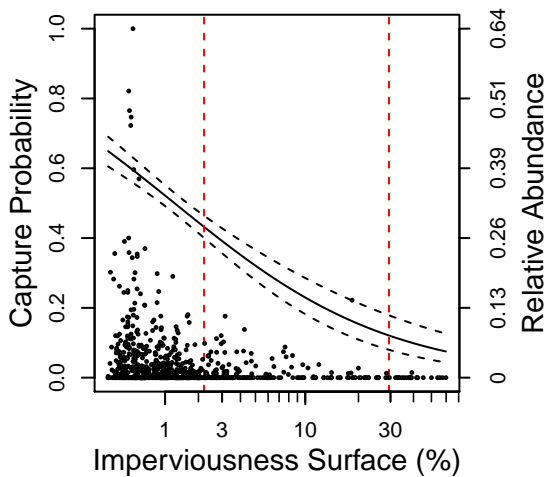


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

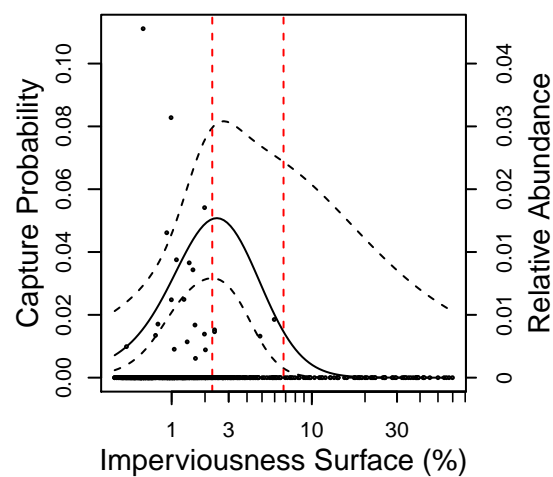
*Helicopsychidae*



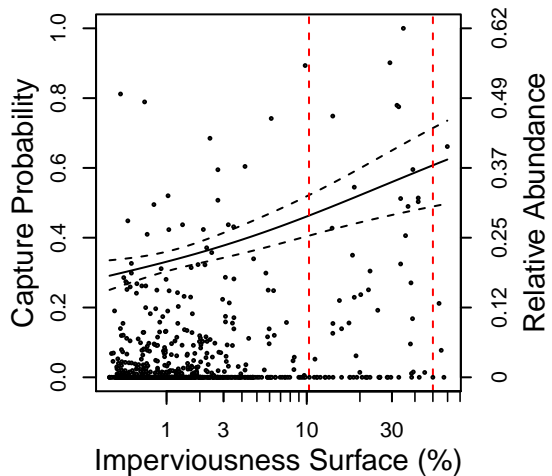
*Heptageniidae*



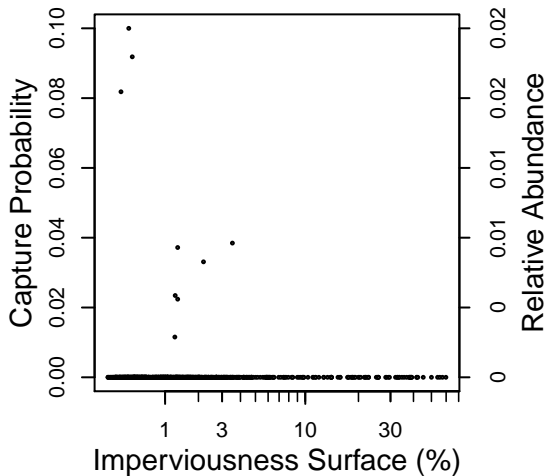
*Heteroceridae*



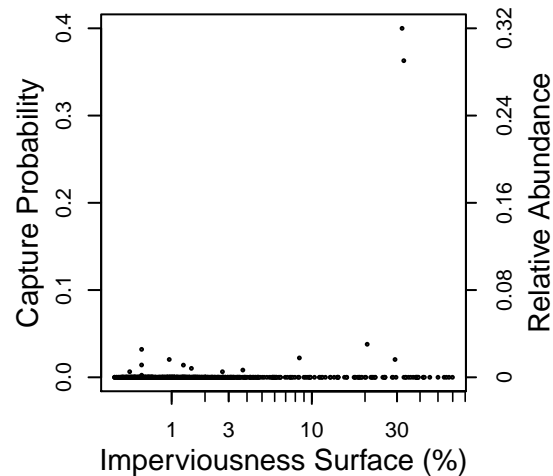
*Hyaletellidae*



*Hydraenidae*



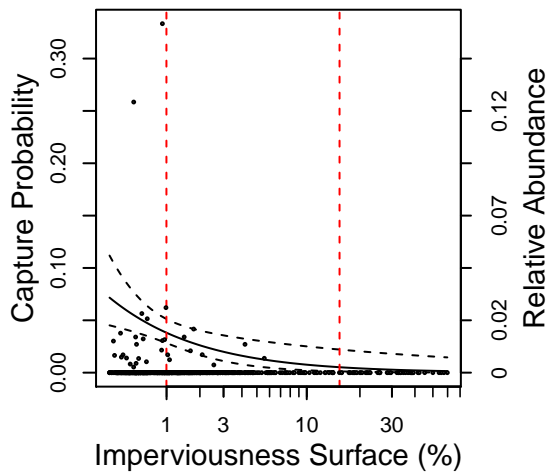
*Hydrobiidae*



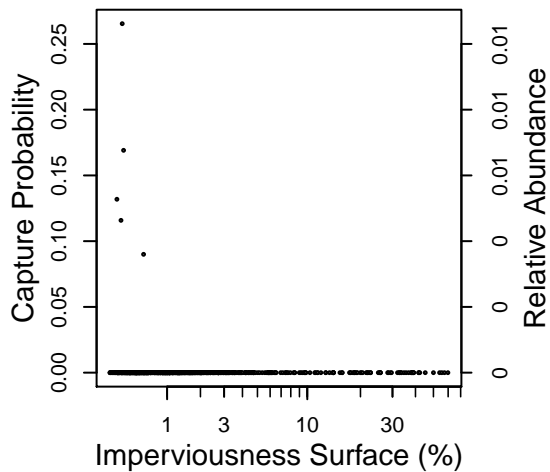


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

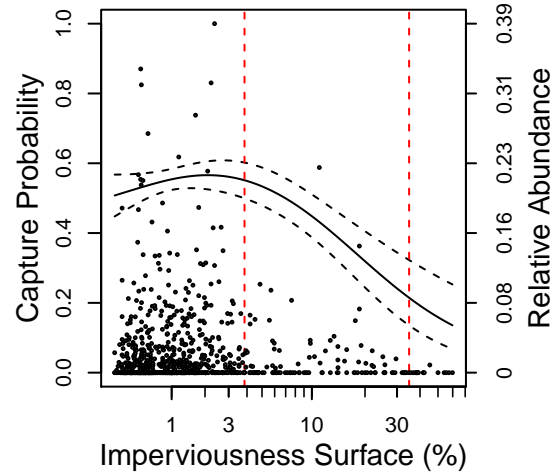
*Hydrochidae*



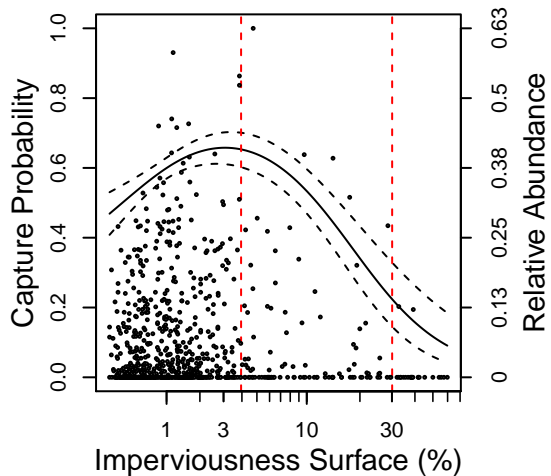
*Hydrometridae*



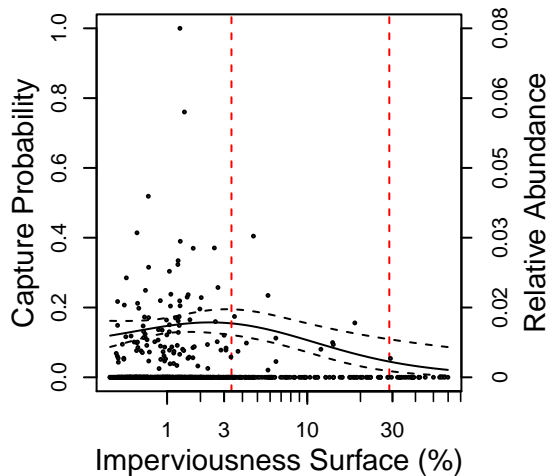
*Hydrophilidae*



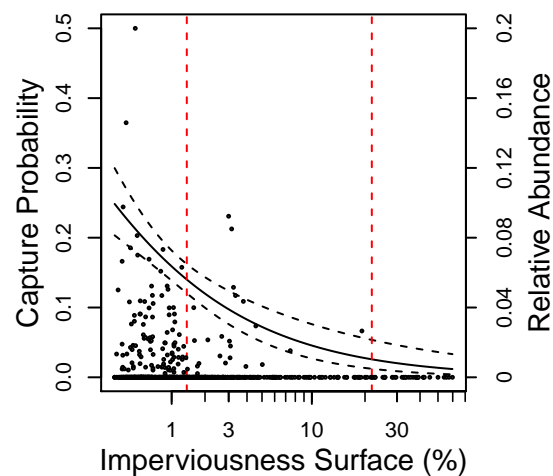
*Hydropsychidae*



*Hydroptilidae*

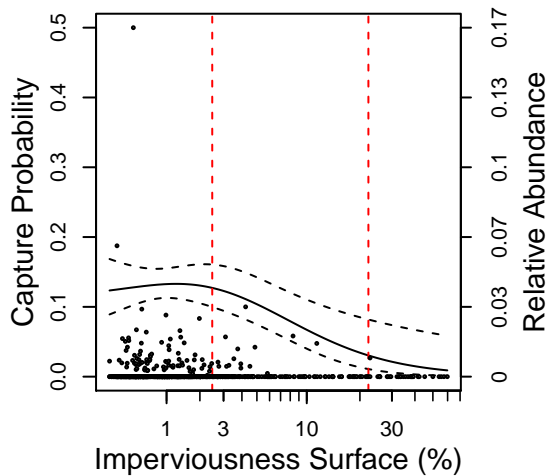


*Isonychiidae*

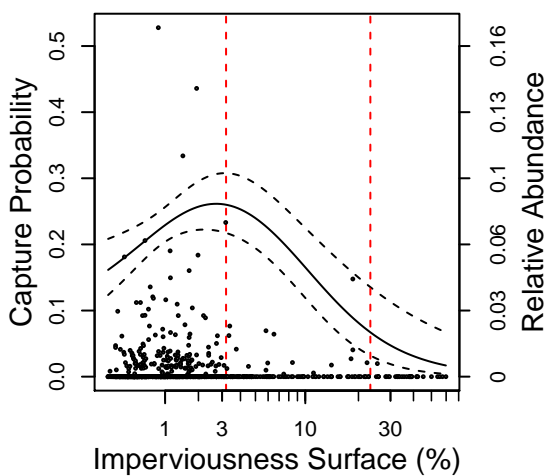


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

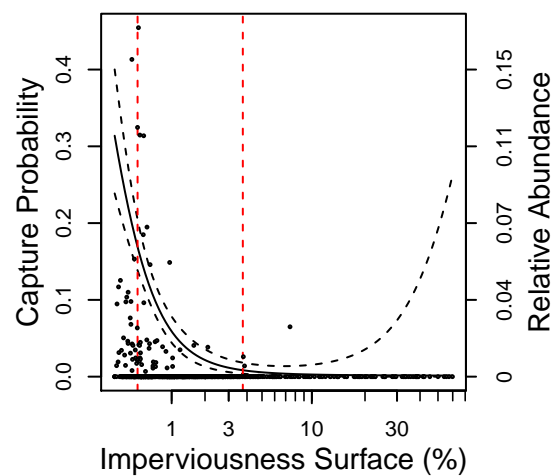
*Isotomidae*



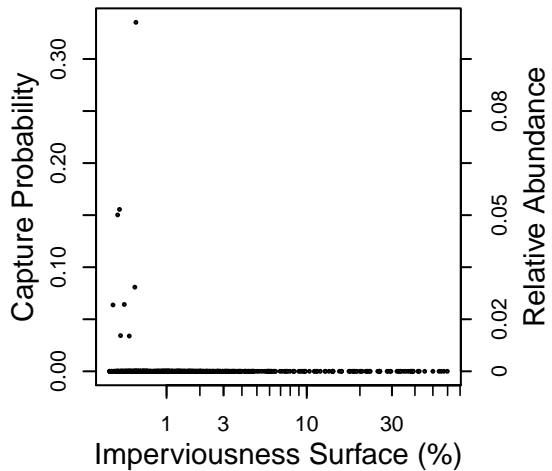
*Leptoceridae*



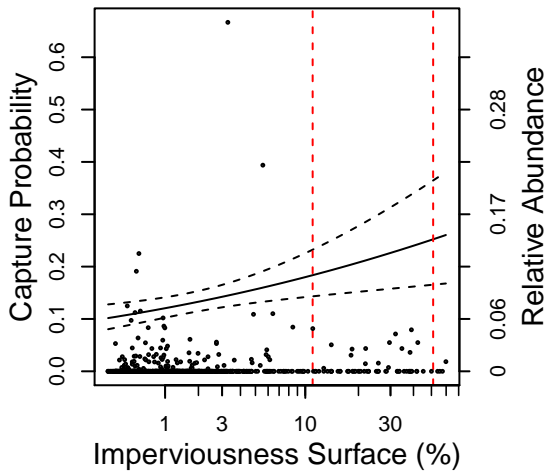
*Leptophlebiidae*



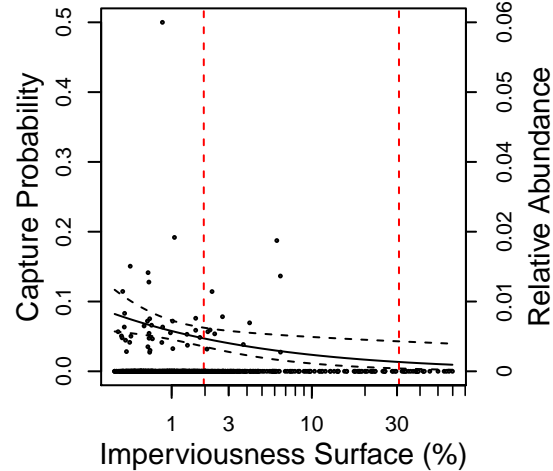
*Leuctridae*



*Libellulidae*

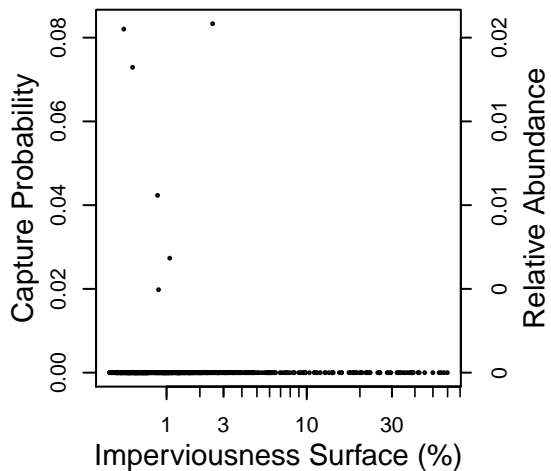


*Limnephilidae*

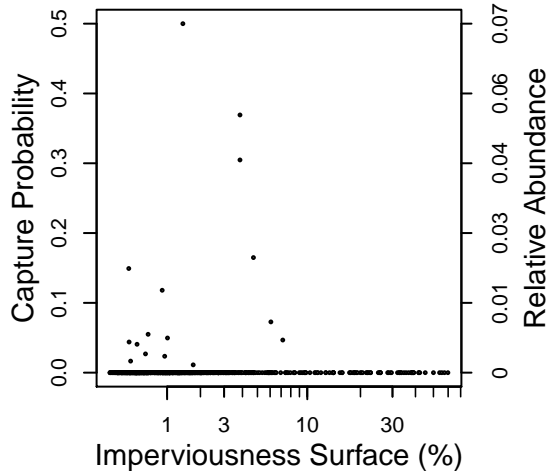


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

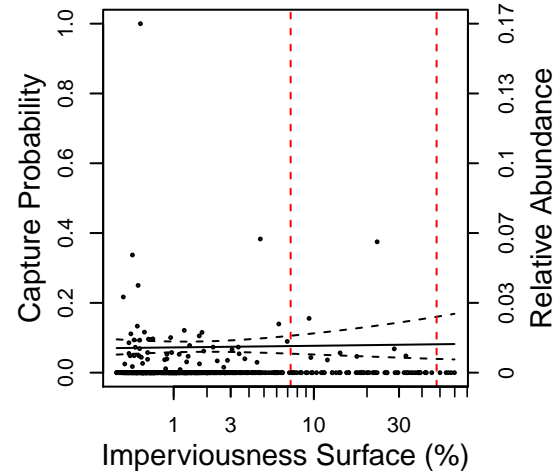
*Limnichidae*



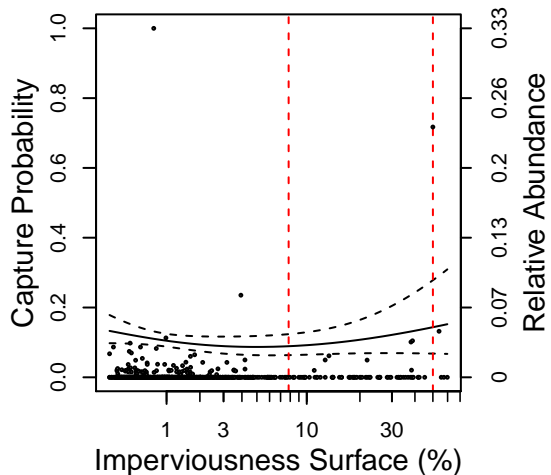
*Lumbricidae*



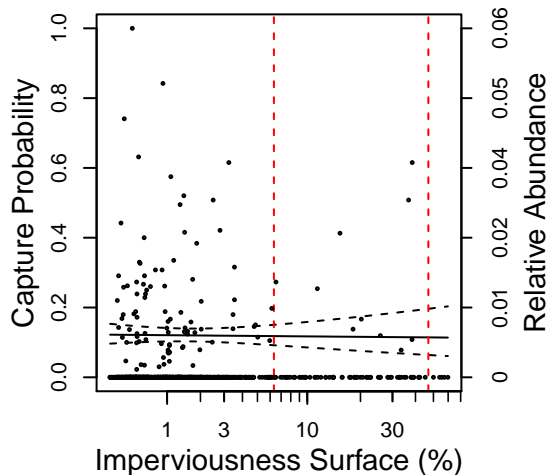
*Lumbriculidae*



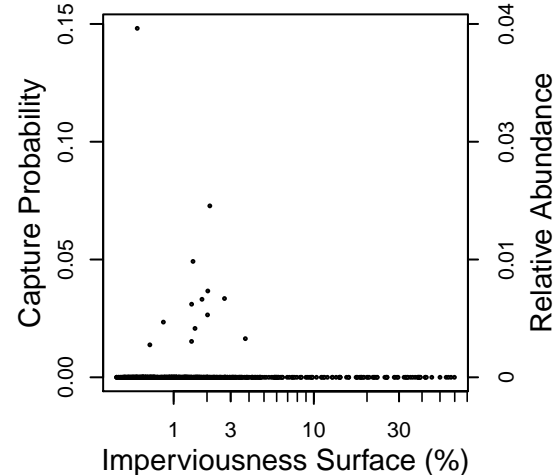
*Lymnaeidae*



*Mesoveliidae*

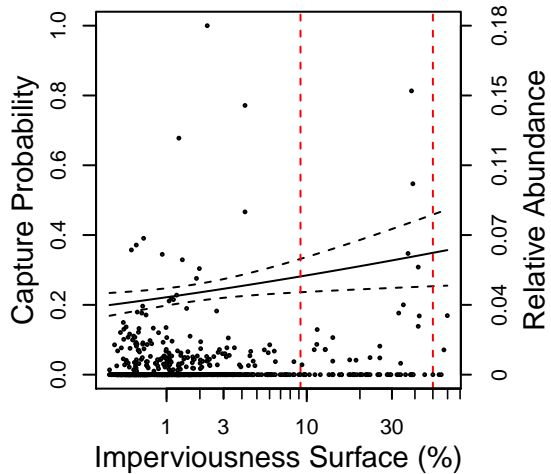


*Muscidae*

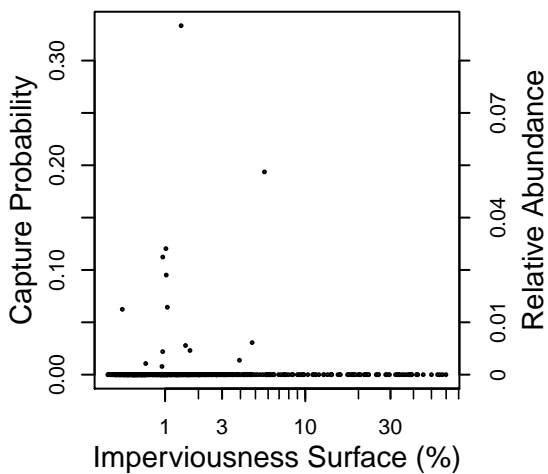


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

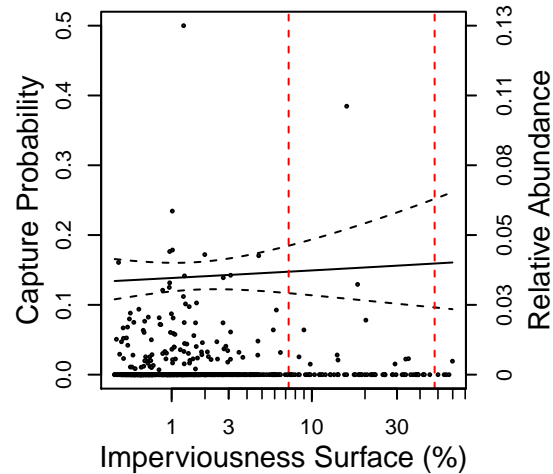
*Naididae*



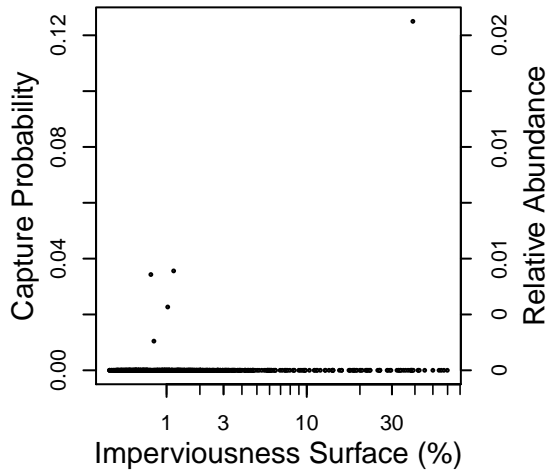
*Naucoridae*



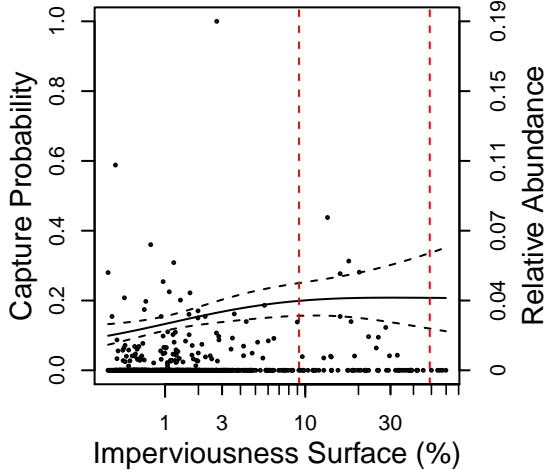
*Nepidae*



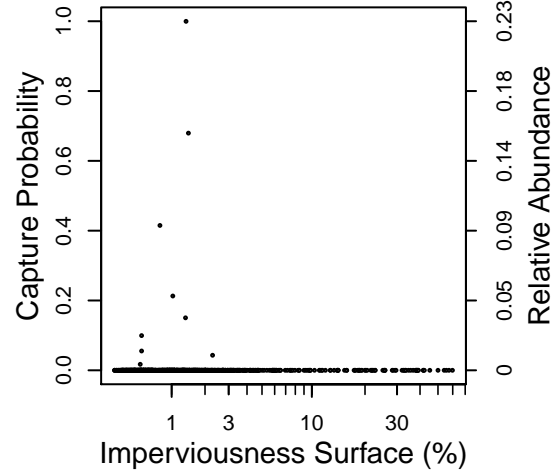
*Noteridae*



*Notonectidae*

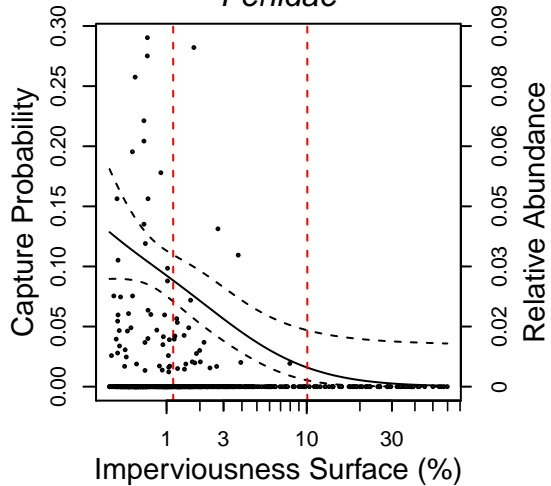


*Palaemonidae*

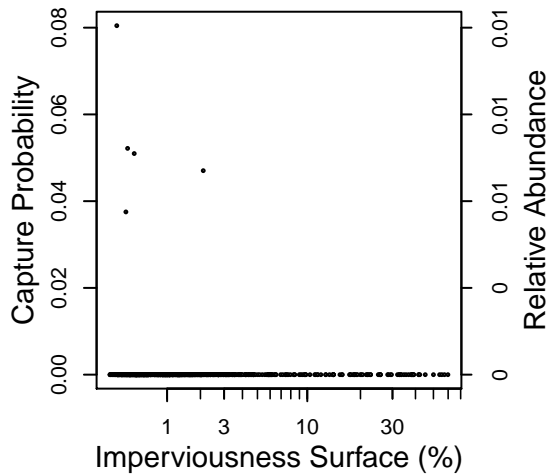


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

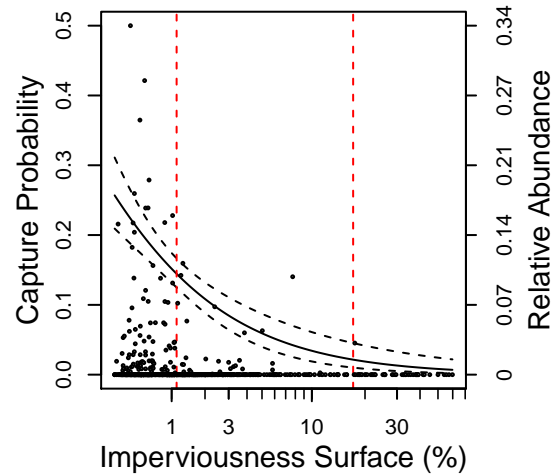
*Perlidae*



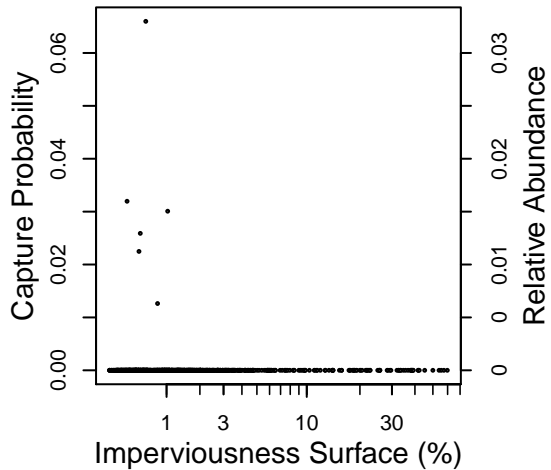
*Perlodidae*



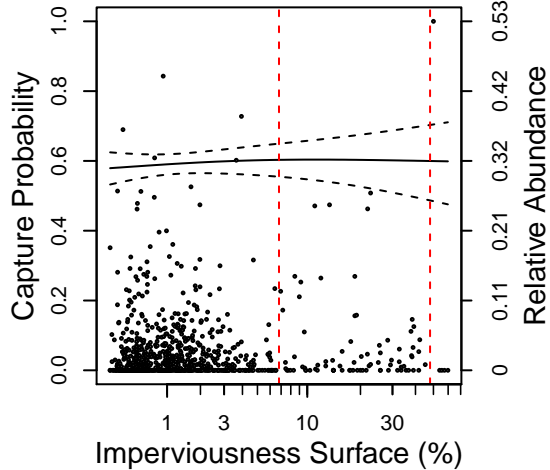
*Philopotamidae*



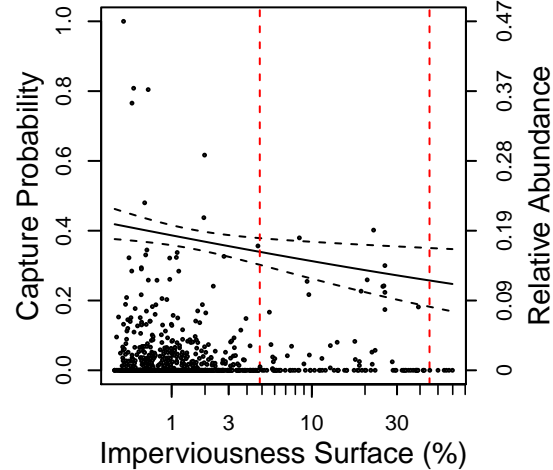
*Phryganeidae*



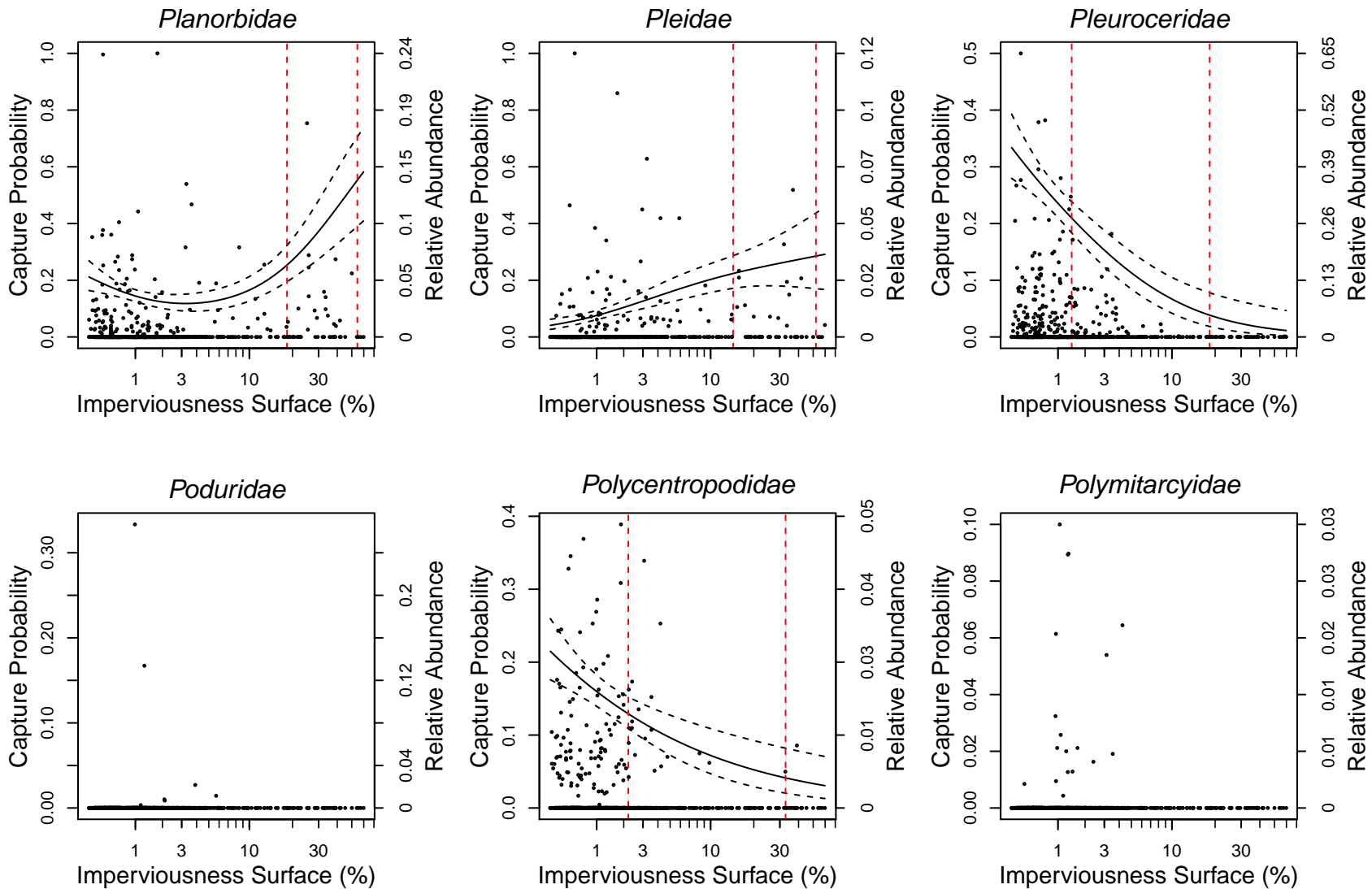
*Physidae*



*Pisidiidae*

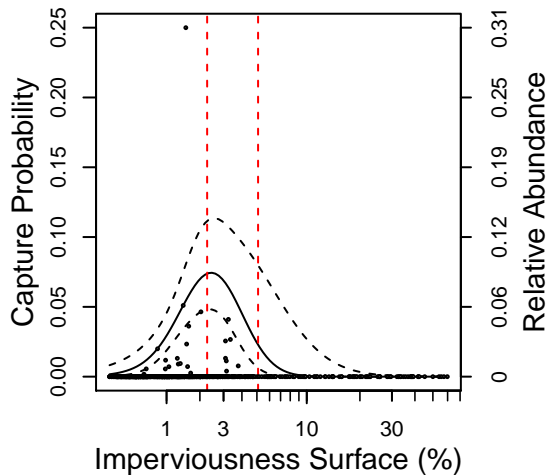


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

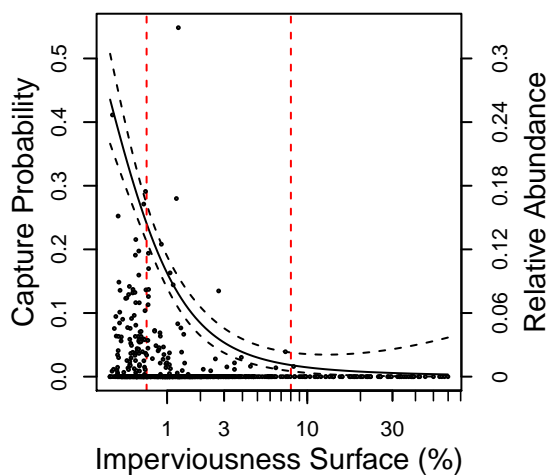


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

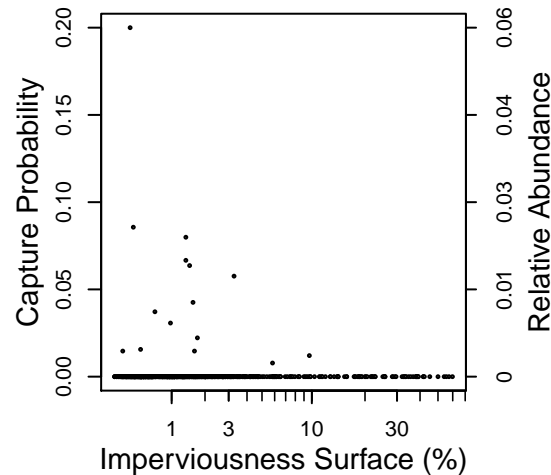
*Potamanthidae*



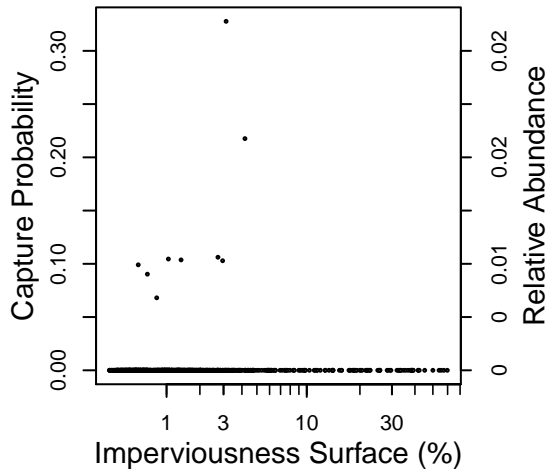
*Psephenidae*



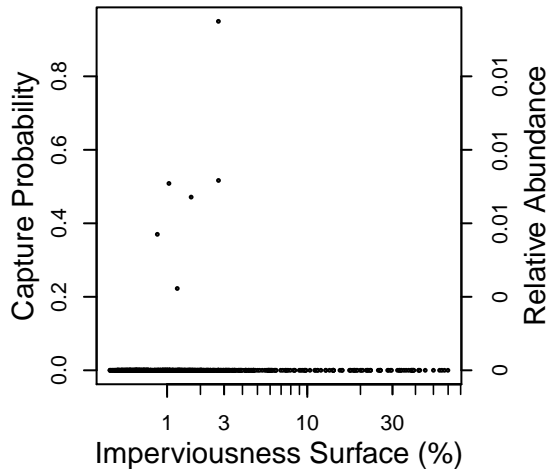
*Psychodidae*



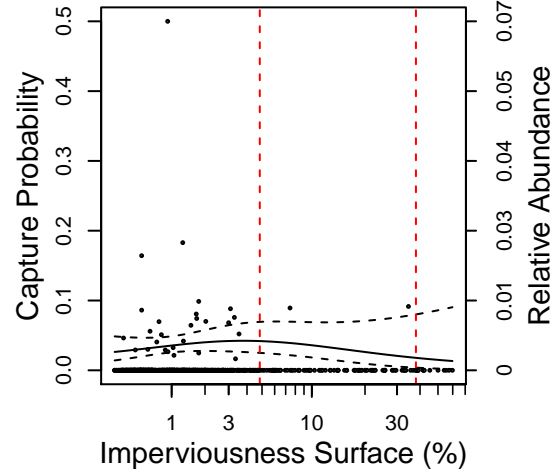
*Psychomyiidae*



*Pteronarcyidae*

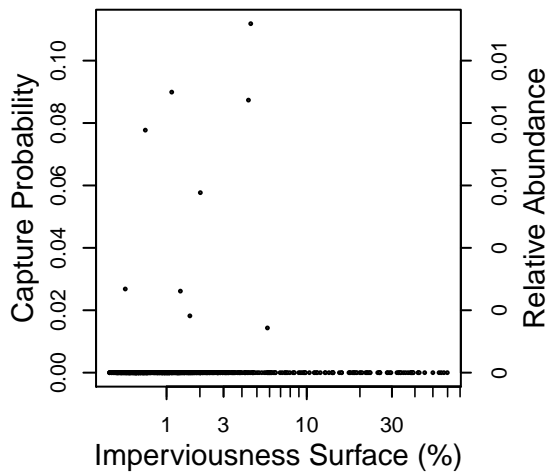


*Pyralidae*

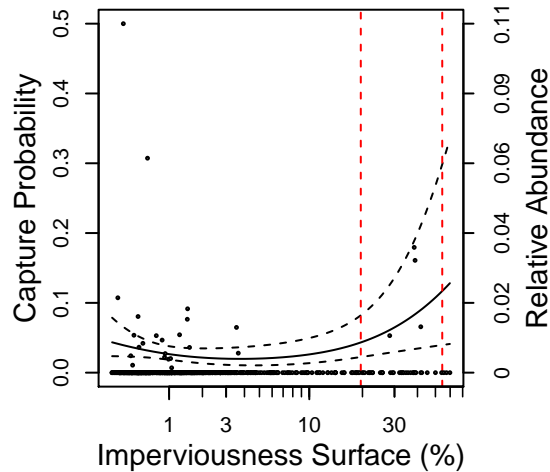


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

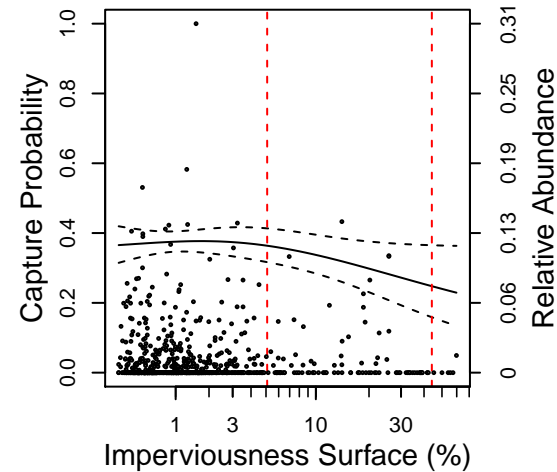
*Saldidae*



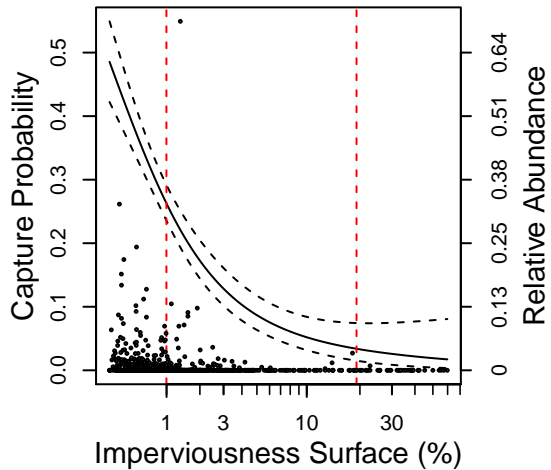
*Sciomyzidae*



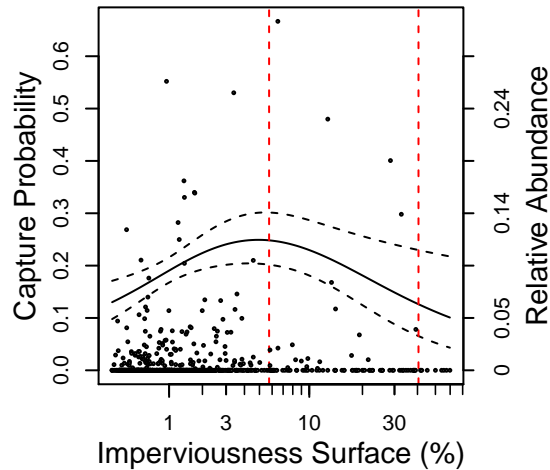
*Scirtidae*



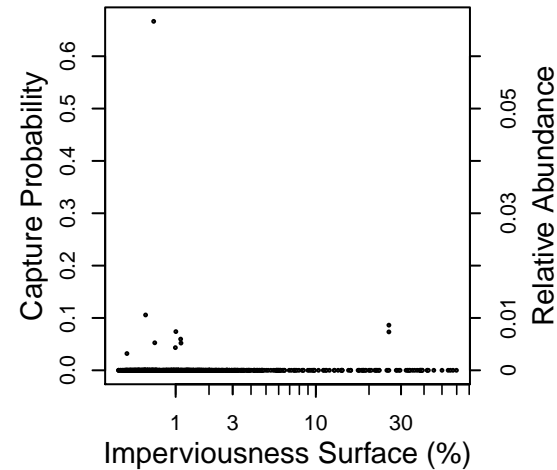
*Sialidae*



*Simuliidae*



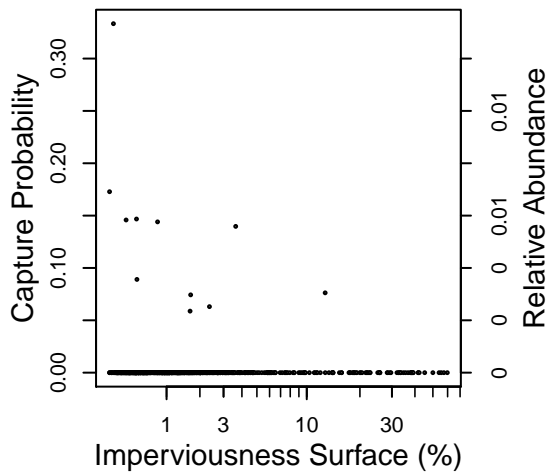
*Sisyridae*



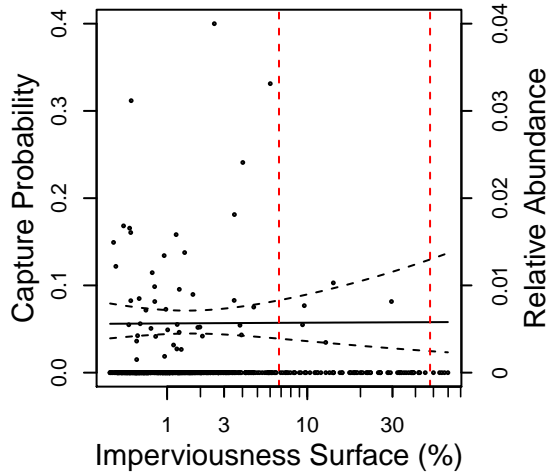


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

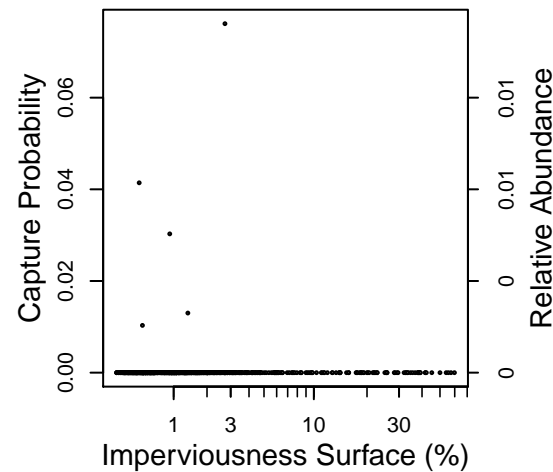
*Sminthuridae*



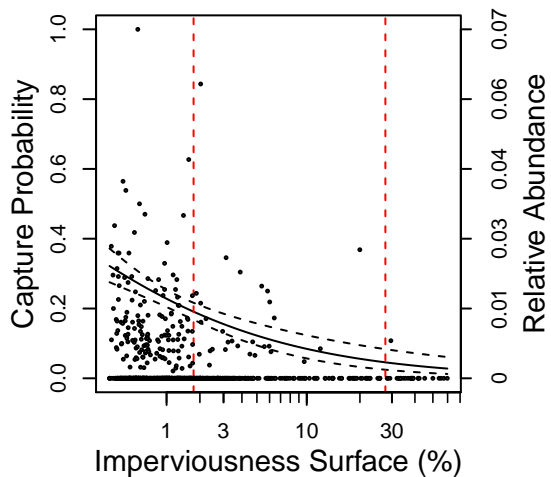
*Stratiomyidae*



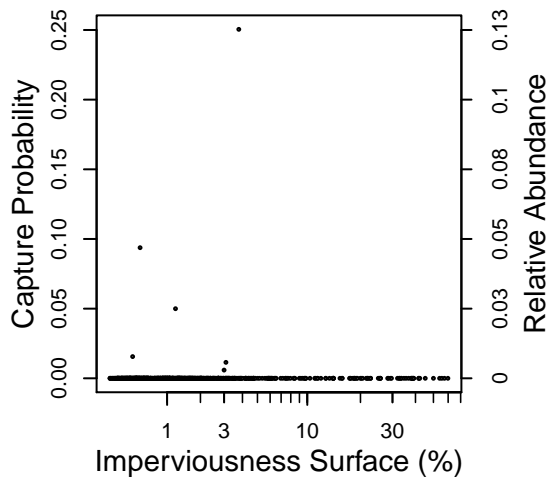
*Syrphidae*



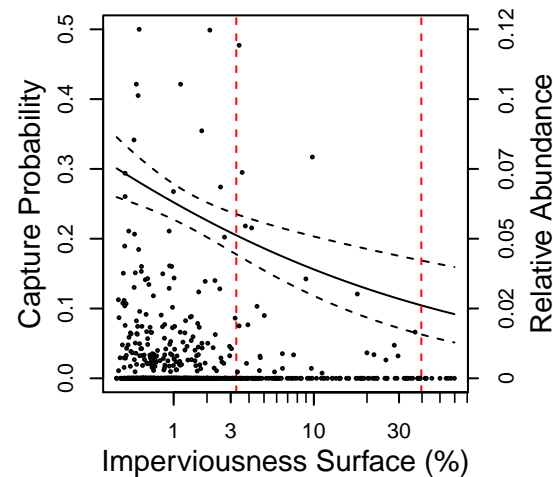
*Tabanidae*



*Taeniopterygidae*

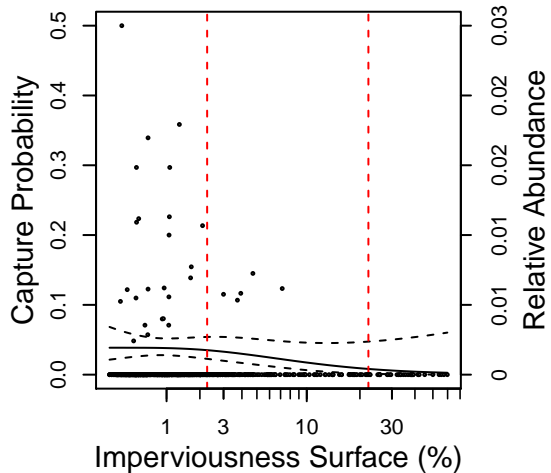


*Tipulidae*

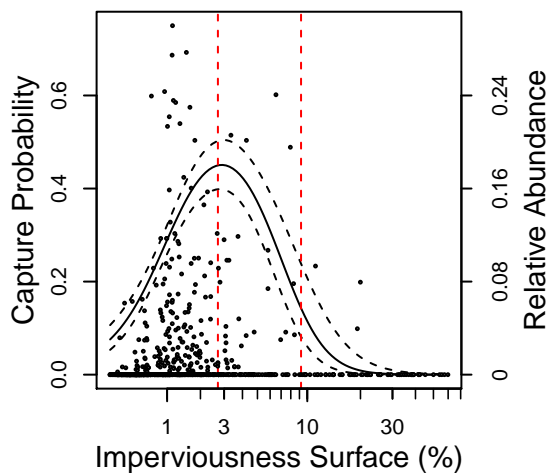


# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

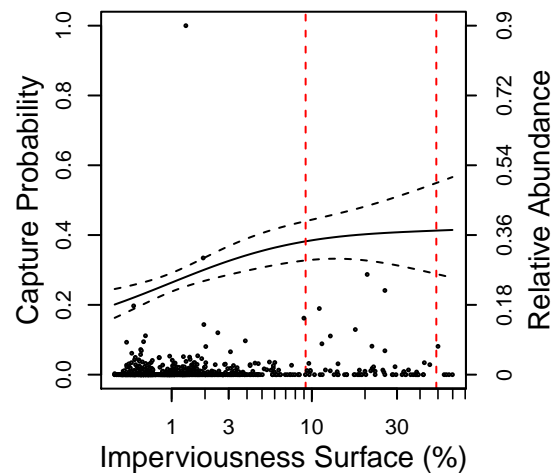
*Trichoptera*



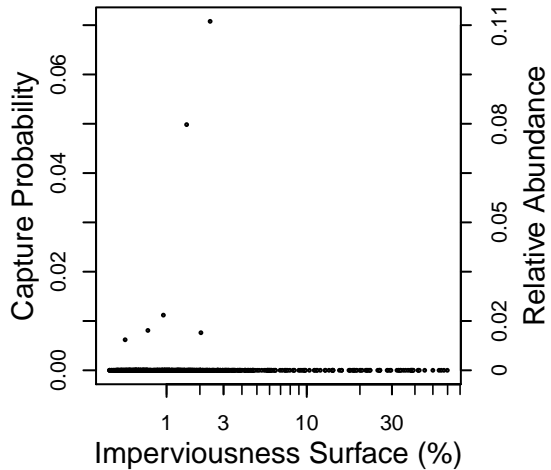
*Tricorythidae*



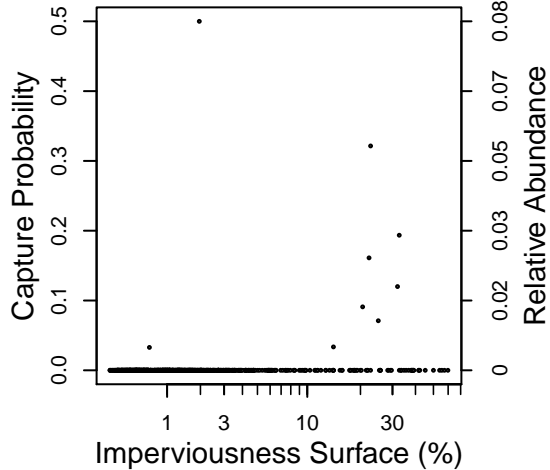
*Tubificidae*



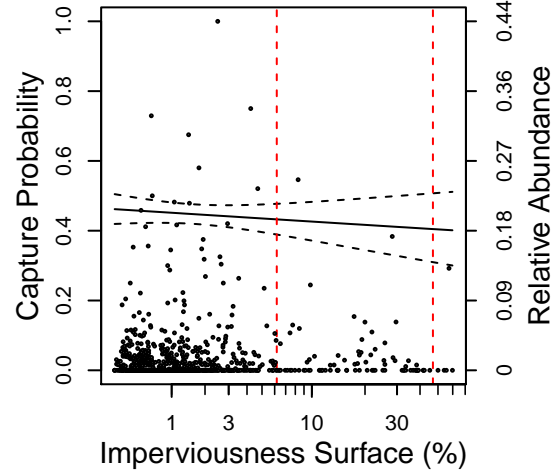
*Uenoidae*



*Valvatidae*

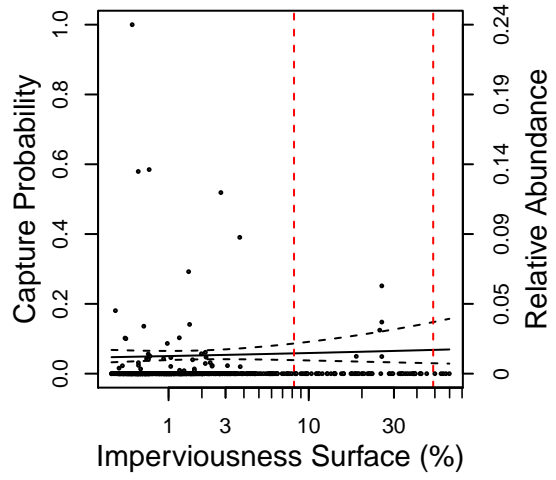


*Veliidae*



# Capture Probability of Macroinvertebrate Taxon Along Imperviousness Gradient

*Viviparidae*



## Appendix D

### Macroinvertebrate BCG Sample Worksheet

The following worksheet is an example of a sample summary and taxa list that was displayed to the expert panel for rating on the BCG scale. The upper left portion has sample metadata and metric summaries. The complete taxa list is below that, including the BCG attributes for each taxon, counts, families, and functional feeding groups (FFG). The upper right portion has other sample metadata, site characteristics, and metrics that are not based on BCG attributes. Some fields are hidden because they could inform the experts about specific location or stressor conditions. The ratings were made before the hidden information was revealed.

| ExerciseID           | Samp0014                     | Best Tier    | x               | Assigned Tier          |                      | Reasoning                                 |              |
|----------------------|------------------------------|--------------|-----------------|------------------------|----------------------|---|--------------|
| Collection Date      | 7/18/2007                    | Median Tier  | x               |                        |                      |   |              |
| Collection Method    |                              | Worst Tier   | x               |                        |                      |   |              |
|                      |                              |              |                 |                        |                      | <b>STATION AND SAMPLE CHARACTERISTICS</b> |              |
| <b>TAXA SUMMARY</b>  |                              |              |                 |                        |                      | StationID                                 |              |
| <b>BCG Attribute</b> | <b>Number of Taxa</b>        | <b>Count</b> | <b>Pct Taxa</b> | <b>Pct Individuals</b> | ActivityID           |   |              |
| 1                    | 0                            | 0            | 0%              | 0%                     | Latitude             |   |              |
| 2                    | 0                            | 0            | 0%              | 0%                     | Longitude            |   |              |
| 3                    | 0                            | 0            | 0%              | 0%                     | Date                 | 7/18/2007                                 |              |
| 4                    | 11                           | 33           | 44%             | 44%                    | Waterbody Name       |   |              |
| 5                    | 4                            | 13           | 16%             | 17%                    | Basin                |   |              |
| 6                    | 0                            | 0            | 0%              | 0%                     | SubEcoregion         | 55f                                       |              |
| 10                   | 0                            | 0            | 0%              | 0%                     | Area (sq mi)         | 73.15                                     |              |
| x                    | 10                           | 29           | 40%             | 39%                    | Reference Status     |   |              |
| Total                | 25                           | 75           | 100%            | 100%                   | Habitat Score (QHEI) |   |              |
| <b>TAXA LIST</b>     |                              |              |                 |                        |                      | Imperviousness                            |              |
| <b>BCG Attribute</b> | <b>FinalID</b>               | <b>Count</b> | <b>Count150</b> | <b>Family</b>          | <b>FFG</b>           | % Agriculture Urban                       |              |
| x                    | Branchiobdellida             | 8            | 8               | Cambarincolidae        |                      | TN  |              |
| x                    | Naididae                     | 3            | 3               | Naididae               | Collector            | TP  |              |
| 5                    | Physidae                     | 1            | 1               | Physidae               | Scraper              | Specific Conductivity                     |              |
| 4                    | Hyalella                     | 3            | 3               | Hyalellidae            | Collector            | Dissolved Oxygen                          |              |
| x                    | Acari                        | 5            | 5               |                        |                      | <b>Metrics</b>                            |              |
| 4                    | Dubiraphia                   | 5            | 5               | Elmidae                | Omnivore             | Number of Taxa, EPT                       | 1            |
| x                    | Dubiraphia minima group      | 5            | 5               | Elmidae                | Scraper              | Percent of Individuals, EPT               | 8.0          |
| 4                    | Macronychus glabratus        | 1            | 1               | Elmidae                | Scraper              | Number of Taxa, sens EPT (att 2 or 3)     | 0            |
| 4                    | Gyrinus                      | 1            | 1               | Gyrinidae              | Shredder             | Percent of Indiv, sens EPT (att 2 or 3)   | 0.0          |
| x                    | Heteroceridae                | 1            | 1               | Heteroceridae          |                      |   |              |
| 4                    | Ceratopogonidae              | 1            | 1               | Ceratopogonidae        |                      | <a href="#">ParticipantAssignments</a>    |              |
| 5                    | Chironomus                   | 9            | 9               | Chironomidae           | Omnivore             | <b>Participant</b>                        | <b>Score</b> |
| 4                    | Cryptotendipes               | 2            | 2               | Chironomidae           | Scraper              | Participant01                             |              |
| 4                    | Dicrotendipes                | 1            | 1               | Chironomidae           | Predator             | Participant02                             |              |
| x                    | Microtendipes pedellus group | 1            | 1               | Chironomidae           | Predator             | Participant03                             |              |
| 4                    | Paratendipes albimanus       | 2            | 2               | Chironomidae           | Collector            | Participant04                             |              |
| x                    | Phaenopsectra/Tribelos       | 1            | 1               | Chironomidae           | Collector            | Participant05                             |              |
| x                    | Polypedilum scalaenum group  | 2            | 2               | Chironomidae           | Filterer             | Participant06                             |              |
| 5                    | Procladius                   | 2            | 2               | Chironomidae           | Predator             | Participant07                             |              |
| x                    | Thienemannimyia group        | 1            | 1               | Chironomidae           | Predator             | Participant08                             |              |
| 4                    | Chrysops                     | 1            | 1               | Tabanidae              |                      | Participant09                             |              |
| 4                    | Caenis                       | 6            | 6               | Caenidae               | Scraper              | Participant10                             |              |
| x                    | Corixidae                    | 2            | 2               | Corixidae              | Predator             | Participant11                             |              |
| 4                    | Sialis                       | 10           | 10              | Sialidae               | Predator             | Participant12                             |              |
| 5                    | Argia tibialis               | 1            | 1               | Coenagrionidae         | Predator             | Participant13                             |              |

## Appendix E

### BCG Level Assignments

| Station ID  | WB Name               | Site Class | Latitude | Longitude | Exercise ID | Visit Date | BCG<br>Rating | Cal/Conf |
|-------------|-----------------------|------------|----------|-----------|-------------|------------|---------------|----------|
| OBS140-0007 | Blue River            | So-Cent    | 38.38581 | -86.2472  | Samp0249    | 8/16/2005  | 2-            | Calib    |
| OBS010-0004 | Mosquito Creek        | So-Cent    | 38.05253 | -85.9953  | Samp0234    | 8/9/2005   | 2-            | Calib    |
| OBS180-0025 | Little Blue River     | So-Cent    | 38.1773  | -86.4136  | Samp0266    | 9/7/2010   | 2-            | Calib    |
| WLV070-0013 | Big Shawnee Creek     | Nor-Cent   | 40.25499 | -87.1985  | Samp0567    | 8/11/2009  | 2-            | Calib    |
| WWL-03-0031 | Little Richland Creek | So-Cent    | 39.12955 | -86.6957  | Samp0777    | 8/9/2011   | 2-            | Calib    |
| OBS150-0021 | Blue River            | So-Cent    | 38.22593 | -86.2783  | Samp0256    | 8/15/2005  | 2-            | Calib    |
| WTI060-0037 | Tippecanoe River      | North      | 41.07822 | -86.584   | Samp0701    | 7/16/2008  | 2-            | Calib    |
| OBS090-0007 | Indian Creek          | So-Cent    | 38.31045 | -86.0397  | Samp0238    | 8/10/2005  | 3+            | Calib    |
| GMW050-0016 | Salt Creek            | Nor-Cent   | 39.36205 | -85.2559  | Samp0025    | 7/24/2007  | 3+            | Calib    |
| OBS140-0008 | Blue River            | So-Cent    | 38.39461 | -86.2523  | Samp0250    | 10/16/2005 | 3+            | Calib    |
| WEL-09-0001 | Spring Creek          | So-Cent    | 38.91401 | -86.6487  | Samp0484    | 8/21/2013  | 3+            | Calib    |
| WLV050-0005 | Mud Pine Creek        | Nor-Cent   | 40.44    | -87.3583  | Samp0565    | 10/12/2004 | 3+            | Calib    |
| WWL-03-0038 | Richland Creek        | So-Cent    | 39.12101 | -86.7861  | Samp0784    | 8/10/2011  | 3+            | Calib    |
| GMW070-0104 | Dubois Creek          | Nor-Cent   | 39.55497 | -84.9386  | Samp0040    | 7/17/2007  | 3             | Calib    |
| UMK060-0018 | Yellow River          | North      | 41.30278 | -86.6208  | Samp0385    | 9/29/2004  | 3             | Calib    |
| WDE050-0011 | Deer Creek            | Nor-Cent   | 40.57444 | -86.6831  | Samp0433    | 10/5/2004  | 3             | Calib    |
| WEL030-0004 | Guthrie Creek         | So-Cent    | 38.80222 | -86.2953  | Samp0474    | 11/15/2004 | 3             | Calib    |
| WEM020-0022 | Graham Creek          | So-Cent    | 39.02889 | -85.2972  | Samp0516    | 10/4/2007  | 3             | Calib    |
| WWE-02-0002 | Little Walnut Creek   | So-Cent    | 39.65146 | -86.9358  | Samp0726    | 7/19/2011  | 3             | Calib    |
| WWL-03-0035 | Richland Creek        | So-Cent    | 39.16985 | -86.6829  | Samp0781    | 8/8/2011   | 3             | Calib    |
| WTI150-0017 | Spring Creek          | Nor-Cent   | 40.62302 | -86.819   | Samp0709    | 7/21/2008  | 3             | Calib    |

| Station ID  | WB Name                        | Site Class | Latitude | Longitude | Exercise ID | Visit Date | BCG Rating | Cal/Conf |
|-------------|--------------------------------|------------|----------|-----------|-------------|------------|------------|----------|
| GMW040-0040 | Little Williams Creek          | Nor-Cent   | 39.61981 | -85.1717  | Samp0019    | 7/17/2007  | 3          | Calib    |
| OSK-02-0016 | Indian Kentuck Creek           | Southeast  | 38.75841 | -85.2478  | Samp0321    | 10/4/2012  | 3          | Calib    |
| WED090-0008 | Sugar Creek                    | Nor-Cent   | 39.38111 | -86.0058  | Samp0458    | 11/15/2004 | 3          | Calib    |
| WEL110-0017 | Indian Creek                   | So-Cent    | 38.79742 | -86.7042  | Samp0492    | 8/1/2007   | 3          | Calib    |
| WPA010-0045 | Youngs Creek                   | So-Cent    | 38.47067 | -86.4979  | Samp0595    | 7/31/2006  | 3          | Calib    |
| WWL-03-0033 | Stalcup Branch                 | So-Cent    | 39.00116 | -86.8352  | Samp0779    | 8/15/2011  | 3          | Calib    |
| GMW010-0044 | Morgan Creek                   | Nor-Cent   | 39.90753 | -85.0852  | Samp0007    | 7/17/2007  | 3-         | Calib    |
| LMJ190-0025 | Elkhart River                  | North      | 41.46794 | -85.5999  | Samp0214    | 7/25/2005  | 3-         | Calib    |
| OSK030-0009 | West Fork Indian Kentuck Creek | Southeast  | 38.78861 | -85.2831  | Samp0327    | 10/25/2004 | 34tie      | Calib    |
| OSK-02-0016 | Indian Kentuck Creek           | Southeast  | 38.75841 | -85.2478  | Samp0320    | 10/4/2012  | 34tie      | Calib    |
| WWL-03-0027 | Ore Branch                     | Southwest  | 39.02009 | -86.9077  | Samp0772    | 8/9/2011   | 34tie      | Calib    |
| WEL090-0013 | Henderson Creek                | So-Cent    | 38.96194 | -86.3689  | Samp0486    | 10/27/2004 | 4+         | Calib    |
| WEM020-0038 | Little Graham Creek            | So-Cent    | 38.95272 | -85.4887  | Samp0529    | 10/2/2007  | 4+         | Calib    |
| WWL040-0056 | Plummer Creek                  | Southwest  | 38.99591 | -86.8911  | Samp0787    | 7/24/2006  | 4+         | Calib    |
| UMI030-0046 | Slough Creek                   | North      | 40.89423 | -87.1681  | Samp0364    | 8/4/2009   | 4+         | Calib    |
| WLV190-0020 | Rock Run                       | Southwest  | 39.73054 | -87.2847  | Samp0579    | 8/10/2009  | 4+         | Calib    |
| WLV040-0053 | Tributary of Big Pine Creek    | North      | 40.43998 | -87.3167  | Samp0563    | 7/20/2009  | 4          | Calib    |
| LEJ050-0066 | Fish Creek                     | Nor-Cent   | 41.53546 | -84.8615  | Samp0054    | 7/19/2010  | 4          | Calib    |
| LES060-0022 | Houk Ditch                     | Nor-Cent   | 40.9886  | -85.0969  | Samp0084    | 7/13/2010  | 4          | Calib    |
| OBS140-0006 | Blue River                     | So-Cent    | 38.35201 | -86.2797  | Samp0247    | 8/23/2005  | 4-         | Calib    |
| OBS200-0006 | Little Oil Creek               | So-Cent    | 38.09369 | -86.4852  | Samp0268    | 8/15/2005  | 4          | Calib    |
| OHP030-0027 | Pigeon Creek                   | Southwest  | 38.09654 | -87.3993  | Samp0274    | 7/26/2010  | 4-         | Calib    |
| OML070-0021 | Laughery Creek                 | Southeast  | 39.02698 | -85.222   | Samp0301    | 8/17/2010  | 4-         | Calib    |
| UMI010-0008 | Oliver Ditch                   | North      | 41.02925 | -87.1163  | Samp0359    | 8/4/2009   | 4          | Calib    |
| LMG-04-0036 | Reynolds Creek                 | North      | 41.61722 | -86.9419  | Samp0134    | 8/7/2012   | 4          | Calib    |
| LMG100-0009 | Tributary of Spring Creek      | North      | 41.7529  | -86.5604  | Samp0191    | 7/14/2010  | 4          | Calib    |
| LMJ120-0040 | Pigeon River                   | North      | 41.69358 | -85.3073  | Samp0198    | 9/12/2005  | 4          | Calib    |
| OBS180-0019 | Little Blue River              | So-Cent    | 38.32979 | -86.4762  | Samp0262    | 8/16/2005  | 4          | Calib    |
| UMI030-0044 | Carpenter Creek                | North      | 40.82432 | -87.1768  | Samp0363    | 7/28/2009  | 4          | Calib    |

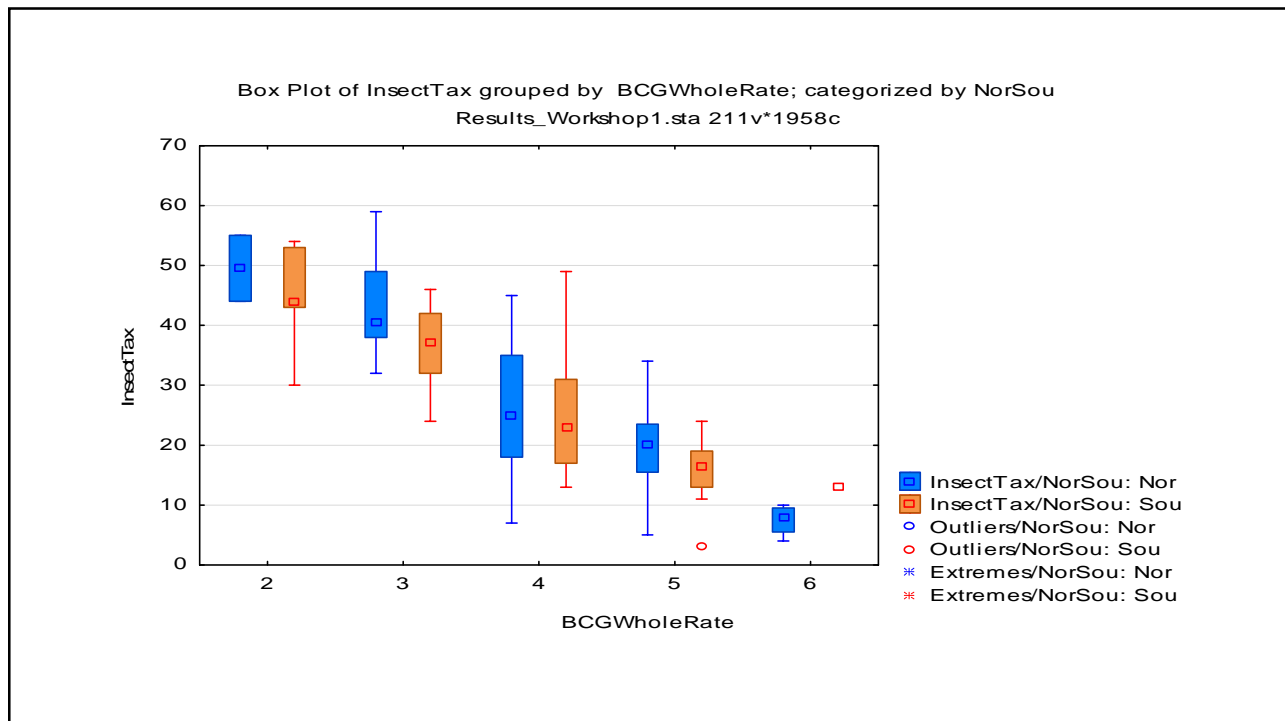
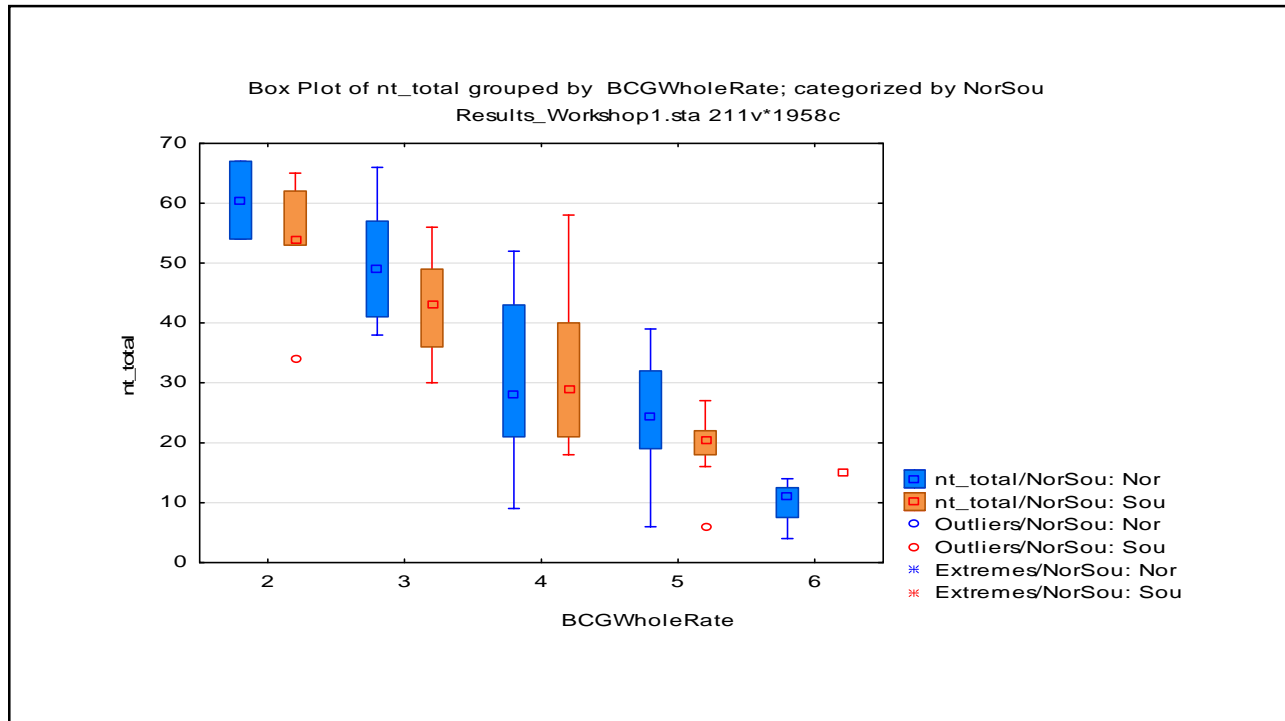
| Station ID  | WB Name                                 | Site Class | Latitude | Longitude | Exercise ID | Visit Date | BCG Rating | Cal/Conf |
|-------------|---|------------|----------|-----------|-------------|------------|------------|----------|
| WED-04-0001 | Sugar Creek                             | Nor-Cent   | 39.93161 | -85.699   | Samp0451    | 7/16/2013  | 4          | Calib    |
| WEL110-0016 | Indian Creek                            | So-Cent    | 38.93315 | -86.6877  | Samp0491    | 8/1/2007   | 4          | Calib    |
| WEM020-0025 | Little Graham Creek                     | So-Cent    | 38.99946 | -85.3609  | Samp0518    | 10/1/2007  | 4          | Calib    |
| WWL-03-0036 | Beech Creek                             | So-Cent    | 39.06441 | -86.7744  | Samp0782    | 8/15/2011  | 4          | Calib    |
| WWU070-0002 | Stony Creek                             | Nor-Cent   | 40.02889 | -85.995   | Samp0813    | 10/14/2004 | 4          | Calib    |
| WWL-03-0032 | Beech Creek                             | So-Cent    | 39.05895 | -86.7468  | Samp0778    | 8/16/2011  | 4          | Calib    |
| LEJ060-0015 | Big Run                                 | Nor-Cent   | 41.42989 | -84.8462  | Samp0056    | 7/20/2010  | 4-         | Calib    |
| LMG-04-0034 | Tributary of Reynolds Creek             | North      | 41.60699 | -86.948   | Samp0131    | 8/8/2012   | 4-         | Calib    |
| LMG070-0035 | East Branch of Trail Creek              | North      | 41.70657 | -86.7706  | Samp0189    | 7/19/2005  | 4-         | Calib    |
| LMJ170-0080 | Middle Br Elkhart River                 | North      | 41.50679 | -85.3948  | Samp0210    | 7/21/2010  | 4-         | Calib    |
| OSK030-0012 | Indian Kentuck Creek                    | Southeast  | 38.83917 | -85.2603  | Samp0328    | 10/26/2004 | 4-         | Calib    |
| WEM-02-0001 | Little Graham Creek                     | So-Cent    | 38.93877 | -85.4764  | Samp0509    | 8/6/2013   | 4-         | Calib    |
| WTI020-0061 | Deeds Creek                             | North      | 41.23318 | -85.7794  | Samp0690    | 7/14/2008  | 4-         | Calib    |
| WWE-07-0005 | Croys Creek                             | Southwest  | 39.50512 | -87.0175  | Samp0736    | 7/12/2011  | 4-         | Calib    |
| WWU130-0048 | Pleasant Run Creek                      | Nor-Cent   | 39.62742 | -86.1804  | Samp0836    | 7/26/2006  | 4-         | Calib    |
| OML070-0015 | Hayes Branch                            | Southeast  | 38.97269 | -85.0457  | Samp0299    | 8/2/2005   | 45tie      | Calib    |
| LMG-04-0022 | Tributary of East Branch Little Calumet | North      | 41.60691 | -86.9896  | Samp0118    | 8/14/2012  | 4-         | Calib    |
| WPA-02-0002 | Straight River                          | Southwest  | 38.35435 | -86.9     | Samp0598    | 7/17/2012  | 5+         | Calib    |
| WPA020-0056 | Patoka River                            | So-Cent    | 38.47055 | -86.7618  | Samp0607    | 9/7/2006   | 5+         | Calib    |
| WUW100-0009 | Calf Creek                              | Nor-Cent   | 41.00077 | -85.3944  | Samp0716    | 7/14/2008  | 45tie      | Calib    |
| LMG-04-0015 | Coffee Creek                            | North      | 41.55563 | -87.0076  | Samp0110    | 8/8/2012   | 5+         | Calib    |
| LMG-05-0011 | Deep River                              | North      | 41.51189 | -87.286   | Samp0153    | 7/22/2013  | 5+         | Calib    |
| LMJ200-0054 | Turkey Creek                            | North      | 41.41689 | -85.8714  | Samp0221    | 7/25/2005  | 5+         | Calib    |
| OML060-0017 | Tub Creek                               | Southeast  | 39.27258 | -85.3005  | Samp0297    | 8/16/2010  | 5+         | Calib    |
| WBU130-0005 | Turman Creek                            | Southwest  | 39.15711 | -87.5511  | Samp0421    | 8/4/2009   | 5+         | Calib    |
| WPA080-0048 | Keg Creek                               | Southwest  | 38.3182  | -87.3605  | Samp0673    | 8/2/2006   | 5+         | Calib    |
| LMJ240-0046 | Bowman Creek                            | North      | 41.62984 | -86.2763  | Samp0233    | 8/3/2010   | 5+         | Calib    |
| LMG-04-0016 | Coffee Creek                            | North      | 41.54213 | -87.0036  | Samp0112    | 8/8/2012   | 5+         | Calib    |
| WEM020-0031 | Rush Creek                              | So-Cent    | 38.97783 | -85.4749  | Samp0524    | 10/2/2007  | 5+         | Calib    |



| Station ID  | WB Name                              | Site Class | Latitude | Longitude | Exercise ID | Visit Date | BCG Rating | Cal/Conf |
|-------------|--------------------------------------|------------|----------|-----------|-------------|------------|------------|----------|
| WEM-07-0005 | Mutton Creek Ditch                   | So-Cent    | 38.91423 | -85.8305  | Samp0540    | 10/21/2013 | 5+         | Calib    |
| GMW030-0025 | Nolands Fork                         | Nor-Cent   | 39.7781  | -85.0562  | Samp0014    | 7/18/2007  | 5          | Calib    |
| LES030-0002 | Saint Marys River                    | Nor-Cent   | 40.76414 | -84.8097  | Samp0077    | 7/21/2010  | 5          | Calib    |
| LMG-05-0008 | Tributary of Deep River              | North      | 41.55883 | -87.2364  | Samp0148    | 7/22/2013  | 5          | Calib    |
| OBS080-0008 | Indian Creek                         | So-Cent    | 38.3641  | -85.9367  | Samp0236    | 8/8/2005   | 5          | Calib    |
| OSK140-0042 | Silver Creek                         | Southeast  | 38.45674 | -85.7614  | Samp0341    | 7/12/2010  | 5+         | Calib    |
| WEL-04-0001 | South Fork Salt Creek                | So-Cent    | 39.05024 | -86.2827  | Samp0476    | 8/26/2013  | 5-         | Calib    |
| WPA-03-0006 | Hunley Creek                         | Southwest  | 38.27541 | -86.9053  | Samp0617    | 7/11/2012  | 5+         | Calib    |
| WWL-03-0039 | Plummer Creek                        | Southwest  | 38.99306 | -86.9379  | Samp0785    | 8/9/2011   | 5+         | Calib    |
| WEL-13-0024 | Lost River                           | So-Cent    | 38.61127 | -86.5889  | Samp0494    | 7/29/2013  | 5          | Calib    |
| UMC030-0021 | Plum Creek                           | North      | 41.52594 | -87.4991  | Samp0345    | 8/3/2009   | 5          | Calib    |
| GMU110-0004 | Armstrong Anderson Ditch             | Nor-Cent   | 40.09281 | -84.8729  | Samp0003    | 7/16/2007  | 5          | Calib    |
| LMG-05-0006 | Deep River                           | North      | 41.56558 | -87.2944  | Samp0146    | 7/22/2013  | 5          | Calib    |
| OSK-02-0017 | Lost Fork Creek                      | Southeast  | 38.72165 | -85.2077  | Samp0322    | 10/4/2012  | 5          | Calib    |
| LMG030-0029 | Main Beaver Dam Ditch                | North      | 41.43706 | -87.3416  | Samp0093    | 7/12/2010  | 5-         | Calib    |
| LMG-04-0005 | East Branch Little Calumet River     | North      | 41.62219 | -87.0675  | Samp0100    | 8/13/2012  | 5-         | Calib    |
| LMG-04-0013 | Coffee Creek                         | North      | 41.57114 | -87.028   | Samp0108    | 8/7/2012   | 5-         | Calib    |
| UMK100-0014 | Wolf Creek                           | North      | 41.2422  | -87.1125  | Samp0397    | 7/15/2009  | 5-         | Calib    |
| WEM-08-0003 | Honey Run                            | So-Cent    | 38.7009  | -85.7934  | Samp0542    | 8/20/2013  | 5-         | Calib    |
| WPA-03-0001 | Hunley Creek                         | Southwest  | 38.25239 | -86.9022  | Samp0611    | 7/16/2012  | 5-         | Calib    |
| WPA-07-0009 | Wheeler Creek                        | Southwest  | 38.3078  | -87.282   | Samp0668    | 7/24/2012  | 5-         | Calib    |
| UMC-04-0006 | Grand Calumet River                  | North      | 41.6093  | -87.3401  | Samp0351    | 9/24/2013  | 56tie      | Calib    |
| WPA-04-0008 | Polson Creek                         | So-Cent    | 38.43417 | -86.804   | Samp0637    | 7/17/2012  | 6+         | Calib    |
| WPA-07-0002 | South Fork Patoka River              | Southwest  | 38.34778 | -87.32    | Samp0660    | 7/24/2012  | 6+         | Calib    |
| WPA070-0029 | Tributary of South Fork Patoka River | Southwest  | 38.29291 | -87.224   | Samp0662    | 7/24/2012  | 6          | Calib    |
| LMG060-0005 | Burns Ditch                          | North      | 41.61261 | -87.174   | Samp0182    | 8/13/2012  | 6          | Calib    |
| LMJ230-0010 | Davidhizer Ditch                     | North      | 41.51103 | -85.9827  | Samp0230    | 7/25/2005  | 6          | Calib    |
| WSU050-0033 | Sugar Creek                          | Nor-Cent   | 39.94124 | -87.1144  | Samp0685    | 7/21/2009  | 2          | Confirm  |
| OBS140-0010 | Blue River                           | So-Cent    | 38.41939 | -86.23    | Samp0251    | 8/24/2010  | 2-         | Confirm  |

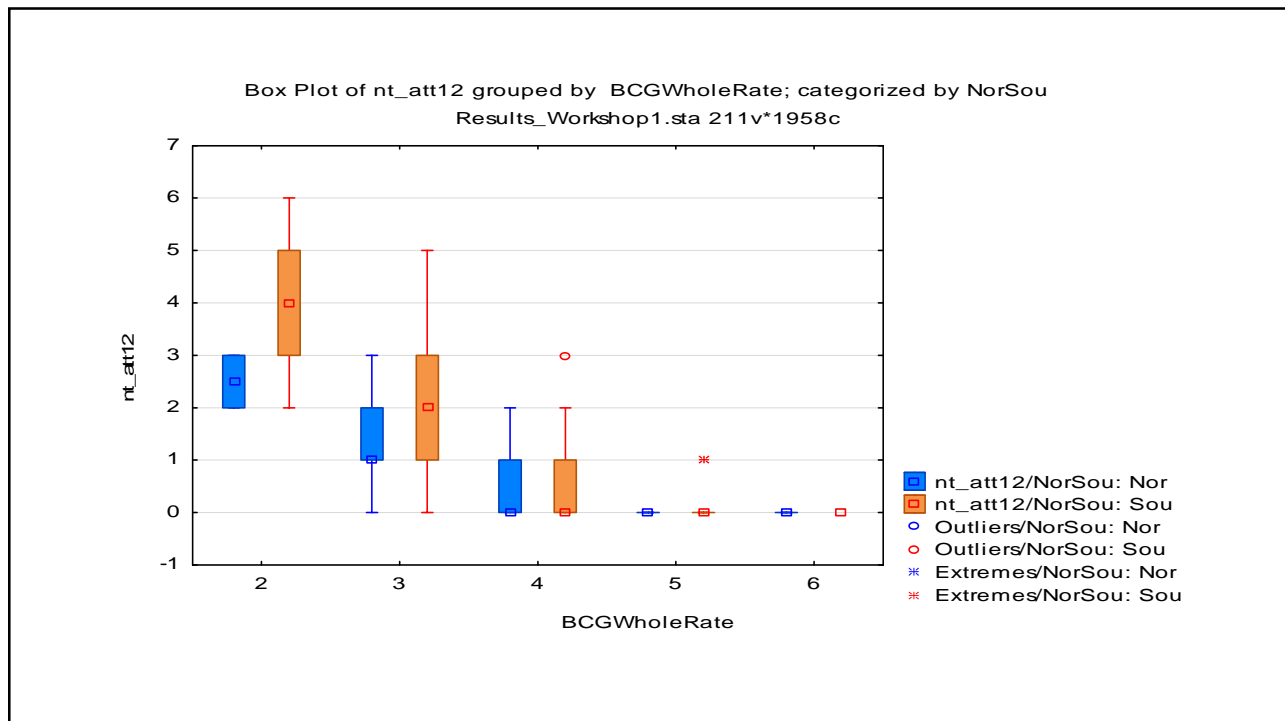
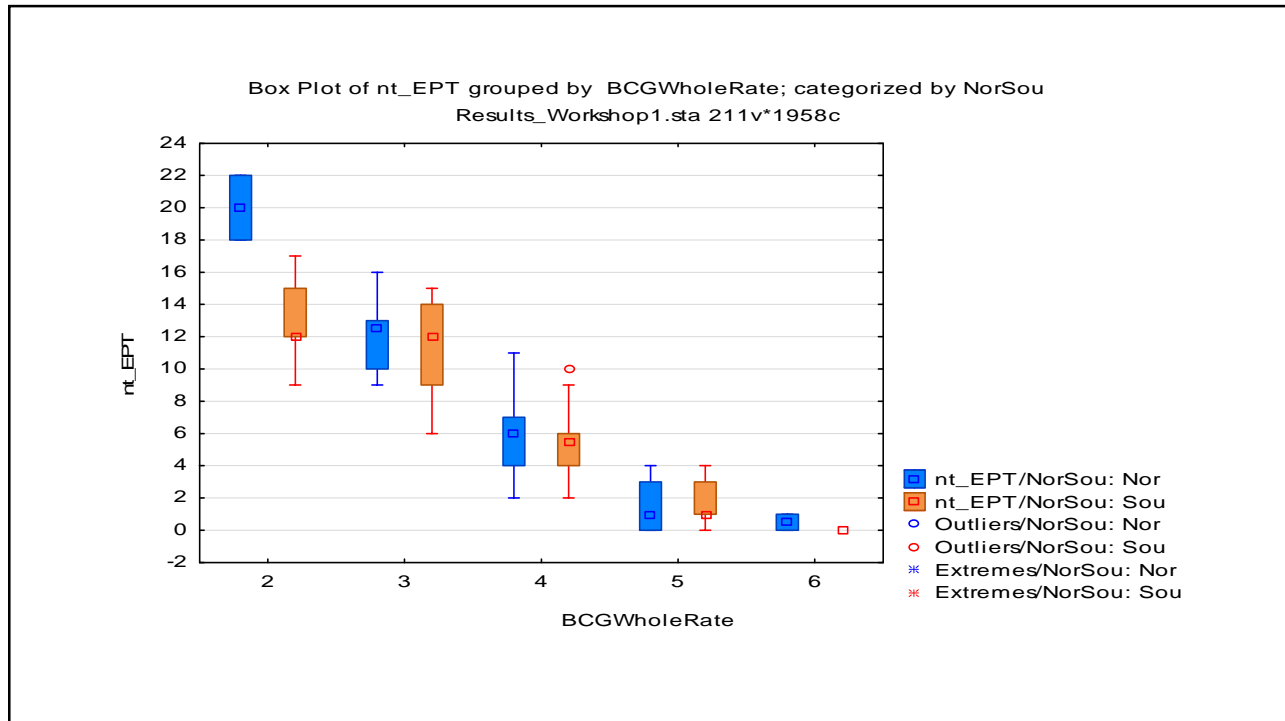
| Station ID  | WB Name             | Site Class | Latitude | Longitude | Exercise ID | Visit Date | BCG<br>Rating | Cal/Conf |
|-------------|---------------------|------------|----------|-----------|-------------|------------|---------------|----------|
| GMW060-0018 | Whitewater River    | Nor-Cent   | 39.42875 | -85.045   | Samp0029    | 7/23/2007  | 3+            | Confirm  |
| WEL-09-0001 | Spring Creek        | So-Cent    | 38.91401 | -86.6487  | Samp0485    | 8/21/2013  | 3+            | Confirm  |
| WLV110-0008 | Prairie Creek       | Nor-Cent   | 40.04318 | -87.3029  | Samp0574    | 7/21/2009  | 3+            | Confirm  |
| OBS090-0009 | Indian Creek        | So-Cent    | 38.21651 | -86.1293  | Samp0241    | 8/25/2010  | 3+            | Confirm  |
| OSK070-0014 | Fourteenmile Creek  | Southeast  | 38.53927 | -85.5911  | Samp0333    | 8/8/2005   | 3+            | Confirm  |
| WWU-08-0002 | Lick Creek          | Nor-Cent   | 39.95015 | -85.8094  | Samp0818    | 7/18/2011  | 3+            | Confirm  |
| GMW020-0033 | Greens Fork         | Nor-Cent   | 39.89912 | -85.042   | Samp0011    | 7/17/2007  | 3             | Confirm  |
| WEM020-0015 | Graham Creek        | So-Cent    | 38.91629 | -85.5988  | Samp0510    | 7/24/2007  | 3             | Confirm  |
| GMW070-0107 | Silver Creek        | Nor-Cent   | 39.63611 | -84.9431  | Samp0041    | 7/23/2007  | 4             | Confirm  |
| OML060-0019 | Laughery Creek      | Southeast  | 39.16019 | -85.2524  | Samp0298    | 8/17/2010  | 4             | Confirm  |
| WPA-06-0006 | Patoka River        | Southwest  | 38.35307 | -87.1355  | Samp0655    | 9/12/2012  | 4             | Confirm  |
| OBS180-0021 | Otter Creek         | So-Cent    | 38.29589 | -86.5213  | Samp0263    | 8/10/2005  | 4-            | Confirm  |
| WEL-01-0003 | Rush Creek          | So-Cent    | 38.70967 | -86.2083  | Samp0472    | 7/29/2013  | 45tie         | Confirm  |
| LMG-05-0007 | Deep River          | North      | 41.56282 | -87.2908  | Samp0147    | 7/22/2013  | 5+            | Confirm  |
| OSK140-0041 | Silver Creek        | Southeast  | 38.34307 | -85.7775  | Samp0340    | 8/30/2010  | 5+            | Confirm  |
| WPA-02-0007 | Straight River      | Southwest  | 38.35487 | -86.8943  | Samp0610    | 7/23/2012  | 5+            | Confirm  |
| UMC050-0010 | Grand Calumet River | North      | 41.62278 | -87.5128  | Samp0358    | 9/25/2013  | 6             | Confirm  |
| WEM020-0029 | Little Graham Creek | So-Cent    | 38.99252 | -85.306   | Samp0522    | 10/3/2007  | 6             | Confirm  |
| WPA020-0052 | Patoka River        | So-Cent    | 38.42825 | -86.8703  | Samp0606    | 10/11/2006 | 6             | Confirm  |
| WPA-06-0001 | Patoka River        | Southwest  | 38.3746  | -87.1785  | Samp0647    | 8/21/2012  | 6             | Confirm  |

Appendix F: Metric Box Plots by BCG Rating



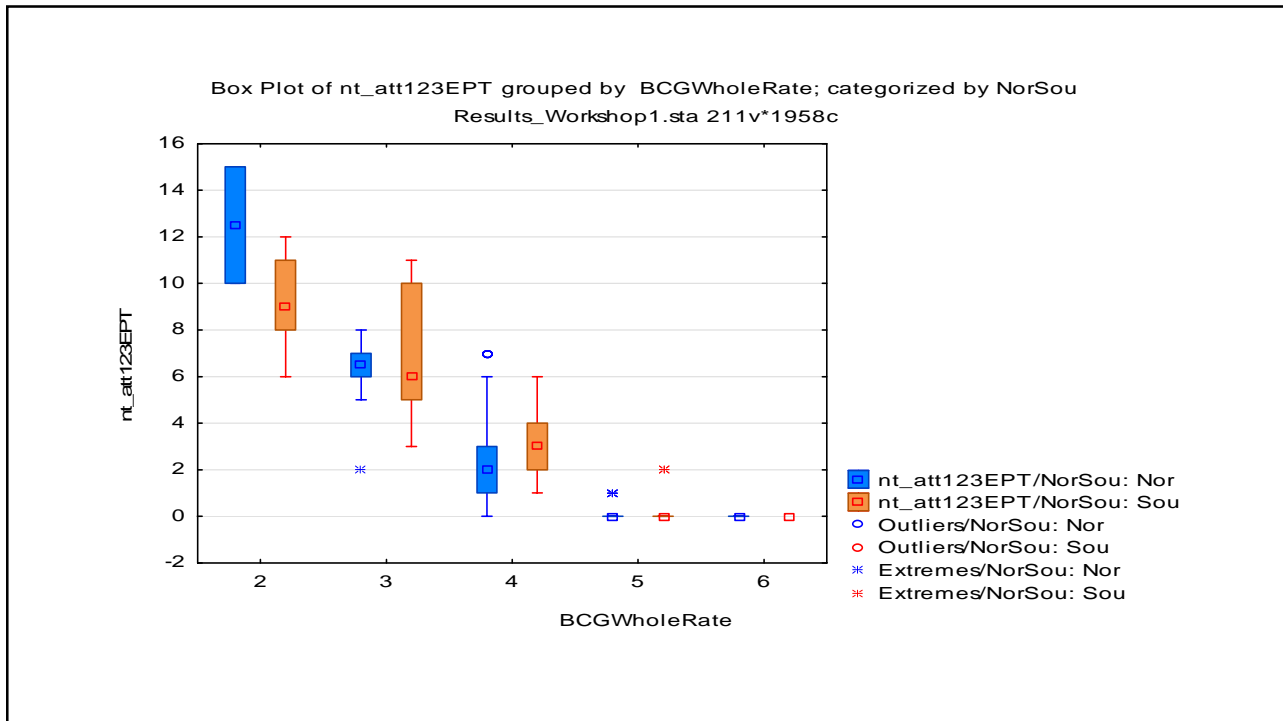
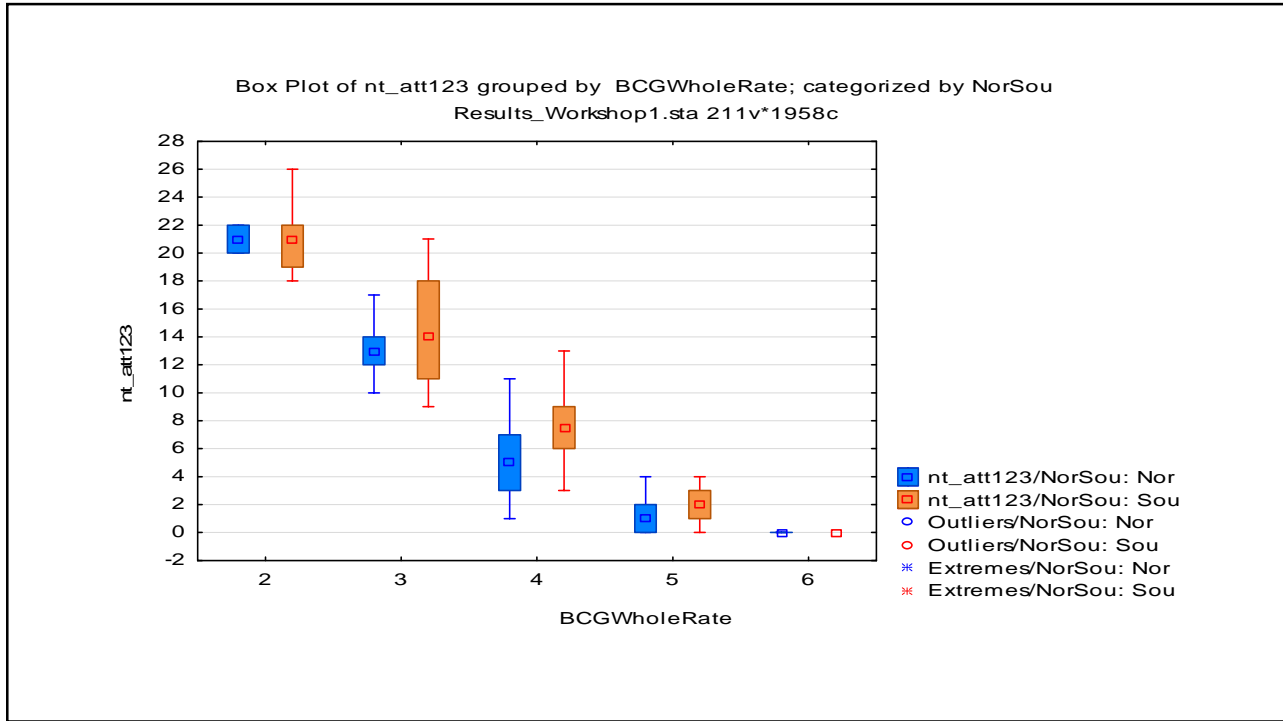
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating



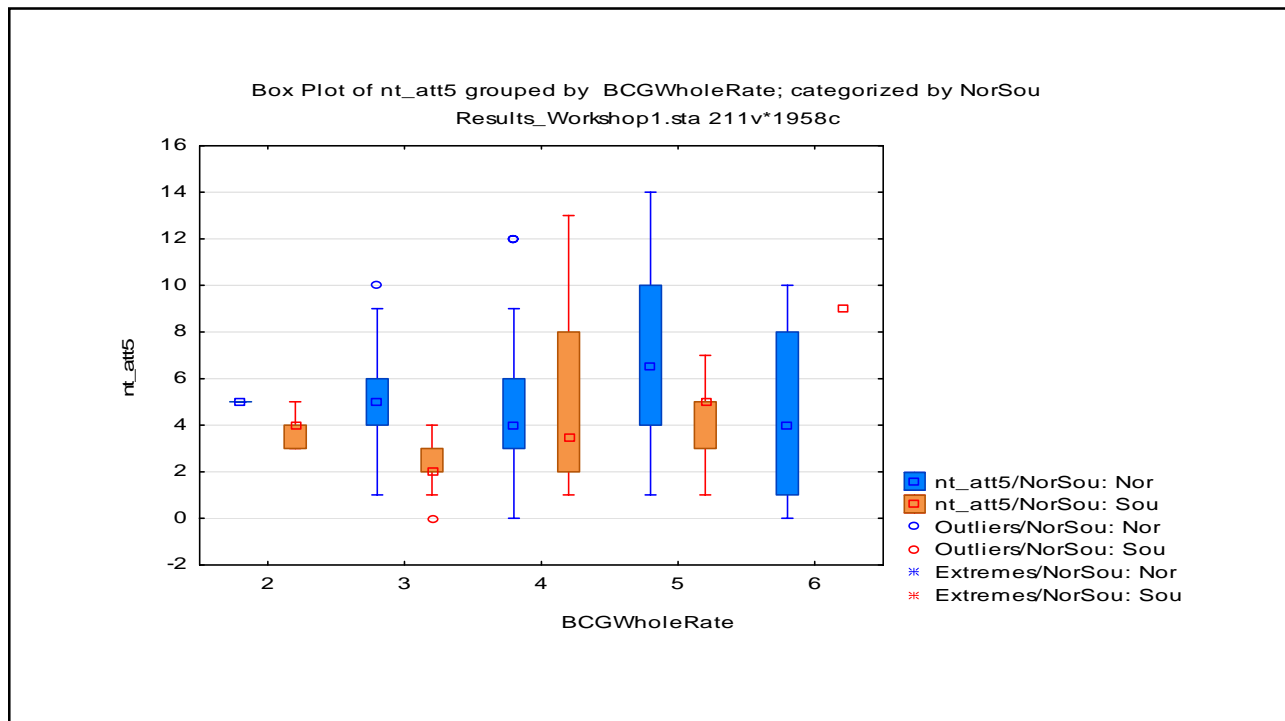
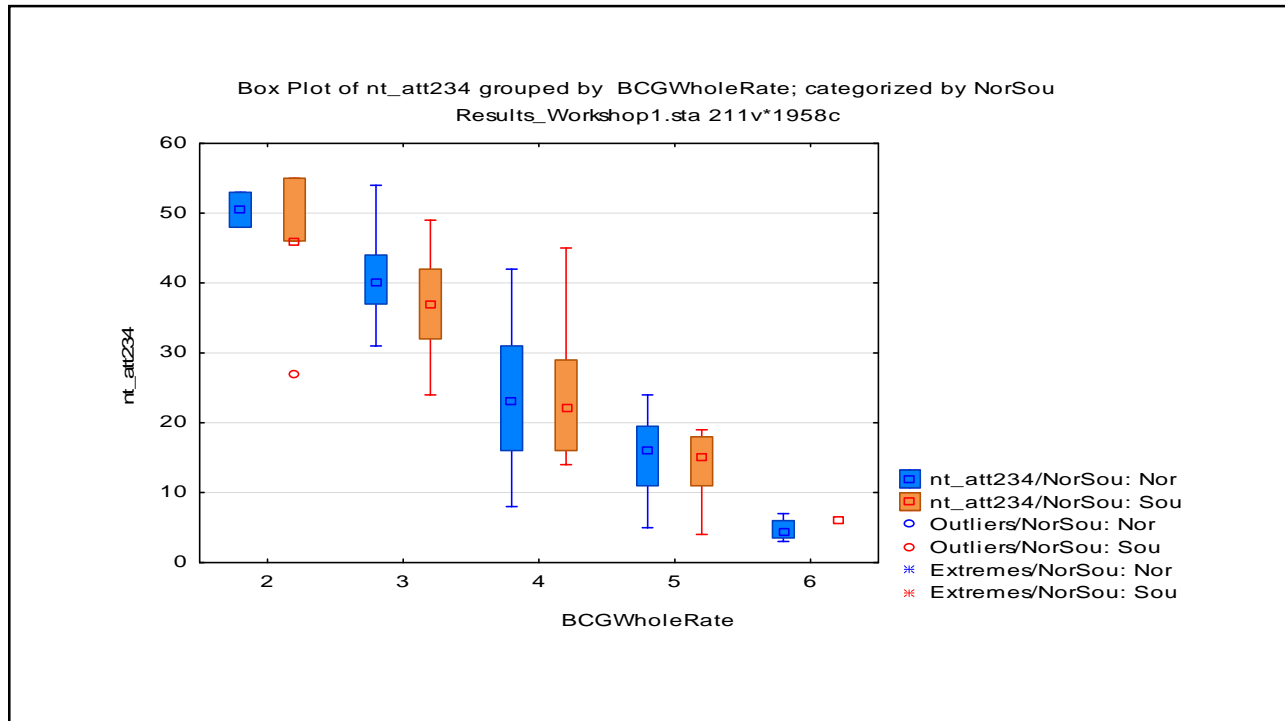
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating



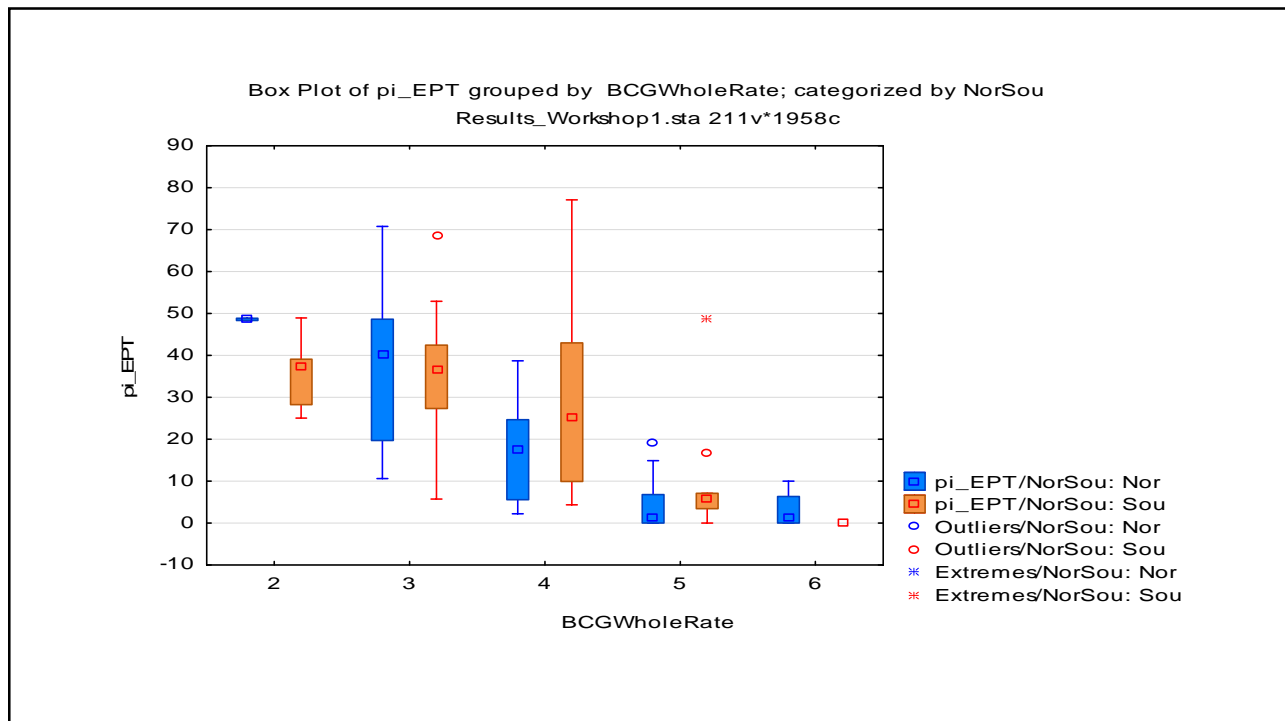
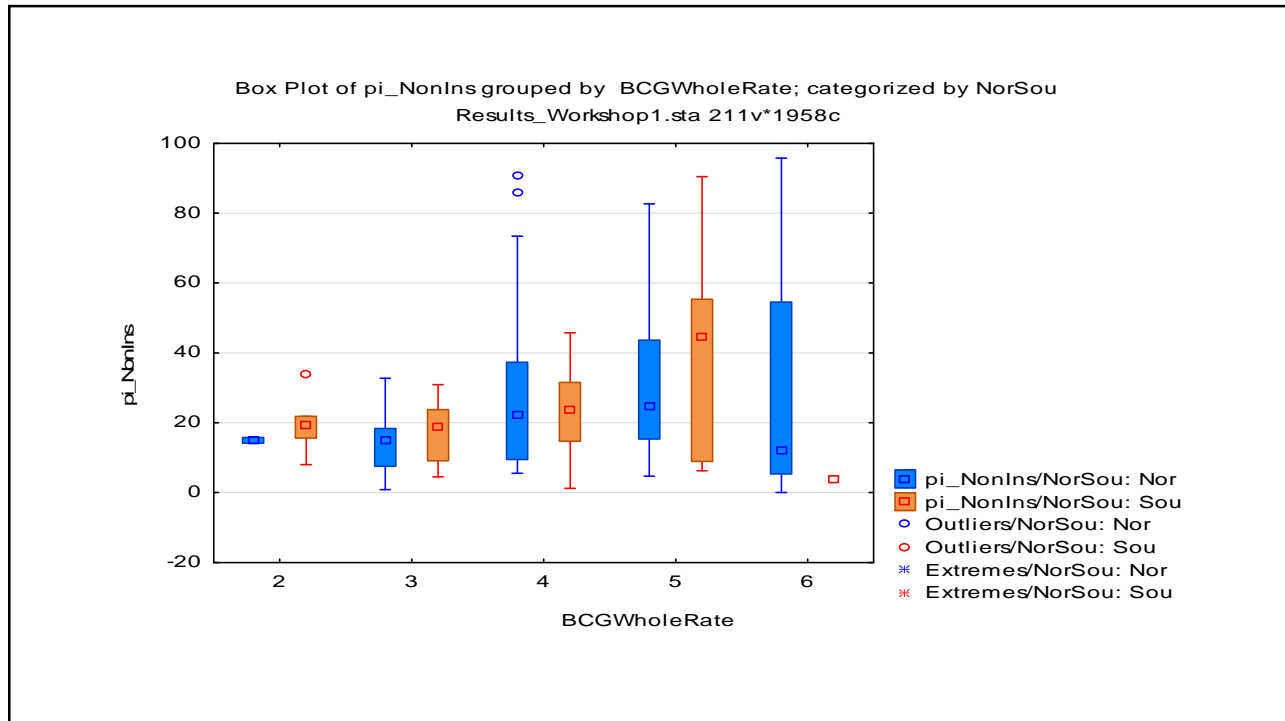
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating



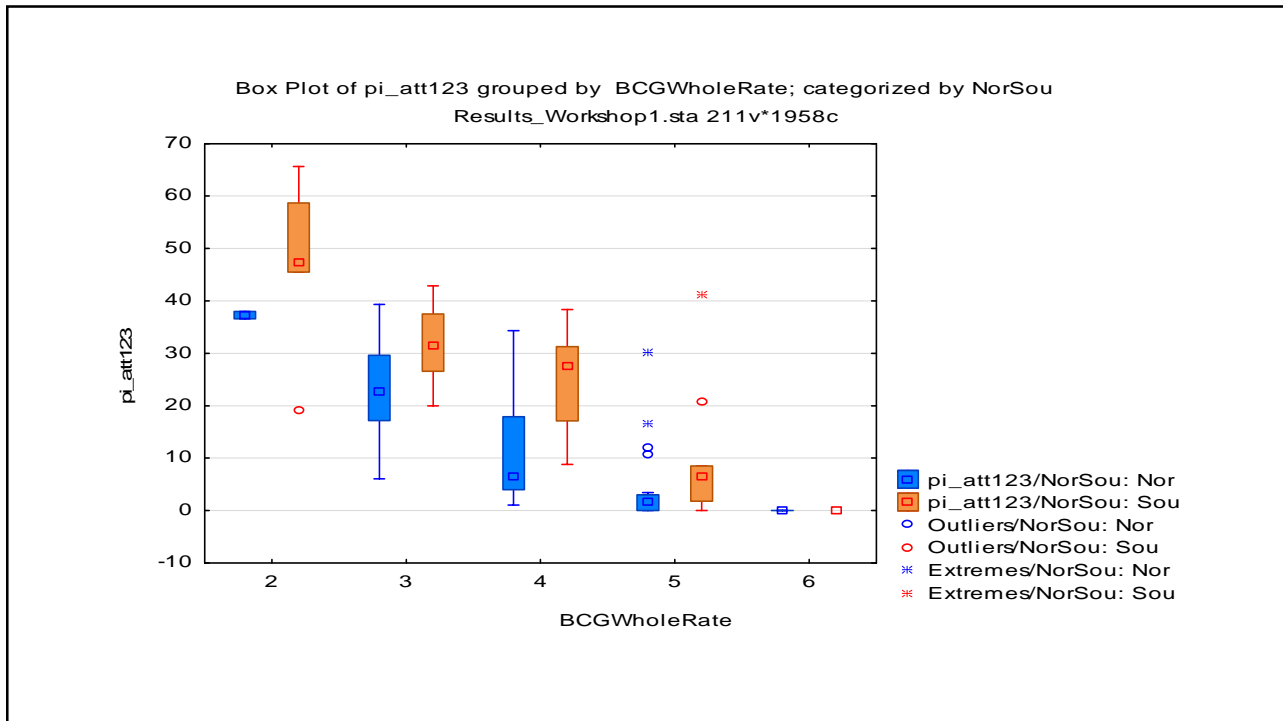
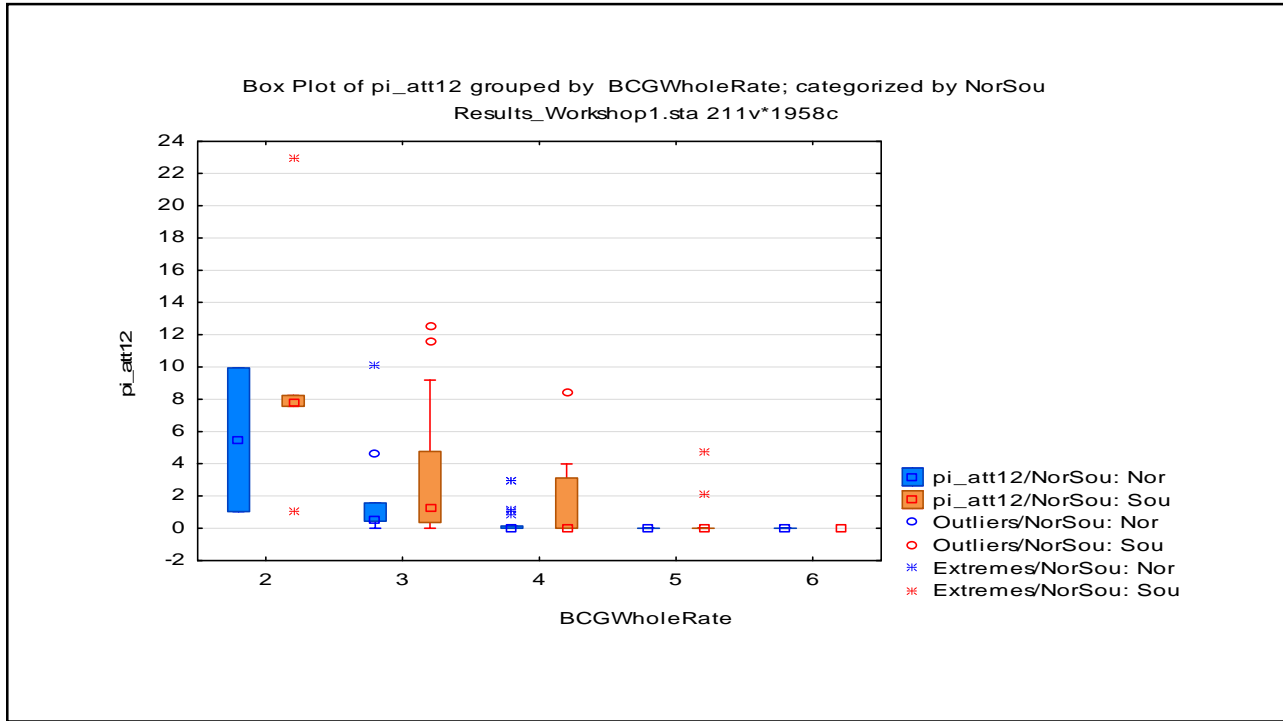
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating



nt = number of taxa, pi = percent individuals, pt = percent taxa

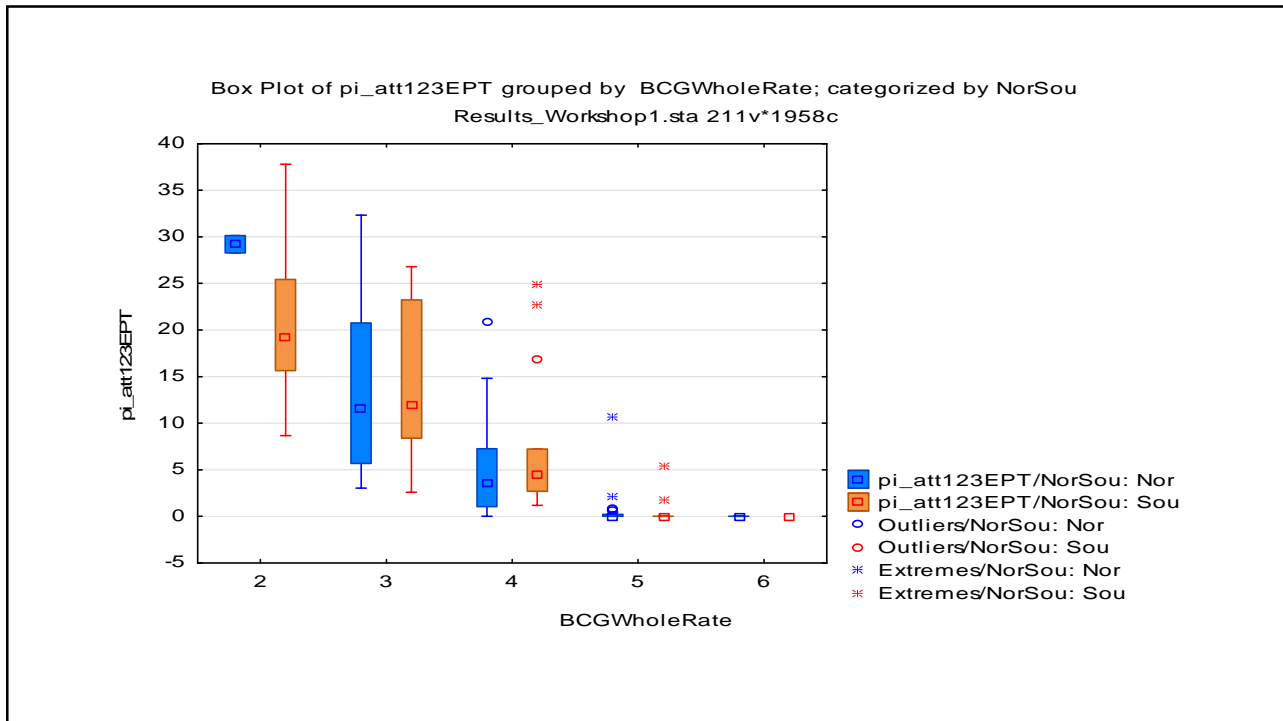
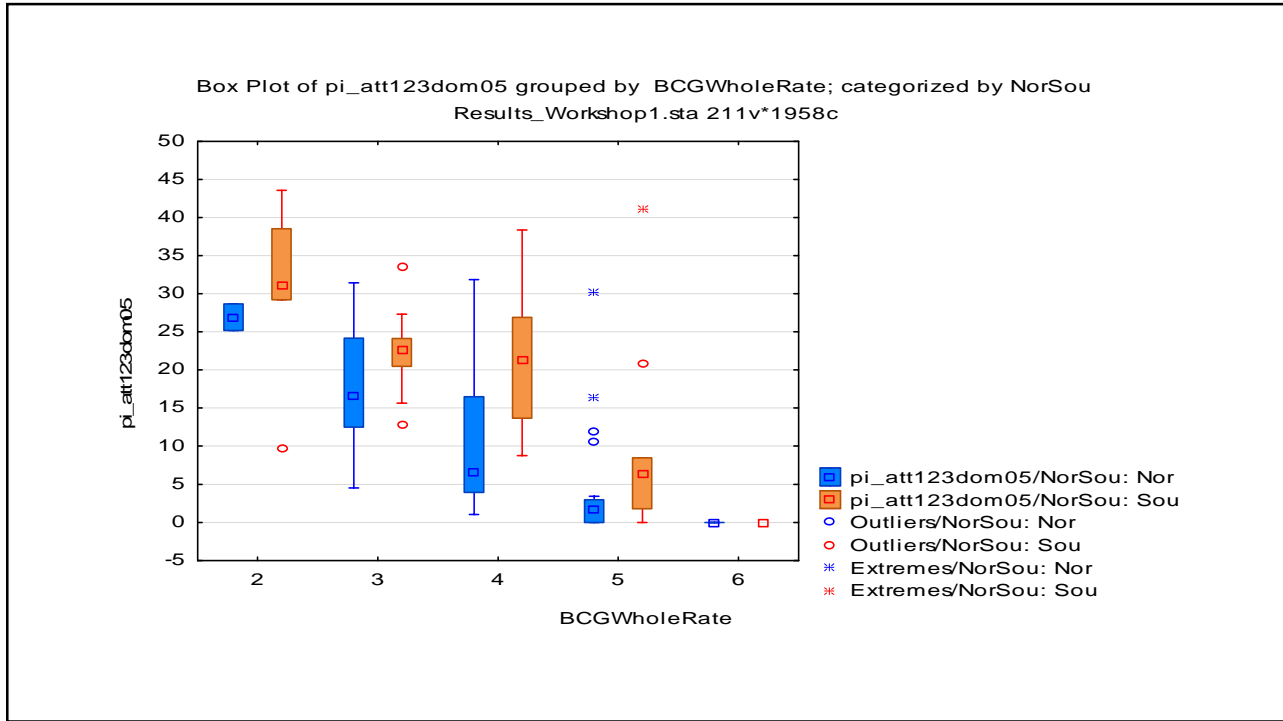
Appendix F: Metric Box Plots by BCG Rating



nt = number of taxa, pi = percent individuals, pt = percent taxa

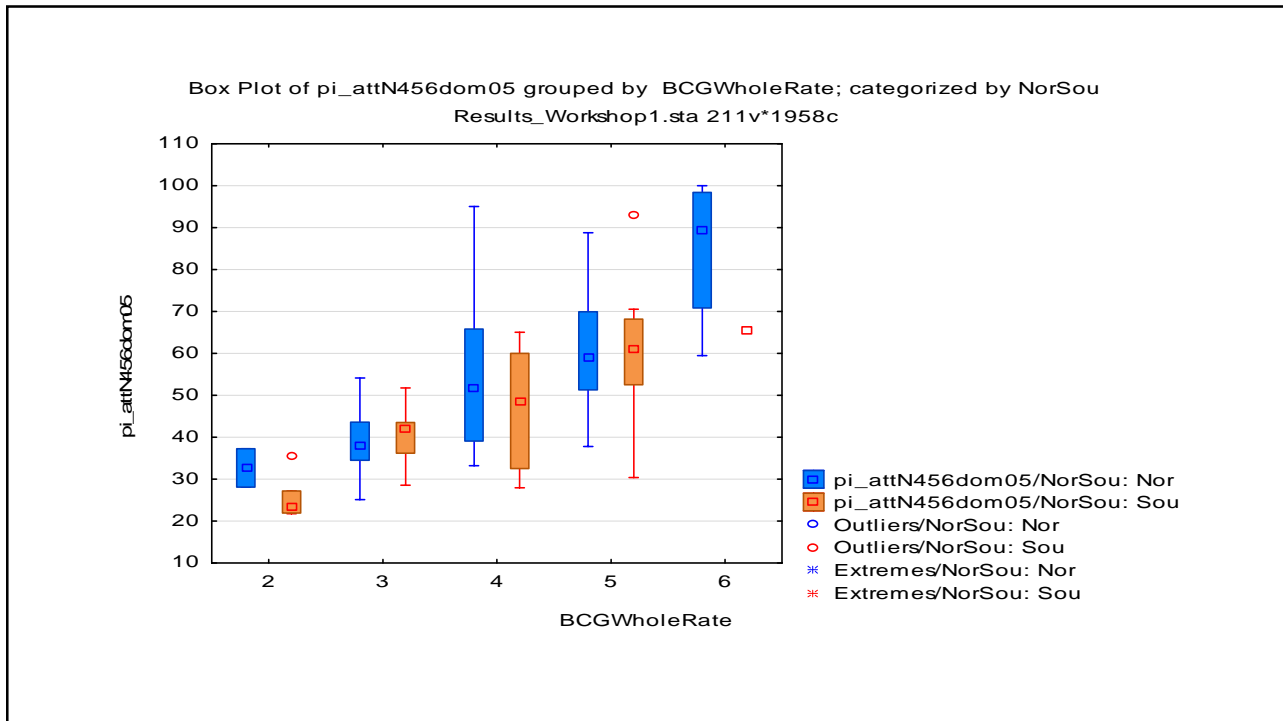
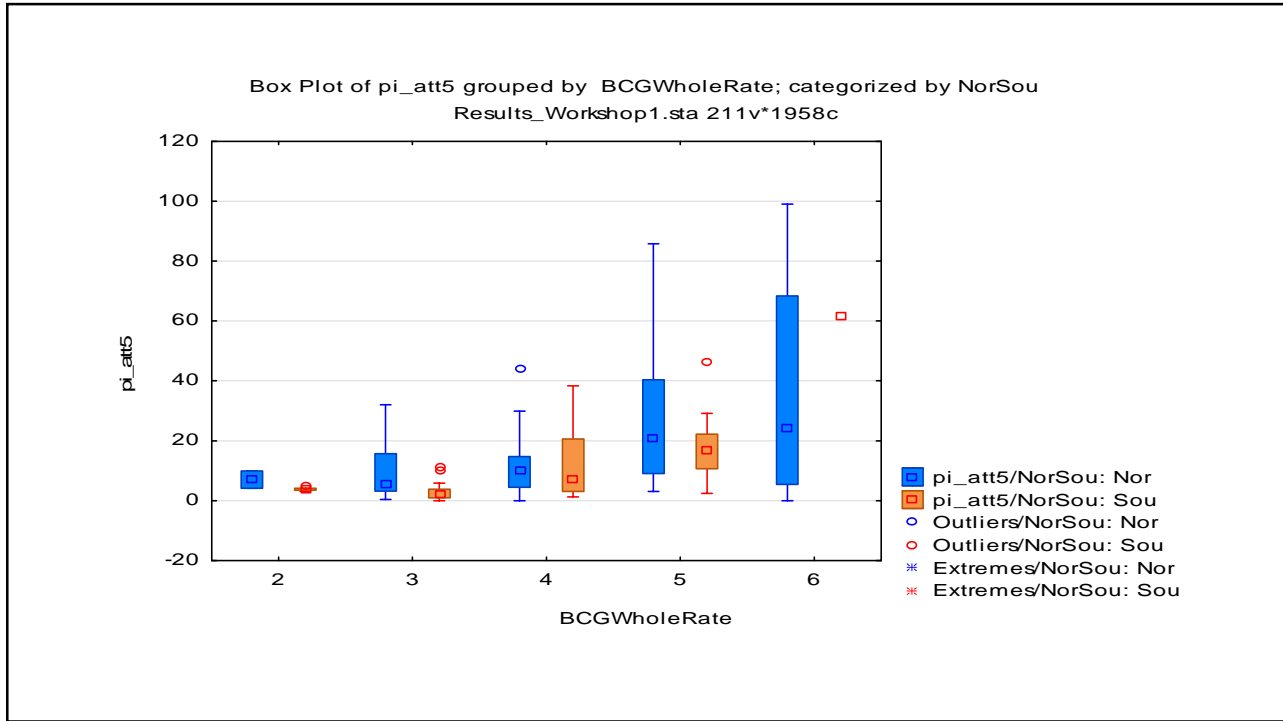


Appendix F: Metric Box Plots by BCG Rating



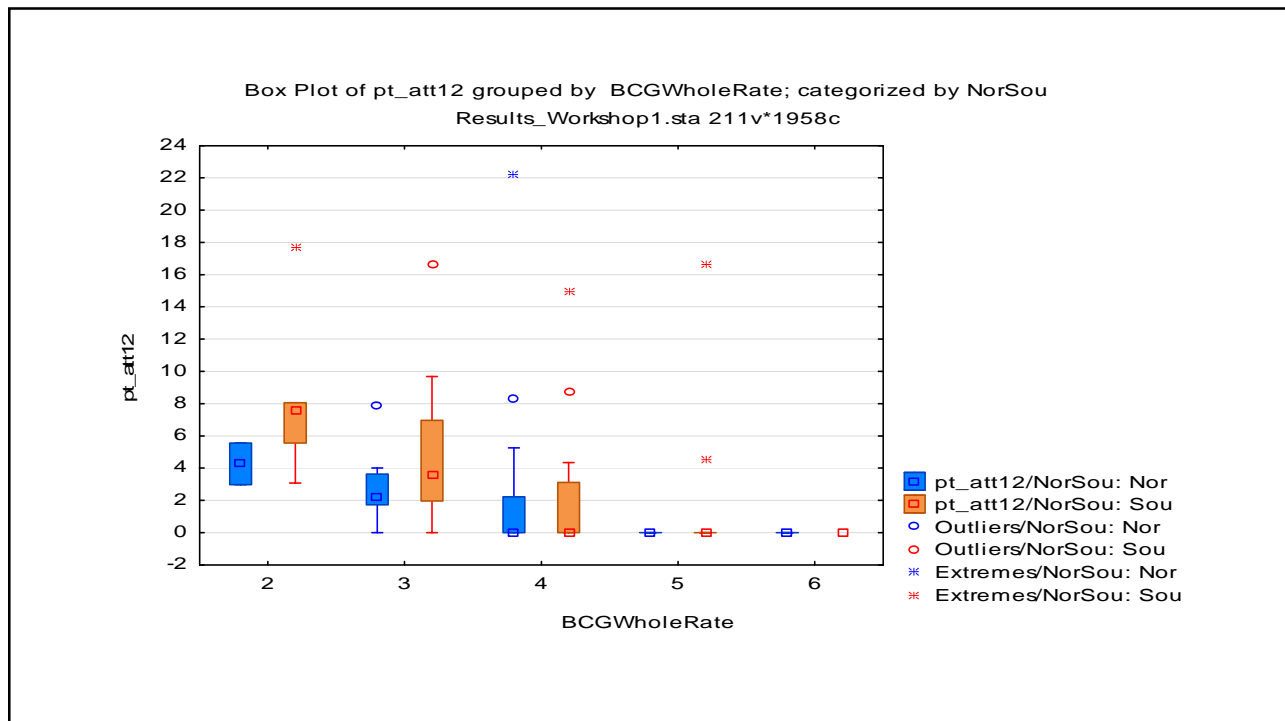
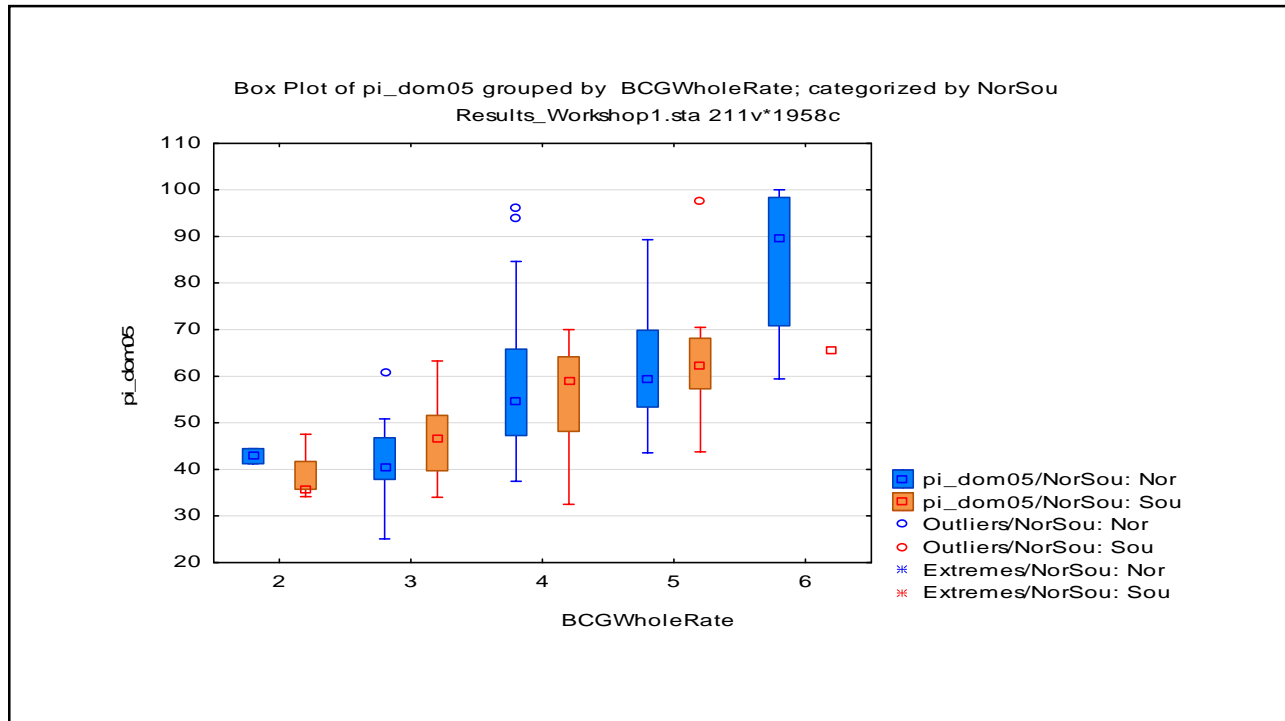
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating



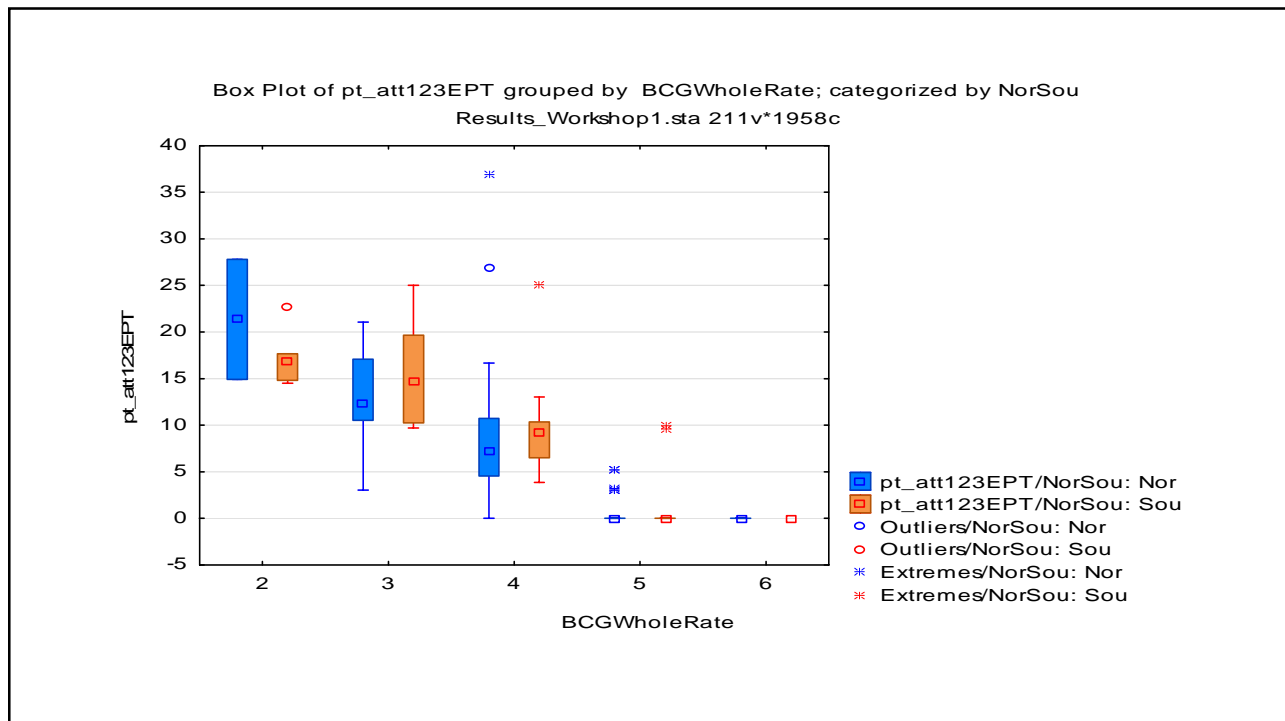
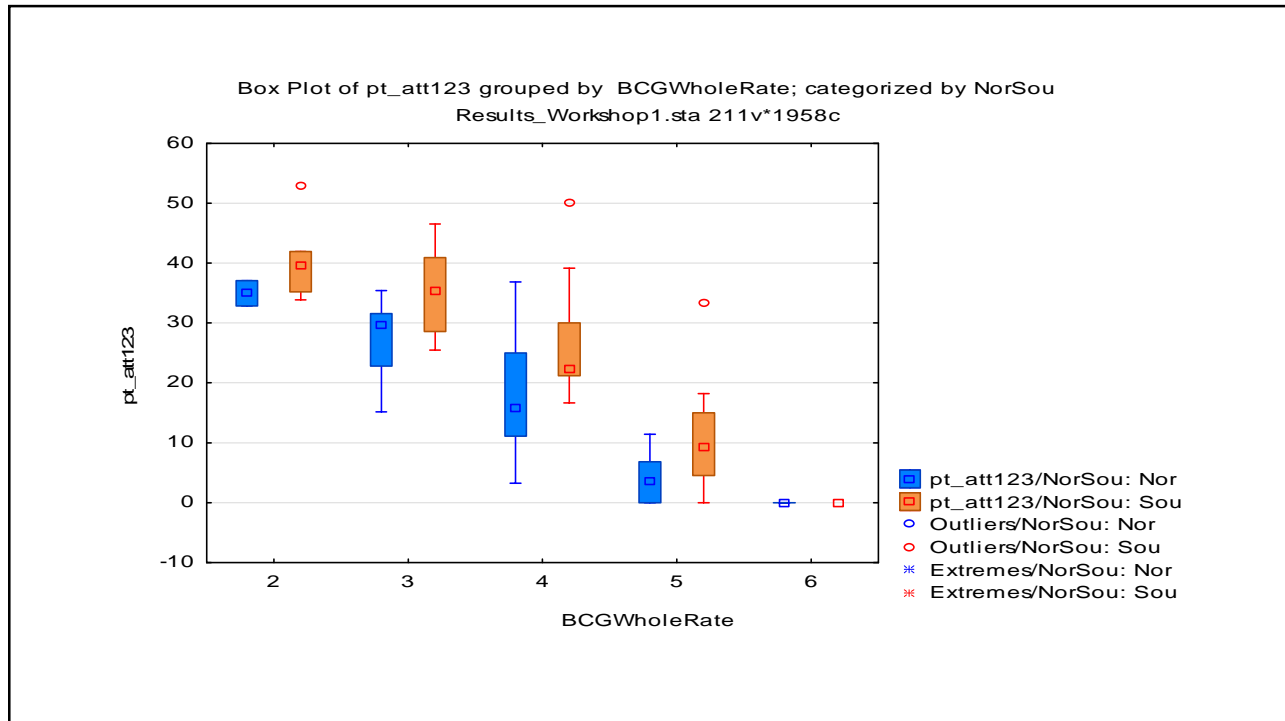
nt = number of taxa, pi = percent individuals, pt = percent taxa

Appendix F: Metric Box Plots by BCG Rating

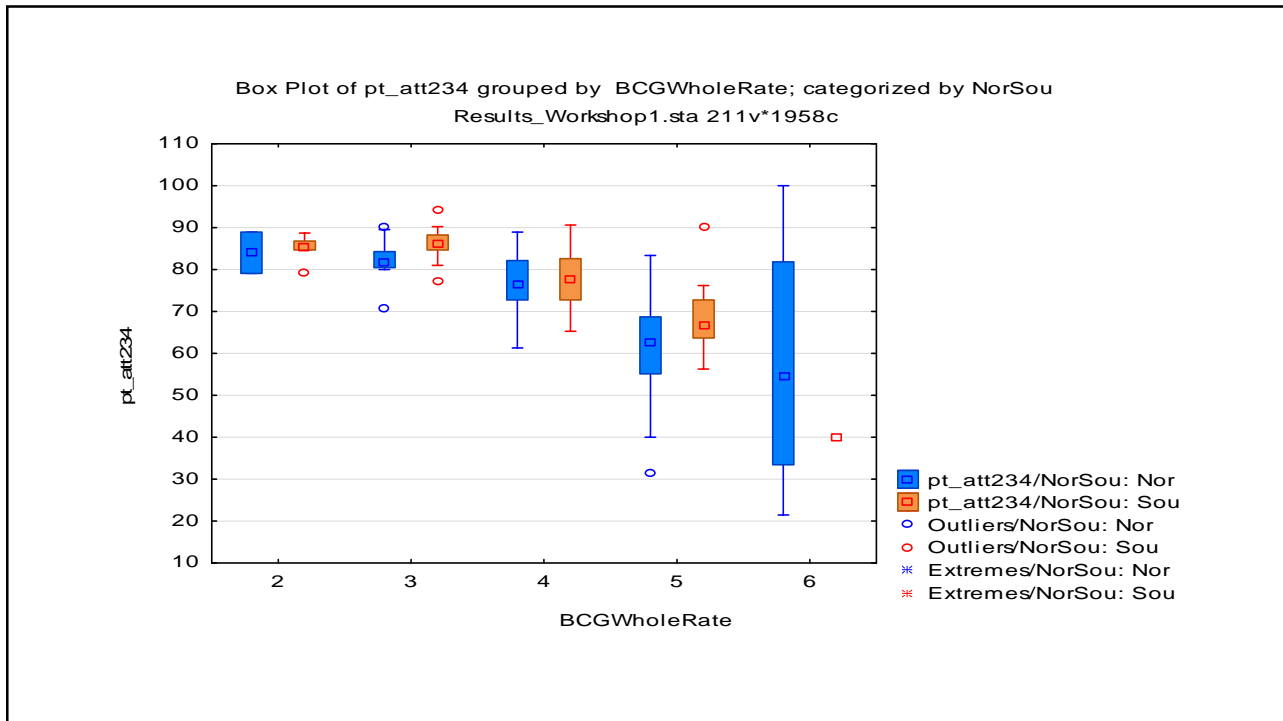
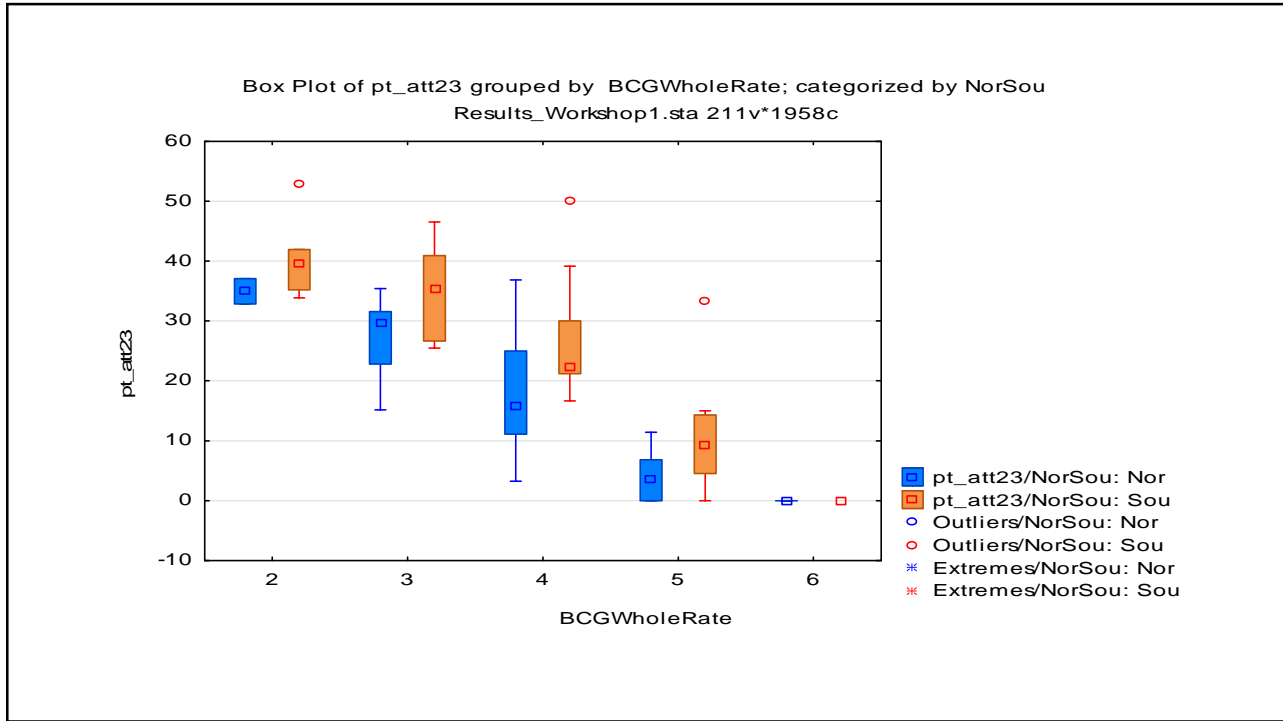


nt = number of taxa, pi = percent individuals, pt = percent taxa

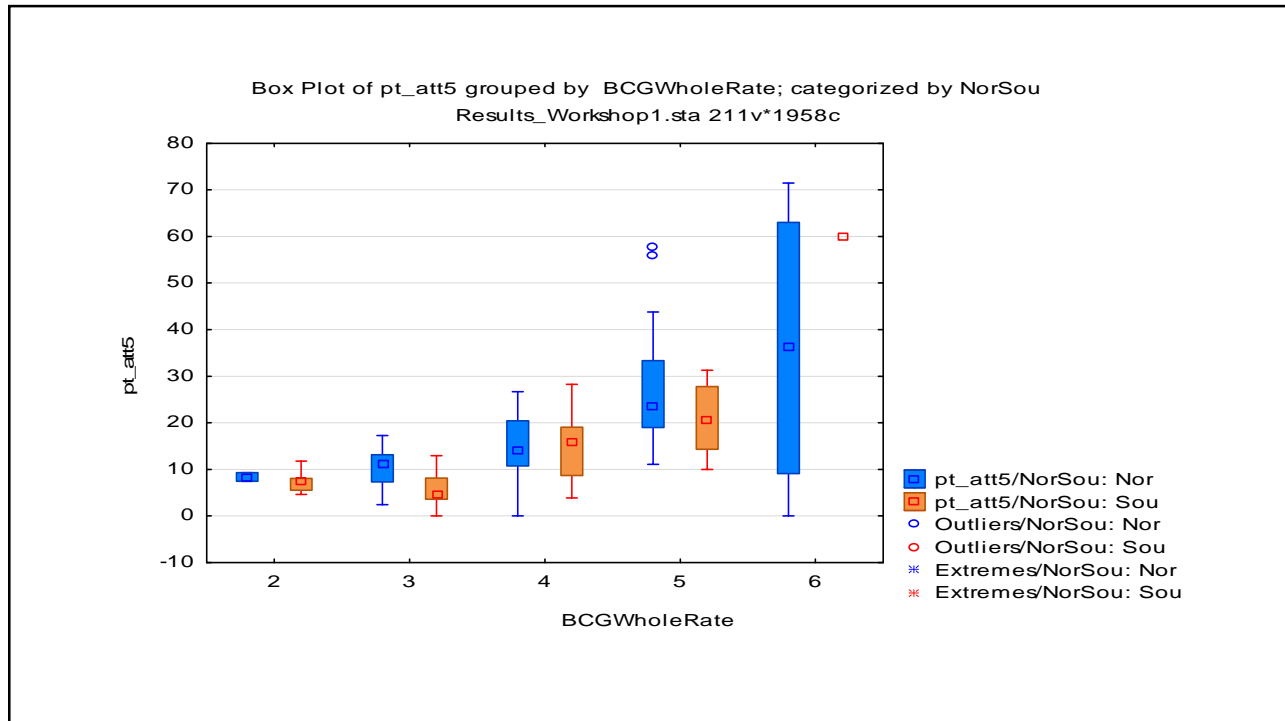
Appendix F: Metric Box Plots by BCG Rating



nt = number of taxa, pi = percent individuals, pt = percent taxa



Appendix F: Metric Box Plots by BCG Rating



## Appendix G

### BCG comparison IL and IN macroinvertebrates

A check of BCG model results for the independently developed IN and IL macroinvertebrate BCG models was conducted to determine whether the two neighboring states were calibrated to each other as well as to the BCG scale. The concern is that the state experts did not recognize the BCG levels equally, especially in Levels 2 and 3, which represent the most natural conditions, and in Level 4, which might become an impairment threshold. When convening experts in a region with intensive and nearly ubiquitous disturbance, the natural community characteristics are largely unknown and there could be a default to thinking that “the best we can observe is a natural Level 2”. During workshops, facilitators emphasized that the natural condition might not be observable and experts should conceptualize a community that could thrive with no disturbance in the catchment or region. A question to the experts when they identified a Level 2 was, “What might be missing from this sample?” There were no historical data from time periods with less disturbance, so the conceptualization of a natural sample was elicited, but not confirmed.

#### *Model Applications across Data Sets*

The IN calibration dataset was applied in the IL model using metrics calculated for IN. This comparison would necessarily include any bias associated with BCG attribute assignments as well as model calibrations because of differences in attribute assignments among states. Nevertheless, in comparable ecoregions 54, 71, and 72 (for which specific models are defined in Illinois) the exact matches in BCG model results to expert assignments were 89%, 53% and 67%, respectively. In ecoregion 54 (Central Corn Belt Plains), the Illinois model resulted in a worse BCG level in 1 of the 9 comparisons and did not give any better results. In ecoregion 72 (Interior River Valleys and Hills), the Illinois 72 (south) model resulted in a better BCG level in 3 of the 9 comparisons and did not give any worse results. In ecoregion 71 (Interior Plateau), the Illinois model resulted in a better BCG level in 7 of the 17 comparisons and gave a worse result in 1 sample. Four of the five samples rated as BCG Level 2 by Indiana experts were predicted to be a Level 2 using the Illinois model. Level 2 samples were only identified in ecoregions 55 and 71 in Indiana, and ecoregion 55 was not represented in Illinois. Indiana samples from ecoregions 55 and 56 performed best when the model for Illinois ecoregion 54 was applied, resulting in 21 of 28 (75%) exact matches in expert ratings and model results.

The BCG attributes were compared for those taxa with matching final identifications in both states (N=359 taxa). Identical attributes were assigned for 226 taxa (63%). Indiana assigned more sensitive attributes to 70 taxa and less sensitive attributes to 63 taxa. The occurrences of the taxa with different attribute assignments was similar for the more and less sensitive groups,

suggesting that metrics calculated from either set of attributes might not result in biased model results in the whole data set. In general, Indiana identified a greater proportion of the state taxa list as highly sensitive attribute II (4% of 822 taxa) and III (23%) compared to proportions of the Illinois taxa list (3% attribute II and 18% attribute III). These differences might affect the attribute metrics and the thresholds used in rules.

Another way to compare the data was to calculate metrics for Illinois samples using Indiana attributes, overwriting Illinois attributes for taxa in common. Then the Illinois calibration samples with Indiana attributes were applied in the Indiana draft model for samples from Illinois regions 54, 71, and 72S. The results were generally that the Indiana model predicted BCG levels that were the same or worse than the expert rating. All but one of the Illinois samples that the experts rated Level 2 were predicted to be Level 3 by the Indiana model. The rules that were not met were primarily the number of attribute 1, 2, and 3 taxa and the percent dominance of individuals in the 2 most common taxa. The Illinois samples rated Level 3 failed the Indiana Level 3 model in 20 of the 33 samples, often failing the rule for the number of attribute 1, 2, and 3 taxa. The Illinois samples rated Level 4 failed the Indiana Level 4 model in 10 of the 59 calibration samples. Ten of 25 Level 5 Illinois samples were predicted at a different Level by the Indiana model. At this level, 8 of the 10 errors were predictions of a better level. All of the four Level 6 Illinois samples were correctly predicted by the Indiana model.

Making comparisons using samples from different states, different sampling methods, different attribute assignments, and different model rules can give inconclusive results. However, it appears that the Level 2 samples identified in Indiana were largely confirmed when assessed using the Illinois model. Conversely, the Illinois Level 2 samples were not confirmed when assessed with the draft Indiana model, which predicted only one 2-3 tie and otherwise all Level 3s. The lower assessment using the Indiana model was despite using Indiana attributes, which generally indicated more sensitive taxa compared to Illinois attributes.

Differences in BCG Levels 3, 4, and 5 assessments among the states were fairly consistent within the levels. Most of the Level 3 Illinois samples were predicted to be Level 4 according to the Indiana model. A smaller percentage of Illinois Level 4 samples were predicted to be worse when assessed with the Indiana model. At Level 5, most Indiana draft model errors predicted that the Illinois samples were better than the experts assigned. Except for Level 6, which was recognized using both Illinois and Indiana ratings and models, the extremes of the BCG scale were not predicted precisely when applying across states and models.

### ***Independent Expert Assessments***

A set of 13 Illinois samples were rated by six Indiana experts and the medians of ratings from the two expert groups were compared. The Indiana experts had taxa lists with both Indiana and Illinois attribute assignments, but attribute metrics were calculated only using the Illinois attributes. The Indiana experts were briefed on the sampling protocols used in Illinois and were asked to consider how those differences might affect their perceptions and ratings. The samples were selected to represent a range of Illinois BCG ratings in the three ecoregions that are



common to both Illinois and Indiana. Only 13 samples were rated because this exercise was in addition to exercises already assigned to the Indiana experts.

The Indiana experts arrived at the same rating as the Illinois experts in 7 of the 13 samples and were tied at a rating similar to the Illinois rating for 1 more, resulting in similar ratings for 62% of the samples (Table F-1). For all other samples, the Indiana experts rated the samples 1 Level worse than the Illinois rating. The closest comparisons were in ecoregion 54 (Central Corn Belt Plains), where all but one of five ratings were identical.

**Table F-1.** Comparisons of median BCG ratings for 13 Illinois samples by independent Illinois and Indiana expert groups.

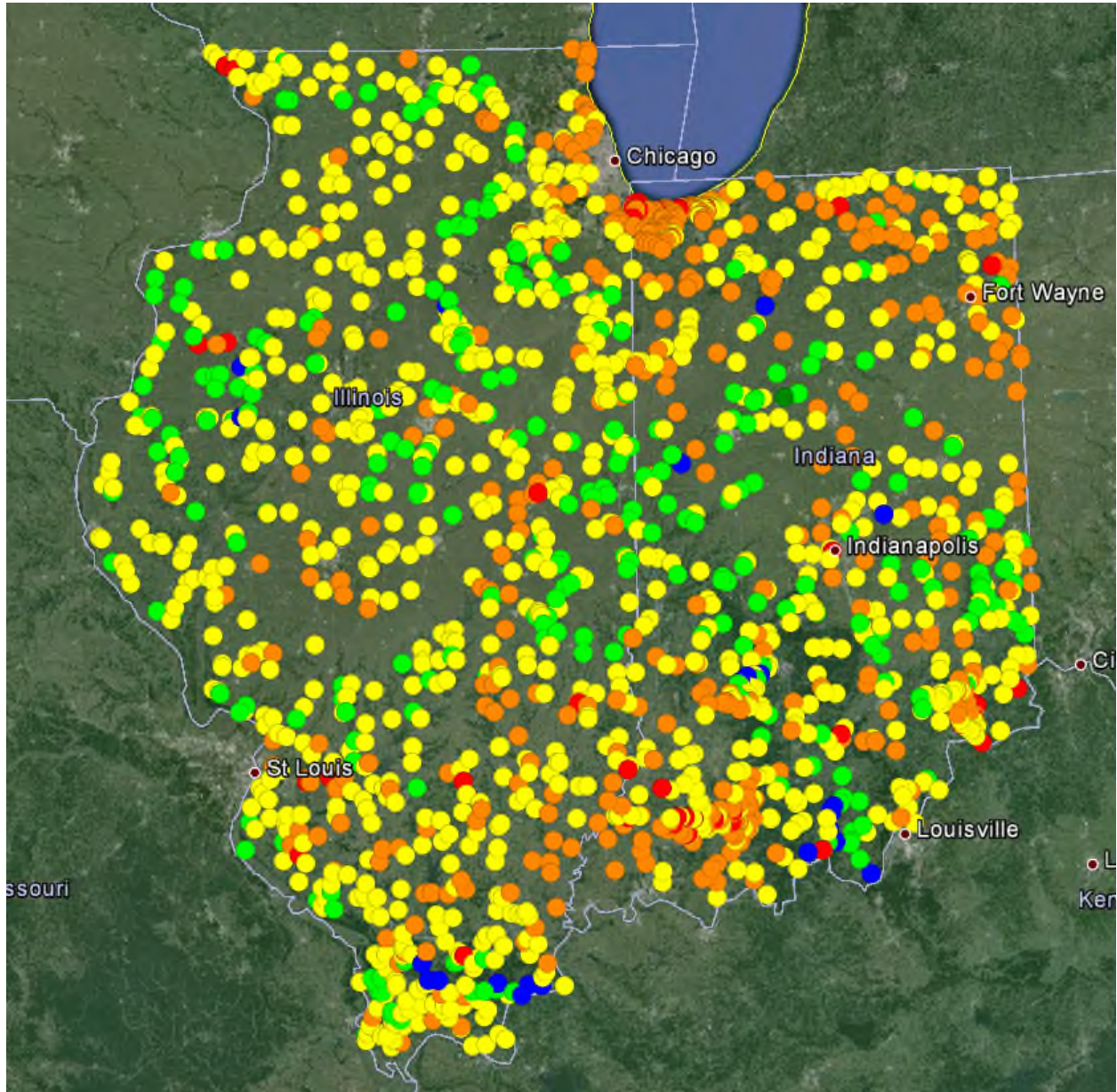
| Ecoregion     | StationID   | Date      | IL Rating | IN Rating |
|---------------|-------------|-----------|-----------|-----------|
| Eco54 (CCBP)  | PQJ-01      | 8/16/2001 | 4         | 4         |
|               | DS-20       | 7/7/2009  | 2-        | 3         |
|               | EID-16      | 8/18/2003 | 5         | 5+        |
|               | BPJCA-UC-D1 | 9/17/2001 | 6         | 6         |
|               | EIE-10      | 8/21/2003 | 3         | 3         |
| Eco71 (IP)    | NDC-99      | 6/18/2008 | 5         | 45tie     |
|               | ATHG-02     | 9/5/2001  | 3         | 4+        |
|               | ADD-01      | 7/21/2004 | 4         | 4         |
|               | AK-07       | 9/13/2001 | 2         | 3         |
| Eco72S (IRVH) | BH-05       | 8/9/2001  | 3         | 4-        |
|               | NDDA-01     | 6/10/2008 | 4         | 4-        |
|               | ATHG-01     | 8/10/2005 | 6         | 6         |

### ***BCG predictions mapped at the border***

BCG model predictions were mapped as an additional exercise to explore possible bias among states (Figure F-1). When sites were marked by model BCG Level and plotted in Illinois and Indiana there were no obvious differences occurring at the border (Figure 1). In the north near Chicago and in the south near the Ohio River there were predominantly Level 5 and 6 assessments in both states. In the mid-section of the border, Levels 3 and 4 were predominant in both states. In one mid-north border region, it appears that there might be more Level 3 assessments in Illinois (near Kankakee) compared to Indiana (near Wheatfield), which has more Level 4s and 5s. This difference might relate to different intensities of disturbance on either side of the border, but might also be related to model differences or perceptions of the different expert groups.

It was apparent that most of the Level 2 assessments occur in the south of each state, in ecoregion 71, the Interior Plateau or Shawnee Hills. These regions appear to have more forest cover and less intensive agricultural land uses compared to northern parts of the states. There are

a few Level 2 assessments in the Corn Belt Plains and the northern Interior River Lowlands in Illinois, but these are not grouped in a way that suggests broad natural areas. The Level 2 assessments are anomalies in the northern regions.



**Figure F-1.** Sample sites marked by BCG model predictions derived from each state’s data and models. BCG Levels are 2 (blue), 3 (green), 4 (yellow), 5 (orange), and 6 (red).