

FOREWORD

There are four major groups of insects whose immature stages are almost all aquatic: the caddisflies (Trichoptera), the dragonflies and damselflies (Odonata), the mayflies (Ephemeroptera), and the stoneflies (Plecoptera). These groups are conspicuous and important elements in most freshwater habitats. There are about 7,000 described species of caddisflies known from the world, and about 1,200 of these are found in America north of Mexico. All play a significant role in various aquatic ecosystems, some as carnivores and others as consumers of plant tissues. The latter group of species is an important converter of plant to animal biomass. Both groups provide food for fish, not only in larval but in pupal and adult stages as well. Experienced fishermen have long imitated these larvae and adults with a wide variety of flies and other artificial lures. It is not surprising, then, that the caddisflies have been studied in detail in many parts of the world, and Oregon, with its wide variety of aquatic habitats, is no exception.

Any significant accumulation of these insects, including their various developmental stages (egg, larva, pupa, adult) requires the combined efforts of many people. Some collect, some describe new species or various life stages, and others concentrate on studying and describing the habits of one or more species. Gradually, a body of information accumulates about a group of insects for a particular region, but this information is often widely scattered and much effort is required to synthesize and collate the knowledge.

The author of this volume, Norman H. Anderson, is eminently qualified to perform this time-consuming and demanding task. He joined the faculty of the Department of Entomology as an aquatic entomologist in 1962 and has spent most of his professional career working on aquatic insects, chiefly in Oregon, but also in England—a country with a long tradition of study of aquatic insects. Dr. Anderson, his collaborators, and his students, have collected and studied caddisflies throughout the state for many years, adding thousands of specimens and significant data to the body of knowledge on Oregon Trichoptera. This bulletin represents a summation of the knowledge of the Oregon fauna, a foundation upon which future work will be based.

For Oregon, 16 families, 80 genera, and more than 280 species are recorded with data on distribution, seasonal occurrence, and known biology. In comparison, 174 species were reported from New York in 1926, 184 species from Illinois in 1944, 168 species from California in 1956, 164 species from North Carolina in 1971, 208 species from Wisconsin in 1973, 175 species from Kentucky in 1975, about 200 species from Alberta in 1971, and 191 species from Quebec in 1975. Thus, at least for the present, more species are known to occur in Oregon than in any other state or province. The great diversity of Oregon's aquatic habitats is at least partially responsible for the large number of species. Many groups are cold adapted and find abundant suitable aquatic habitats in the state. Past geological events, and the dispersal of the many groups, also have contributed to species diversity.

In spite of the combined collecting efforts of dedicated entomologists over many years, additional work remains to be done as the map showing numbers of species found in the various counties clearly indicates. Benton County is known to have 120 species. Several other counties (Lane and Douglas, for example) ultimately may be shown to have as many or more. The Benton County total, naturally, represents the efforts of many individuals associated with Oregon State University. While aquatic

habitats are not as varied or extensive in many eastern counties of the state, some interesting additions will reward the careful collector. Specimens may be sent either to Dr. Anderson or to the Entomology Museum, Oregon State University, Corvallis.

This volume on the Trichoptera of Oregon is a welcome addition to the literature on aquatic insects of North America. It will be a useful companion to Stanley Jewett's 1959 work on the stoneflies, or Plecoptera, of the Pacific Northwest. Entomologists and fishery biologists are indebted to Dr. Anderson for a fine job. We look forward to additional volumes on other groups of aquatic insects of the Pacific Northwest.

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The Distribution and Biology of the Oregon Trichoptera

N. H. ANDERSON

ABSTRACT

More than 280 species of caddisflies (Trichoptera), representing 80 genera in 16 families, are known to occur in Oregon. Detailed distribution records within the state are given, as well as the known geographic range for each species. Biological information, such as life cycle, habitat preference, flight period, and larval feeding habits, are presented if the data are available.

INTRODUCTION

The Trichoptera, or caddisflies, comprise one of the largest orders of aquatic insects, with about 7,000 known species. They occur in most geographic regions of the world and in a wide variety of habitats. In addition to the typical lake and stream situations, larvae of caddisflies are known from marine shores, estuaries, hot springs, and ephemeral streams and ponds. A few species are terrestrial.

Adult caddisflies are small to medium-sized insects. They resemble moths, but can be distinguished from the latter by being clothed with hairs, rather than scales, and in lacking the typical coiled proboscis of the Lepidoptera. They tend to be secretive, slow-flying insects that stay near the water. Many species are strongly attracted to lights and can cause nuisance problems. Some species of Hydropsychidae and Hydropsylophilidae, that breed in the rapids of large rivers, are particularly troublesome in this respect.

In contrast to the adults, caddisfly larvae are an easily recognizable component of the aquatic fauna because many species build portable cases (Figure 1). The typical case is composed of a silken tube covered with vegetative or mineral materials. There is a wide variety in the materials used and in the shapes of the cases, but generally the case is quite characteristic for a species. The larvae of some families are free-living, while others construct fixed nets or retreats (Figure 2).

Most caddisflies have a one-year life cycle, though some are multi-brooded and others require two years. The eggs are laid in or near the water, either as strings or sheets surrounded by a cementlike matrix, or as masses enclosed by a gelatinous covering that swells upon absorbing

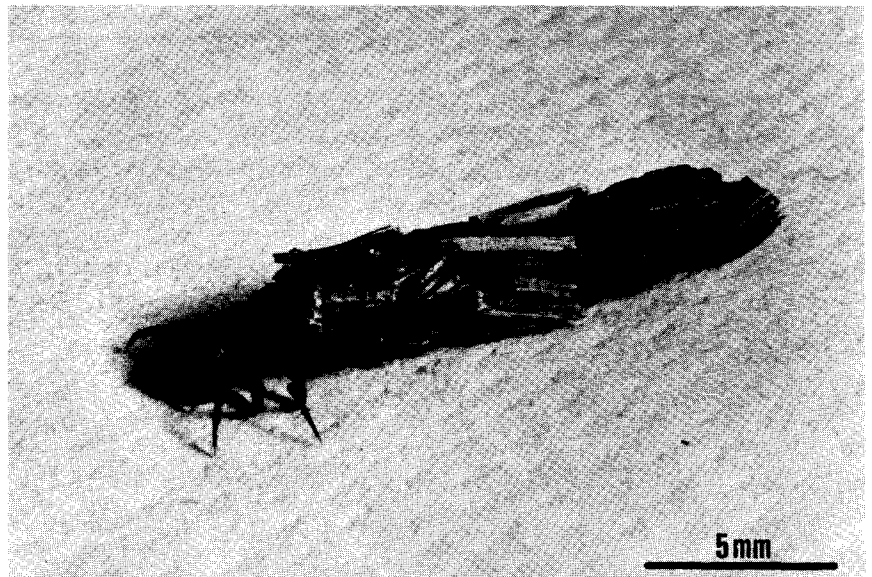
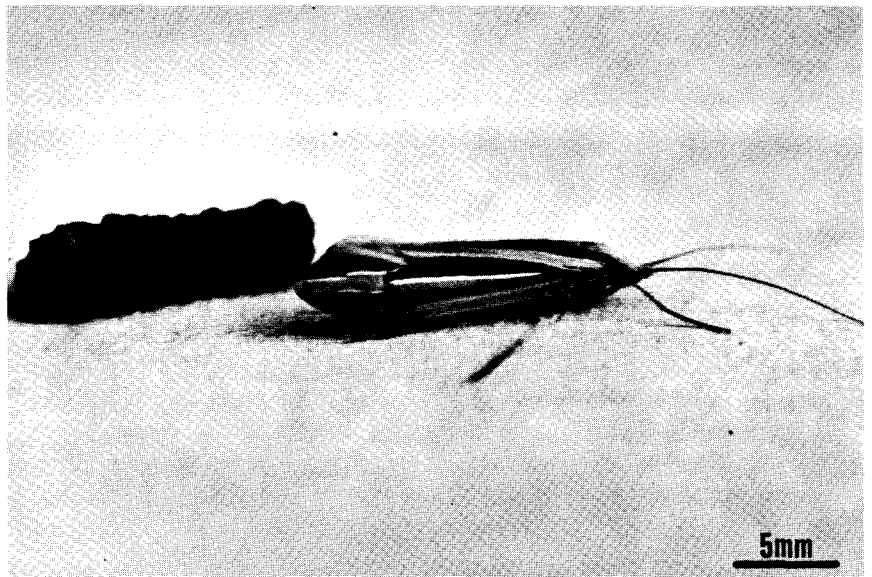


Figure 1. Adult and larva of caddisflies. Top photo: *Hesperophylax* sp. (Limnephilidae) adult with pupal case. Bottom photo: *Hydatophylax* sp. larva (Limnephilidae); the case is atypical for the genus as larvae were laboratory reared and provided only with conifer needles for case building.

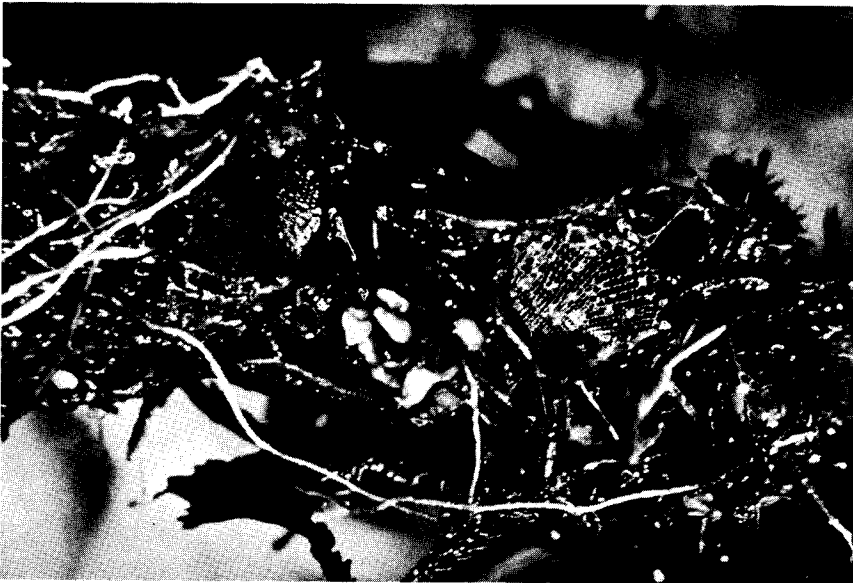
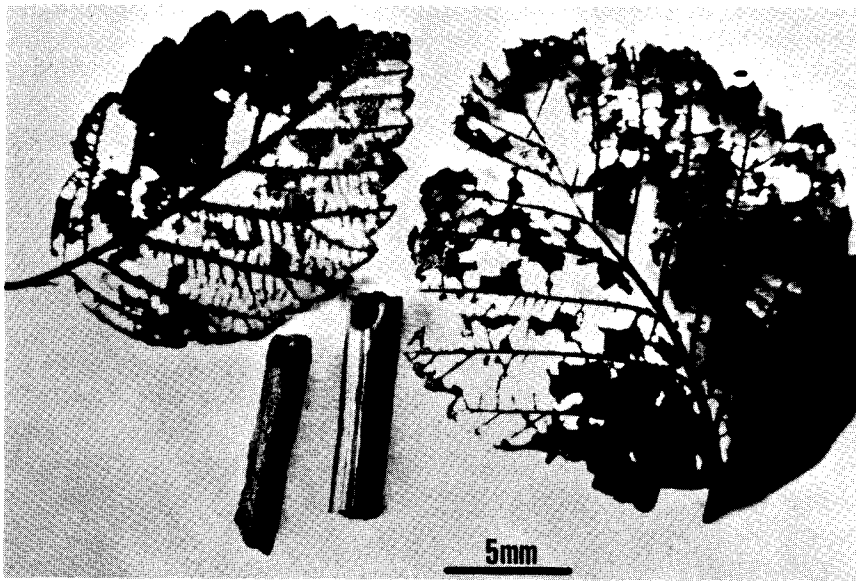


Figure 2. Trichoptera larvae feeding habits. Top photo: Alder leaves shredded by *Heteroplectron californicum* larvae (Calamoceratidae); the larval cases are hollowed-out twigs. Bottom photo: Capture nets of *Hydropsyche* sp. larvae (Hydropsychidae). The nets are attached to stones, wood, or other substrates in areas of rapid flow, and filter out detritus, small insects, and other invertebrates that are then ingested by the larvae.

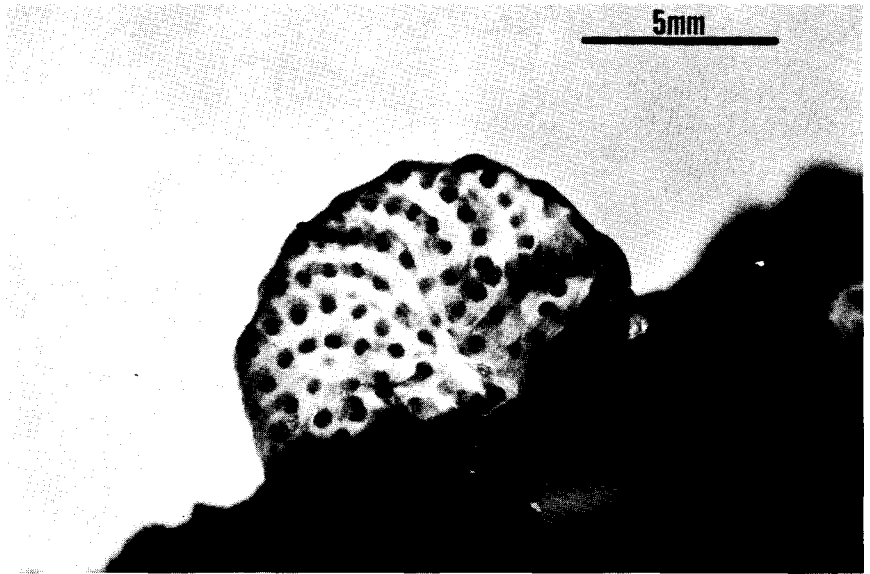


Figure 3. Egg mass of *Pseudostenophylax edwardsi* (Limnephilidae). This type of egg mass, containing about 300 eggs, is deposited on stones or other substrates above the water line.

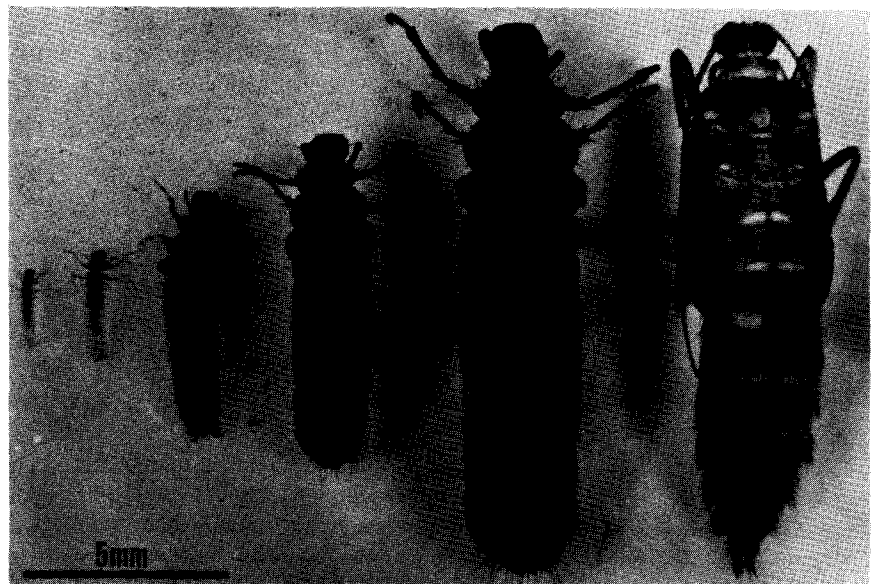


Figure 4. Larval instars and pupa of *Clistoronia magnifica* (Limnephilidae).

moisture (Figure 3). If the larva is a casemaker, it begins to construct a case very soon after emergence. There are typically five larval instars, though six or seven instars occur in some species (Figure 4). Pupation occurs within a case or shelter; free-living larvae construct a crude case and spin a cocoon within it, whereas tube-case makers attach their case to the substrate, close off the anterior end, and pupate within the larval case. The pupa has large mandibles that are used for cutting an exit hole at emergence. The pupa then crawls to shore or swims to the water surface. The adult discards the pupal exuviae, expands its wings, and flies away. There is considerable variation in adult longevity, with some species living for only a few days while others live for several months.

SYSTEMATICS AND CLASSIFICATION

Fischer's catalogue, "Trichoptera Catalogus" (1960-1973), consisting of 12 volumes plus 4 supplements, provides a comprehensive literature review up to 1960. This catalogue has been extremely valuable in organizing the present study, especially in locating original citations and type locality records.

The phylogenetic classification proposed by Ross (1967) for families and higher categories is used, with some modifications, in this bulletin.¹ Ross states that "Existing caddisfly families form two fairly homogeneous large groups with three families left over." The large groups are the suborders: (1) Annulipalpia, the retreat makers; and (2) Integripalpia, the tube-case makers. The remaining families, Rhyacophilidae, Glossosomatidae and Hydroptilidae, are grouped by Ross at the base of the Integripalpia line, though Lepneva (1964) and others include them in the Annulipalpia. However, it is generally agreed that these three families are primitive, so these are the first taxa to be discussed.

The arrangement used below the family level varies, depending upon the availability of recent systematic studies of the taxa. All of the subfamilies used are from Wiggins (1977). Genera are listed alphabetically unless there is a recent phylogenetic study. Species are treated in alphabetical order, except for the large genus *Rhyacophila*, where several levels of subgeneric categories are used.

Ross (1967) states that the value of larval characteristics in determining family relationships has been emphasized in the Trichoptera from early in the century. Intensive rearing programs associating larval and adult caddisflies that began about 1950 have led to new interpreta-

¹Wiggins (1977) presents convincing arguments for replacing the Annulipalpia-Integripalpia classification with the Superfamilies of Ross (1967). The arrangement that I have used fits Ross' classification as follows: Superfamily Hydropsychoidea (Annulipalpia as used here); Superfamily Rhyacophiloidea (Families Rhyacophilidae, Glossosomatidae, and Hydroptilidae); Superfamily Limnephiloidea (Integripalpia as used here).

tions of phylogeny. Thus, much of the attention concerning caddisfly evolution in recent years has been centered on the immature stages. Associations are commonly obtained by the "metamorphotype method" (M. Milne 1938). Caddisfly pupae have the sclerites of the final-instar larvae packed in the end of the pupal case and mature pupae have the fully developed genitalic structures that are used for species identification of adults.

The interest by taxonomists in the immature stages will be particularly useful to field biologists because their problem has been lack of keys below the family level. The publication of Glenn B. Wiggins' book, *The Larvae of North American Trichoptera* (1977), provides the basic framework for a quantum jump in research at the species level. I have been fortunate to have a manuscript copy for use while preparing this bulletin. Dr. Wiggins' research has been the major impetus for our rearing program to obtain larval-adult associations.

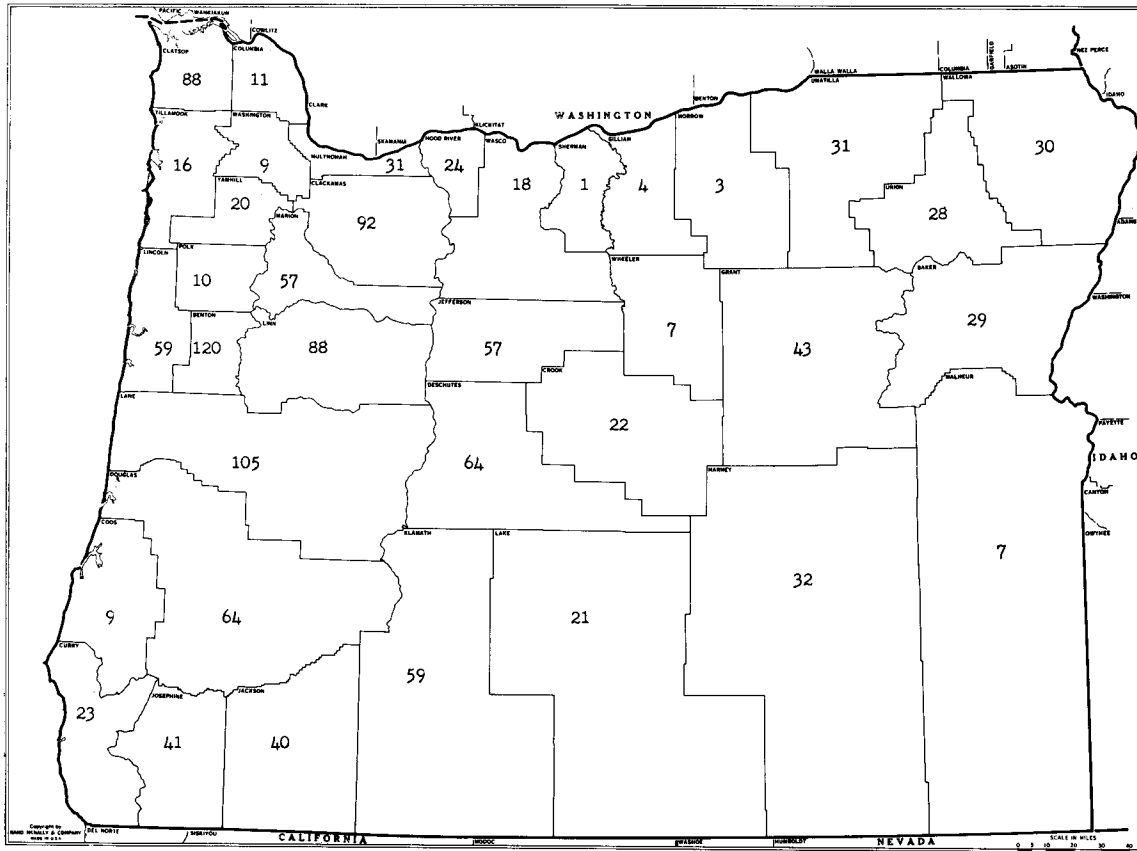
ORGANIZATION OF RECORDS AND MATERIAL EXAMINED

This inventory is meant to be useful to stream biologists by indicating the species of caddisflies known to occur in Oregon and, where possible, to delimit the type of habitat where the larvae are found. Thus, except for the common species that are widely distributed, detailed locality records are given. These are recorded by county using an alphabetical arrangement for the counties (Figure 5). Though the mass of the data could be condensed by summarizing records on a county basis, this would limit the usefulness of the records. Many of the Oregon counties are very large and extend through a range of diverse topographical and climatic regions. For example, Lane County extends from the Pacific to the crest of the Cascade Range, an altitudinal gradient of 3000 meters, and Klamath County has habitats as diverse as deserts, marshes, coniferous forests, and alpine lakes and streams.

It was my initial intention to plot collection records on a physiographic map of the state to associate occurrence with topographical regions. However, this does not appear to be very productive because of inadequate collecting in many areas and because so many species are currently known from only one or a few records.

Distribution Records

The distributions in Fischer's catalogue are given only at the state level. Thus, to obtain precise data and locality records, I have conducted an extensive literature search. Publications by the following Trichopterists



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Figure 5. County map of Oregon showing number of caddisfly species recorded from each county.

contain most of the published records of Oregon caddisflies: N. Banks, D. G. Denning, L. J. Milne, H. H. Ross, F. Schmid, and G. B. Wiggins.

In addition to literature citations, the records are based on the following major sources:

1. Examination of the collection at the Royal Ontario Museum, Toronto. G. B. Wiggins, Tosh Yamamoto, and other members of field parties from the museum have collected extensively in the western states and Canada. The purpose of their field work was to obtain larval-adult associations, so the collection contains a wealth of identified, reared material that provides both distribution and habitat data. Records from material in this collection are indicated as: (ROM).

2. Records provided by Ken Goeden, Oregon Department of Agriculture. These are based on light-trap material identified by D. G. Denning, Moraga, California. These records are particularly useful because they include collections from a wide geographical area of the state. Most of this material is in the collection of the Oregon State Department of Agriculture, Salem. The records are listed as: Goeden (det. Denning).

3. Records obtained from Stanley G. Jewett, West Linn, Oregon. Mr. Jewett has collected extensively in Oregon, especially in Clatsop and Clackamas counties. He has supplied Oregon material to several of the major collections in North America, including the U.S. National Museum, California Academy, Illinois Natural History Survey, Royal Ontario Museum, and Oregon State University. Records from his lists of material sent to these museums are designated as: (col. & det. Jewett).

4. Material in the Entomology Museum, Oregon State University. This collection includes both pinned and alcohol material collected from the early 1900's up to the present. Most of the older material was identified by H. H. Ross in the 1940's or by D. G. Denning in the 1950's. A few specimens have labels by Cornelius Betten and L. J. Milne. Beginning in the mid 1960's, my graduate students and I have intensified the Trichoptera studies. In addition to general collections for distribution records, much of the material has been obtained from ecological projects in streams. As most of this work has dealt with larvae, it has been necessary to obtain species identifications of adults by laboratory rearing or emergence-trap collections, or by collecting mature pupae. Students who have cooperated in these studies are Elwin D. Evans, William N. Frost, Edward Grafius, Cary D. Kerst, Sally Stefferud, Michael P. Tew, and Janet L. Wold. Most of the material has been identified by G. B. Wiggins, D. G. Denning, or Oliver Flint, Smithsonian Institution. In addition, material has been sent to Stamford D. Smith and Don Givens, Central Washington State College, and to Vincent Resh, University of California, Berkeley.

CLIMATIC AND PHYSIOGRAPHIC FEATURES OF OREGON

Oregon is a large state, with 121,681 square kilometers within its boundaries. The varied climates result in complex vegetation patterns. Franklin and Dyrness (1973) indicate that this is due to the interplay between maritime and continental airmasses and the mountain ranges, particularly the Cascade Range that divides the state into western and eastern parts. Western Oregon has a maritime climate characterized by mild temperatures with prolonged cloudy periods and muted extremes. The heavy precipitation (typically 170 to 300 centimeters on the coast and 80 to 120 centimeters in the Willamette Valley) occurs chiefly as winter rains. Eastern Oregon has combined features of both maritime and continental climates. Temperatures are milder than those of the Great Plains, but winters are colder, summers are warmer, and frost-free seasons are shorter than in western Oregon. Precipitation is low because the area is in the rain shadow of the Cascade Range; annual precipitation is typically 25 to 50 centimeters, much of which falls as snow.

The state may be divided into 10 physiographic and geological provinces (Figure 6). The following summary of these areas is taken from Franklin and Dyrness (1973), with the addition of notes on aquatic habitats.

1. Coast Ranges. This province is topographically mature, with steep mountain slopes and sharp ridges. Elevation of the summits range from 450 to 750 meters, with Marys Peak, 1249 meters, as the highest mountain in the Coast Range. The Coast Ranges are largely composed of Tye sandstones of the Eocene epoch, with some areas of basalt laid down in early Eocene times. The area is dominated by dense coniferous forests, reflecting the high annual precipitation and mild winters. The slopes are drained by numerous small, westward-flowing creeks and rivers. There are very few lakes in the mountains. Along the coast there are several sand-dune lakes, as well as estuaries and marshes. The latter are extensive along the Columbia River and around Coos Bay. The caddisfly fauna of these marshes is largely unknown.

2. Klamath Mountains. This is a complex of ranges with rugged, deep, dissected terrain with some volcanic tuffs and sedimentary rocks of the Paleozoic era and further deposition in the late Triassic period with extensive metamorphism. The crests of the ridges range up to 1200 meters, with some higher peaks such as Mount Ashland, 2280 meters. Aquatic habitats of this area are primarily streams of various sizes. These tend to be warmer and perhaps more eutrophic than in the Coast Ranges. Other habitats are hot springs, mineral springs, *Darlingtonia* bogs, and a few lakes.

3. **Willamette Valley.** This extends as broad alluvial flats 200 kilometers long and 30 to 50 kilometers wide, between the Coast and Cascade ranges. It is in the rain shadow of the Coast Range but has heavy winter rains. The natural vegetation is largely grassland with some wooded areas. Aquatic habitats include streams ranging in size from small woodland streams up to a large meandering river. There are several oxbow lakes and swampy areas in the floodplain of the Willamette River. Intermittent streams and ponds from the winter rains are common.

4. **Western Cascades.** These are old volcanic flows and pyroclastic rocks laid down in the Oligocene and Miocene epochs. The main ridge crests average 1500 meters. The area receives heavy winter rainfall, and is densely forested with conifers. The major valleys are U-shaped due to alpine glaciation. The area is drained westward by a large number of streams and rivers that are characteristically low in nutrients. Many of the rivers are dammed for flood control or hydroelectric purposes.

5. **High Cascades.** This province is geologically young, with some lava flows only several hundred years old. It is an area of rolling terrain with a general elevation of 1500 to 1800 meters, and interrupted by glaciated channels carrying westward-flowing streams. It is dotted with volcanic peaks and cones including Mount Hood (3427 m), Mt. Jefferson (3199 m), and the Three Sisters (3062-3157 m). Much of the province is covered by pumice and ash, the most extensive area from the explosion of Mount Mazama, 6600 years ago, that resulted in Crater Lake. This province contains diverse aquatic habitats suitable for a cold-adapted fauna. These include springs, seeps, alpine bogs, snow-melt pools, streams, and a large number of lakes. The Metolius River, on the eastern slopes of the Cascades, is a faunistically rich stream where extensive collections have been made (see next section).

6. **Blue Mountains.** Several ranges are included in this province, separated by faulted valleys and synclinal basins. The western part contains outcrops of Paleozoic formations that are the oldest rocks in Oregon. Maximum elevations range from 2100 meters in the Ochocos to 2900 meters in the Wallowa Mountains, and valley elevations range from 750 to 900 meters. As a result of the moisture gradient, the higher elevations are forested while lower areas are shrub-grassland or grassland. This area probably has the greatest range of aquatic habitats of all the provinces in Oregon, because of the size of the region and gradients in topography, temperature, and precipitation. Lotic waters range from clear mountain streams to warm silty rivers in deep canyons. Lentic habitats include cirque lakes, subalpine ponds, and marshes. Cold and hot springs and temporary streams are characteristic aquatic habitats in much of the area.

7. **Columbia Basin.** This is an extensive area of shrubby grassland between the Cascades and the Blue Mountains. It is gently undulating to moderately hilly with deep canyons cut by rivers such as the Deschutes. Elevations range from 300 to 600 meters and down to 150 meters along the Columbia River. The area is largely underlain by Miocene lavas of Columbia River basalt that are 600 to 1500 meters in thickness. There is little water except for the large rivers and farm impoundments or irrigation drainage.

8. **High Lava Plains.** This province is characterized by young lava flows (Pliocene and Recent), with scattered cinder cones and lava buttes. The base elevation is about 1200 meters. Many streams are seasonal because of porous bedrock and low rainfall. Undrained basins with playa lakes, some dry and others with fluctuating levels, are common. There are extensive marshes around Malheur Lake in the eastern part of the area.

9. & 10. **Basin and Range, and Owyhee Uplands.** There are these two provinces in southeastern Oregon of similar geology but with different topography. The area is characterized by Miocene and Recent basalts, pyroclastic and alluvial sediments. The Basin and Range province contains fault-block mountains enclosing basins with internal drainage. The Owyhee Upland province is basically a north-facing basin drained by the Owyhee River. Elevations range from 1200 meters to 2930 meters for Steens Mountain. The area is rolling, with low relief, except for the slopes of the fault-block mountains. Precipitation is only 20 to 30 centimeters, thus many streams are intermittent and the undrained basins have shallow saline lakes, such as Summer Lake and Abert Lake. Though much of the area is desert or semidesert, there is a great variety of aquatic habitats, few of which have been adequately collected. Upper Klamath Lake, which is one of the largest lakes in the country, is a shallow, highly eutrophic lake, bordered by extensive marshes. It is fed by the Sprague and Williamson rivers, which are faunistically rich. The lakes and streams on Steens Mountain provide a subalpine component to this province (see below). Hot springs occur in several parts of the area. The Owyhee and Malheur rivers are major tributaries of the Snake River on the eastern border of Oregon. The large-river fauna has undoubtedly been altered by the impoundments on the Snake and Owyhee.

AREAS OF INTENSIVE COLLECTIONS OF CADDISFLIES

The number of species of caddisflies recorded from each county is given in Figure 5. A preponderance of the records are from the western counties. This bias largely reflects the proximity to Corvallis, where per-

sonnel associated with Oregon State University have collected material. However, the diverse topography of the Coast Range, Willamette Valley, and Cascade Range also affords a wide spectrum of habitats for a varied fauna.

Locations where intensive collections of caddisflies have been made are indicated in Figure 6, and further described below. Descriptions of these areas indicate the types of habitats from which the fauna is now reasonably well known. Most of these sites are small streams in hilly or mountainous regions. Ross (1967) indicated that a surprising number of Trichoptera are restricted to small woodland streams. Noticeably absent from the intensively collected sites are large rivers and lentic habitats. The general collecting, particularly the light-trap collections by Kenneth Goeden, may give a fair indication of the fauna of these types of waters, but in general the species occurrence in these habitats is poorly known.

1. Drift Creek Drainage, Lincoln County. A long-term project on the impact of logging practices on salmon-rearing streams has been conducted in three small streams of this drainage: Flynn Creek, Deer Creek, and Needle Branch (Hall & Lantz 1969). The invertebrates collected in conjunction with this project include 20 species of caddisflies, many of which were reared from larvae or associated by the metamorphotype method. These streams are about 15 kilometers inland from the Pacific, about 150 to 200 meters above sea level, in an area with an average rainfall of 245 centimeters per year. The substrates range from sand to small rubble. The watersheds have been partially logged of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, and the streams have a dense riparian vegetation of salmonberry, *Rubus spectabilis* Pursh, and red alder, *Alnus rubra* Bong.

2. Nehalem River Valley, Clatsop County. S. G. Jewett has collected extensively for aquatic insects in this area, both with a black light and by sweeping. Much of his material was taken where he formerly had a cabin on Gronnel Road, near Elsie. Most of the caddisflies probably emerged from the Nehalem River. However, a small stream, Osweg Creek, and an intermittent stream are also nearby.

3. Marys Peak, Benton County. This mountain is the highest point in the Coast Range in Oregon (1249 m) and has long been favored by entomologists as a collecting area. Several streams drain eastward into the Willamette system, but the mountain is also the headwaters of the westerly flowing Alsea River. Parker Creek, which drains into the Alsea, contains an exceptional number of rare genera in the headwater region near the summit of the mountain in a subalpine zone. In this area the stream has a relatively low gradient and the surrounding forest is dominated by noble fir, *Abies procera* Rehd. Field work, by G. B. Wiggins and

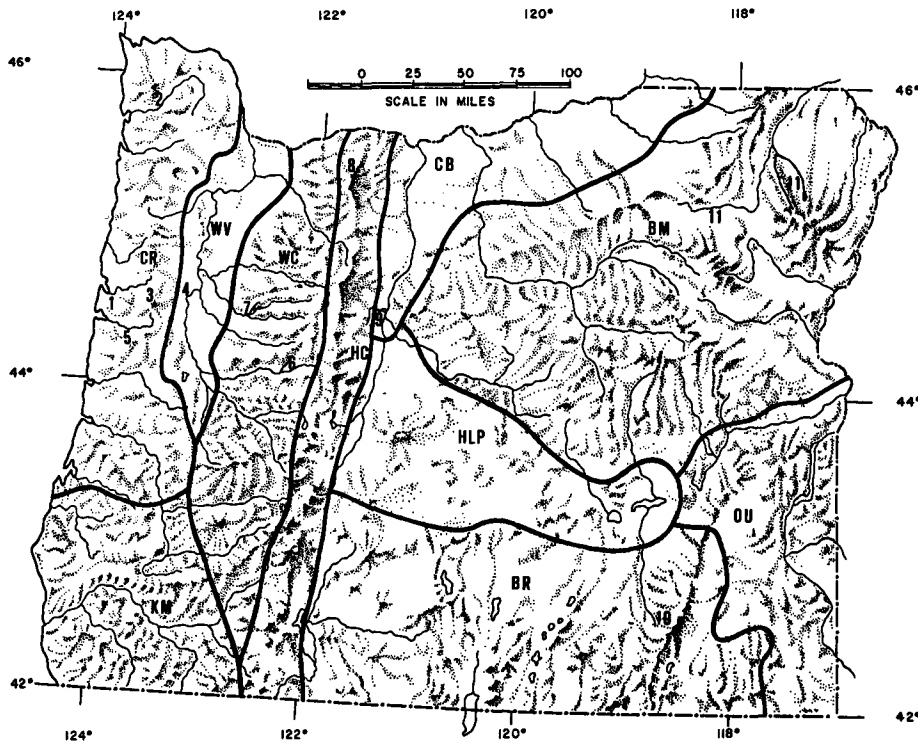


Figure 6. Physiographic provinces of Oregon and areas of intensive collections of caddisflies. Abbreviations (WV, WC, etc.) refer to the physiographic provinces used in the text and described by Franklin and Dyrness (1973). The numbers (1-11) indicate sites, of intensive collections of caddisflies as listed on pages 12-15.

Royal Ontario Museum field parties, in the small streams and seeps on Marys Peak has established larval-adult associations for several of the poorly known western genera and species.

4. **Oak Creek and Berry Creek, Benton County.** These two small streams are in the eastern foothills of the Coast Range in McDonald Forest, near Corvallis. Both streams have been used extensively as study sites for several years. In addition to sweeping and light-trap collections, caddisflies have been obtained from emergence traps (Kraft 1963, Anderson & Wold 1972). Each stream has a list of over 40 species. The stream-side vegetation is chiefly maple (*Acer macrophyllum* Pursh), alder, oak (*Quercus garryana* Dougl.), and Douglas-fir. Substrates are basaltic, ranging from small gravel to rubble. Water temperature rarely exceeds 20°C and ice formation is uncommon. Collections have been made from Oak Creek between 75 and 200 meters elevation, whereas studies at Berry Creek have been chiefly at one site at about 90 meters. Tew (1971)

recorded nine species of caddisflies from an intermittent tributary of Berry Creek. This stream, which has surface water from November to April, flows through open pasture.

5. **Lobster Creek, Benton County.** This stream is one of the larger tributaries of the Alsea River. It is a low-elevation stream draining the farmlands of Lobster Valley and the heavily wooded hillsides. Collections were concentrated at a site of 50 meters elevation, about 25 kilometers southwest of Alsea and 3 kilometers upstream from the confluence with Five Rivers. At this location, the stream is about 10 meters wide and partially shaded by dense growths of alder. The substrate is basaltic gravel and rubble with several areas of exposed bedrock. As is typical with all western Oregon streams, the flow regime is characterized by several peaks due to winter rains and much decreased flows during the dry summer and fall.

6. **H. J. Andrews Experimental Forest, Lane County.** Research on the Oregon portion of the Coniferous Forest Biome, International Biological Project was centered on this area of the Willamette National Forest in the Cascade Mountains about 80 kilometers east of Eugene. The drainage has a mean annual rainfall of 229 to 254 centimeters and elevations ranging from 457 to 1615 meters. The vegetation is old-growth Douglas-fir, hemlock (*Tsuga heterophylla* (Raf.) Sarg.), maple, and alder. Stream research was concentrated on three streams: Watershed 10, a first-order stream ranging in elevation from 435 to 695 meters; Mack Creek, a third-order stream with collecting sites at 745 and 775 meters, and a fifth-order stream, Lookout Creek, where the sampling site was at 500 meters. Benthos and emergence-trap collections were made at all sites throughout the year.

7. **Quartzville Road, Linn County.** This site, along Quartzville Creek east of Green Peter Dam in the Cascade Range at 350 meters elevation, is only a small roadside ditch and seepage area on a mossy hillside. The site was sampled monthly for a year primarily to study the life history of the limnephilid, *Pseudostenophylax edwardsi* (Banks). However, the site was also the larval habitat of such obscure genera as *Parthina*, *Homoplectra*, *Goeracea*, and *Philocasca*.

8. **Mount Hood.** The highest peak in Oregon (3427 m) extends into three counties: Hood River, Wasco, and Clackamas. Water from the perennial snowfields provides an abundance of habitats for cold-adapted species. There have been extensive collections from the streams and seeps, particularly on the western slopes in Clackamas County, by S. G. Jewett, K. M. Fender, and G. B. Wiggins. Mount Hood is the type locality for 10 species of caddisflies. Many of these are known only from this restricted area, or from a few of the high Cascade peaks in Oregon and Washington.

9. **Metolius River, Jefferson County.** This is a broad, shallow river that emerges as a full-sized stream from springs south of Camp Sherman. It is located in the rain shadow east of the crest of the Cascade Range, with the headwater region at 900 meters, in an area of ponderosa pine (*Pinus ponderosa* Dougl. ex Loud.) and meadows. The river has a relatively constant flow of cold water during all seasons, ranging from 6 to 13.5°C. The substrates are volcanic in origin (andesitic gravel) mostly under 5 centimeters diameter. In contrast to streams west of the Cascades, the Metolius has beds of emergent vegetation, primarily *Ranunculus*, and hummocks of sedge. Anderson (1967a) recorded about 30 species of caddisflies from a site at Riverside Forest Camp near Camp Sherman, and at least 10 more are added in the present list.

10. **Steens Mountain, Harney County.** There are records for several typically northern caddisflies from this fault-block mountain that rises to 2930 meters in the arid uplands of south-central Oregon. Most of the collections are from the subalpine region at Fish Lake (elevation 2190 m).

11. **Northeastern Oregon.** I have made several collecting trips to this area in the summer, but the caddisfly fauna is not well collected because of lack of material from other seasons. A number of records are listed for Wallowa Creek and Little Sheep Creek, Wallowa County (altitude about 1200 m). In 1974, several streams in the Blue Mountains, Union County, were surveyed for caddisflies in conjunction with the monitoring program for impact on the stream biota of aerial DDT spraying against tussock moth. These included Butcher Creek near Huron, Phillips Creek near Elgin, and Meadow Creek, 30 kilometers southwest of La Grande.

Distribution Records of the Species of Trichoptera in Oregon

FAMILY RHYACOPHILIDAE

The Rhyacophilidae (along with the Glossosomatidae and Hydropsychidae) occupy a position between the two large groups, or suborders, the retreat makers and the tube-case makers (Figure 7). Lepneva (1964) places this family in the Annulipalpia, but Ross (1967) considers the Rhyacophilidae to be at the base of the line leading to the Integripalpia. However, despite these differences in phylogenetic interpretation, there is general agreement that the rhyacophilids are amongst the most primitive of the caddisflies.

The Rhyacophilidae are a characteristic element of the fauna of cool, mountain streams. These types of streams are considered by Ross (1956) to be the habitat of the ancestral trichopteron. According to Ross, the rhyacophilid species tend to have small geographic ranges, with many species individually restricted to only one or two high mountains.

The larvae are free-living and largely carnivorous. Prior to pupation the larva constructs a "case," which is typically a crude shelter of small stones tied together and attached to the substrate with silk. Within this case the larva spins a brown, parchmentlike cocoon.

There are two subfamilies, the Rhyacophilinae and Hydrobiosinae. Only the former is cool adapted and occurs in Oregon.

Subfamily Rhyacophilinae

There are only three genera in this subfamily: *Philocrena*, a monotypic genus in Russia; *Himalopsyche*, which occurs in Asia and North America; and *Rhyacophila*, a very large and widely distributed genus.

Himalopsyche Banks 1940 (Figure 7a)

This genus contains about 40 species largely restricted to the Himalayan region and eastern Asia (Schmid & Botosaneanu 1966). One species occurs in North America.

H. phryganea (Ross) 1941a. Type locality: OREGON, MULTNOMAH Co., Horsetail Falls, Apr 18/40, S. G. Jewett.

BENTON Co., Marys Peak, Parker Cr., many records, pupae & adults in July and Aug. CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Aug. 10/55 (col. & det. Jewett), & June 10-11/67 (prepupae & adults) (ROM). JOSEPHINE Co., Lake Cr. & Cave Cr., Oregon Caves Nat. Mon., Aug 5/67 (pupae & adults) (col. & det. Wo'd.) KLAMATH Co., Klamath Falls, Feb 15/41 (larva) (Flint 1961a). LANE Co., streams W of Blue River, July 17/70 (larvae), Wold & Evans; Mack Cr., Andrews For., 11 mi NE Blue River, Nov 11/74 (larva), J. Undurraga (det. Anderson). LINN Co., Quartzville Rd., near Green Peter Dam, Aug 6/70 (prepupa), Wold & Anderson; upper McKenzie Riv., June 6/67, & Pamela Cr., trib. N Santiam Riv., May 28/50 (col. & det. Jewett). MARION Co., Niagara, May 31/70, Evans & Tew, & Aug 21/68 (larvae & adults), E. D. Evans (both det. Wold). MULTNOMAH Co., Horsetail Falls, June 30/57, Sept 17/49 (col. & det. Jewett); Wahkeena Falls, near Corbett, Sept 27/66 (ROM).

Distribution and Biology: *H. phryganea* has been recorded from mountain areas of California, Oregon, and Washington (Schmid & Botosaneanu 1966). All of the Oregon records are from cold streams in the Coast, Cascade, and Klamath ranges.

Flint (1961a) described the "presumed" larva, correctly reasoning that it was so large (to 32mm) and distinctive that it could not be placed elsewhere. The larva is characteristically rhyacophiloid, but easily distinguished from *Rhyacophila* because the bushy gills occur on the metathorax as well as on the abdomen. The larvae and pupae are abundant in

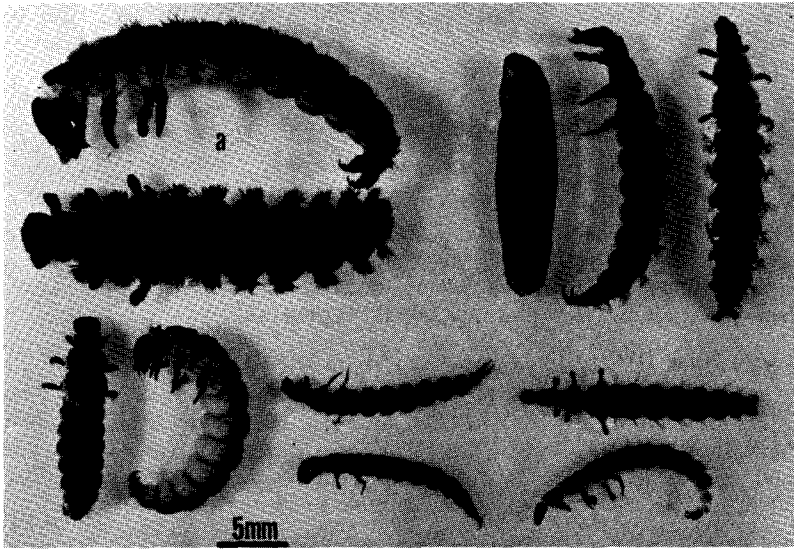


Figure 7. Family Rhyacophilidae, larvae and pupa. (a) *Himalopsyche phryganea* larva; all others, *Rhyacophila* spp.

Parker Creek, on Marys Peak, in mossy areas of the stream. Examination of the gut contents of a few larvae suggests that they may be partially phytophagous though they are known to consume arthropods as well.

***Rhyacophila* Pictet 1834 (Figure 7)**

Schmid (1970) monographed the world fauna of this very large genus. There are 400 to 500 species widely distributed through the Holarctic region and south into Indonesia. They are particularly well represented in the mountainous areas of Asia and western North America.

The treatment of this genus for Oregon is largely a summary of the records compiled by Janet Wold (1974). She provides larval-adult associations, detailed distribution records, and a key to the larvae of the western species of *Rhyacophila*. Wold demonstrated that the larvae can be placed quite well within the species-groups proposed by Schmid (1970) for the adults, but in many instances they cannot be identified at the species level. The systematic arrangement in this bulletin uses Schmid's categories of Division and Species-group but not his Branches. Adult records are listed at the species level, but for many of the larvae only for species-groups. The species listed as occurring in western North America by Schmid (1970) and Wold (1974) are given in parentheses for each species-group. The western species that are not recorded from Oregon are marked with an asterisk; further collections may indicate that some of

these occur in Oregon. Identifications not specifically credited are by Janet Wold.

Vulgaris Division

Rotunda Group (**R. ebria* Denning, **R. latitergum* Davis, *R. norcuta* Ross, **R. rotunda* Banks, and *R. tralala* Schmid)

The larvae of the *rotunda* group cannot yet be separated. They have been collected from the following counties in Oregon, most of which are in, or west of, the Cascade Range: BENTON, CLACKAMAS, HOOD RIVER, JOSEPHINE, KLAMATH, LANE, LINN, and MULTNOMAH.

***R. norcuta* Ross 1938b.** Type locality: WASHINGTON, Ilwaco.

BENTON Co., Marys Peak, many dates, pupae Feb 26 to Aug 7, & adults June 16 to Sept 16. CLACKAMAS Co., Mt. Hood, stream 2.7 mi N McNeil F. C., July 7/68 (pupa), Wold, & stream below Timberline Lodge, Mar 28/64 (col. & det. Jewett). LINCOLN Co., Newport, Mar 30/30. LINN Co., trib. streams Carmen Reservoir, July 7/66 (pupa), Wold; Quartzville Rd., E of Green Peter Dam, July 24/68 (pupa), Wold, & Aug 6/70 (pupae), Wold & Anderson. MULTNOMAH Co., Multnomah Falls, Apr 8/39 (col. & det. Jewett). UMATILLA Co., Ukiah-Dale Wayside, 2 mi S Ukiah, June 14/74, Anderson (det. Flint).

Distribution and Biology: *R. norcuta* occurs from western British Columbia, south to California. This is one of the few species of *Rhyacophila* that has adapted to temporary stream situations (Tew 1971, Wold 1974). It is the only species of *Rhyacophila* in North America for which eggs have been described (Wold 1974).

***R. tralala* Schmid 1970.** Type locality: WASHINGTON, MASON Co., Stimson Creek.

This species is known only from the high Cascades in Oregon and Washington. Schmid (1970) included the following Oregon material in the type series: CLACKAMAS Co., Mt. Hood, Timberline Lodge, June 23/65. HOOD RIVER Co., Bennett Pass & Barlow Pass, June 24/65. JEFFERSON Co., Santiam Pass, June 13/65.

Oreta Group (**R. basalis* Banks and *R. oreta* Ross)

***R. oreta* Ross 1941a.** Type locality: UTAH, Scout Camp, Logan Canyon.

Larvae, pupae, and/or adults have been recorded from the following counties: BENTON, CLACKAMAS, CLATSOP, DESCHUTES, HARNEY, HOOD RIVER, JACKSON, JEFFERSON, KLAMATH, LANE, LINN, MARION, MULTNOMAH, and UMATILLA.

Distribution and Biology: *R. oreta* has been recorded from British Columbia to California and west to Utah and Wyoming (Wold 1974). The larvae are frequently found in seep areas and springs, often on sub-

merged pieces of wood and in crevices of rock. Information on larval instars is given by Wold (1974). The adults are recorded from Oregon from March 7 to October 26.

Viquaea Group (*R. viquaea* Milne and **R. lineata* Denning)

***R. viquaea* Milne 1936.** Type locality: OREGON, CLACKAMAS Co., Salmon River, Welches, June 18/33, R. E. Dimick.

The only other Oregon record is for the holotype of *R. celina* Denning, which was synonymized with *R. viquaea* by Ross (1956): BENTON Co., Philomath, 6.5 mi SW, along Hyde Cr., Apr 13/51, R. E. Noble (Denning 1954a).

Distribution: This uncommon species is recorded only from Oregon and Washington, and only from adult records.

Vagrita Group (*R. vagrita* Milne and **R. milnei* Ross)

***R. vagrita* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

BAKER Co., Rock Cr., Sept. 30/70, Goeden (det. Denning). CLACKAMAS Co., Mt. Hood, Lost Cr. F.C., 2050 ft, July 17/68, & 2.7 mi N McNeil F.C., 2500 ft, Aug 27/68 (larvae), Wold. GRANT Co., John Day Riv., Oct 2-9/53 (col. & det. Jewett). JEFFERSON Co., Metolius Riv., Bridge 99, Sept 23/65, Anderson. KLAMATH Co., Annie Cr., Crater Lake Nat. Pk., Oct 1/66 (ROM). WALLOWA Co., Wallowa Lake, Sept. 12/49, V. Roth.

Biology and Distribution: This is a late-season species that is distributed from Alberta to California and east to Utah and Montana. Thut (1969) studied the life history and feeding habits in a spring-fed experimental stream in the Cascade Range of southwestern Washington. The larvae preyed primarily on chironomids and also on copepods and caddis larvae. Thut reported that *R. vagrita* was univoltine, with the larvae occurring from April to September, maximum emergence in November, and apparently an extended duration for the egg stage from autumn until April.

Philopotamoides Division

Alberta Group (**R. alberta* Banks, **R. glaciera* Denning, *R. kincaidi* Schmid, and *R. tucula* Ross)

Larvae of the *alberta* group presently cannot be separated at the species level. They have been collected from the following counties: CLACKAMAS, DESCHUTES, GRANT, HOOD RIVER, JOSEPHINE, LANE, LINN, MULTNOMAH, and WALLOWA.

***R. kincaidi* Schmid 1970.** Type locality: BRITISH COLUMBIA, Skagit River Camp.

HOOD RIVER Co., Mt. Hood, N Fk. Iron Cr., near Bennett Pass, 4400 ft, July 11/68 (pupa), Wold.

Biology and Distribution: In Oregon this species has only been collected in this one very cold (5°C in summer) high-elevation stream. This is the southern extremity of the known range. Other records are from Washington, British Columbia, and Alaska (Wold, 1974).

***R. tucula* Ross 1950a.** Type locality: WYOMING, Gardner River, Yellowstone National Park.

BAKER Co., Rock Cr., Sept 30/70, Goeden (det. Denning). DOUGLAS Co., Foster Cr., 10 mi N Union Cr., Sept 11/66 (pupa), J. P. Lohrenz. JACKSON Co., mouth of Muir Cr., Aug 15/57 (col. & det. Jewett). JEFFERSON Co., Metolius Riv., Bridge 99, June 15/66 & Sept 23/65, Anderson; Wizard Falls, Metolius Riv., Sept. 19/49 (col. & det. Jewett). LANE Co., McKenzie Bridge, Sept 21/34, R. E. Dimick (det. Ross). LINN Co., Marion Forks & vicinity, Sept 20-21/68, E. Evans; McKenzie Riv., bridge near Clear Lake, Oct 7/65 (col. & det. Jewett). MARION Co., Niagara Sept 21/68, E. Evans; Silver Cr. Falls St. Pk., June 22/57 (col. & det. Jewett).

Biology and Distribution: Nimmo (1971) gives the known range as from Alaska to Wyoming and Oregon with the center of distribution primarily in the Coast Ranges. Wold (1974) recorded larvae of the *alberta* group from El Dorado and Nevada counties of California that are probably *R. tucula*. As this is the common species of the *alberta* group in Oregon, the county records for larvae given under the group are probably referable to *R. tucula*. Smith (1968a) recorded the larvae from rubble-bottomed, small to medium streams. Nimmo (1971) indicated that the habitat was "fairly fast, rock filled streams." The flight season of *R. tucula* occurs during the early fall. In the Oregon list there are two anomalous records of adults in June for the Metolius River (Jefferson Co.) and Silver Creek Falls (Marion Co.).

Hyalinata Group (*R. hyalinata* Banks and *R. vocala* Milne)

According to Smith (1968a) the two species in this group tend to be allopatric, with *R. hyalinata* known chiefly from the Rocky Mountains and *R. vocala* from the Cascade Range but with a broad range of overlap in Idaho. He found the adults to be highly variable, and no consistent characters would separate the larvae of the two species. Thus, Smith suggested that they might constitute a single, highly variable species or geographically distinctive populations.

Larvae of this species-group are recorded from the following counties: BENTON, CLATSOP, HOOD RIVER, JEFFERSON, JOSEPHINE, KLAMATH, LAKE, LINCOLN, LINN, MARION, MULTNOMAH, and WALLOWA.

***R. hyalinata* Banks 1905.** Type locality: Southwest COLORADO.

The following records are all of adults collected and determined by S. G. Jewett. CLACKAMAS Co., Eagle Fern Pk., May 7/67. CLATSOP Co., Youngs Riv., Apr 17/49; Osweg Cr., ca. 2 mi E E'sie, May 29-30/64. DOUGLAS Co., S. Umpqua Riv. near Roseburg, May 5/50. JEFFERSON Co., Metolius Riv., May 21 & 27/50. One specimen, from WASHINGTON Co., Gales Cr., Apr 26/42, Jewett, was determined by H. H. Ross.

Biology and Distribution: Nimmo (1971) records the range as from Alberta and British Columbia to California and Colorado. Both Nimmo and Smith (1968a) record the larval habitat as turbulent mountain streams with rocky beds. Smith indicates that overwintering occurs as third- or fourth-instar larvae. Nimmo's flight records in Alberta extend from early July to mid-September. All of the Oregon adult records are for April and May. However, there is the possibility that these specimens should be referred to *R. vocala*.

***R. vocala* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

BENTON Co., 5 mi SW Philomath, May 23/59 (col. & det. Jewett). CLACKAMAS Co., Clackamas Riv., 23 mi NE Detroit, 2600 ft, July 11/68, Anderson; Mt. Hood, 2.7 mi N McNeil F.C. jct., 2300 ft, Aug 27/68, Wold. CLATSOP Co., Osweg Cr., Apr 17-18/65, Nehalem Riv. at Red Bluff Rd., Apr 10-11/65, & Gronnel Rd., 2 mi E Elsie, June 17/67 (all col. & det. Jewett). DOUGLAS Co., S. Umpqua Riv. near Roseburg, Apr 5/50 (col. & det. Jewett). KLAMATH Co., Annie Cr., Crater Lake Nat. Pk., June 9/68 (ROM). LINN Co., Olla'ie Cr. F.C., Rt. 126, June 30/66, Wold, & July 17/70, Wold & Evans. MARION Co., Niagara, May 31/70, Evans & Tew. WALLOWA Co., W Fk. Wallowa Cr., near Wallowa Lake, July 9/68, Anderson.

Distribution: This species is known chiefly from the western mountain ranges, with records from British Columbia to California, and also in Idaho and Utah (Smith 1968a). The possibility that it is a variable form of *R. hyalinata* is discussed by Smith.

Coloradensis Group (**R. amabilis* Denning, *R. bifila* Banks, **R. coloradensis* Banks, *R. insularis* Schmid, **R. ternada* Ross, **R. reana* Denning, **R. sierra* Denning, and *R. new species*)

Schmid (1970) recognized two widely distributed species in this group, *R. coloradensis* and *R. bifila*, and five other species known only from restricted localities. In an unpublished study of the *coloradensis* complex, D. Peck and S. D. Smith, Central Washington State College, have demonstrated that, though the males are very similar, the females

have distinctive characteristics. They have modified the species concepts within the group, so previous distribution records no longer apply. They kindly provided the records listed below. These differ considerably from those given by Wold (1974). Her records of *R. coloradensis* are now given as either *R. insularis* or as *R. new species*.

The larvae of the *coloradensis* group are not easily found because they occur along margins of rapids or in deep water around boulders in rapids (Smith 1968a). In contrast, though, Smith found that prior to pupation the larvae of *R. bifila* congregate in large numbers on the upstream side of large boulders, so the pupae are readily collected. Though Wold (1974) lists many metamorphotypes, she only includes two Oregon records for larvae of this species-group, which tends to support Smith's observations. Pupal cases of the *coloradensis* group are made of sand grains and are smooth and symmetrical rather than the crude case of stones that is typical of most *Rhyacophila* (Smith 1968a).

Oregon county records for immatures of the *coloradensis* group include: BAKER, BENTON, CLACKAMAS, CLATSOP, DESCHUTES, JACKSON, JEFFERSON, JOSEPHINE, KLAMATH, LANE, LINN, SHERMAN, TILLAMOOK, UMATILLA, WALLOWA, and WASCO.

***R. bifila* Banks 1914.** Type locality: BRITISH COLUMBIA, Vernon.

CLACKAMAS Co., Bull Run Riv., June 21/33, R. E. Dimick. CLATSOP Co., Gronnel Rd., 2 mi E Elsie, June 3/67 & Aug 14/65, Jewett. JACKSON Co., Gold Hill, June 5/49, Jewett. JOSEPHINE Co., Sucker Cr. & Grayback Cr., 12-13 mi E Cave Junction, July 27/73, D. R. & B. R. Givens. KLAMATH Co., Williamson Riv., Collier St. Pk., June 12/50, Jewett; same, Mar 27/70 & Apr 14/67, E. D. Evans. LANE Co., Blue River, July 22/74, D. R. Givens. MARION Co., Pamela Cr., 9 mi E Idanha, July 21/74, D. R. Givens. WALLOWA Co., Little Sheep Cr., 9 mi NE Joseph, July 10/68, Anderson; jct. of Wallowa Riv. and Minam Riv., July 16/74, C. Kitayama. WASCO Co., Deschutes Riv., Maupin, June 5/47, Jewett.

Distribution: Wold (1974) gives the geographical range as from Alberta and Wyoming west to British Columbia and California.

***R. insularis* Schmid 1970.** Type locality: BRITISH COLUMBIA, Qualicum Falls, Vancouver Island.

CLACKAMAS Co., Gronnel Rd., 2 mi E Elsie, Aug & Sept (many dates), Jewett. GRANT Co., Beech Cr., 9.5 mi N Mt Vernon, Rt. 395, July 7/74, S. D. Smith. UMATILLA Co., Camas Cr., 2.5 mi S Ukiah, July 6/74, Smith & Kitayama. WHEELER Co., Rock Cr., 26.5 mi W Mitchell, July 7/74, S. D. Smith.

Distribution: Records from Don Peck and his associates at Central Washington State College extend the distribution of *R. insularis* from Vancouver Island south to Shasta County, California.

R. new species

DESCHUTES Co., Deschutes Riv., near Redmond, June 3/39, Schuh & Gray; Pringle Falls, June 7/49, Jewett; Deschutes Riv., 1.5 mi below Little Lava Lake, Sept 17/48, Jewett. KLAMATH Co., Spring Cr., ca 35 mi N Klamath Falls, Aug 9/73, June 8 & 17/74, S. D. Smith. LINN Co., Ollalie Cr. F.C., Rt. 126, July 17/70, Evans & Wold.

Distribution: Only the Oregon records are included for this currently undescribed species.

Angelita Group (*R. angelita* Banks, **R. newelli* Denning, *R. perplana* Ross & Spencer, and *R. vuzana* Milne)

Larvae of this group have been collected from the following counties: BAKER, BENTON, CLACKAMAS, CLATSOP, CURRY, DOUGLAS, GRANT, JACKSON, JEFFERSON, JOSEPHINE, LANE, LAKE, LINCOLN, LINN, MARION, MULTNOMAH, POLK, TILLAMOOK, UMATILLA, UNION, WALLOWA, and YAMHILL.

***R. angelita* Banks 1911.** Type locality: CALIFORNIA, LOS ANGELES Co., Pasadena.

Adults have been collected from May 30 to September 24 in the following counties: BAKER, BENTON, CLACKAMAS, COOS, CURRY, GRANT, HOOD RIVER, JEFFERSON, LINN, MARION, UMATILLA, and UNION.

Biology and Distribution: Smith (1968a) described the larval habitat as "medium and mixed rubble bottoms of fast riffles in cold clear streams." *R. angelita* has an unusual and widespread distribution, occurring from the Yukon to California and Colorado, as well as in the Appalachians (Wold 1974).

***R. perplana* Ross & Spencer 1952.** Type locality: BRITISH COLUMBIA, Cultus Lake, South Creek.

The only Oregon record of this species is a mature pupa from YAMHILL Co., 14 mi W Yamhill, Aug 8/66, Wold.

Distribution: *R. perplana* has previously been recorded only from British Columbia.

***R. vuzana* Milne 1936.** Type locality: OREGON, LINN Co., McKenzie Bridge, Sept 21/34, R. E. Dimick.

The adults of this species have been recorded from the following counties from May 20 to October 27: BENTON (Anderson & Wold 1972), CLACKAMAS, CLATSOP, DESCHUTES, LANE, LINN, and MARION.

Distribution: Wold (1974) lists *R. vuzana* from British Columbia south to California and also in Idaho. Most of the Oregon records are

from west of the Cascades, but the Deschutes County record and Idaho records indicate an inland distribution also.

Sibirica Group (**R. belona* Ross, *R. blarina* Ross, *R. colonus* Schmid, *R. narvae* Navás, *R. pellisa* Ross, **R. rickeri* Ross, **R. unimaculata* Denning, *R. unipunctata* Schmid, *R. valuma* Milne, and *R. vetina* Milne)

***R. blarina* Ross 1941a.** Type locality: OREGON, COLUMBIA Co., Clatskanie, May 9/36, Gray & Schuh.

This species is common in the Coast Range and is also recorded from the Cascade Range in Oregon and Washington (Wold 1974). In Oregon it is recorded from the following counties: BENTON, CLACKAMAS, CLATSOP, COLUMBIA, JACKSON, LINCOLN, and WASHINGTON.

Biology: Based on extensive collections from Oak Creek, near Corvallis, Wold (1974) determined that *R. blarina* was univoltine. The larval instars occurred as follows: I, early July; II, July-October; III, August-October; IV, late September-February; and V, January-April. The flight period, based on Oregon records, is only from mid-April to mid-June. Though the larvae were common in Oak Creek, no adults were obtained in emergence traps (Anderson & Wold 1972). The traps were placed on riffles and it appears that *R. blarina* pupates in a microhabitat that was not sampled by these traps.

***R. colonus* Schmid 1970.** Type locality: OREGON, JOSEPHINE Co., O'Brien, June 5/65, F. Schmid.

This species is known only from the type locality.

***R. narvae* Navás 1926.** Type locality: SIBERIA, Vladivostock.

Schmid (1970) synonymized *R. vepulsa* Milne 1936 (Type locality: OREGON, LINCOLN Co., Salmon River, Apr 26/35) with *narvae*. However, other workers such as Nimmo (1971) and S. D. Smith (pers. comm.) consider that *vepulsa* is the appropriate name for the form that occurs in North America.

The Oregon records are from the following counties: BAKER, BENTON, CLACKAMAS, CLATSOP, COLUMBIA, DESCHUTES, GRANT, JACKSON, JEFFERSON, LINCOLN, LINN, MARION, and WASHINGTON.

Biology and Distribution: Nimmo (1971) records the North American range as Alaska to California and Montana. This is a common species in the western mountains, with a flight period extending from late April through early September (Wold 1974). Smith (1968a) gives the habitat preference as riffle areas of headwater streams with compact, small rubble substrates. Detailed food consumption studies by Thut (1969) indicated

that the prey of *R. narvae* was largely chironomids, with lesser amounts of copepods, mites, and other small benthic invertebrates.

***R. pellisa* Ross 1938b.** Type locality: COLORADO, Cascade Lodge, Rocky Mountain National Park.

BENTON Co., Oak Cr. near Corvallis, June 10-July 1/68 (Anderson & Wold 1972). JEFFERSON Co., Metolius Riv., Apr 28/56, R. Figaered.

Biology and Distribution: The range of *R. pellisa* is through the western mountain region from Alberta to Colorado and California (Smith 1968a, Nimmo 1971). Though adult records are extensive, and Nimmo indicates that the habitat ranges from small brooks to larger fast rocky rivers, the larva is unknown.

***R. unipunctata* Schmid 1970.** Type locality: OREGON, LANE Co., Hemlock Butte Pass, June 10/65, F. Schmid.

The type series also includes: HOOD RIVER Co., Mt. Hood, Barlow Pass, June 24/65, F. Schmid.

Distribution: The type series, from the Oregon Cascades, are the only known records for this species.

***R. valuma* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

In Oregon this species is recorded from the following counties: BAKER, BENTON, CLACKAMAS, CLATSOP, DESCHUTES, JEFFERSON, JOSEPHINE, LANE, LINN, MARION, and WALLOWA.

Distribution and Biology: Wold (1974) summarized the range as British Columbia to California, Colorado, and Utah, and the flight period as late March to late September. She associated the larvae and adults of this small rhyacophilid (mature larvae, 7 mm long) from a metamorphotype collected in Oak Creek near Corvallis.

***R. vetina* Milne 1936.** Type locality: WASHINGTON, Mt. Rainier, White River.

Adults of this species are recorded from CLACKAMAS Co., Mt. Hood, tributary of Salmon Riv., June & July (several dates) (col. & det. Jewett).

Distribution: Wold (1974) gives the distribution of *R. vetina* as the high Cascades of Oregon and Washington.

Vofixa Group (**R. harmstoni* Ross, *R. iranda* Ross, **R. ophrys* Ross, *R. velora* Denning, **R. vobara* Milne, and **R. vofixa* Milne)

***R. iranda* Ross 1938a.** Type locality: WASHINGTON, Mt. Baker, Razorhone Creek.

BENTON Co., Oak Cr. near Corvallis, mid-May (Anderson & Wold 1972). DESCHUTES Co., Green Lake, Sisters Mt., Aug 28-30/52, V. Roth. KLAMATH Co., Annie Cr., Crater Lake Nat. Pk., Oct 1/66 (ROM). LINCOLN Co., Salmon Riv. Ranger Sta., June 12/53, K. M. Fender (det. Denning). LINN Co., Ollalie Cr. F. C., Rt. 126, July 17/70, Wold & Evans.

Distribution: The known range is Oregon and Washington, westward from the Cascade Range.

***R. velora* Denning 1954a.** Type locality: CALIFORNIA, SHASTA Co., Burney Falls State Park.

LANE Co., small stream ca. 2 mi W Blue River, near McKenzie Riv., June 10/68 (larvae) (ROM) & July 17/70 (pupae), Wold & Evans. MARION Co., trib. Humbug Cr., Breitenbush, July 5/58 (col. & det. Jewett).

Biology and Distribution: This species pupates amongst thick moss on bedrock in areas of rapid flow. The pupal cases are a combination of sand and moss. The above records are the only known collections of *R. velora*.

Betteni Group (**R. ardala* Denning, *R. betteni* Ling, **R. cerita* Denning, *R. chilsia* Denning, *R. fenderi* Ross, **R. karila* Denning, *R. malkini* Ross, *R. perda* Ross, **R. spinata* Denning, *R. vaccua* Milne, *R. vedra* Milne, and *R. willametta* Ross)

Metamorphotypes are available for eight species in this group but, except for those of *R. malkini*, all are very similar and cannot be separated. Following are the Oregon counties from which *betteni* group larvae (excluding *malkini*) have been collected: BENTON, CLACKAMAS, CLATSOP, CURRY, DESCHUTES, DOUGLAS, JACKSON, JEFFERSON, JOSEPHINE, LAKE, LANE, LINCOLN, LINN, MARION, MULTNOMAH, POLK, TILLAMOOK, WALLOWA, and YAMHILL.

***R. betteni* Ling 1938.** Type locality: CALIFORNIA, MARIN Co., Mt. Tamalpais.

This species is recorded from California and Oregon by Schmid (1970) but no locality records are given.

***R. chilsia* Denning 1950.** Type locality: ALBERTA, Jasper, Maligh Canyon.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66 (ROM). CLATSOP Co., Big Cr., Sept 8/49, S. Jewett (det. Denning).

HOOD RIVER Co., S Fk. Iron Cr., Sept. 28-29/66 (ROM). LINN Co., Scott Cr., McKenzie Riv. area, June 30/66 (pupa), Wold.

Distribution: Wold (1974) records *R. chilsia* from Alberta, British Columbia, and Oregon.

***R. fenderi* Ross 1948a.** Type locality: OREGON, YAMHILL Co., Peavine Ridge near McMinnville, Aug 6/47, K. M. Fender.

BENTON Co., Oak Cr. near Corvallis, June & Sept (Anderson & Wold 1972). YAMHILL Co., Peavine Ridge, near McMinnville, June/53, K. M. Fender (det. Jewett & Denning), & July 9/63 (larvae), K. M. Fender.

Distribution: This species is known only from the Coast Ranges of Oregon and California (Wold 1974).

***R. malkini* Ross 1947.** Type locality: OREGON, LANE Co., Eugene, Sept 26/46, B. Malkin.

This species is known only from Oregon. It is recorded from the following counties: BENTON, CLACKAMAS, CLATSOP, CURRY, DOUGLAS, JACKSON, JOSEPHINE, LANE, LINCOLN, LINN, MARION, and TILLAMOOK. All records are from counties in or west of the Cascade Range.

Biology: Adults were collected from mid-July to mid-November and pupae in September and October. The records for larvae are primarily from large creeks and rivers.

***R. perda* Ross 1938a.** Type locality: WASHINGTON, Mt. Baker, along Razorhone Creek.

Adults and pupae have been recorded from the following counties: CLACKAMAS, DESCHUTES, HOOD RIVER, JEFFERSON, JOSEPHINE, LANE, LINN, MARION, MULTNOMAH, and WASCO.

Biology and Distribution: Pupae of *R. perda* have been collected from June to late September and adults from May 21 to September 17. The geographical range extends from southern British Columbia to Oregon in the Cascade Range (Wold 1974).

***R. vaccua* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

Adults have been recorded from July to October from the following counties: BENTON, CLATSOP, DESCHUTES, JEFFERSON, KLAMATH, LANE, LINCOLN, LINN, MARION, MULTNOMAH, and TILLAMOOK.

Biology and Distribution: The range of *R. vaccua* is from British Columbia and Alberta south to California and east to Montana (Smith 1968a). Thut (1969) studied both the life history and feeding habits in a Washington stream. Though chironomids constituted the largest percentage of the diet, stoneflies, copepods, and mites were fed upon in a greater proportion than occurred in the benthos.

R. vedra Milne 1936. Type locality: OREGON, BENTON Co., Oak Creek near Corvallis, May 29/34, E. S. Ball.

Adults of this species have been recorded from late May to mid-October from the following counties: BENTON, CLACKAMAS, CLATSOP, COOS, CURRY, JACKSON, JOSEPHINE, LANE, LINCOLN, LINN, MARION, and TILLAMOOK.

Biology and Distribution: *R. vedra* is known only from California, Oregon, and Washington. It was the most common *Rhyacophila* in the Oak Creek emergence-trap collections, with an extended flight period from May through October (Anderson & Wold 1972). At Berry Creek, a nearby stream, the adults were common in a black-light trap from June through August (Wold 1974).

R. willametta Ross 1950a. Type locality: OREGON, LANE Co., Salt Creek Falls, Willamette Pass, Aug 7/48, K. M. Fender.

BENTON Co., Marys Peak, Aug 7/68, E. Evans; same, Sept 12/68 (pupa) Wold, & July 23/66 (pupa), J. P. Lohrenz; May 17/58, H. A. Hacker (det. Jewett); Rock Cr., 5 mi SW Philomath, June 17/64, Aug 4/64, Anderson (det. ROM); Oak Cr. near Corvallis, Apr-Sept (Anderson & Wold 1972). JOSEPHINE Co., Grayback Cr. F. C., Siskiyou Mtns., Aug 8/50, K. M. Fender (det. J. Davis); Store Gulch Guard Sta., Siskiyou Mtns., Aug 9/48 (det. Ross). LANE Co., Horse Cr., 4 mi S McKenzie Bridge, June 30/66 (pupa), Wold; small stream ca. 1 mi W Blue River, July 17/70, Wold & Evans; Watershed 10, H. J. Andrews For., 5 mi NE Blue River, Aug 31/72, Anderson.

Distribution and Biology: *R. willametta* has been collected in the Coast and Cascade ranges of Oregon and the Olympic Mountains in Washington. Larval collection records suggest that this is a head-waters-stream species.

Verrula Group (**R. potteri* Denning and *R. verrula* Milne)

R. verrula Milne 1936. Type locality: BRITISH COLUMBIA, Cultus Lake.

Larvae, pupae, and adults of *R. verrula* have been recorded from the following counties: BAKER, BENTON, CLACKAMAS, DESCHUTES, DOUGLAS, HOOD RIVER, JEFFERSON, JOSEPHINE, KLAMATH, LANE, LINN, MARION, UMATILLA, UNION, WALLOWA, and WASCO.

Biology and Distribution: This unusual species is widespread in the western montane region, being recorded from Alaska to California and east to Montana and Colorado (Smith 1968a). In addition to having unusual genitalic characteristics, *R. verrula* is the only *Rhyacophila* known to be exclusively phytophagous. Smith (1968a) reported that it fed on algae (especially *Prasiola*), watercress, and other plants. In Thut's (1969) study, aquatic mosses were the dominant food of *R. verrula*, with fila-

mentous algae and diatoms also common in the guts. The flight period is extensive; Thut reported adults in nearly all months at the Kalama Springs site, where water temperature was constant throughout the year, but Wold (1974) indicated that most adults occur from June through October.

Divaricata Division
Ecosa Group (*R. ecosia* Ross)

The *ecosia* group of Ross (1956) and of Schmid (1970) contains only the one species, which occurs in the Coast and Cascade ranges from Washington to northern California. Metamorphotypes are not available, but Wold (1974) tentatively described the larva on the basis of distribution records and similarities to related groups.

***R. ecosia* Ross 1941a.** Type locality: OREGON, LINCOLN Co., Boyer, May 6/34, M. L. H.

BENTON Co., Oak Cr. near Corvallis, site 1, May and July-Aug (Anderson & Wold 1972); Marys Peak, Parker Cr. Falls, July 19/63 (ROM). CLACKAMAS Co., Mt. Hood, Still Cr., near Swim, July 12/48, Jewett; spring stream 3.3 mi below Timberline Lodge, July 16/63 (ROM). CURRY Co., creek ca. 8 mi above mouth of Rogue Riv., June 19/49, (col. & det. Jewett). LANE Co., Watershed 10, Andrews For., 5 mi NE Blue River, June 22/72, Anderson (det. Denning). LINCOLN Co., 10 mi S Toledo, July 1/64, Anderson. LINN Co., Quartzville Rd., ca. 2.5 mi E Rocky Top Rd. Bridge, Mar 24/74, Anderson (det. ROM).

Biology: The flight period of *R. ecosia* is from March to early August. Several of the collection records are from very small streams or from seep areas, which suggests that the larvae may occur in a restricted microhabitat.

Vemna Group (**R. gemona* Ross, **R. robusta* Schmid, and
R. vemna Milne)

***R. vemna* Milne 1936.** Type locality: WASHINGTON, Mt. Rainier, White River.

CLACKAMAS Co., Mt. Hood, trib. Salmon Riv., July & Aug (many dates), & Still Cr., June 17/67 & July 23/55 (col. & det. Jewett); Mt. Hood, stream 3.3 mi below Timberline Lodge, June 8/69 (ROM). MULTNOMAH Co., Wahkeena Falls, June 30/57 (col. & det. Jewett).

Distribution and Biology: Nimmo (1971) lists the known range as the Rockies of Alberta and the Cascades of Washington; the Oregon records are a southward extension to the Mt. Hood area. According to Nimmo, *R. vemna* inhabits small, swift, gravel-bedded mountain streams.

The larva is not known, but Wold (1974) examined specimens from Mt. Hood that were larger than *R. acropedes* but with a similar gill pattern that could be the larvae of *R. vemna*.

Acropedes Group (*R. acropedes*, **R. brunnea* Banks, *R. inculta* Ross & Spencer, *R. vao* Milne, *R. wallowa* Denning, *R. grandis* Banks, **R. neo-grandis* Denning, and **R. sequoia* Denning)

Wold (1974) divided Schmid's (1970) *acropedes* group into two subgroups on the basis of larval gill characteristics. In the *acropedes* subgroup (*acropedes*, *brunnea*, *inculta*, *vao*, and *wallowa*) metamorphotypes are available for all but *R. brunnea*, but the species cannot be distinguished. The larvae have a pair of branching gills on abdominal segment I, three pair on segments II-VII, and two pair on segment VIII. Wold examined over 1900 larvae and pupae of this subgroup; they are so widely distributed in the western montane region that Oregon county records are omitted here. Records for the *grandis* subgroup, with only one species known from Oregon, are given under *R. grandis*. The larvae of the *grandis* subgroup have a pair of branched gills on segments I and VIII, and two pair on segments II-VII.

Within the two subgroups, the species are very closely related and further study may indicate that some of these are synonyms.

***R. acropedes* Banks 1914.** Type locality: UTAH, Deer Creek, Provo Canyon.

Adults and mature pupae have been recorded from the following Oregon counties: BENTON, CLACKAMAS, CLATSOP, CROOK, CURRY, DESCHUTES, DOUGLAS, GRANT, JACKSON, JEFFERSON, KLAMATH, LANE, LINN, MARION, WALLOWA, WASCO, and WASHINGTON.

Distribution and Biology: This is one of the two species of *Rhyacophila* with a transcontinental distribution. *R. acropedes* is abundant throughout the western montane region, from British Columbia and Alberta to Colorado and California, and also occurs in several areas of the midwest and east. The flight period in Oregon extends from early April to late September (Wold 1974). Mecom (1972) reported that larvae of *R. acropedes* were overwhelmingly detritus feeders, with 94 to 98% of the gut contents being detritus.

***R. inculta* Ross & Spencer 1952.** Type locality: BRITISH COLUMBIA, Cultus Lake.

Adults have been collected from the following counties: BENTON, CLACKAMAS, CLATSOP, CURRY, LINCOLN, MARION, and YAMHILL.

Biology and Distribution: Two pupae of this species were collected in Oregon July 5 and August 21. Adults were collected from May 28 to

September 8. This species is recorded from British Columbia to California (Wold 1974).

***R. vao* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

Adults and pupae have been collected from the following counties: BENTON, CLACKAMAS, CLATSOP, COOS, DESCHUTES, DOUGLAS, HOOD RIVER, JEFFERSON, LANE, LINN, MARION, MULTNOMAH, UNION, WALLOWA, WASHINGTON, and WHEELER.

Distribution and Biology: Smith (1968a) lists this species as occurring from Oregon to Alaska, and in Idaho and Alberta, but Nimmo (1971) does not include it in his Alberta list. Wold (1974) gives the flight period as April to August. Smith suggested that where *R. vao* occurred sympatrically with *R. acropedes*, there was some habitat segregation of the larvae. *R. vao* was more tolerant of silty conditions in small warm streams, whereas *R. acropedes* was restricted to small stream habitats that are cooler and clear.

***R. wallowa* Denning 1956a.** Type locality: OREGON, WALLOWA Co., Wallowa River, July 15/49, G. & J. Sperry.

BENTON Co., Yew Cr., at Hwy. 34, 1 mi W of summit of Coast Range, Mar 20/68 (pupa), Wold. CLATSOP Co., Canyon Cr., Ecola St. Pk., June 25/63 (pupa), Anderson. GRANT Co., Dans Cr. Rd. near Dixie summit, Hwy. 26, May 31/70 (pupae), Evans & Tew. JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, June 1/66, Anderson. MARION Co., Niagara, Aug 21/68, E. D. Evans. WALLOWA Co., Wallowa Lake St. Pk., spring area, May 30/70 (pupa), Evans & Tew.

Distribution: In addition to the Oregon records, Wold (1974) identified material from mountain regions of California, Washington, Idaho, and Wyoming.

***R. grandis* Banks 1911.** Type locality: BRITISH COLUMBIA, Bon Accord.

Oregon records, based on larvae, pupae, and adults, include the following counties: BENTON, CLACKAMAS, COOS, CURRY, DOUGLAS, HOOD RIVER, JACKSON, JOSEPHINE, LANE, LINCOLN, LINN, MULTNOMAH, POLK, TILLAMOOK, WASHINGTON, and YAMHILL.

Distribution and Biology: *R. grandis* occurs in the Cascade Range and west to the Pacific coast from British Columbia to northern California. In western Oregon this is the most obvious *Rhyacophila* because the larvae are abundant, of large size (to 30 mm), and have characteristic profuse, bushy, abdominal gills. They are most abundant in small streams and occasionally in intermittent ones. The life cycle is not clearly defined, as Wold (1974) found final-instar larvae in all months of the year, pupae from February to August, and adults from early May through September.

Naviculata Division

Only a single species of this predominantly Asian division occurs in North America (Schmid 1970).

Lieftincki Group (*R. arnaudi* Denning)

***R. arnaudi* Denning 1948a.** Type locality: OREGON, DESCHUTES Co., Camp Abbot, Apr 2/44, P. H. Arnaud.

Adults, pupae, and larvae are recorded from the following Oregon counties: BENTON, CLACKAMAS, DESCHUTES, KLAMATH, LANE, LINCOLN, and WASCO.

Distribution and Biology: Wold (1974) described the larvae of *R. arnaudi*. She recorded this species from southern Washington to northern California; most records are from the Cascade Range, but there is also some material from the coastal counties. Thut (1969) studied the life cycle and feeding habits at Kalama Springs, Washington. *R. arnaudi* is a univoltine, early-season species with the flight period in March and April. The larvae occurred in medium to high currents (ca. 1.4-1.75 ft/sec) and fed chiefly on chironomid midges.

Species of Uncertain Status

Schmid (1970) was not able to place the following groups or species within his phylogenetic classification.

Nevadensis Group (*R. jewetti* Denning, **R. nevadensis* Banks, and *R. vaefes* Milne)

***R. jewetti* Denning 1954a.** Type locality: OREGON, LANE Co., Ollalie Creek Campground, McKenzie River, July 15/52, S. G. Jewett.

CLACKAMAS Co., Mt. Hood, trib. Still Cr., Aug 28/55 (col. & det. Jewett). LANE Co., Mack Cr., Andrews For., 11 mi NE Blue River, Aug 25/71, July 17/72, Anderson. LINN Co., Monument Pk., Aug 1/69, Goeden (det. Denning).

Distribution and Biology: This rare species is known only from the Oregon Cascades. The larva is unknown, even though the adults at the Mack Creek site were collected in emergence traps and the adjacent substrates were searched for larvae.

***R. vaefes* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

Larvae, pupae, and adults of this species have been recorded from the following counties: CLACKAMAS, CLATSOP, DESCHUTES, JEFFERSON, JOSEPHINE, KLAMATH, LANE, LINCOLN, LINN, and MARION.

Distribution and Biology: This is a relatively common species in the Pacific Northwest from British Columbia to Oregon. Adults were collected

in Oregon from April to September. Thut (1969) recorded *R. vaefes* as an omnivorous feeder with 40% of the diet being plant material, especially diatoms. Wold (1974) described the larvae and provided head-capsule measurements of all instars.

Oreia Group (**R. oreia* Ross and *R. visor* Milne)

***R. visor* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

BENTON Co., Marys Peak, June 16/68 (pupa), July 11/68 (larvae), July 27/66 (larvae, pupae, adults), Wold; same, June 4/68 (pupae) & July 19/63 (ROM). CLACKAMAS Co., Mt. Hood, small streams near Timberline Lodge, June-Aug (many dates) (col. Jewett, Wold, & ROM). HOOD RIVER Co., Mt. Hood, July 11/67 (ROM); same, July 11/68, E. Evans. LINN Co., Monument Peak, Aug 1/69, Goeden (det. Denning). MULTNOMAH Co., Wahkeena Falls, June 30/57 (col. & det. Jewett).

Distribution and Biology: This species occurs in the Coast and Cascade ranges of British Columbia, Washington, and Oregon. Adults have been collected from June through August. Wold (1974) described the larva.

Unplaced Species

***R. chandleri* Denning 1956a.** Type locality: CALIFORNIA, SISKIYOU Co., Sacramento River.

The one record of this species in Oregon is from LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning). It has previously been recorded only from California.

***R. haddocki* Denning 1968a.** Type locality: OREGON, BENTON Co., Marys Peak, Gravel Creek, July 30/66, J. Haddock.

This species is recorded only from the type locality. Gravel Creek is more commonly known as Parker Creek.

FAMILY GLOSSOSOMATIDAE

This is a primitive family that has been considered a subfamily of Rhyacophilidae (Denning 1956b), but the two groups are readily distinguished as larvae because glossosomatids construct cases (Figure 8). Wiggins (1977) recognizes 3 subfamilies, 6 genera, and about 80 species for North America outside of Mexico. Two subfamilies and three genera occur in Oregon. The glossosomatids are well represented in this area, with the larvae being abundant in small, cool streams and in rivers.

Glossosomatid larvae are recognized by their characteristic "turtle-shell" cases which are open at both ends. The larvae occur on the tops of stones, grazing the periphyton film so they can be easily seen. Anderson

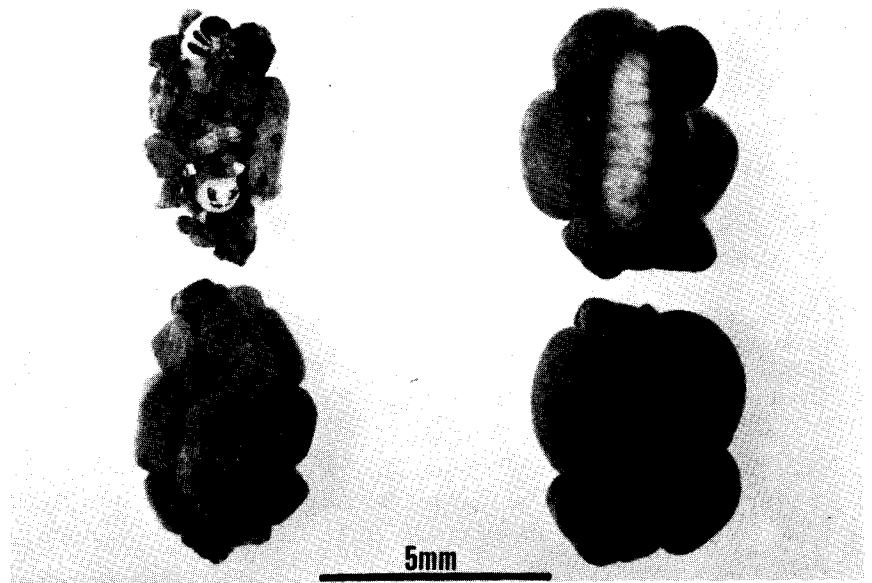


Figure 8. Family Glossosomatidae. Larva, pupa, and cases of *Glossosoma traviatum*.

and Bourne (1974) compared the life histories of a species from each of the three genera that occur in Oregon.

Both larvae and adults are relatively uniform in appearance throughout the family but the size ranges considerably; Ross (1956) gives a range in adult body length from 3 to 10 millimeters.

Subfamily Agapetinae

Agapetus Curtis 1834

This is a large genus of worldwide distribution, except for South America. *Agapetus* is not primarily a montane group, though all species require cool streams and most occur in hilly country. In North America there are about 25 closely related species, most of which appear to have a very limited distribution (Ross 1956).

The life histories of two of the four Oregon species have been studied and both are very similar. *A. bifidus* Denning and *A. occidentis* Denning both overwinter in egg diapause and the larvae complete development within 2 to 3 months. The flight period is short, with most adults at a given site emerging within 4 to 6 weeks. The larvae may occur in the same streams as *Anagapetus* and *Glossosoma*, but are readily dis-

tinguished by their case type, smaller size, and the presence of small sclerites on the meso- and metanotum (Anderson & Bourne 1974).

A. bifidus Denning 1949a. Type locality: OREGON, BENTON Co., Oak Creek, May 29/34, E. Ball.

Our only records for this species are from Oak Cr. and Berry Cr., both in BENTON Co., & LINCOLN Co., July 5/70, Beverly Beach, Goeden (det. Denning). It is not known to occur outside of Oregon.

Biology: In Oak Creek and Berry Creek, the larvae are abundant in the glide areas from April to June and the flight period is restricted to late June to early August. Though the European species, *A. fuscipes* Curtis, has seven larval instars, only five instars occur in *A. bifidus*. Extensive life-history data are given by Anderson and Wold (1972) and Anderson and Bourne (1974).

Note: The holotype, which was recorded by Denning as deposited at Oregon State College, has recently been deposited in the California Academy.

A. denningi Ross 1951a. Type locality: OREGON, JACKSON Co., Rogue River National Forest.

No date was indicated for the type series, which is the only record for *A. denningi*.

A. occidentis Denning 1949a. Type locality: OREGON, BENTON Co., Adair, 11 miles N Corvallis, May 9/49, J. Duspiva.

LANE Co., emergence traps, Lookout Cr., Andrews For., 8 mi NE Blue River, Aug & Sept/72 & 73, Anderson (det. Denning). LINN Co., 3.5 mi E Crabtree, July 5/68, E. D. Evans (det. ROM). MARION Co., Aumsville, June 6/67, Goeden (det. Denning). WASCO Co., The Dalles, June 17/68, Goeden (det. Denning). YAMHILL Co., Newberg, June 9 & 20/67, June 10 & 27/68, Goeden (det. Denning).

Biology and Distribution: This species is known only from Oregon. The above records are distributed through the Willamette Valley, in west-side Cascade streams (Lane and Linn counties) and east of the Cascades at The Dalles. The latter collection was 100+ specimens in a black-light trap, which indicates a definite attraction to lights and also a good population in the area. In England, *A. fuscipes* is one of the dominant caddisflies, but it does not occur in light-trap collections (I. Crichton, Reading Univ., pers. comm.).

Studies of *A. occidentis* were conducted at Lookout Creek, Lane County, for 2 years, using benthos collections for immature stages and emergence traps for adults. At this site the larvae coexisted with those of *Glossosoma pyroxum*. Larval development was rapid, as early instars were collected in the first part of June and final instars peaked by mid-

July, at which time there were also considerable numbers of prepupae. Adults were collected only during August and September in the Lookout Creek emergence traps, which indicates a univoltine life cycle. However, the timing of the flight period at this site is about 2 months later than the flight periods of all other Oregon records. Though it is in the Cascade Range, the collecting site on Lookout Creek is at 500 meters, so it seems unlikely that temperature would completely account for this delayed flight period.

Note: The holotype of *A. occidentis* is now deposited in the California Academy and not at Oregon State College as indicated by Denning (1949a).

A. taho Ross 1947. Type locality: CALIFORNIA, Taylor Creek, near Tahoe City.

LAKE Co., Lakeview, Aug 14/66, Aug 1/68, Goeden (det. Denning). LANE Co., Eugene, Oct 12/66, Goeden (det. Denning). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning).

Distribution: The three collection records for Oregon are scattered from the Willamette Valley to the northeast and southeast parts of the state. *A. taho* also is recorded from a few counties in northern California (Denning 1965c).

Subfamily Glossosomatinae

Anagapetus Ross 1938a

This small genus is restricted to North America, and occurs in head-water regions. It is considered to be the most primitive genus in the family (Ross 1951a,b; 1956). Three of the six known species occur in Oregon.

A. bernea Ross 1947. Type locality: OREGON, HOOD RIVER Co., Oxbow Springs, May 19/40, S. G. Jewett.

BENTON Co., Oak Cr., emergence traps, April-May, (Anderson & Wold 1972). CLACKAMAS Co., Still Cr. F. C., June 10-11/67 (ROM); Swim, July 2/42, J. Schuh (det. Denning). KLAMATH Co., sidehill rill, 15 mi SW Keno, June 21/64, J. Schuh (det. Jewett). LANE Co., emergence traps, Mack Cr., Andrews For., 11 mi NE Blue River, June-July, E. Grafius (det. Denning). LINN Co., Quartzville Rd., 1.4 mi E Yellowstone Guard Sta., June 16/68 (ROM). MARION Co., Niagara, May 31/70, Evans & Tew (det. Denning). MULTNOMAH Co., Corbett, 1.7 mi E Crown Point, Apr 20/64 (ROM), & Wahkeena Cr. (pupae), June 11/74, Anderson (det. ROM).

Distribution and Biology: The range of this species extends from Washington to northern California (Denning 1965c). Life-history studies were conducted by Anderson and Wold (1972) and by Anderson and

Bourne (1974) in Oak Creek, near Corvallis. *A. bernea* was relatively common at 200 meters in the headwaters and small feeder streams. This species was univoltine, with a restricted emergence period in April and May. Early-instar larvae occurred in late July and August and most of the growth and development occurred during the winter months. The flight period at sites in the Cascade Range tends to be later than those in Oak Creek.

***A. debilis* (Ross) 1938.** Type locality: UTAH, Logan Canyon.

BAKER Co., Durkee, Powell Cr., June 13/47, (Ross 1951b); 12 mi S Baker, July 11/53, Roth & Beer (det. Denning). WALLOWA Co., Bridge over W Fk Wallowa Cr., near Wallowa Lake, July 9/68, Anderson (det. Smith); Wallowa Cr. at head of lake, Aug 5/64, Jewett (det. ROM).

Distribution and Biology: This species has the widest distribution within the genus, being found from Oregon and Washington east to Colorado, Wyoming, and Montana (Denning 1965c). Nimmo (1974) recorded it in the Rockies of Alberta and British Columbia. The Oregon records are from the northeastern part of the state. Ross (1951b) stated that all of his records were from brook-type streams rather than more cascading mountain creeks. In no case did he take them in the same stream with *Glossosoma*, which occurs in larger and more rapid streams.

***A. hoodi* Ross 1951b.** Type locality: OREGON, HOOD RIVER Co., North Fork Iron Creek, July 30/48, K. M. Fender.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., June 17/67 (col. & det. Jewett); streams near Government Camp, June 12/67, June 20/68 (ROM). DESCHUTES Co., Spring Cr., Aug 11/48, Jewett (det. ROM); Fall Riv., July 13/48 (col. & det. Jewett). LINN Co., Ollalie Cr. F. C., Rt. 126, July 17/70, Evans & Wold (det. ROM).

Distribution: Denning (1965c) lists this species from BAKER and KLAMATH counties, which indicates a fairly widespread distribution within Oregon. He also recorded it from Mt. Rainier, Washington, which is the only record outside of Oregon.

***Glossosoma* Curtis 1834**

This Holarctic genus includes about 25 North American species of which all but 3 occur in the western montane area (Wiggins 1977). Except for *G. penitum* Banks, all of the Oregon species are placed in the subgenus *Ripaeglossa*, which Ross (1956) describes as a curious group that abounds in the large streams of the western montane region and is found in no other area. The larvae of all species are very similar in appearance and no morphological characters have been found to distinguish the species.

***G. alascense* Banks 1900b.** Type locality: ALASKA, Popof Island.

HARNEY Co., Oct 1/64, Goeden (det. Denning). UNION Co., Gordon Cr., 5 mi NW Elgin, June 12/74 (pupae), Anderson (det. ROM). WALLOWA Co., Imnaha Riv., Blackhorse Cpgrd., July 16/73 (pupae), Anderson (det. ROM).

Distribution and Biology: Nimmo (1974) gives the known range of *G. alascense* as from Alaska to Utah, and from Montana to Oregon. In Alberta, he collected adults from May to August near turbulent mountain streams, large plains rivers, and gently flowing creeks.

***G. bruna* Denning 1954a.** Type locality: CALIFORNIA, SHASTA Co., Hat Creek, Highway 299.

LANE Co., Eugene, Oct 12/66, Goeden (det. Denning).

Distribution: Northern California and the one Oregon record.

***G. califica* Denning 1948a.** Type locality: CALIFORNIA, INYO Co., Independence.

CURRY Co., Gold Beach, June 30/67, Goeden (det. Denning). DOUGLAS Co., Days Cr., 1 mi E Days Creek, June 10/75 (larvae & pupae), Anderson (det. ROM). JACKSON Co., Trail, July 4/42, R. L. Post (det. Denning). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, June 18/68 (ROM). JOSEPHINE Co., W Fk. Illinois Riv. near Cave Junction, June 2/63, Jewett (det. ROM). LAKE Co., Deadhorse Cr., ca. 25 mi NW Lakeview, July 31/65 (pupa), Anderson (det. ROM).

Distribution: The Oregon records are from the southern part of the state, except for the Metolius River. Ross (1956) lists an additional record from northwest Oregon. This species also occurs in California.

***G. excitum* Ross 1938a.** Type locality: OREGON, DESCHUTES Co., Pringle Falls, May 26/35, N.F. Canova.

DESCHUTES Co., Deschutes Riv., 3 mi S Lava Lake, July 24/69, Goeden (det. Denning); 10 mi W Bend, June 21/39, Gray & Schuh (det. Ross). DOUGLAS Co., Clearwater Riv., Boulder Flats Cpgrd., Rt. 138, E Idleyld, June 9/68 (ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Aug 26/65 (Anderson 1967); same, June 16-17/67, June 18/68, Aug 11/66, Sept 19-23/66 (ROM). Camp Sherman, June 6/64, Jewett (det. ROM).

Distribution: Though I have records from only three localities in Oregon, Ross's (1956) maps indicate several records from the northern Cascades or Columbia Gorge region, as well as records in Washington and Montana.

***G. montana* Ross 1941a.** Type locality: MONTANA, Toston, along Missouri River.

DESCHUTES Co., Deschutes Riv. near Redmond, July 19/34, Schuh & Gray (det. Ross); 3 mi S Lava Lake, June 24/69, Goeden (det. Denning). HARNEY Co., Blitzen Riv., July 12/64 (larvae, emerged July 20-Aug 1/64), Anderson (det. ROM); Big Indian Cr., Steens Mtn. summit rd., 5500 ft, July 17/73 (pupa), Anderson (det. ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, June 15/66, Anderson (det. Jewett); Deschutes Riv., Warm Springs, June 5/64, Jewett (det. ROM). UMATILLA Co., Woodward Cpgrd., Rt. 204, E Tollgate, Blue Mtns., Sept 18/66 (ROM). WASCO Co., near mouth Deschutes Riv., Oct 12/65 (col. & det. Jewett).

Distribution and Biology: This species occurs from the Cascades east to Montana. Adults of *G. montana*, *excitum*, and *califica* have all been collected at the Riverside F. C. site on the Metolius River during mid-June, and a fourth species, *G. schuhi*, was collected in several months.

***G. oregonense* Ling 1938.** Type locality: OREGON, KLAMATH Co., Crater Lake, July 18/22, E. Van Dyke.

CLATSOP Co., Astoria, June 6/67, Goeden (det. Denning). JACKSON Co., Ashland, Aug 7/66, Goeden (det. Denning). MARION Co., Aumsville, June 6/67, Goeden (det. Denning).

Distribution: Denning (1954a) records this poorly known species as occurring throughout Oregon, northern California, and western Nevada, with collecting dates from June to September.

***G. penitum* Banks 1914.** Type locality: BRITISH COLUMBIA, Peachland.

My Oregon records indicate *G. penitum* is common in counties in, and west of, the Cascade Range. Records are available from: BENTON, CLACKAMAS, CLATSOP, DESCHUTES, DOUGLAS, JACKSON, LANE, LINN, TILLAMOOK, and WASHINGTON counties. In addition, there is a record from WALLOWA Co., Gumboot Cr., 5 mi E Lick Cr. Cpgrd., 4500 ft, July 16/73 (pupa), Anderson (det. ROM).

Biology and Distribution: This species is placed as the only species in the subgenus *Anseriglossa* by Ross (1956). He records its range as extending over much of the western montane region. Anderson and Wold (1972) and Anderson and Bourne (1974) give life-history data for this species in Oak Creek and Berry Creek near Corvallis. *G. penitum* is bivoltine with two broad emergence periods from February through June and from late July to November. *G. penitum* is possibly ecologically segregated from its congeners as it is common in small creeks, whereas Ross (1956) states that species in the subgenus *Ripaeglossa* abound in the large streams of the western montane region.

***G. pterna* Ross 1947.** Type locality: CALIFORNIA, SANTA CRUZ Co., Waddell Creek.

The only Oregon record is: LANE Co., McKenzie Riv., 2.5 mi W Blue River, June 10/68 (ROM).

Distribution: This species was previously recorded only from California. According to Nimmo (1974), there is also one doubtful record from Alberta.

***G. pyroxum* Ross 1941a.** Type locality: OREGON, BENTON Co., Alsea Fish Hatchery, S. G. Jewett, Jan 24/38.

This is another common species in western Oregon. Ross (1956) has also recorded it from Washington. Oregon records are from: BENTON, CLACKAMAS, CLATSOP, COLUMBIA, LANE, LINN, TILLAMOOK, and WASHINGTON counties.

Biology: Adult records from areas west of the Willamette River indicate a dominant fall and winter flight period from mid-September to February, with an apparent peak in November. There are also disparate records from Clatsop County in April and July and coastal Lane County in June. However, at Lookout Creek, Lane County, in the Cascade Range, I have collected quantitative monthly samples for 2 years that indicate a different life cycle. Eggs and early-instar larvae peak in August and September, growth continues through the winter, and pupation begins in February. Adult emergence was recorded in the summer from May to August. As the life cycles in the two areas are so dissimilar, there may be more than a single species involved.

***G. schuhi* Ross 1947.** Type locality: OREGON, DESCHUTES Co., Redmond, June 1/39, Schuh & Gray.

JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Feb 26 & June 15/66 (pupae), Anderson; Sept 19-23/66 (adults, det. ROM as *nr. schuhi*); Deschutes Riv., Warm Springs, May 31/41 (allotype, Ross 1947), & June 5/64, Jewett (det. ROM), June 19/68 (ROM). KLAMATH Co., Crooked Cr., Rt. 62, S of Fort Klamath, Oct 1/66 (ROM); same, June 8/68 (larvae & pupae) (ROM).

Distribution: In Oregon, the records are from in, or east of, the Cascades. Ross (1956) gives the range as Oregon and Idaho.

***G. traviatum* Banks 1936.** Type locality: WASHINGTON, Walla Walla.

BAKER Co., Pine Cr., Halfway, Apr 27/61, Jewett (det. ROM). COLUMBIA Co., St. Helens, Sept 5/68, Goeden (det. Denning). CROOK Co., Marks Cr., 15 mi E Prineville, July 26/63 & July 10/64 (pupa), Anderson (det. ROM). DOUGLAS Co., Cow Cr. at Quines Cr., Apr 8/68 (col. & det. Jewett). GRANT Co., John Day, Oct 3/64, Aug 17/66, & Canyon City, Aug 17/66, all Goeden (det. Denning); S Fk. John Day Riv., Dayville, June 15/74 (pupae), Anderson (det. ROM). JOSEPHINE

Co., Grants Pass, May 24/64, Goeden (det. Denning), & Sept 17/68, Vi Speir (det. Smith). LINN Co., Calapooya Riv., May 12/39 (pupae), Pillow (det. ROM). UMATILLA Co., Woodward Cpgrd., E Tollgate, Sept 18/66 (ROM); Milton-Freewater, Oct 7/64, & Pendleton, June 14/67, all Goeden (det. Denning). UNION Co., Meadow Cr., Rt. 244, 21 mi SW La Grande June 14/74 (larvae & pupae), Anderson (det. ROM); La Grande, May 24/64, Goeden (det. Denning). WALLOWA Co., Imnaha, July 3/69, Goeden (det. Denning). WHEELER Co., Badger Cr., Rt. 26, 30 mi E Mitchell, June 15/74, Anderson (det. ROM).

Distribution: The species occurs in several areas of Oregon, with most records in eastern Oregon and the Siskiyou. Ross (1956) gives additional records in Washington, Idaho, Montana, and Wyoming.

***G. velona* Ross 1938a.** Type locality: WASHINGTON, Centralia.

This species is widespread in the Northwest, with its range extending from the McKenzie River in northern Canada to Utah, and from Montana to the Pacific (Nimmo 1974). In Oregon, the records are from BENTON, CLATSOP, DOUGLAS, GILLIAM (paratype), LAKE, LANE, LINN, MARION, and POLK counties.

Biology: The flight period in Oregon appears to be bimodal, with the first occurring from late March through mid-June and the second period from August to November. Nimmo (1974) recorded *G. velona* chiefly from large, slow-flowing rivers.

***G. verdona* Ross 1938a.** Type locality: WYOMING, Pinedale, along Green River.

LAKE Co., Deadhorse Cr., ca. 25 mi NW Lakeview, July 31/65 (pupa), Anderson (det. ROM).

Distribution: Ross (1956) indicated that this is a Rocky Mountain species, occurring in Utah and Wyoming.

***G. wenatchee* Ross & Spencer 1952.** Type locality: WASHINGTON, Cashmere, Wenatchee River.

DESCHUTES Co., Sparks Lake, July 24/69, & 3 mi S Lava Lake, July 24/69, Goeden (det. Denning). WASCO Co., Deschutes Riv., Maupin, June 5/47 (Ross & Spencer 1952); The Dalles, July 3/70, Goeden (det. Denning).

Distribution: Ross (1956) lists this species from Oregon, Washington, and British Columbia, but his map also indicates a collection in the Yukon Territory.

FAMILY HYDROPTILIDAE

These are the microcaddisflies, many of which are only about 2 millimeters long (Figure 9). Because of their small size they are seldom col-

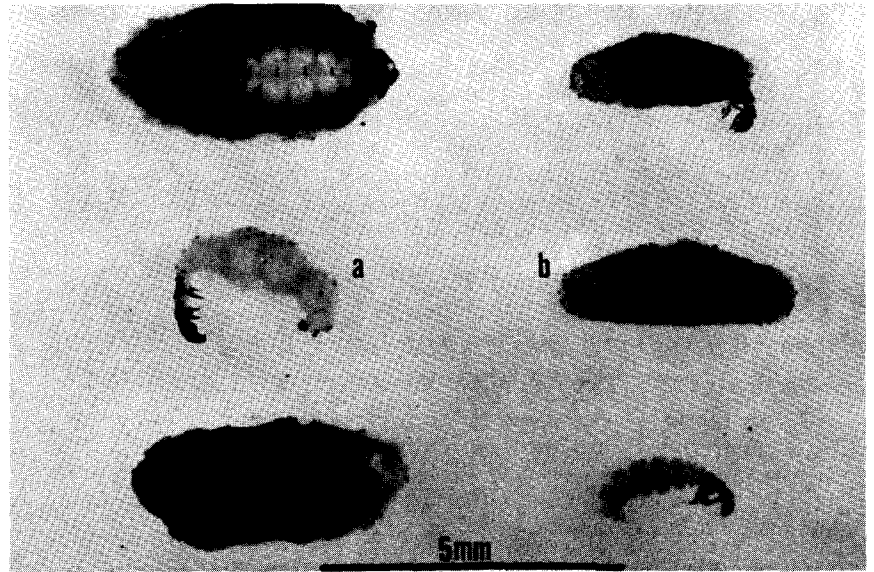


Figure 9. Family Hydroptilidae, larvae and cases. (a) *Leucotrichia pictipes*; (b) *Hydroptila* sp.

lected. The limited number of records in the list below is probably not a good indication of their actual diversity and abundance. Hydroptilid adults have wings fringed with long hairs which are readily rubbed off and can cause allergic reactions when inhaled. Several species are classed as nuisance organisms because they are attracted to lights in large numbers (Corbet et al. 1966). Because of their small size they can crawl through window screens.

Though Ross (1967) places the Hydroptilidae in the suborder Integripalpia and Lepneva (1964) places it in the Annulipalpia, there is general agreement that it represents a primitive group related to the Glososomatidae, and near the base of the phylogenetic line leading to the tube-building families.

The larvae are unique amongst the Trichoptera in that most genera exhibit hypermetamorphosis (Ross 1944). The early instars have a slender body with long anal legs and claws, and are free-living. In the fifth instar they make a silken case, and the abdomen becomes greatly enlarged while the anal prolegs and hooks are reduced. Most of the growth occurs during the fifth instar. Pupation also takes place within the sealed larval case. In *Alisotrichia*, the larva is free-living throughout the feeding period (Flint 1970). At the end of the final instar, it spins a simple dorsal covering and then immediately constructs a complete central cocoon, enclosing

itself for pupation. The early-instar larvae are poorly known for Nearctic hydroptilids, but Nielsen (1948) has made extensive studies of five genera of the European fauna. Ross (1959) and Wiggins (1977) provide keys to the final instars of the American genera; several of these are recognizable by differences in type of case.

According to Wiggins (1977), the Hydroptilidae are a highly diverse group, both in the range of habitats occupied and in their case-making behavior. He records about 175 species in 14 genera in America north of Mexico. The subfamilial classification used by Wiggins is followed in the present list, with genera and species listed alphabetically. Only 7 genera and 17 species are known for Oregon, but further collections will undoubtedly increase the numbers.

Subfamily Hydroptilinae *Agraylea* Curtis 1834

Two of the three North American species of this Holarctic genus are known from Oregon. The larvae occur in lakes, ponds, and large rivers. Ross (1944) described the case as purselike with two symmetrical valves constructed of silk.

***A. multipunctata* Curtis 1834.** Type locality: ENGLAND.

HARNEY Co., Fish Lake, Steens Mtn., 7200 ft, July 12/67, E. Evans
(det. Denning).

Distribution and Biology: This species is Holarctic in distribution and common in the northern states and Canada (Ross 1944). Nielsen (1948) studied *A. multipunctata* in Denmark and described all larval instars. The larvae feed on filamentous algae, piercing and sucking the contents from individual cells.

***A. saltsea* Ross 1938a.** Type locality: MONTANA, Saltese.

CLATSOP Co., Astoria, Aug 29/68, G. Brown (det. Denning).

Distribution: This species was previously recorded only from Montana and California (Wiggins 1977).

Hydroptila Dalman 1819 (Figure 9b)

This is a large genus of worldwide distribution with about 60 species known from North America (Wiggins 1977). The larvae occur in rivers and lakes. They construct cases with laterally compressed silk valves that are covered with sand grains. The case is carried vertically. In the Metolius River, the larvae of *H. rono* Ross were abundant on *Ranunculus* and diatom-encrusted stones. Drift rates of larvae were surprisingly high

considering that the sand-grained cases were relatively heavy (Anderson 1967a).

***H. ajax* Ross 1938a.** Type locality: ILLINOIS, Salt Fork River, Oakwood. UNION Co., Grande Ronde Riv., La Grande, July 30/36, H. H. Ross (paratype).

Distribution: Ross (1944) states that the range of this species extends from Oklahoma to New York, without mentioning his Oregon record.

***H. consimilis* Morton 1905.** Type locality: NEW YORK, Ithaca. JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Aug 21/69, C. D. Kerst (det. ROM as prob. *consimilis*).

Distribution: *H. consimilis* is recorded from Oregon by Ross (1944). The species' range is given as the mountainous and heavily wooded area from Texas to British Columbia, and east to New York.

***H. hamata* Morton 1905.** Type locality: NEW YORK, Ithaca.

Distribution: Ross (1944) lists this species from Oregon. It is widely distributed, occurring in mountainous and hilly country from southern Mexico to Washington and east to Ontario and New York.

***H. rono* Ross 1941a.** Type locality: UTAH, Huntsville.

JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, May/65 (Anderson 1967a); same, July 28/64 & Aug 21/69, Anderson (det. Flint). UMATILLA Co., Ukiah-Dale Wayside, 2 mi S Ukiah, June 14/74, Anderson (det. Flint).

Biology: The two sites where I have collected *H. rono* indicate a wide diversity in larval habitats. The Metolius is a broad, rapid, shallow river, whereas the only water available at Ukiah-Dale Wayside was a hillside seep and small ditch.

***Ochrotrichia* Mosely 1934**

Denning and Blicke (1972) ascribe 55 species to this exclusively North American genus. The larvae occur in a range of lotic habitats from small springs and warm rivers to intermittent streams (Wiggins 1977). The purse-case, which is similar to that of *Hydroptila*, is elongate and covered with sand grains. In *P. riesi* Ross it is like a tortoise shell, with an ovoid top piece and a bottom plate that covers all but the front and back openings (Ross 1944). The adults are dark, somber colored, and hairy, with a size range of 2 to 4 millimeters (Denning & Blicke 1972).

***O. alsea* Denning & Blickle 1972.** Type locality: OREGON, DESCHUTES Co., Tumalo State Park, July 19/61, G. Guyer.

BENTON Co., N Fk. Alsea Riv., 5 mi NE Alsea, July 17/61, J. D. Lattin (allotype).

Distribution: The two Oregon specimens from the type series are the only records.

***O. nacora* Denning & Blickle 1972.** Type locality: CALIFORNIA, HUMBOLDT Co., Bear River.

CURRY Co., Chetco Riv., Myrtle Grove St. Pk., Aug 4/50, C. P. Alexander, & Gold Beach, Sept 18/64, Goeden (paratypes).

Distribution: Known only from the holotype and paratypes.

***O. oregona* (Ross) 1938a.** Type locality: OREGON, UNION Co., Grande Ronde River, La Grande, July 30/36, H. H. Ross.

Distribution: Denning and Blickle (1972) record it from Oregon, Colorado, and Wyoming.

***O. phenosa* Ross 1947.** Type locality: OREGON, DESCHUTES Co., Deschutes River, Redmond, July 28/39, J. Schuh.

Distribution: Denning and Blickle (1972) record it only from Oregon.

***O. stylata* (Ross) 1938a.** Type locality: WYOMING, Farson.

LANE Co., Eugene, Sept 12/66, Goeden (det. Denning.)

Distribution: This species has the widest distribution of any western species of *Ochrotrichia*, extending from the Rocky Mountain states to the Pacific (Denning & Blickle 1972).

***O. vertreesi* Denning & Blickle 1972.** Type locality: OREGON, DOUGLAS Co., North Umpqua River, 7 miles W Roseburg, July 31/66, J. D. Vertrees.

Distribution: Known only from the type series.

***Stactobiella* Martynov 1924b**

This is a small Holarctic genus with three species recorded from North America. According to Wiggins (1977), the larvae and the silken-valved cases are similar to those of other Hydroptilinae but only about 3 millimeters long. They occur on rocks in small rapid streams.

The only record for this genus in Oregon is the unassociated larva figured by Wiggins (1977).

***Stactobiella* sp.**

BENTON Co., Berry Cr., 9 mi N Corvallis, Apr 10/65 (ROM).

Subfamily Leucotrichiinae
Leucotrichia Mosely 1934 (Figure 9a)

Flint (1970) monographed the Nearctic species. He lists 10 species and provides keys for males and most of the larvae. *Leucotrichia* is largely a southern genus, with only *L. pictipes* (Banks) having a widespread distribution in the United States.

L. pictipes (Banks) 1911. Type locality: New York, Hales Creek, Johnstown.

BENTON Co., Lobster Cr., 15 mi SW Alsea, June 8/74 (larvae) & Aug 4/74 (larvae & pupae), Anderson (det. ROM). CURRY Co., Illahe, July 31/40, L. Miller (det. Ross). KLAMATH Co., Klamath Lake, July 27, Dyar & Caudell (Flint 1970). POLK Co., Willamette Riv., Buena Vista, June 22/74, Anderson (det. Denning as prob. *pictipes*). UNION Co., Meadow Cr., 21 mi SW La Grande, Rt. 244, June 14/74 (pupae), Anderson (det. ROM).

Distribution and Biology: *L. pictipes* occurs from Oregon and California east to Virginia and New York (Wiggins 1977). The final-instar larva and cases are described by Ross (1944), Flint (1970), and Wiggins (1977). The flat, silken case with a small opening at each end is cemented to rocks in very fast water. The mature larva is distinctive because abdominal segments V-VII are distended laterally more than twice the width of the anterior segments. The larvae graze periphyton and particulate debris by extending the slender anterior part of the body through either of the case openings (Wiggins 1977).

Subfamily Ptilocolepinae
Palaeagapetus Ulmer 1912

This genus was described from Baltic Amber as a glossosomatid, but Ross (1956) considered it to be a very primitive Hydroptilidae. The larvae of *P. celsus* Ross, found in small seepage springs of the Great Smoky Mountains, also show some relationship with glossosomatids (Flint 1972). Wiggins (1977) describes the case of *P. celsus* as being two silken valves, as in many hydroptilids, but carried with the flattened surfaces held dorsoventrally. The case is distinctive in being covered with small pieces of liverwort. The dorsoventrally depressed larva is unique in having truncate fleshy tubercles on the sides of the abdominal segments (Wiggins 1977).

The larvae of the two western species of *Palaeagapetus* are unknown. Janet Wold found a larva in a benthos sample from Quartz Creek, near Blue River Reservoir, Lane County, that Oliver Flint confirmed as belonging to this genus.

***P. guppyi* Schmid 1951.** Type locality: BRITISH COLUMBIA, Vancouver Island.

BENTON Co., Marys Peak, Parker Cr. Falls, July 19/63 (ROM).
CLACKAMAS Co., Mt. Hood, Still Cr. F. C., July 19/67 (ROM).

Distribution: This species was previously known only from British Columbia.

***P. nearcticus* Banks 1936.** Type locality: WASHINGTON, Mt. Rainier, White River.

BENTON Co., emergence trap, Oak Cr., near Corvallis, May-June (Anderson & Wold 1972). LINN Co., Monument Peak, Aug 1/69, Goeden (det. Denning).

Distribution: This species is known from Washington, Oregon, and California.

Subfamily Incertae sedis

Wiggins (1977) considers the two genera, *Mayatrichia* and *Neotrichia*, to comprise a unit of subfamily rank, but he did not create a new subfamily because he had studied only the immature stages.

***Neotrichia* Morton 1905**

This genus is restricted to the New World with 16 species known north of Mexico. None has been previously recorded from the northwest (Wiggins 1977). *Neotrichia* includes the smallest North American caddisflies, with mature larvae and adults being only 2 millimeters long (Ross 1944). The larvae construct cylindrical cases covered with tiny sand grains. The body is evenly rounded, rather than depressed or compressed as in most hydroptilids (Wiggins 1977). The larvae occur on rocks in fast water.

***Neotrichia* sp.**

BENTON Co., Lobster Cr., 15 mi SW Alsea, Aug 4/74 (pupae), Anderson (det. ROM).

Biology: The minute pupal cases were attached on the underside of damp wood at the edge of the stream.

FAMILY PHILOPOTAMIDAE

The Philopotamidae is a generalized family in the suborder Annulipalpia, the retreat makers (Figure 10a). It is a relatively small group but individuals are abundant in rapid clear streams from the tropics to the

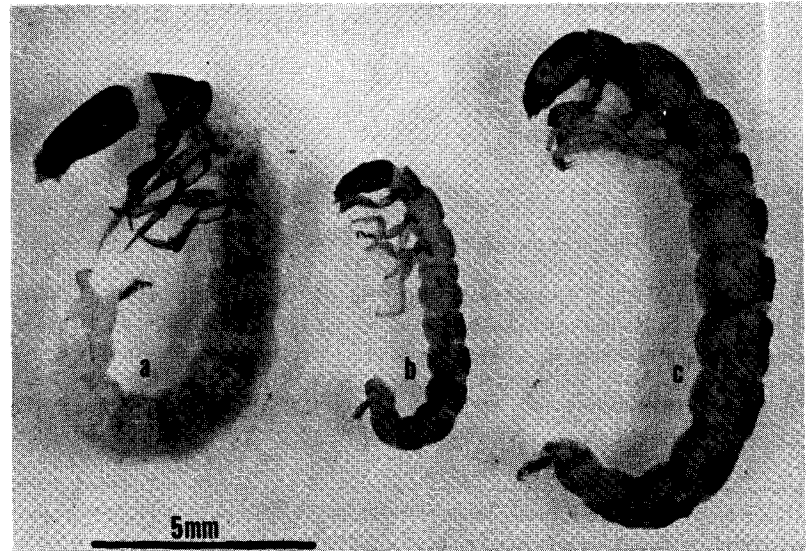


Figure 10. Families Philopotamidae, Psychomyiidae, and Polycentropodidae, larvae. (a) Philopotamidae, *Wormaldia* sp.; (b) Psychomyiidae, *Psychomyia* sp.; (c) Polycentropodidae, *Polycentropus* sp.

subarctic (Ross 1956). The larvae are uniform in appearance throughout the family. They construct elongate, sac-like nets (finger nets) under stones, which serve both for shelter and food gathering. Lepneva (1964) suggests that the larvae are microphagous. Wiggins (1977) summarized feeding behavior, indicating that they feed by cleaning the inside of the net with their unusual membranous labrum; in addition to fine particulate detritus, they ingest diatoms, pieces of vascular plants, and some animal material.

Though the adults range in size from 3-4 millimeters to 20 millimeters (Ross 1956), the large showy species are tropical, and the Oregon species are all small and drab.

There are three genera and about 40 species of Philopotamidae in America north of Mexico (Wiggins 1977). The arrangement used is alphabetical and the nomenclature follows Wiggins.

***Chimarra* Stephens 1829**

This large, cosmopolitan genus contains some large, showy, tropical species with red, yellow, or black bodies and patterned wings. Denning (1962) recorded 25 species in North America, but most of these occur in the subtropical regions. Only two species are recorded in Oregon, both from east of the Cascade Range. Williams and Hynes (1973) studied the

biology of *C. aterrima* Hagen in Ontario. The larvae preferred sites under large rocks in shallow, fast-flowing water. Their nets have a very fine mesh (6 by 70 μm) that effectively filters particles of suspended detritus.

***C. siva* Denning 1949a.** Type locality: MONTANA, BROADWATER Co., Avalanche Creek, 40 miles S Cascade Glen.

MALHEUR Co., Three Forks, 40 mi S Jordan Valley, Oct 1/62, Goeden (det. Denning).

Distribution: This species is known from Montana and California, as well as from Oregon (Denning 1956b).

***C. utahensis* Ross 1938a.** Type locality: UTAH, Gandy.

DESCHUTES Co., Bend, Aug 11/64, & Redmond, Aug 25/67, Goeden (det. Denning).

Distribution: This species is also recorded from Idaho, California, South Dakota, and Wyoming (Fischer 1961).

***Dolophilodes* McLachlan 1868**

Wiggins (1977) considers *Dolophilodes* to be equivalent to *Sortosa* as defined by Ross (1956). This genus is worldwide in distribution. All but one of the North American species are restricted to the western montane region and occur in Oregon. The capture net is typical for the family—a slender finger-shaped net with a small hole at the posterior end to allow water to pass through even when the meshes are clogged, and also to serve as an exit for the larva (Wiggins 1977). In addition to nets in streams, I have seen *Dolophilodes* nets hanging vertically on a mossy rock face.

***D. aequalis* (Banks) 1924.** Type locality: COLORADO, Tolland.

BENTON Co., Marys Peak, Mar 12/63, Anderson (det. Smith).
CURRY Co., Rogue Riv., Apr 25/41, M. Cumings (det. Ross).
DOUGLAS Co., Rt. 138, 43.4 mi E Idleyld Pk., June 9/68 (ROM);
trib. of Rogue Riv., June 17/49 (col. & det. Jewett). JACKSON Co.,
Bybee Cr., trib. of Rogue Riv., June 17/49 (col. & det. Jewett).

Distribution and Biology: All of the Oregon records are from the western counties, though Ross (1956) indicates that this is a widespread species in the western mountains. The records indicate that it is an early-season flier. Denning (1949a) states that it is variable in size and color; those collected early in the season are large and colored grey to black, whereas those collected later are smaller and a light brown color.

***D. dorcus* (Ross) 1938a.** Type locality: IDAHO, Burke.

BENTON Co., Oak Cr., May-July (Anderson & Wold 1972); Rock Cr., 5 mi SW Philomath, June 9/49, Roth & Chiang (det. Denning).

CLACKAMAS Co., Beaver Cr., trib. of Sandy Riv., June 15/47 (col. & det. Jewett); Clackamas Riv., 23 mi NE Detroit, 2600 ft, July 11/68, Anderson (det. Smith). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, June 17/67, July 3-4/65 (col. & det. Jewett). DOUGLAS Co., Bogus Cr. Cprgd., Rt. 138, 14.4 mi E Idlelyld Pk., June 10/68 (ROM). JOSEPHINE Co., Reuben Cr., trib to Grave Cr., June 5/49, Jewett (det. Denning); Grayback Cr. St. Pk., 15 mi E Cave Junction, June 13/63, Anderson (det. Smith). LANE Co., emergence trap, Lookout Cr., Andrews For., 8 mi NE Blue River, June-Aug. & emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, June-July, all Grafius (det. Denning). LINN Co., Yellowbottom Cprgd., Quartzville Rd., June 21/68 (ROM). MARION Co., Niagara, May 31/70, Evans & Tew (det. Denning).

Distribution and Biology: Ross and Spencer (1952) gave the distribution of this species as only in the western mountain ranges from British Columbia to Oregon. All of our records are from areas in, or west of, the Cascade Range. The flight period extends from May to August, with a peak in June and July.

***D. novusamericana* (Ling) 1938.** Type locality: CALIFORNIA, MARIN CO.

BENTON Co., Rt. 34, 1 mi W Alsea Mtn. summit, Feb 23/65, Anderson (det. Smith); Alder Cr., 7 mi E Alsea, Apr 4 & 15/64 (ROM). Marys Peak, Parker Cr., Chintimini Cr., & W Fk. Rock Cr., Apr 3-14/64 (ROM); Alsea Fish Hatchery, Jan 24/38, Jewett (det. Ross). CURRY Co., Hume Trail, Sugarloaf Mtn. near Pistol Riv., R. L. Post, March 20/40 (det. Ross). JOSEPHINE Co., Reuben Cr., trib. of Grave Cr., June 5/49, Jewett (det. Denning). Store Gulch, Illinois Riv., Aug 8/48, C. P. Alexander (Denning 1949); near Oregon Caves Nat. Mon., June 14/63, Anderson (det. Denning). KLAMATH Co., 1 mi W Dairy Cr. Camp, 22 mi NE Bly, July 9/64, Rieder & Schuh (det. Denning). LANE Co., emergence trap, Watershed 10, Andrews For., 5 mi NE Blue River, July 3 & 17/72; emergence trap, Watershed 2, Andrews For., 5 mi NE Blue River, Apr 20/72, & emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, Feb-Sept, all Grafius (det. Denning). LINN Co., hillside seep, Quartzville Rd., 2.5 mi E Rocky Top Rd. Bridge, Anderson (det. ROM). UMATILLA Co., Ukiah-Dale Wayside, 2 mi S Ukiah, June 14/74, Anderson (det. Flint). WALLOWA Co., 8 mi N Imnaha, July 2/69, Goeden (det. Denning).

Distribution and Biology: Nimmo (1974) records the range of this species as from California and Utah to southern British Columbia. The flight period extends from February to August. Some of the records for *D. novusamericana* are from seeps or very small trickles of water. Vertical nets found hanging from a mossy bank at the Quartzville Road site, Linn County, are probably of this species. However, we also have emergence-trap records from Mack Creek, Lane County, that are from a fast, rocky stream.

***D. oregona* (Denning) 1966.** Type locality: OREGON, JACKSON CO., Jackson Creek near Jacksonville, French Gulch Road, May 22/64, J. Schuh.

Distribution: Known only from the type locality.

D. pallidipes (Banks) 1936. Type locality: (?) IDAHO, Moscow (type series from Oregon, Washington, Idaho, and Montana).

BENTON Co., Marys Peak, Chintimini Cr., and N Fk. Rock Cr., Sept 25/66 (ROM). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66 (ROM). LANE Co., emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, Sept/71, Grafius (det. Denning). MULTNOMAH Co., Wahkeena Falls near Corbett, Sept 27/66 (ROM).

Biology and Distribution: All of the above records are for a flight period in late September. At Mack Creek, Lane County, this species has been collected from the same emergence traps as *D. dorcus* and *D. novus-america*, and was the latest species to emerge. Denning (1949a) gives records for Vancouver Island and Montana, indicating that this species is widely distributed in the west.

D. sisko (Ross) 1949c. Type locality: OREGON, YAMHILL Co., Peavine Ridge, McMinnville, May 22/47, K. M. Fender.

COOS Co., Daphne Grove Camp, S Fk. Coquille Riv., Aug 5/50, K. M. Fender (det. Jewett). JOSEPHINE Co., Store Gulch G.S., 7 mi W Selma, Aug 9/48 (allotype), K. M. Fender. LANE Co., emergence trap, Watershed 10, Andrews For., 5 mi NE Blue River, July 71 & 72, & emergence trap, Lookout Cr., 8 mi NE Blue River, Aug 7/72, all Grafius (det. Denning). YAMHILL Co., Peavine Ridge, near McMinnville, May 15 & 27/47 (paratypes), K. M. Fender.

Distribution: Ross (1956) indicates a very curious distribution for this species; it is known from Oregon and California, and from the mountains of North Carolina.

Wormaldia McLachlan 1865

This is a widespread genus occurring on all continents except Australia (Ross 1956). There are about 16 North American species, most of which occur in the west (Wiggins 1977). Denning (1956a) provides a key to the species of the United States and Canada. Earlier records are under the generic name *Dolophilus*, which Ross (1949) synonymized with *Wormaldia*.

W. anilla (Ross) 1941a. Type locality: BRITISH COLUMBIA, Stave Falls.

This is a common species in Oregon, particularly in the western counties. It is recorded from BENTON, CLACKAMAS, CLATSOP, COLUMBIA, GRANT, HARNEY, LANE, LINCOLN, LINN, MARION, POLK, and TILLAMOOK counties.

Biology and Distribution: *W. anilla* adults have been recorded in all months. Most records are from April to June and September to No-

ember, a bimodal flight period suggesting two generations per year. Emergence-trap collections from Oak Creek (Anderson & Wold 1972) and from streams in the Andrews Forest, Lane County, indicate that this species commonly occurs in headwater regions or very small streams.

***W. gabriella* (Banks) 1930.** Type locality: CALIFORNIA, San Gabriel Mountains.

This species, compared with *W. anilla*, has been recorded from more of the southwestern and eastern counties of Oregon: BAKER, BENTON, CLACKAMAS, CLATSOP, COOS, CURRY, GRANT, JACKSON, LANE, LINCOLN, LINN, and UNION counties.

Biology and Distribution: Flight records extend from May to October but peak from August to October. Anderson & Wold (1972) suggested that *W. gabriella* succeeded *W. anilla* in a downstream direction in Oak Creek, and other data also indicate that *W. gabriella* is more common in larger streams. The geographical range of *W. gabriella* is from Alberta to California and east to Utah and Nevada (Nimmo 1974).

***W. occidea* (Ross) 1938a.** Type locality: OREGON, (?) LINCOLN Co., Yew Creek, in Alsea mountains, May 3/36, R. E. Rieder.

BENTON Co., Marys Peak, several localities, April-June (ROM); Rt. 34, 1 mi W Alsea Mtn. summit, Mar 15/65, Anderson (det. Smith). CLACKAMAS Co., Eagle Fern Pk., Aug 1/48 (col. & det. Jewett). CLATSOP Co., Big Cr., Nov 2/48, Necanicum Riv., Oct 14 & 16/48, & E Humbug Cr., Oct 3/48, & Osweg Cr., ca. 2 mi E Elsie, Aug 9/63 (all col. & det. Jewett); Gronnel Rd., Elsie, May 30/64, Aug 9/63, Jewett (det. ROM). COLUMBIA Co., Scappoose Cr., July 17/48 (col. & det. Jewett). DOUGLAS Co., 1-2 mi below Muir Cr. Cpgd., July 4/61 (ROM).

Distribution: Newell and Potter (1973) recorded *W. occidea* from Montana, which is an eastward extension from the previously recorded range of Oregon and California.

Note: Apparently there is an error in the county designation of the holotype. Yew Creek and Alsea Mountain are in Benton County.

FAMILY PSYCHOMYIIDAE

The Psychomyiidae (Figure 10b) is a small family of cosmopolitan distribution, except for the Australian region. Five genera and about fifteen species are known from North America (Wiggins 1977). Within the suborder Annulipalpia, they occupy an intermediate position (Ross 1967). The Polycentropodidae, which were formerly included as a subfamily of Psychomyiidae, are a more advanced group (Lepneva 1964). Psychomyiid larvae occur in running water and in the littoral region of

large lakes. They occupy fixed silken tunnels that are attached along their entire length to rocks, wood, or other substrate (Hickin 1967). These slender, winding tubes are 7 to 8 centimeters long and may be 10 or more times as long as the larvae.

Of the four subfamilies recognized by Wiggins (1977), only the Psychomyiinae occurs in Oregon. The state fauna includes two genera, *Psychomyia*, with two or three species, and *Tinodes* with four species.

Subfamily Psychomyiinae
***Psychomyia* Latreille 1829**

This genus is of Holarctic and Oriental distribution (Wiggins 1977). All three of the known North American species are recorded from Oregon.

***P. flavida* Hagen 1851.** Type locality: CANADA, St. Lawrence River.

BENTON Co., Lobster Cr., 15 mi SW Asea, June 8/74 (pupa), Anderson (det. Flint), & July 13/75, Anderson (det. ROM); Corvallis, July 31/49, V. Roth (det. Denning). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates, June 3-Aug 6/63 (Jewett & ROM). COOS Co., S Fk. Coquille Riv., Myrtle Grove Camp, Aug 6-9/39, Jewett (det ROM). JEFFERSON Co., Deschutes Riv., near Redmond, June 3/39, Schuh & Gray (det. Ross); Deschutes Riv., at Warm Springs, June 5/64, Jewett (det. ROM). KLAMATH Co., Miller Cr., Gerber Reservoir, July 28/65, Anderson (det. ROM); Sprague Riv., near Chiloquin, June 10/75, Anderson (det. ROM). LANE Co., Triangle Lake, Apr 19/41, D. Dickey (det. Ross); Willamette Riv., Eugene, Sept 2/46, Jewett (det. Ross). LINCOLN Co., Slide Cpgrd., 8 mi E Tidewater, July 3/63 (ROM). MULTNOMAH Co., Portland, June 8/52, V. Roth (det. Denning); Dabney St. Pk. 3 mi E Troutdale, July 13/63 (ROM). POLK Co., Willamette Riv., Buena Vista, June 22/74, Anderson (det. Denning). WASCO Co., Deschutes Riv., Maupin, June 5/47, Jewett (det. Ross).

Distribution and Biology: This species is widespread throughout North America and frequently occurs in abundance in light-trap collections. Nimmo (1966) recorded a sex ratio of 2 ♂♂ : 13,000 ♀♀ at lights in the Shadfly Project at Montreal. While this could result from differential attraction of the sexes to lights, Corbet (1966) has demonstrated that *P. flavida* can be parthenogenic. Corbet states that in some areas the sex ratio of this species can approach unity. In collections by S. G. Jewett in Clatsop County (chiefly at lights), 666 of 802 (83%) were females. However, in a sweep net collection at Buena Vista, Polk County, I collected 66 males and only 2 females. In Oregon, the flight records range from April to early September, with a pronounced peak in June and July. Corbet and others (1966) record it from mid-June to late September at Montreal.

***P. lumina* (Ross) 1938a.** Type locality: OREGON, DESCHUTES Co., Pringle Falls, May 26/35, N. F. Canova.

BENTON Co., Berry Cr., 9 mi N Corvallis, many dates, chiefly May and June (det. Denning & Anderson); Oak Cr., near Corvallis, June (Anderson & Wold 1972); N Fk. Alsea Riv., spring run, July 7/63 (ROM); Rock Cr., 5 mi SW Philomath, June 9/49, Roth & Chiang (det. Denning), & May 27/42, J. E. Davis (det. Denning); Corvallis, May 4/61, (col. & det. Lattin). CLACKAMAS Co., Eagle Cr., June 27/48 (Jewett); Mollala Riv., Apr 13/48, Jewett (det. Ross). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates, Apr 20-June 27 (Jewett & ROM); Humbug Cr., June 13/48 & June 27/64 (col. & det. Jewett). COLUMBIA Co., Beaver Cr., May 5/40, Jewett & Goble, May 22/38, Schuh & Gray (both det. Ross). DESCHUTES Co., Pringle Falls, June 7/49 (col. & det. Jewett). JACKSON Co., Trail, July 4/42, R. L. Post (det. Denning). JEFFERSON Co., Deschutes Riv., Warm Springs, May 31/41, Jewett (det. Ross). KLAMATH Co., Crescent Riv., June 8/62 (col. & det. Jewett) & Aug 6/62, Jewett (det. ROM). LANE Co., Triangle Lake, Apr 20/41 (det. Ross); McKenzie Riv., 2.5 mi W Blue River, June 8/68 & Limberlost Cprgd., June 6/69 (ROM); Leaburg Dam, June 30/74, R. Rood (det. ROM). LINN Co., Yellowbottom Cprgd., Quartzville Rd., June 16/68 (ROM). TILLAMOOK Co., Kellow Cr., Dolph, July 10/63 (ROM).

Biology and Distribution: Denning (1956b) indicated that *P. lumina* was known only from Oregon but probably occurred in California. It is a common species in Berry Creek, near Corvallis. The larvae are found in slender, winding tubes on the upper surface of stones. They occur chiefly in shaded, shallow riffles, commonly associated with glossosomatid larvae. Larvae are present in late summer, autumn, and early spring. The pupal chamber is formed in a shortened but broadened section of the tube, and is evident from March to May. The flight period is somewhat earlier than that of *P. flavida*, extending from April to early August, with a peak in June.

***P. nomada* (Ross) 1938a.** Type locality: NORTH CAROLINA, Cherokee, along branch of Little Tennessee River.

BENTON Co., Alsea Riv., May 24/39, G. Black, & Rock Cr., 5 mi SW Philomath, May 10/41, J. W. Joyce (both det. Ross).

Distribution: Though Ross (1944) indicated that this species is restricted to eastern North America, the above records, from the OSU Museum, are from specimens identified by him in 1945.

***Tinodes* Curtis 1834**

This genus occurs in all faunal regions except the Australian (Wiggins 1977). In North America it is restricted to the western states. Denning (1956a) provided a key to seven species. Though none of these larvae

have been definitely associated with the adults, Flint (1964) described the probable larva of a *Tinodes* sp. from Utah, and Wiggins (1977) also provides a generic diagnosis. Denning (1956b) notes that the adults are frequently found along warm, slowly flowing streams and are often abundant.

***T. belisa* Denning 1950.** Type locality: OREGON, JOSEPHINE Co., Store Gulch, Illinois River, 1190 feet, Aug 8/48, C. P. Alexander.

Distribution: Denning (1956b) has also recorded this species from Shasta to Sonoma County in California.

***T. cascadia* Denning 1956a.** Type locality: OREGON, TILLAMOOK Co., Cascade Head Experimental Forest, near Otis, July 27/51, K. M. Fender.

DOUGLAS Co., Steamboat, June 8/65 (Schmid 1968a); 13 mi E Reedsport, June 1/66, Vertrees & Schuh (det. Denning). LANE Co., Devil's Elbow St. Pk., 13 mi S Yachats, May 30/59, J. D. Lattin. LINN Co., Quartzville Rd., 1.4, 1.6, & 1.7 mi E Yellowstone Guard Sta., June 17/68 (ROM). MARION Co., Mill City, June 16/65 (Schmid 1968a).

Distribution: This species is known only from Oregon.

***T. consuetus* McLachlan 1871.** Type locality: CALIFORNIA.

CURRY Co., Gold Beach, June 30/67, Goeden (det. Denning). JACKSON Co., Medford, July 1/66, L. Gentner (det. Denning).

Distribution: Denning (1956b) lists *T. consuetus* as widespread in the western states.

***T. siskiyou* Denning 1951.** Type locality: OREGON, JACKSON Co., Rogue River National Forest, Beaver Sulphur Camp, 1750 feet, Aug 10/50, C. P. Alexander.

WALLOWA Co., 8 mi N Imnaha, July 1/67, Goeden (det. Denning).

Distribution: This species is known only from Oregon, but the two records are from the southwest and northeast corners of the state.

FAMILY POLYCENTROPODIDAE

This family (Figure 10c) occurs in all faunal regions. In North America there are 7 genera and about 70 species (Wiggins 1977). All Nearctic genera except *Phylocentropus* are included in the subfamily Polycentropodinae.

According to Lepneva (1964) this group is given family status, rather than being a subfamily of the Psychomyiidae, because of differences in the larvae. The Psychomyiidae are small primitive microphagous forms

which build simple tubular tunnels, whereas polycentropodid larvae are highly specialized predators which build capturing nets of several kinds. In addition the Polycentropodidae have a rich secondary chaetotaxy and the longest anal prolegs amongst the Trichoptera. Pupation occurs in a cavelike case of small stones, within which there is a loose cocoon. The polycentropodids occur in a wide range of habitats from rapid mountain streams to rivers in the plains and the calm shores of lakes and other lentic waters (Lepneva 1964). At least three species of *Polycentropus* have been collected from temporary vernal pools in Ontario (Wiggins 1973a).

This is not an abundant family in Oregon, neither in numbers of species nor individuals. The two genera and five species are listed alphabetically. Some of the *Polycentropus* spp. are listed in Fischer's catalogue (1962) under *Plectrocnemia*.

Subfamily Polycentropodinae
***Nyctiophylax* Brauer 1865**

There are 23 known species in this genus, distributed in all major land areas except Europe. Morse (1972) gives distribution records for the seven Nearctic species. He designated *Nyctiophylax vestitus* (Hagen) as a *nomen dubium*, so my single record for the genus is listed under *N. moestus*.

***N. moestus* Banks 1911.** Type locality: BRITISH COLUMBIA, Peachland.

CLATSOP Co., Warrenton, July 27/68 & Aug 13/70, Brown and Goeden (det. Denning as *N. vestitus*).

Distribution and Biology: This species occurs across the northern states and Canada. Morse (1972) included Oregon in his distribution records.

Flint (1964) states that *Nyctiophylax* larvae occur on rocks in streams near the ends of pools. They construct a rigid silken shelter, but apparently no trap net. At pupation they strengthen and close the shelter except for a cylindrical aperture at one end. This cylinder is partially closed by a silken sieve. Flint's description of *N.* species A is referable to *N. moestus* (Morse 1972).

***Polycentropus* Curtis 1835a**

This cosmopolitan genus contains about half of the species in the family. There are about 40 species in North America, with representatives occurring in most areas of the continent (Wiggins 1977). The predacious larvae build silken tubes with flared ends, or baglike structures that are expanded by the current (Wiggins 1977).

***P. cinereus* Hagen 1861.** Type locality: CANADA, St. Lawrence River.

BENTON Co., Muddy Cr., 5 mi SW Corvallis, May 6/39, G. Black (det. Ross); Coffin Butte quarry, 12 mi N Corvallis, June 9/49, Roth & Chiang (det. Denning). CLACKAMAS Co., Oswego Lake, Aug 11/32 (det. Denning). CLATSOP Co., Astoria, Aug 6/68 & Sept 5/68, Goeden (det. Denning); Gronnel Rd., 2 mi E Elsie, many dates, June 14-Aug 20 (Jewett & ROM). DOUGLAS Co., Bogus Cr. Cpgrd., Rt 138, 14.4 mi E Idleyld Pk., June 10/68 (ROM). LAKE Co., Lakeview, Aug 4/66, Goeden (det. Denning). LANE Co., 12 mi SE Eugene, June 24/68, Goeden (det. Denning).

Distribution and Biology: This is a widely distributed species occurring across the northern states and southern Canada. Winterbourn (1971a) provides life-history data for *P. cinereus* in Marion Lake, British Columbia.

***P. denningi* Smith 1962.** Type locality: IDAHO, LATAH CO., Moscow Mountain.

CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates, Aug 6-Sept 29/66 (col. & det. Jewett).

Distribution: This species was previously known only from the type locality in Idaho.

***P. halidus* Milne 1936.** Type locality: NEW MEXICO, Hot Springs.

CURRY Co., Gold Beach, Sept 18/64, Goeden (det. Denning). DESCHUTES Co., 3 mi S Lava Lake, July 24/69, & Dutchman's Flat, Century Dr., July 24/69, Goeden (det. Denning). GRANT Co., Mt. Vernon, Sept 8/68, Goeden (det. Denning). HARNEY Co., Burns, July 15/65, Goeden (det. Denning). LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning); emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, Aug 14/72, Grafus (det. Denning). LINCOLN Co., Beverly Beach, Aug 1/69, Goeden (det. Denning).

Biology and Distribution: The records indicate a flight period from July to September. The distribution pattern is curious, with two records on the coast (Curry and Lincoln counties) and the remainder in or east of the Cascades. Fischer (1962) only records *P. halidus* from New Mexico.

***P. variegatus* Banks 1900a.** Type locality: WASHINGTON, Pullman.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66 (ROM). CLATSOP Co., Necanicum Riv., 9 mi W Elsie, July 14/63 (ROM). CURRY Co., Patton Camp, Bald Mt., Siskiyou Nat. For., Aug 6/50, K. M. Fender (det. Jewett). DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., July 1/61 (ROM); Bogus Cr. Cpgrd., 14.4 mi E Idleyld Pk., June 10/68 (pupae) (ROM). LINN Co., Yellowbottom Cpgrd., Quartzville Rd., June 12/68 (ROM).

Distribution: This species is known from British Columbia, Washington, California, and Wyoming (Fischer 1962).

FAMILY HYDROPSYCHIDAE

This is the largest family in the suborder Annulipalpia (Figure 11) and second only to the Limnephilidae amongst the Trichoptera (Lepneva 1964). They are of worldwide distribution and frequently occur in such abundance as to constitute a severe nuisance problem. Eleven genera in four subfamilies are known from America north of Mexico (Wiggins 1977).

The larvae are the most common net-spinners, occurring in all sizes of streams. They are particularly characteristic of large rivers. Nuisance problems, as a result of larvae developing in shallow rapids and the emerging adults being attracted to lights, occur on such rivers as the Mississippi, Niagara, St. Lawrence, and Columbia. Dam construction has sometimes eliminated the problem, for example, at Arlington on the Columbia, by transforming riffle areas to lentic habitats. However, in other areas such as at Keokuk, Iowa, the spillways from dams have become the source of the problem by providing ideal attachment sites and flow conditions for the larvae (Flemling 1960).

The adults are diverse in size and shape but larvae of all genera are uniform in habits and appearance. The combination of rows of bushy abdominal gills and a sclerotized notum on each thoracic segment are

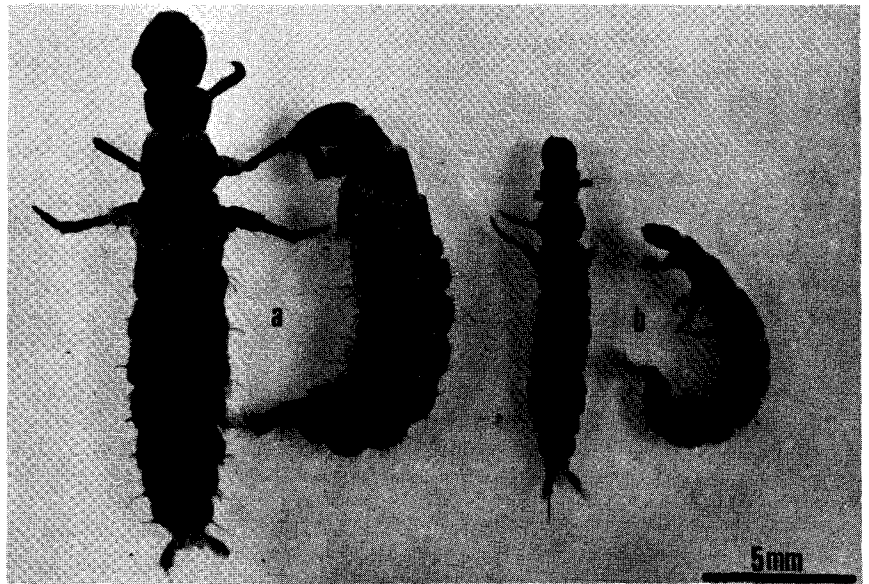


Figure 11. Family Hydropsychoidea, larvae. (a) *Arctopsyche grandis*; (b) *Hydropsyche* sp.

distinctive characters for the larvae of this family. Studies by Wallace (1975a, b) have demonstrated details of net-spinning behavior. The larvae of different genera tend to weave nets with particular mesh size, thus specializing their filtering for a particular particle size. Within this range, the foods include detritus, algae, and small invertebrates.

Subfamily Arctopsychinae

This subfamily contains about 50 species in 2 genera, *Arctopsyche* and *Parapsyche* (Schmid 1968b). Most species occur in Asia; only five are recorded from Oregon. This group is considered to be one of the most primitive of the Hydropsychidae and is sometimes accorded family status (Lepneva 1964, Schmid 1968b). In habitat, the larvae tend to be restricted to cold, rapid streams, and absent from large rivers where other genera of hydropsychids are abundant. The mesh size of arctopsychid nets is the largest in the family (Wallace 1975a); as the particle size of ingested food is large, the diet of this subfamily probably contains a greater component of animal prey than that of other groups.

Arctopsyche McLachlan 1868 (Figure 11a)

This genus contains 17 species with a broad distribution in boreal and montane regions of the northern hemisphere (Wiggins 1977). Of the four species in North America, only *A. grandis* has been recorded from Oregon.

A. grandis (Banks) 1900a. Type locality: SW COLORADO.

This is a common species in Oregon and throughout much of western North America. I have records from the following counties in Oregon: BENTON, CLACKAMAS, CLATSOP, DOUGLAS, HOOD RIVER, JACKSON, JEFFERSON, KLAMATH, LANE, LINN, MARION, POLK, and WALLOWA.

Biology: *A. grandis* is the largest hydropsychid in Oregon. Smith (1968b) gives the length of mature larvae as 20 to 25 millimeters, and pupae as 13 to 18 millimeters. He states that the life cycle requires 2 years, with overwintering occurring most commonly as mature larvae. The larvae are found on rubble in areas of strong current. Data on food habits are given by Mecom (1972) and on capture nets by Wallace (1975a). Pupation occurs in a two-layered case; the inner one is composed of mineral material embedded in silk, over which is a layer of conifer needles or other vegetative material (D. Givens, Central Washington State College, pers. comm.).

The Oregon flight records extend from late March to August, with a peak in May and June.

Parapsyche Betten 1934

Of the seven known North American species, four are recorded from Oregon. Smith (1968b) described the immature stages of *P. almota* Ross and *P. elsis* Milne, the two common Oregon species.

Detailed biological studies of the genus are lacking. The larvae occur in clear, cold streams of mountainous areas. Based on the extended period of occurrence of the larvae, pupae, and adults, Flint (1961b) suggested that *P. apicalis* (Banks) possibly had several generations a year without definite broods. However, Smith (1968b) interpreted the larval collection data for *P. elsis* to indicate a 2-year life cycle.

***P. almota* Ross 1938b.** Type locality: WASHINGTON, WHITMAN CO., Almota.

This species is recorded from the following counties in Oregon: BAKER, BENTON, CLACKAMAS, CLATSOP, CROOK, DESCHUTES, GRANT, HARNEY, JEFFERSON, JOSEPHINE, LINCOLN, MULTNOMAH, POLK, and TILLAMOOK.

Distribution and Biology: Smith (1968b) gives the distribution as western North America, where it is most commonly collected in the coastal ranges. The majority of the Oregon records are from the western counties. Based on Smith's records from Idaho, and the Oregon records, the flight period extends from April to early November. There are very few records from June to August, suggesting a spring and fall flight pattern and a possible ovarial diapause during the summer. Tew (1971) recorded *P. almota* as fairly abundant in a temporary stream near Corvallis in a year when the flow began in mid-October. However, the following year, when surface water first occurred in early November, no larvae were collected from the stream, though adults were caught on sticky traps in late October. In the year that the stream was colonized, Tew found pupae during the latter part of March in rock shelters fastened to the underside of stones. Emergence occurred in April just before, or slightly after, the stream lost surface water.

***P. elsis* Milne 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

This species is widely distributed in western North America, and is the most common *Parapsyche* in Oregon. It is recorded from the following counties: BAKER, BENTON, CLACKAMAS, CLATSOP, CROOK, DESCHUTES, DOUGLAS, GRANT, HOOD RIVER, JACKSON, JOSEPHINE, LANE, LINN, MULTNOMAH, and WALLOWA.

Biology: Smith (1968b) described the immature stages of *P. elsis*. In some respects they seem more closely allied to *Arctopsyche* than to *Parapsyche*. He reports the larval habitat as riffles in small and medium-sized clear streams, sometimes intermixed with populations of *A. grandis*. Overwintering occurs either as young or nearly mature larvae. Pupae

were found in June and July. Smith suggests a 2-year life cycle for *P. elsis*. The Oregon flight period extends from April to September, with most records for adults being in June and July.

***P. spinata* Denning, 1949a.** Type locality: OREGON, LINN CO., House Rock Forest Camp, Aug 3/48, C. P. Alexander.

LANE Co., 1 mi W Blue River, July 17/70, Evans & Wold (det. Denning, & Givens).

Distribution: Denning (1968b) also records this species from Tulare County, California.

***P. turbinata* Schmid 1968b.** Type locality: OREGON, JACKSON CO., Prospect, June 6/65.

BENTON Co., Marys Peak, Chintimini Cr., Apr 14/64 (ROM).
HOOD RIVER Co., Bennett Pass, June 24/65 (allotype, Schmid 1968b).

Distribution: This species is known only from Oregon.

Subfamily Diplectroninae

Of the four genera included in this subfamily by Wiggins (1977), only *Homoplectra* is known from Oregon. The larvae of this group have globose heads, and the gills are more sparsely branched than in other hydropsychids (Wiggins 1977).

Homoplectra Ross 1938b

All eight species of this uncommon genus are restricted to mountainous areas of Oregon and California. The species appear to be local in occurrence and larvae have only recently been described (Wiggins 1977). I have a larva of *Homoplectra* sp. collected in a hillside seep by R. J. Anderson in Linn County, Quartzville Road, Aug 26/73. A trickle of water is an unusual habitat for hydropsychids, and this may explain why larvae of this genus were not discovered until recently. The three species listed below have apparently been collected only in Oregon.

***H. alsea* Ross 1938b.** Type locality: OREGON, BENTON Co., Alsea Mountain, May 3/36, H. A. Scullen.

BENTON Co., Alsea Mtn., May 3/36, Yewer (det. Ross); Marys Peak, Woods Cr., Apr 3/64 (ROM); N Fk. Alsea Riv., May 7/65, Mays & Marsh (det. Denning). LANE Co., Archers Camp, Creswell, J. E. Davis, Mar 29/42 (det. Ross). LINCOLN Co., Tidewater, Apr 21/35, J. Schuh (det. Ross). YAMHILL Co., Peavine Ridge near McMinnville, June 22/51, K. M. Fender (det. ROM).

Biology: All of the above records are from adjacent counties in the Coast Range. *H. alsea* is a spring and early summer species.

***H. luchia* Denning 1966.** Type locality: OREGON, DOUGLAS CO., Loon Lake Road, 18 miles E Reedsport, May 27/64, J. D. Vertrees.

A specimen determined as "*H. nr luchia*" by G. B. Wiggins was collected from LINN Co., Quartzville Rd., 2.5 mi E Rocky Top Rd. Bridge, Mar 29/74, Anderson.

Biology: The habitat of the type was a seepage area on a steep canyon wall above the Umpqua River (Denning 1966).

***H. schuhi* Denning 1965.** Type locality: OREGON, KLAMATH CO., 10 miles SW Keno, near Klamath River, May 16/63, Schuh & Denning.

JACKSON Co., 15 mi W Mt. Ashland, July 13/68, Goeden (det. Denning).

Biology: The habitat of the type series is described as a spring seepage area, which appears to be consistent with the meager habitat data for other species in the genus.

Subfamily Hydropsychinae

There are two genera recorded from Oregon within this very widespread and abundant group: *Cheumatopsyche* and *Hydropsyche*. Though some species have a very local distribution, others occur all across the continent. For example, 3 of the 17 hydropsychine species recorded at lights in the Shadfly study at Montreal (Corbet et al. 1966) also occur in Oregon. Some species exhibit an extreme range of ecological tolerance, occurring in clear streams and also in those with considerable pollution where few or no other caddisflies are found (Ross 1944). Gordon and Wallace (1975) have recently completed an intensive study of the distribution patterns of hydropsychids of the Savannah River. They demonstrated that temperature and oxygen regimes, linked with altitude and stream size, were the major parameters governing the distribution patterns.

Cheumatopsyche Wallengren 1891

This large genus occurs in all continents except South America (Wiggins 1977). In Gordon's (1974) extensive taxonomic treatment of adults, there are 44 species listed for America north of Mexico. The larvae tend to be dominant over *Hydropsyche* in warmer streams (Ross 1959a).

***C. analis* (Banks) 1903.** See *C. pettiti* (Banks) 1908.

***C. campyla* Ross 1938a.** Type locality: ILLINOIS, Kankakee River, Mokence.

This is a very common riverine species, with a geographical distribution throughout the continental United States and Canada (Gordon 1974).

Including Gordon's records, *C. campyla* is known from the following counties: BAKER, BENTON, DESCHUTES, GILLIAM, GRANT, JACKSON, JEFFERSON, JOSEPHINE, KLAMATH, LANE, LINN, MALHEUR, MARION, MORROW, UMATILLA, and UNION.

Biology: The flight period in Oregon is from May to November. In the Savannah River drainage of the southeastern states, Gordon and Wallace (1975) record *C. campyla* as an inhabitant of large streams and small rivers. In Oregon it has been collected from most of the large rivers; records include the Columbia, Deschutes, John Day, Malheur, Owyhee, Rogue, Snake, Umatilla, and Willamette rivers.

Studies by Fremling (1960), on the Mississippi, indicate that this nuisance species is bivoltine. He reared the summer generation from egg to adult in 51 days. Females enter the water to oviposit and may remain submerged for several hours. Fremling found that none lived longer than a day after ovipositing. The larvae construct loose voluminous nets and are most abundant in the tailwaters and other areas where the current is moderated. Ross (1944) states that *C. campyla* larvae are very pollution tolerant.

***C. enonis* Ross 1938a.** Type locality: WYOMING, North Platte River, Parco.

BAKER Co., (Gordon 1975). CROOK Co., Ochoco Mtns., Hwy 26 near summit, July 31/65 (col. & det. Jewett). GRANT Co., John Day, July 20/67 & Aug 17/66, Goeden (det. Denning); John Day Riv. gorge, June 14/57, B. Malkin (det. Jewett, & Gordon), MALHEUR Co., Ontario, Aug 28/65, & Adrian, Sept 2/67, Goeden (det. Denning); Succor Cr., June 15-18/51, B. Malkin (det. Jewett, & Gordon), Snake Riv., near Huntington, June 5/48 (col. & det. Denning as *C. geolca* Denn.).

Distribution: Gordon (1974) records *C. enonis* as a widespread species in the western states, with a flight period from June to August. She synonymized *C. geolca* Denning with *enonis*.

***C. mickeli* Denning 1942.** Type locality: CALIFORNIA, SANTA CLARA Co., Morgan Hill.

DOUGLAS Co., S Umpqua Riv. at mouth of Coffee Cr., S of Kellogg, June 7/68 (ROM). JACKSON Co., Beaver Sulphur Camp, Rogue Riv. Nat. For., Aug 10/50, K. Fender (det. Jewett). JOSEPHINE Co., Grants Pass, Sept 5/68, Goeden (det. Denning).

Distribution: Gordon (1974) records *C. mickeli* from Mexico, California, and Wyoming, so the above records from southwestern Oregon represent a range extension.

***C. mollala* Ross 1941a.** Type locality: OREGON, CLACKAMAS Co., Mollala River, Apr 13/38, S. G. Jewett.

CLACKAMAS Co., Eagle Fern Pk., July 15/61, Jewett (det. ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates, May 29-Sept 2

(col. & det. Jewett). DOUGLAS Co., S Umpqua Riv. at mouth of Coffee Cr., S of Kellogg, June 7/68 (ROM). JOSEPHINE Co., W Fk. Illinois Riv., near Cave Junction, June 7/63, Jewett (det. ROM). LANE Co., Siuslaw Riv., Linslaw Pk., Rt. 126, June 23/66 (pupae), J. Bedea (det. ROM).

Distribution and Biology: Outside of Oregon, *C. mollala* is known only from Idaho (Gordon 1974). It was one of the dominant species in collections by S. G. Jewett near Elsie, Clatsop County. At this site, *C. mollala* adults occurred from late May to early September, with no apparent peak. From records of 511 specimens, there were 283 males and 228 females, suggesting that the sex ratio of adults collected at light-traps is near unity.

***C. pasella* Ross 1941a.** Type locality: KENTUCKY, Pinewood.

Gordon (1974) lists a single Oregon record: DESCHUTES Co., Redmond, July.

Distribution and Biology: Gordon (1974) records *C. pasella* as occurring throughout the continental United States, except in the southwest. In the Savannah River study, the major habitat of *C. pasella* larvae was fallen branches and tree limbs in small to large rivers (Gordon & Wallace 1975).

***C. pettiti* (Banks) 1908.** Type locality: MICHIGAN, Agricultural College.

Gordon (1974) designated *C. analis* (Banks) 1903 as a *nomina dubia* because the damaged holotype was unrecognizable. She resurrected *C. pettiti* as a valid species, so all of the distribution records for *C. analis* are listed here under *pettiti*.

BENTON Co., Oak Cr., May 22/34, E. Ball (det. Denning); Muddy Cr., Corvallis, May 15/48, V. Roth (det. Denning). GRANT Co., 10 mi S John Day, July 22/35, J. Schuh (det. Ross); John Day, Aug 17/66, Goeden (det. Denning). HARNEY Co., Burns, Aug 17/66, Goeden (det. Denning); Roaring Springs Ranch, 15 mi S Frenchglen, May 19/56, E. R. Turner (det. Denning), & Apr 22/50, Fender & Jewett (det. Jewett). JOSEPHINE Co., Grants Pass, May 24/64, Goeden (det. Denning). LANE Co., Fern Ridge Reservoir, Sept 4/46, Jewett (det. Ross). MARION Co., Woodburn, July 1/65, E. R. Larson (det. Denning), June 6/67, Goeden (det. Denning); Aumsville, June & August (Gordon 1974).

Distribution and Biology: Ross (1944) indicates that this species ranges from the Atlantic to the Pacific. It is one of the three species of caddisflies known from Hawaii (Denning & Beardsley 1967). It shows a preference for small streams, but also occurs in large rivers. Gordon and Wallace (1975) classify *C. pettiti* as an inhabitant of streams to large rivers. It is a pollution-tolerant species (Ross 1944). The adults that

emerge early are dark colored and successively lighter-colored forms are collected as the season becomes warmer.

C. wabasha Denning 1947. Type locality: MINNESOTA, Wabasha.

Gordon (1974) states that this species is known only from Minnesota and Oregon. Her record for the latter is DESCHUTES Co., Redmond, July.

***Hydropsyche* Pictet 1834 (Figure 11b)**

This is a very large genus with about 70 North American species and a broad global distribution, though absent from South America (Wiggins 1977). The larvae occur in practically all kinds of permanent streams, with some found abundantly in large rivers and other restricted to spring-fed brooks (Ross 1944). *Hydropsyche* and *Cheumatopsyche* are the dominant types of nuisance caddisflies. The records listed below are based almost entirely on adult collections and thus give only limited information on the habitats of the larvae of different species.

H. abella Denning 1952. Type locality: OREGON, LAKE Co., 2.5 miles up Warner Canyon from Route 395, N Lakeview, July 16/50, H. B. Leech.

This species is only known from Oregon. My other record is also from LAKE Co.: Lakeview, Aug 1/68, Goeden (det. Denning).

H. amblis Ross 1938b. Type locality: OREGON, BENTON Co., Corvallis, June 6/35, G. Ferguson.

BENTON Co., emergence traps, Oak Cr. near Corvallis, May-July (Anderson & Wold 1972); Berry Cr., 9 mi N Corvallis, May 31/64 & Aug 15/63, R. K. Eppley (det. Smith). CLATSOP Co., Humbug Cr., July 21/48 (col. & det. Jewett). COLUMBIA Co., Clatskanie, May 9/36, Gray & Schuh (det. Ross).

Biology and Distribution: The 40 specimens in emergence traps from Oak Creek were collected from the headwater region downstream to an area where low summer flow is about 0.1 cfs, which suggests that *H. amblis* is a small-stream species. Ross and Spencer (1952) recorded this species from British Columbia.

H. bicornuta Denning 1965a. Type locality: OREGON, KLAMATH Co., seepage area along Klamath River, May 16/63, D. G. Denning.

JOSEPHINE Co., Grants Pass, May 24/67, Goeden (det. Denning).

Distribution: The paratype series included specimens from El Dorado County, California.

***H. californica* Banks 1899.** Type locality: CALIFORNIA, Tehama.

This is a common species in Oregon, with flight records from May to October in the following counties: BENTON, CLATSOP, CURRY, GILLIAM, HARNEY, JEFFERSON, JOSEPHINE, KLAMATH, LINN, MALHEUR, MARION, MORROW, UMATILLA, and WASCO.

Distribution: *H. californica* is recorded from Minnesota and Utah westward to the Pacific (Fischer 1963).

***H. centra* Ross 1938a.** Type locality: WASHINGTON, Centralia.

This is another relatively common species in Oregon, with records from BENTON, CLACKAMAS, COLUMBIA, DESCHUTES, DOUGLAS, JEFFERSON, LAKE, LANE, LINCOLN, LINN, MARION, and WASCO counties. The flight period extends from late April to late September, with most records in May and June.

Distribution: *H. centra* is recorded from British Columbia, Washington, and Oregon (Fischer 1963).

***H. cockerelli* Banks 1905.** Type locality: NEW MEXICO, Pecos.

This is another abundant and widespread species in Oregon. County records include: BAKER, BENTON, CLATSOP, CROOK, GILLIAM, GRANT, JOSEPHINE, MALHEUR, MORROW, UMATILLA, WALLOWA, and WHEELER counties. Adults were collected from February to October.

Distribution and Biology: In Fischer's catalogue (1963), *H. cockerelli* is recorded from California, New Mexico, Colorado, and Utah. Newell and Potter (1973) give a Montana record. The majority of the Oregon records are from east of the Cascades near large rivers such as the Columbia, John Day, and Malheur. This is one of the complex of hydropsychids that contributed to the shadfly nuisance problems at Columbia River towns, such as Arlington, before the river was impounded.

Collections by S. G. Jewett on the Nehalem River, near Elsie, Clatsop County, indicates that *H. cockerelli* is a common species in that area. The peak flight period, based on about 600 specimens collected at lights, was during August and September.

***H. occidentalis* Banks 1900a.** Type locality: WASHINGTON, Pullman.

County records for this species include: BAKER, BENTON, CLATSOP, CROOK, DESCHUTES, DOUGLAS, GRANT, HARNEY, JEFFERSON, JOSEPHINE, LAKE, LANE, LINCOLN, LINN, MALHEUR, MARION, UMATILLA, and UNION. Adults have been collected from mid-May to mid-September.

Distribution and Biology: Ross and Spencer (1952) record *H. occidentalis* as a widespread western montane species. This was the dominant caddisfly implicated as a pest that reduced flow in a water conduit in the Sierra Nevada Mountains (Simmons et al. 1942). Where the popu-

lation was about 300 per square foot, the larval shelters and nets impeded flow to the extent that the conduits had to be shut down for cleaning.

***H. oslari* Banks 1905.** Type locality: SW COLORADO.

This is another abundant and widespread western species. Oregon records are from the following counties: BAKER, BENTON, CLATSOP, CROOK, DESCHUTES, DOUGLAS, GRANT, HARNEY, JEFFERSON, JOSEPHINE, LAKE, LANE, LINCOLN, LINN, UMATILLA, UNION, WALLOWA, and WASCO. The flight period extends from mid-June to mid-September, with most records in July and August.

Distribution: Many of the collection records are from mountain regions, including the Blue, Ochoco, and Strawberry mountains, the Cascades, and the Coast Range. Pupae are recorded from small and medium-sized streams. The geographical range recorded by Fischer (1963) is from British Columbia to California and east to Utah and New Mexico.

***H. recurvata* Banks 1914.** Type locality: ONTARIO, Split Rock, Go Home Bay.

GRANT Co., John Day, Aug 17/66, Goeden (det. Denning). Another record, determined by Denning as this species, though not typical, is UMATILLA Co., Pendleton, June 14/67, Goeden.

Distribution: Ross (1944) gives the distribution as in swift, cold rivers from Saskatchewan and Minnesota east to Quebec and New York.

***H. winema* Denning 1965a.** Type locality: OREGON, KLAMATH Co., Little Deschutes River near Crescent, Aug 30/54, D. G. Denning.

BAKER Co., N Powder Riv., 6 mi W of North Powder, July 13/64 (pupae), Anderson (det. Givens). HARNEY Co., Burns, July 28/67 (det. Denning). KLAMATH Co., Klamath Falls, June 16/52, V. Roth (det. ROM). LAKE Co., Summer Lake, Aug 2/66, & Lakeview, Aug 14/66, both Goeden (det. Denning).

Distribution: To date, *H. winema* has been recorded only from Oregon.

FAMILY PHRYGANEIDAE

Wiggins (1960, 1962) provided detailed studies of the immature stages of the phryganeid genera in North America. He records 27 species from the northern and montane areas of the continent. They occur in a variety of lentic and lotic habitats but, unlike some of the Limnephilidae, they are largely restricted to permanent waters.

Wiggins (1962) and Ross (1967) believe that the Phryganeidae are the most primitive family of the limnephilid line of the suborder Integripalpia. Wiggins bases his contention of their primitive nature on the



Figure 12. Family Phryganeidae, larva and cases. (a) *Ptilostomis* sp. case, illustrating ring-type case; (b) *Banksiola crotchi*, larva and case, illustrating spiral-type case; (c) *Yphria californica* case.

morphology and behavior of the larvae. The suberuciform larvae (Figure 12b) are intermediate between the free-living compodeiform larvae of the Rhyacophilidae and the eruciform larvae of the advanced tube-case-making groups. Phryganeid larvae are active and abandon their cases after only minor provocation, which Wiggins contrasts with the lethargic wormlike larvae of most of the case-making families.

The case is usually constructed of plant material fastened together to make a smooth cylinder. These are of two distinct types: in one, the larvae construct a spiral case composed of a single band of pieces placed side by side (Figure 12b); in the other, the case is composed of a series of separate rings, with these joined similar to several lengths of stove pipe (Figure 12a). Merrill (1965) conducted interesting experiments on their case-making behavior that demonstrated the mechanism of "measuring" to determine case-length. By removal of the anal prolegs and posterior sensory setae, she obtained cases several times their normal length—in extreme instances, up to 9 inches long.

Though several species of phryganeids are recorded from Oregon, none is common. All species are relatively large and thus would not be expected to be overlooked if they were abundant. In addition, Wiggins has collected extensively in Oregon without obtaining large series of many phryganeids.

Subfamily Yphriinae

There is only one species in this subfamily, *Yphria californica* (Banks). This was described as a phryganeid, but later was assigned to the family Kitagamiidae by Wiggins (1956) on the basis of adult characters. However, Wiggins (1962) erected a subfamily of the Phryganeidae for this unusual and very primitive species when the larva was associated. In the adult stage, this subfamily has five-segmented maxillary palpi in both sexes, whereas the Phryganeinae have four-segmented maxillary palpi in males and five in females. The larvae of Yphriinae have large sclerotized plates on the mesonotum that are absent in the Phryganeinae.

Yphria Milne 1934 (Figure 12c)

Y. californica (Banks) 1907. Type locality: CALIFORNIA.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., June 17/67 (col. & det. Jewett). DESCHUTES Co., Indian Ford Cr., 6 mi W Sisters, Apr 23/64 (larvae) (ROM). DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., July 2-3/61 (Wiggins 1962). JACKSON Co., Prospect (Wiggins 1962). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman (Anderson 1967).

Biology and Distribution: Wiggins (1962) has suggested that this is possibly the most primitive living species of the tube-case-making caddisflies. They have been recorded only from California and Oregon in the Sierra Nevadas, Siskiyou, and Cascades. The larval habitat in California was only in pools of small, cool streams between 5000 and 6000 feet. In Oregon, the altitudinal records are somewhat lower, but still from mountain streams. I collected larvae from backwaters of the Metolius River, which is spring-fed, but this record extends the habitat type considerably.

Wiggins (1962) described the larval case as cylindrical, composed of small pebbles, bark, and twigs arranged irregularly, without a trace of the spiral or ring-type of architecture that is characteristic of other phryganeids (Figure 12c). The mature larva is about 18 millimeters long. The pupal case is quite different: a long (35 mm), slender cylinder composed almost entirely of mineral material, with a rock-covered bulbous silken sack at the posterior end. The only egg mass collected by Wiggins was fastened to a twig below water. It was a spherical mass of clear jelly containing conspicuous light-blue eggs.

Subfamily Phryganeinae *Agrypnia* Curtis 1835b

Of the nine known species in North America, two have been recorded in Oregon, *A. improba* (Hagen) and *A. vestita* (Walker). The larvae of

both species are described by Wiggins (1960). They construct cases of the spiral type and live in ponds, lakes, and slow-flowing rivers and streams.

A. improba (Hagen) 1873. Type locality: SASKATCHEWAN.

The only Oregon record is LANE Co., Craig Lake, McKenzie Pass, June 20 & 29/34, J. Schuh (det. Milne, Denning, & ROM).

Distribution: Wiggins (1960) gives the distribution as widespread in northern North America, from British Columbia to Newfoundland and south to North Carolina.

A. vestita (Walker) 1852. Type locality: GEORGIA.

CLATSOP Co., Astoria, Aug 29/69 & Sept 16/68 (Denning 1971); Warrenton, Sept 1/70, Brown & Goeden (det. Denning).

Distribution: Wiggins (1960) recorded this species as restricted to the eastern half of North America, extending from North Dakota to Maine and south to Alabama. Denning's records from Oregon extend this to make it a transcontinental species. Ross (1944) and Wiggins (1960) have described the larvae.

***Banksiola* Martynov 1924a (Figure 12b)**

Of the five species in this Nearctic genus, only *B. crotchi* Banks is transcontinental and occurs in Oregon. Larvae of the three known species construct cases of the spiral type, and pupae do not have the typical blade-like mandibles that are characteristic of most caddisflies (Wiggins 1960).

B. crotchi Banks 1944. Type locality: BRITISH COLUMBIA.

CLATSOP Co., Astoria, Aug 6/68, Goeden, & Warrenton, July 27/68, R. Brown (both det. Denning). DESCHUTES Co., Sparks Lake, July 24/69, Goeden (det. Denning). LANE Co., Scott Lake, Three Sisters Mtns., 4650 ft, July 12/36, R. E. Rieder (det. ROM).

Biology: Wiggins (1960) states that the larvae occur in a variety of habitats including lakes, ponds, slow-flowing rivers, and sluggish, rather warm streams. Mature larvae are about 20 millimeters long. Winterbourn (1971b) conducted a detailed life-history study of *B. crotchi* in Marion Lake, in southwestern British Columbia. Eggs were laid in the fall on submerged vegetation. The larvae exhibited rapid growth in fall and spring and adults occurred from July to September. Early-instar larvae fed on filamentous green algae, but fourth-instar larvae were partially predacious and the final instar almost exclusively so. The prey included chironomids, heleids, mayflies, and cladocerans. Winterbourn suggests that the change to a predatory mode of life is obligatory to permit the rapid increase in weight required before pupation. The final stadium

lasts 1 to 2 months; because of the low efficiency with which the larvae digest algae, Winterbourn believes that it would be a physical impossibility to ingest sufficient algae in that time.

Phryganea Linnaeus 1758

There are two species of this genus in North America. Wiggins (1960) has associated larvae of both species but found no structural characters to distinguish them. However, *P. sayi* Milne is restricted to the east-central states whereas *P. cinerea* Walker is more northern and transcontinental in distribution, extending into the western montane areas.

Larvae of *Phryganea* live in lakes, ponds, and rivers. The larval case is a spiral of plant material which may be either dextral or sinistral. The mature larvae attain a length of about 40 millimeters (Wiggins 1960).

P. cinerea Walker 1852. Type locality: CANADA.

The only Oregon record for this species is KLAMATH Co., Pelican Marina, Klamath Falls, July 25/65, C. Hazel (det. ROM).

Ptilostomis Kolenati 1859 (Figure 12a)

The genus contains four species and is confined to North America (Wiggins 1960). Though two species, *ocellifera* (Walker) and *semifaciata* (Say), are transcontinental in distribution, only the former has been recorded from Oregon.

P. ocellifera (Walker) 1852. Type locality: Unknown.

BENTON Co., Corvallis, May 25/33 (det. Ross), June 8/50, V. Roth (det. Jewett), June 23/59, S. Furst, & July 3/61, F. Hasbrouck; Summit, June 12/49, R. Rosenstiel (det. Denning); Berry Cr., 9 mi N Corvallis, July 23-26/68, E. D. Evans (det. Denning). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Aug 10/68 (col. & det. Jewett); Astoria, Aug 6/68, Goeden (det. Denning). JACKSON Co., Medford, May 19/54, G. W. Bishop (det. Denning). JOSEPHINE Co., Grants Pass, 1966, Goeden (det. Denning). LANE Co., Triangle Lake, May 5/52, B. Malkin (det. Jewett); Junction City, 1907 (det. Betten); Eugene, May 23-31/46, B. Malkin (det. Denning). LINN Co., 3.5 mi E Crabtree, July 5/68, E. D. Evans (det. ROM). YAMHILL Co., McMinnville, June 7-8/48, & Peavine Ridge near McMinnville, July 3/32, K. M. Fender (det. ROM).

Biology and Distribution: The larvae of *P. ocellifera* were described by Wiggins (1960). They live in cool waters, often streams or spring pools. The cases are of the ring type, and the pupae have semimembranous mandibles. The mature larvae are about 25 millimeters long. *P. ocellifera* is apparently the most common phryganeid in Oregon. Though it is a transcontinental species, all of the Oregon records are in the western counties. The flight period ranges from May to August.

FAMILY LIMNEPHILIDAE

This is the dominant family of Trichoptera in the northern hemisphere (Wiggins 1973c). Adults range in size from small to large (6-30 mm in length), with most species being moderately large and robust. Larvae construct cases of a wide variety of shapes and materials (Figures 13-18). They occur in an extreme range of habitats, including lakes, ponds, marshes, streams, seeps, temporary ponds and streams, and damp terrestrial sites. Eggs are deposited either in, or near, water. Wiggins (1973a) has suggested that evolution of adaptations permitting oviposition away from water has led to new niches for this family, stimulating adaptive radiation. The Oregon fauna, with 35 genera and about 90 species, is particularly interesting because it includes many of the obscure genera that are restricted to damp areas or small, cool streams in mountainous regions. The habitats of several of these species have recently been identified by ROM field parties on Mt. Hood in the Cascades, or on Marys Peak in the Coast Range (Wiggins 1973b,c).

The arrangements of subfamilies and genera follows that of Schmid (1955), which has a phylogenetic basis. However, the Georinae are included as a subfamily, rather than a family, and changes have been made where more recent evidence from the immature stages has clarified the generic relationships (Flint 1960, Wiggins 1973b,c).

Subfamily Dicosmoecinae

Schmid (1955) considers this group to be primitive and on the central stem of evolution of the Limnephilidae. They are largely restricted to eastern and central Asia, North America, and the Cordillera of South America. It is the only subfamily of limnephilid caddisflies in South America.

Though most dicosmoecines occur in cool, lentic habitats, the genus *Ironoquia* in eastern North America and *Magellomyia* in Chile are adapted to temporary pools (Wiggins 1973a). This subfamily is well represented in Oregon, with eight of the nine North American genera occurring here.

Dicosmoecus McLachlan 1875 (Figure 13a)

Flint (1966) revised the genus but suggested that the taxonomic situation among the North American species was still rather confusing even after studying the types and much additional material. In the males he recognized "5 genitalic kinds, which are being considered species . . ." Four of these five species are recorded from Oregon. *D. jucundus* Banks 1943, which was synonymized with *D. atripes* by Flint (1966) but considered by Nimmo (1971) to be distinct, is also recorded from Oregon.

Adults of *Dicosmoecus* are mostly large, dark, strong-flying caddisflies that emerge in the fall. The larvae are frequently abundant in medium and large fast streams. The slightly flattened stone cases are most conspicuous during the summer when aestivating prepupae occur as aggregations attached to the underside of stones. Observations by Wiggins (1973a) indicate that eggs are attached on substrates either wholly or partly submerged.

***D. atripes* (Hagen) 1875.** Type locality: COLORADO, Colorado mountains.

BENTON Co., Oak Cr., 5 mi NW Corvallis, Oct 20/67, E. D. Evans (det. Denning). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66, Salmon Riv. Cpgrd., June 8/69 (larvae), & Tollgate Cpgrd., Zigzag Riv., June 14/67 (larvae) (ROM). CLATSOP Co., Osweg Cr., 2 mi E Elsie, Oct 11/67 (col. & det. Jewett). CROOK Co., Canyon Cr., 2 mi E Ochoco R. S., July 27/63 (larvae), Anderson (det. ROM). DESCHUTES Co., Sparks Lake, July 24/69, Goeden, & Todd Lake, Aug 10/69, R. Brown (det. Denning). GRANT Co., Strawberry Mtn., Aug 20/68, Goeden (det. Denning). HARNEY Co., Burns, Sept 20/67, Goeden (det. Denning). JEFFERSON Co., Riverside F. C., Metolius Riv., 1 mi S Camp Sherman, May 31/68, June 16-17/67, June 18/68, & Sept 19-23/66 (ROM).

Distribution and Biology: The Oregon collection records are mostly from mountainous regions, extending from the Coast and Cascade ranges and to eastern Oregon. On the Metolius River the flight season extended throughout the summer, whereas other records are restricted from late July to September. The geographical distribution extends from Alaska (Wiggins 1973a) to California and New Mexico (Nimmo 1971).

***D. frontalis* (Banks) 1943.** Type locality: BRITISH COLUMBIA, Terrace, Thornhill Mountain.

BENTON Co., Marys Peak, N Fk. Rock Cr., Aug 3/64 (pupa), Anderson; jct. Marys Peak Rd. & Rt. 34, Apr 10/64 (larvae), Wold; Marys Peak Cpgrd., Parker Cr., June 14/68 (pupae, emerged July 12-27/68), Anderson (all det. ROM); Chintimini Cr., Sept. 25/66 (larvae) (ROM); same, June 24/64, D. L. Mays, & Apr 22/73 (larvae, emerged May 26/73), Anderson (det. ROM); Philomath, spring run entering Woods Cr., Apr 24/64 (larvae, emerged July 5/64) (ROM). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66 (larvae) (ROM); near Timberline Lodge & Government Camp, Apr 27/64, June 10-11/67 and Sept. 28-29/66 (larvae) (ROM). LANE Co., Frog Camp F. C., Rt. 242, W Sisters, June 11/68 (pupae, emerged June 21-Aug 13/68) (ROM).

Distribution and Biology: Most of the material in the ROM collection is associated adults from reared larvae or pupae. *D. frontalis* is unlike other species of *Dicosmoecus* in that it constructs its case from pieces of wood rather than small stones or gravel (Wiggins 1975). The larvae

occur in smaller streams than do most *Dicosmoecus*. *D. frontalis* is known from British Columbia, Washington, and Oregon (Flint 1970).

***D. gilvipes* (Hagen) 1875.** Type locality: BRITISH COLUMBIA, Quesnel Lake.

Flint (1966) believes that *D. grandis* Ulmer, which was recorded from Oregon by Schmid (1955), is a synonym, as all males determined by Banks are *gilvipes*. As this is the most abundant *Dicosmoecus* species in the state, the comments under the generic heading largely refer to *D. gilvipes*.

D. gilvipes is very common, with records available from BENTON, CLACKAMAS, CLATSOP, GRANT, JEFFERSON, KLAMATH, LINCOLN, LANE, LINN, MARION, UMATILLA, UNION, and WASCO counties. The adult records are from September to mid-November, except for the Metolius River, where adults have been collected from June 27 to October 4. Large series of associated larvae, pupae, and adults are in the ROM collection.

Distribution: The geographical range given by Schmid (1955) is British Columbia to California, and east to Idaho and Nevada.

***D. jucundus* Banks 1943.** Type locality: CALIFORNIA, MODOC Co.

The only records for Oregon are from the series studied by Banks (1943): GRANT Co., Strawberry Cr., Strawberry Mtn., Aug 20. HARNEY Co., Wildhorse Canyon, Steens Mtn., Sept 1.

Distribution and Biology: Nimmo gives the geographic range as from California to Alberta and British Columbia, and the larval habitat as small to large, smoothly flowing, pebbled streams and rivers.

Note: Flint (1966) considered *D. jucundus* to be a synonym of *D. atripes*, but Nimmo (1971) provides genitalic differences to distinguish them.

***D. palatus* (McLachlan) 1872.** Type locality: SIBERIA.

A single male of the species has been recorded in Oregon: LINCOLN Co., Newport, June 21/69, R. Brown (det. Denning).

Distribution: This species is widely distributed in Siberia (Fischer 1967). Flint (1966) synonymized *D. obscuripennis* Banks from Alaska with *D. palatus*, which established the distribution as both Asian and North American.

***Allocosmoecus* Banks 1943**

This monotypic genus has an apparently limited distribution in the northwest states, as the only records are from Idaho and Oregon. Schmid (1955) placed *Allocosmoecus* within the *Dicosmoecinae* but he was uncertain of its relationship to other genera. Flint (1966) stated that

they bore a striking superficial resemblance to the larger species of *Dicosmoecus*. The larvae are also similar to *Dicosmoecus*, both in morphology and in construction of a large, slightly flattened stone case. *Allocosmoecus* larvae can be distinguished from *Dicosmoecus* by the scale-hairs on the anterior margin of the prothorax and dorsum of the head (Wiggins 1977).

A. *partitus* Banks 1943. Type locality: IDAHO, Wallace.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept. 28-29/66, & Tollgate Cpgd., Zigzag Riv., June 14/67 (larvae) (ROM). CLATSOP Co., Grønnel Rd., 2 mi E Elsie, many dates, Oct 7-Nov 13/67, Jewett (det. ROM). HOOD RIVER Co., 8 mi SW Hood River, Oct 25/68, Goeden (det. Denning). JACKSON Co., 5 mi N Butte Falls, Oct 18/68, Goeden (det. Denning). JEFFERSON Co., Riverside F. C., Metolius Riv., 1 mi S Camp Sherman, Sept/66 (ROM). LANE Co., emergence traps, Mack Cr., Andrews For., 11 mi NE Blue River, Sept 11-20/72, E. Grafius (det. Denning). LINCOLN Co., Trenholm Saddle Rd., 8 mi E Tidewater, June/68 & 69 (larvae), & Sept 24-Oct 13/66 (larvae, pupae, and adults) (ROM).

Biology and Distribution: Though this large grey-black species had only been reported from the holotype male in Idaho, *A. partitus* is common in several areas of Oregon, and I have a record from northern California. In the Coast Range, S. G. Jewett provided many records from light-trap collections in Clatsop County, and ROM field parties collected several half-pint jars of larvae and pupae in Lincoln County. At the Mack Creek site in the Cascade Range in Lane County, the species was a dominant component of the caddisfly biomass. They were most common in a clear-cut area where the larvae grazed the periphyton on large rubble in a cascade-type stream. During July and August they aestivate as prepupae, often in aggregates, on the underside of stones. The emergence period extends from September to early November with a peak during October.

***Onocosmoecus* Banks 1943 (Figure 13b)**

This taxon was elevated from a subgenus of *Dicosmoecus* by Schmid (1955). He included eight species: one from Kamchatka, six from western North America and one from the northeast. Flint (1960) described the larvae, which differ from those of *Dicosmoecus* by the pale stripe on head and thorax and in making their case of plant material. Flint (1960) and Wiggins (pers. comm.) feel that the current species identifications are unreliable as the genus requires revision.

Most Oregon records have been listed under *O. unicolor* (Banks) 1897 (type locality: WASHINGTON, Skokomish Riv.), but *O. coloradensis* (Ulmer) 1905 (type locality: COLORADO) is reported from Oregon by

Banks (1948), and *O. occidentis* (Banks) 1943 (type locality: IDAHO, Wallace) is listed as a widespread western montane species by Ross and Spencer (1952).

Because the specific identifications are unreliable, the following county records for Oregon are for the genus *Onocosmoecus*: BAKER, BENTON, CLATSOP, DESCHUTES, GRANT, HARNEY, JEFFERSON, KLAMATH, LANE, LINN, UMATILLA, WALLOWA, and WASCO.

Biology: Larvae of *Onocosmoecus* are relatively common in the foothill and coastal streams of western Oregon. Nimmo (1971) states that the larvae of *O. unicolor* inhabit streams ranging from small to large rivers with no apparent preference as to the nature of the bottom. He suggests that the larvae might also inhabit lakes. Winterbourn (1971a) included *Onocosmoecus* sp. as a "species inhabiting submerged and marginal vegetation and open sediment . . ." in his studies at Marion Lake, British Columbia. At this site, eggs were laid during September on submerged logs and plants, overwintering occurred as instars III and IV, and final instars were present in large numbers in May and June. Winterbourn noted a curious phenomenon of recolonization by drifting; in the spring, hundreds of larvae were seen drifting either singly or in masses attached to debris. They appeared to have air trapped in their cases and were unable to regain a firm hold on the substrate. All adults collected by

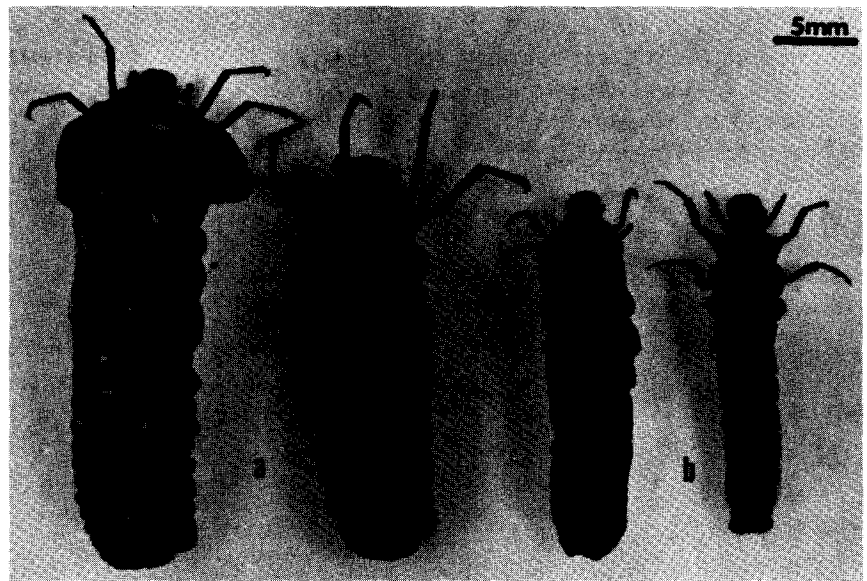


Figure 13. Family Limnephilidae, Subfamily Dicosmoecinae, larvae and cases. (a) *Dicosmoecus* sp.; (b) *Onocosmoecus* sp.

Winterbourn were attracted to lights during the oviposition period in the fall. The Oregon records also indicate that *Onocosmoecus* are abundant in fall light-trap collections. Nimmo (1971) records the flight period as early May to late September, peaking in August.

***Cryptochia* Ross 1950b**

This genus of small limnephilids is restricted to the western states. Six species are described; two of these are recorded from Oregon. The larva was described as *Dicosmoecinae* 1 by Flint (1960). Wiggins (1975) associated the larvae of this genus and demonstrated that Flint's specimens were referable to *Cryptochia*. Wiggins indicates that the larvae have been collected in many localities in western North America, consistently in small, cool streams. I examined the ROM collection for records of the genus from Oregon. Habitats included seepage areas, spring runs, and small creeks. Larvae of this genus were collected from the following counties: BENTON, CLACKAMAS, CLATSOP, DESCHUTES, DOUGLAS, GRANT, KLAMATH, LANE, LINN, MULTNOMAH, and TILLAMOOK.

Cryptochia larvae are characterized by the unusual ruff of hairs on the thorax and posterior of the head. The case is made of small pieces of wood, laid crosswise.

***C. neosa* Denning 1954a.** Type locality: OREGON, GRANT Co., Lunch Creek, Dixie Pass, 5100 feet, June 21/52, B. Malkin.

Distribution: Denning (1964a) indicated that this species was still known only from the type locality.

***C. pilosa* (Banks) 1907.** Type locality: WASHINGTON, Olympia.

BENTON Co., Marys Peak, Parker Cr., above falls, June 4/68 (ROM). DOUGLAS Co., Diamond Lake Cprd., Porcupine Cr., June 9/68 (pupae, emerged June 21-July 17/68) (ROM).

Distribution: This species has a relatively wide distribution, being recorded from Oregon, Washington, Idaho, and British Columbia (Denning 1964a).

***Pedomoecus* Ross 1947**

This monotypic genus is known from the Sierra Nevadas of California and north to Washington (Schmid 1955). Flint (1960) described the larvae; they are readily recognized by seven pair of stout setae on the head that are borne on tubercles.

Oregon records for the single known species are listed below. All of these collections are from the Cascade Range.

***P. sierra* Ross 1947.** Type locality: CALIFORNIA, MONO Co., Convict Creek.

DESCHUTES Co., 3 mi S Lava Lake, July 24/69, Goeden (det. Denning). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, June 16-17/67, June 18/68, Aug 16/64, Sept 19-23/66, Anderson & ROM. LANE Co., Limberlost Cpgrd., Rt. 242, W Sisters, June 10/68 (ROM).

***Amphicosmoecus* Schmid 1955**

***A. canax* (Ross) 1947.** Type locality: UTAH, Logan Canyon.

This is the only described species in the genus. It has been recorded from Alberta and British Columbia south to Utah and California (Nimmo 1971). Newell and Potter (1973) give records from Montana, and Wiggins (1977) from Saskatchewan.

Adults of *A. canax* have not been recorded from Oregon, but larvae associated with this genus in ROM field work have been collected in KLAMATH Co., Crooked Cr., Rt. 62, S of Fort Klamath, June 8/68. Another larval collection is: HARNEY Co., Big Indian Cr., Steens Mtn., 5500 ft, July 17/73, Anderson (det. ROM).

Biology: Nimmo (1971) notes that in Alberta, *A. canax* larvae inhabit a variety of streams from quiet brooks to large rivers and turbulent mountain streams. The flight period in Alberta extends from mid-September to late October. The larval case of *Amphicosmoecus* is either a hollowed twig with a ring of bark pieces at the anterior end or an entire case made of small wood fragments (Wiggins 1977).

***Ecclisocosmoecus* Schmid 1964**

Schmid (1964) erected this genus on the basis of a single specimen of *E. spinosus* from Sakhalin. Wiggins (1975) transferred *Ecclisomyia scylla* Milne to *Ecclisocosmoecus*, thus adding another genus to the North American fauna.

***E. scylla* (Milne) 1935.** Type locality: BRITISH COLUMBIA, Cultus Lake.

CLACKAMAS Co., Mt. Hood, stream 3.3 mi below Timberline Lodge, June 19/68 (pupae, emerged June 28-Aug 14/68); same, Sept 28-29/68 (pupae); also other sites on Mt. Hood (ROM); trib. Salmon Riv., June 17/67 (col. & det. Jewett). DESCHUTES Co., Todd Lake, near Deschutes City, Aug 10/69, R. Brown, Sparks Lake, July 24/69, Goeden & Brown, creek near Wickiup Reservoir, Aug 10/69, J. Wold (all det. Denning). DOUGLAS Co., small creek crossing Rt. 138, E Clearwater, June 9/68 (larvae) (ROM). HOOD RIVER Co., Mt. Hood near Bennett Pass, July 1/68, Anderson (det. ROM). KLAMATH Co., Annie Cr., Crater Lake Nat. Park, Oct 1/66 (larvae) (ROM). LANE Co., Lookout Cr., 10 mi NE Blue River, June 13/72 (larva), Anderson (det. ROM). LINCOLN Co., Flynn Cr., 10 mi S Toledo, Aug 8/73 (larvae), Anderson (det. ROM).

Biology and Distribution: Wiggins (1975) indicates that *E. scylla* ranges from British Columbia to Oregon. The larvae, which are not similar to those of *Ecclisomyia*, occur in small, cool streams.

***Ecclisomyia* Banks 1907**

This genus occurs only in eastern Asia and western North America. Schmid (1955) placed *E. simulata* Banks as a junior synonym of *E. maculosa*, and Wiggins (1975) transferred *scylla* Milne to *Ecclisocosmoecus*. Thus there are now only five species in the genus, two of which occur in Oregon. Ross (1950b) suggested that the distribution patterns of the species could be distinctive; however, as is indicated by the Oregon records, the species coexist at various locations. The larvae occur in clear, cold mountain streams (Ross 1950b, Nimmo 1971). They commonly use conifer needles for case construction and switch to mineral material during the final instar.

***E. conspersa* Banks 1907.** Type locality: WASHINGTON, Olympia.

BAKER Co., Richland, July 11/60, J. G. Baker (det. Jewett, & ROM). CLACKAMAS Co., Rogue Riv. at Foster Cr., June 17/49 (col. & det. Jewett). DESCHUTES Co., Sparks Lake, July 24/64, Goeden (det. Denning); Spring Riv., Aug 11/48 (col. & det. Jewett). DOUGLAS Co., 43 mi E Idleyld Pk., June 9/68 (ROM). GRANT Co., Strawberry Mtn., Strawberry Camp, 5700 ft, July 18-19/36, Rieder & Scullen (det. Ross); Rt. 27, near Dons Cr. Rd., May 31/70, Evans & Tew (det. Denning). JEFFERSON Co., springs of Metolius Riv., May 21-27/50 (col. & det. Jewett), & Apr 25/64 (ROM). KLAMATH Co., Crooked Cr., Rt. 62, S Fort Klamath, June 8/68, & Annie Cr., Crater Lake Nat. Pk., Oct 1/68 (ROM); Williamson Riv., Collier St. Pk., near Chiloquin, May 12/50 (col. & det. Jewett). LINN Co., Lost Cr., Lost Prairie Cpgd., Rt. 20, June 1/68 (larvae & pupae) (ROM); Marion Fk., trib. N Santiam Riv., May 8/50, Fender & Jewett (det. Jewett); upper McKenzie Riv., June 6/64, S. G. Jewett (det. Jewett, & ROM). MULTNOMAH Co., Wahkeena Falls, Apr 20/64 (pupae & adults) (ROM). WALLOWA Co., W Fk., Wallowa Cr., S end Wallowa Lake, 4400 ft, July 12/64 (pupae) and July 9/68, Anderson (det. ROM).

Distribution and Biology: Nimmo (1971) records the geographical distribution as from Alaska to California and New Mexico. He lists the larval habitat as small to large mountain creeks with turbulent flow and small stone or boulder substrate. The Oregon collections are from similar habitats. *E. conspersa* is an early-season flier; most of the Oregon adult records are from April to July. Nimmo observed emergence in May at 6500 feet in Alberta where pupae crawled out on boulders or ice. They emerged within 10 to 15 minutes and required another 10 to 15 minutes before flying.

***E. maculosa* Banks 1907.** Type locality: COLORADO, Boulder.

BAKER Co., Anthony Cr. source at Anthony Lakes, Grande Ronde F. C., 7200 ft, July 13/64 (pupae), Anderson (det. ROM). CLACKAMAS Co., Mt. Hood, near Government Camp, (associated larvae, pupae, & adults), June/67 (ROM); Mt. Hood, trib. Salmon Riv., Aug 13/63, & Still Cr. F. C., June 15/46 (col. & det. Jewett). DESCHUTES Co., Sparks Lake, July 24/69 & Dutchman's Flat, July 16/70, Goeden (det. Denning as *simulata*); Spring Riv., Aug 11/48 (col. & det. Jewett). DOUGLAS Co., Muir Cr., Rogue Riv. Nat. For., July 2-4/61 (pupae & adults) (ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Sept 3/64 (pupae), Apr 25/64 & Sept 19-23/66 (ROM). LANE Co., Mack Cr., Andrews For., 11 mi NE Blue River, June 8/73, E. Grafius (det. Denning as *simulata*). LINCOLN Co., Flynn Cr., ca. 10 mi S Toledo, May 21/75, Anderson (det. ROM). LINN Co., Lost Cr., Lost Prairie Cpgd., June 1/68 (pupae emerged June 4-July 28/68) (ROM); Tombstone Prairie, Santiam Pass, July 22/49, Roth & Beer (det. Denning as *simulata*); McKenzie Riv., Carmen Reservoir, July 14/64 (pupae), J. Bedea (det. ROM). WALLOWA Co., W Fk. Wallowa Cr., S end Wallowa Lake, 4400 ft, July 12/64 (pupae), Anderson (det. ROM). Ross (1905b) lists records (as *E. simulata*) for CLACKAMAS, MARION, DESCHUTES, and KLAMATH counties, all in the Cascade Range.

Biology and Distribution: *E. maculosa* and *E. conspersa* may occupy the same habitats. Pupae of both species have been collected from the same sites and dates at Wallowa Creek, Lost Creek, and Anthony Lakes. The geographical range of *E. maculosa* is listed by Nimmo (1971) as from Alberta and British Columbia to Oregon and Colorado.

Subfamily Apataniinae

Flint (1960) characterizes the Apataniinae as a small, primitive Holarctic subfamily of 8 genera and about 70 species. Within the group, one tribe is endemic to Lake Baikal and another to the mountainous areas from Japan to India (Lepneva 1966). The only other tribe, the Apataniini, is represented in North America by the single genus *Apatania*. The genera *Lepania*, *Imania*, and *Moselyana* were assigned to this subfamily by Schmid (1968a), but Wiggins (1973b,c) demonstrated that larval characters are not concordant with the placement.

***Apatania Kolenati* 1848 (Figure 14a)**

This genus contains about 50 species and is widely distributed in the Holarctic region (Fischer 1973). The North American fauna consists of eight or nine species (Flint 1960), most of which occur in northern Canada. The larvae occur in cold streams or lakes. Flint (1960) described larvae of two species of *Apatania*, one from the eastern states and the other from Great Slave Lake. Two species are known from Oregon.

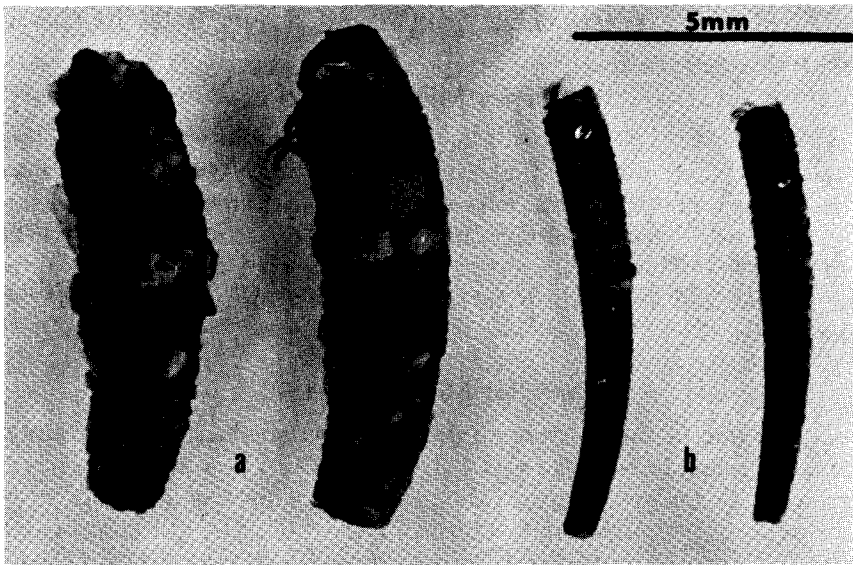


Figure 14. Family Limnephilidae, Subfamilies Apataniinae and Neophylacinae, larvae and cases. (a) *Apatania tavalala*; (b) *Farula malkini*.

A. sorex (Ross) 1941a. Type locality: OREGON, MULTNOMAH Co., Multnomah Falls, Apr 18/38, S. G. Jewett.

LANE Co., emergence traps, Mack Cr., Andrews For., 11 mi NE Blue River, Feb 23-Apr 26/73, & Lookout Cr., 8 mi NE Blue River, Mar-Apr/73, E. Grafius (det. Denning). LINCOLN Co., Needle Branch Cr., 10 mi S Toledo, Nov 10/74 (prepupae, emerged Jan/75), F. Triska (det. ROM).

Biology and Distribution: *A. sorex* apparently overwinters as prepupae or pupae and emerges in early spring. Though records are scarce, larvae of this species were fairly common in both the Mack Creek and Needle Branch sites. They were initially mistaken for early-instar *Neophylax* because of the case, which is cornucopia shaped and made of sand grains, with larger gravel laterally. The Lane County collections were from turbulent, rubble-bottomed mountain streams in the Cascade Range. By contrast, Needle Branch Creek is a very small, low-gradient stream with a sand and gravel substrate and located on the west side of the Coast Range. *A. sorex* occurs from Vancouver Island (Schmid & Guppy 1952), south to Plumas County, California (Denning 1956b).

A. tavalala (Denning) 1953. Type locality: OREGON, JEFFERSON Co., head of Metolius River, May 21/50, Fender & Jewett.

CLACKAMAS Co., Mt. Hood, N Fk. Iron Cr., near Government Camp, June 13/67 (associated larvae, pupae, & adults) (ROM).

Distribution: *A. tavalala* has been recorded only from the Cascade Range in Oregon.

Subfamily Neophylacinae

This subfamily is the smallest, the most characteristic, and the most specialized of the Limnephilidae (Schmid 1955). *Neophylax* occurs in North America and in central and eastern Asia, whereas the other genera (*Oligophlebodes*, *Neothremma*, and *Farula*) are restricted to western North America. The larvae generally occur in cool streams and appear to be specialized in feeding for scraping cryptogamic ooze off rocks (Flint 1960).

Neophylax McLachlan 1871

This is one of the more common genera of the caddisflies in Oregon streams. The larvae occur in rapid streams. Their cases are made of sand or gravel with ballast stones at the sides. Some species aestivate as prepupae over the summer and emerge in the fall. Though some eastern species, such as *N. autumnis* Vorhies, have utilized this aestivation to adapt to streams that become dry in the summer (Ross 1944), none of the Oregon species is known to occur in temporary streams.

Of the three species listed below, *N. splendens* and *N. rickeri* are widespread, while *N. occidentis* is less common; considerably more material of the former two species than I have listed is in the ROM collection. All three species have been collected from the same emergence traps in the Cascade Range near Blue River, Lane County.

***N. occidentis* Banks 1924.** Type locality: NEVADA, Reno.

CLACKAMAS Co., Mt. Hood, Zigzag Riv., Tollgate Cpgrd., June 14/67 (pupae) (ROM). DESCHUTES Co., Tumalo Cr., 10 mi W Bend, June 11/75, Anderson (det. ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Apr-Oct (larvae, prepupae, pupae, & adults) Anderson & ROM; head of Metolius Riv., May 12/50 (col. & det. Jewett). LANE Co., Limberlost F. C., 6 mi E McKenzie Bridge, 1700 ft, June 10/68 (ROM); emergence traps, Mack Cr., Andrews For., 11 mi NE Blue River, June/72 & 73, E. Grafius (det. Denning).

Biology and Distribution: Unlike other members of the genus, *N. occidentis* adults emerge in the spring or summer. All of the above distribution records are from the Cascade Range. This species has been recorded from Nevada, California, Idaho, and Oregon (Fischer 1973).

***N. rickeri* Milne 1935.** Type locality: BRITISH COLUMBIA, Cultus Lake.

This species is widely distributed in Oregon with records from the following counties: BENTON, CLATSOP, CROOK, DOUGLAS, GRANT, HARNEY, JACKSON, JOSEPHINE, LANE, LINCOLN, LINN, MULTNOMAH, TILLAMOOK, UMATILLA, UNION, and WALLOWA.

Biology and Distribution: This species emerges in the fall, after aestivation as prepupae. Flight records are from September to November. Anderson and Wold (1972) recorded 90% of the emergence in Oak Creek, near Corvallis, as occurring during a 3-week period in October. The range of *N. rickeri* extends from California to British Columbia and east to Idaho (Fischer 1973).

***N. splendens* Denning 1948b.** Type locality: WYOMING, Sheridan.

Oregon records are from the following counties: BENTON, CLACKAMAS, CLATSOP, DOUGLAS, GRANT, HARNEY, LANE, LINCOLN, LINN, MARION, MULTNOMAH, TILLAMOOK, UMATILLA, UNION, and WALLOWA.

Biology and Distribution: *N. splendens* has a very similar flight period to that of *N. rickeri*. In Oak Creek, Anderson and Wold (1972) collected both species in the same emergence traps and during the same interval in October. Though larval habitats and adult emergence periods overlap considerably, the peak emergence of *N. splendens* tended to occur a few days earlier than that of *N. rickeri*. Schmid (1955) recorded *N. splendens* only from Wyoming and British Columbia. However, when the widespread distribution in Oregon is considered, it is probable that this species will be found over much of the western montane region.

***Oligophlebodes* Ulmer 1905**

This genus of small caddisflies contains six species and is restricted to the montane region of the western United States and Canada. No biological information is available on the Oregon species. Pearson and Kramer (1972) have studied the life history of *O. sigma* Milne in Utah. They found that the species was univoltine, with emergence occurring from late July to early November. The gravid females migrated upstream and oviposited under water. Adults only lived about 5 days and were frequently observed drinking from the stream but were not observed eating. The larvae are day-active "grazers" on the periphyton-detritus film on the upper surface of stones; their guts contained green and brown algae, diatoms, and unidentifiable plant fragments. Fifth-instar larval cases were 4 to 6 millimeters long. The case was a round, truncated cone of coarse sand grains.

***O. minuta* (Banks) 1897.** Type locality: COLORADO.

JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, July 16/65 (Anderson 1967). LANE Co., Mack Cr., Andrews For., 11 mi NE Blue River, June 6-10/73, E. Grafius (det. Denning).

Distribution: Ross (1949b) indicates that *O. minuta* is abundant in the Rocky Mountain states. Schmid (1955) records it from South Dakota, Wyoming, Utah, New Mexico, and Colorado.

***O. mostbento* Schmid 1968a.** Type locality: OREGON, LINN Co., Tombstone Prairie, 4000 feet.

This species is known only from the type series collected June 20/65 (Schmid 1968a).

***O. ruthae* Ross 1944.** Type locality: MONTANA, Roe's Creek, Glacier National Park.

BAKER Co., Pine Cr., 13 mi NW Baker, July 25/69, Goeden (det. Denning). CLACKAMAS Co., Mt. Hood, Government Camp, 4000 ft, July 23/46 (Ross 1949a), and Still Cr. F. C., Sept 28-29/66 (ROM).

Distribution and Biology: In Alberta, Nimmo (1971) recorded this species at 5000 to 6000 feet with a flight period from July 3 to August 29. The adults appeared to emerge from creeks ranging from relatively slow, gravel-bottomed streams to more torrential, boulder-strewn creeks. He records the geographical range as from Alberta and British Columbia to Oregon and Utah.

***O. sierra* Ross 1944.** Type locality: CALIFORNIA, Dana Fork, Toulumne River, Yosemite National Park, 8500 feet.

CLACKAMAS Co., Mt. Hood, Horsethief Meadows, Zigzag Riv., June 15 & July 18/47 (Ross 1949b); Mt. Hood, Still Cr. F. C., Tollgate Cprgd., Zigzag Riv., & 3.3 mi below Timberline Lodge, June & July (ROM). DESCHUTES Co., Sparks Lake, July 24/69, Goeden (det. Denning). DOUGLAS Co., S Umpqua Falls, 20 mi NE Tiller, June 9/75 (pupae), Anderson (det. ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Sept 19-23/66 (ROM), & head of the Metolius Riv., June 1/56 (col. & det. Jewett). KLAMATH Co., Annie Cr., Crater Lake Nat. Pk., Oct 1/66 (ROM). LANE Co., emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, June 30/72, E. Grafius (det. Denning). LINN Co., Yellowbottom Cprgd., Quartzville Rd., June 16/68 (ROM).

Distribution and Biology: All of the Oregon collections are from the Cascade Range. *O. sierra* extends from California to Colorado and north to Alberta and British Columbia (Nimmo 1971). In the emergence trap collections from Mack Creek, Lane County, this species was collected in the shaded section of the stream, whereas *O. minuta* was identified from a nearby clear-cut area. However, the data are based on too few specimens to know whether the two species have different habitat preferences.

***Neothremma* Banks 1930**

Schmid (1955) placed this genus in the Neophylacinae. However, in a later paper (1968a) he indicated that it was related to *Farula* and the correct placement of the two genera was uncertain. Wiggins' (1973c,

1975) studies of the immature stages also demonstrated the close relationship of the two genera and the difficulty of placing them within the currently recognized subfamilies. *Neothremma* is restricted to the western montane region, with four species known to date (Wiggins 1975). The larvae lack abdominal gills (Ross 1959a). They occur in cold, rapid streams and construct slender, smooth, cylindrical cases of sand grains.

N. alicia Banks 1930. Type locality: COLORADO, Tolland.

WALLOWA Co., Granny Spring, Hat Point Rd., ca. 25 mi SE Imnaha, July 14/73 (larvae & pupae), Anderson (det. ROM); Wallowa Cr., 1 mi S Wallowa Lake, July 9/68 (larvae & pupae), Anderson (det. ROM).

Distribution: The Oregon records are from the northeast corner of the state. This represents a westward extension of the known range of *N. alicia*, as it was previously recorded only from Colorado.

N. andersoni Wiggins 1975. Type locality: OREGON, MULTNOMAH Co., Wahkeena Falls, Columbia River Gorge, June 11/74 (pupa, emerged July 10/74), Anderson.

Distribution and Biology: This species is known only from the type series, all of which were reared from larvae and pupae collected from rubble substrate in Wahkeena Creek, near the parking lot for Wahkeena Falls. Larvae and pupae were collected in June and July. Adults emerged during July and August at 15-16°C.

N. didactyla Ross 1949a. Type locality: WASHINGTON, Mt. Baker, 6000 feet.

CLACKAMAS Co., Mt. Hood, 3.3 mi below Timberline Lodge, June 12/64 & July 13-17/64 (larvae & pupae), & S Fk. Iron Cr., near Government Camp, June 11/67 (larvae & pupae) (ROM). JACKSON Co., Union Cr., 1000 ft, June 7/65 (Schmid 1968a). KLAMATH Co., Annie Cr., Crater Lake Nat. Pk., Oct 1/66 (ROM). LANE Co., emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, July 31/72, E. Grafius (det. Denning). MARION Co., Breitenbush, Aug. 21/68, E. D. Evans (det. ROM).

Distribution: This species has been collected in the Cascade Range from northern Washington to southern Oregon.

Farula Milne 1936 (Figure 14b)

This genus was originally placed in the family Sericostomatidae but was removed to the Linnephilidae by Ross (1944). Schmid (1955) placed it in the subfamily Dicosmoecinae but later (1958a) tentatively assigned it to the Neophylacinae because of its close relationship to *Neothremma*. Characteristics of the immature stages also demonstrate

the close relationship with *Neothremma*, but neither genera are typical neophylacines (Wiggins 1973c). Denning (1958) observed that *Farula* was a very rare genus, as only nine specimens of the four species had been collected at that time. He considered it one of the most curious and specialized genera of the Limnephilidae.

Species of *Farula* are generally collected in cool, high-humidity areas. They are only known from Washington, Oregon, and California (Denning 1973).

***F. davis* Denning 1958.** Type locality: OREGON, JACKSON Co., Green Springs Mountain, 10 to 12 miles E Ashland, J. E. Davis.

Biology: This species is known only from two males in the type series, collected in pear psylla traps in the fall of 1960. These traps were located in a tree near a small stream and across a road from a marshy area.

***F. jewetti* Denning 1958.** Type locality: OREGON, CLACKAMAS Co., Mt. Hood, tributary of Salmon River, July 9/55, S. G. Jewett.

CLACKAMAS Co., All of the other records are also from Mt. Hood: near Timberline Lodge, 5000 ft, June 23/68 (Schmid 1968a); streams crossing road 3.3 mi below Timberline Lodge, July 13/63 & Apr 18-19/64 (larvae & pupae), and S Fk. Iron Cr., near Government Camp, June 11/67 (larvae) (ROM); trib. Salmon Riv., June 17/67 (col. & det. Jewett).

***F. malkini* Ross 1950b.** Type locality: OREGON, BENTON Co., Marys Peak, 2100 feet, May 4/47, Malkin & Sargent.

BENTON Co., Marys Peak, Parker Cr. Falls, June 9/57, B. Malkin (Denning 1958). Marys Peak, Parker Cr., June 3-5/68, Woods Cr., Apr 7-11/64 (pupae & adults), & Wells Cr., 7 mi SW Philomath, Apr 7-11/64 (pupae & adults) (all ROM). Oak Cr., 5-7 mi NW Corvallis, Apr -June (Anderson & Wold 1972). DOUGLAS Co., 18 mi E Reedsport, Loon Creek Rd., May 27/64 & June 1/66, Vertrees & Schuh (Denning 1973).

Biology and Distribution: The above records include all known collections of *F. malkini*. Denning (1973) described the larvae from the Douglas County locality and recorded the habitat as a wet seepage cliff. Though *F. malkini* is considered a rare species, it was the most abundant caddisfly collected in emergence traps in Oak Creek by Anderson and Wold (1972). Near the headwaters, at 200 meters elevation, over 200 adults emerged in one season in a square meter. The emergence period was from mid-April to early June, with the peak in late May. An error in Figure 3 of the Anderson and Wold paper is noted here: the histograms for *F. malkini* in Trap 1 should be shifted one-half month to the left—that is, emergence commences in mid-April. It is likely that *F. malkini* aggregate for pupation; almost a pint of larvae and pupae were collected at the Parker Creek site on Marys Peak by J. Cornell on April 21, 1968.

***F. rainieri* Milne 1936.** Type locality: WASHINGTON, Mt. Rainier, along White River.

MARION Co., Mill City, May 16/66, (Schmid 1968a).

Distribution: *F. rainieri* has only been collected on Mt. Rainier and in Skagit County in Washington and at the Marion County site in Oregon (Denning 1973).

***F. reapi* Schmid 1968a.** Type locality: OREGON, LINN Co., Tombstone Prairie, 4000 feet, June 20/65, F. Schmid.

This species is known only from the male holotype.

Subfamily Pseudostenophylacinae

The five genera in this group are distributed in mountainous areas of Asia and in North America. There are over 50 known species in Asia but less than 10 in North America (Flint 1960).

Pseudostenophylax Martynov 1909

This is the largest genus of the subfamily. With the exception of about five North American species, all others are restricted to central Asia and Japan. Flint (1960) suggested that the two or three eastern U.S. species may not be congeneric with *Pseudostenophylax*. He also transferred *P. frontalis* (Banks) to *Dicosmoecus* so the western fauna contains only one species, *P. edwardsi* (Banks).

***P. edwardsi* (Banks) 1920.** Type locality: CALIFORNIA, MARIN Co.

BENTON Co., several localities, especially Marys Peak area, Apr/64 (larvae, pupae, & adults) (Wiggins & Anderson 1968). COLUMBIA Co., Vernonia, Apr 13/36, Gray & Schuh (det. Ross). DOUGLAS Co., Canyon Cr., Canyonville, Mar 23/34, E. Ball, & Elkton, May 27/64, J. D. Vertrees (det. Denning). JACKSON Co., Tubb Springs, 4300 ft, 6 mi W Pinehurst, May 10/60 (col. & det. J. Lattin); Mt. Ashland, near ski lodge, June 9/75 (larvae) (col. & det. Anderson). KLAMATH Co., along Klamath Riv., May 16/63 (col. & det. Denning). LANE Co., Archers Camp, Creswell, Mar 29/42, J. E. Davis (det. Ross). LINCOLN Co., several areas, Apr/64 (larvae, pupae, & adults) Wiggins & Anderson 1968). LINN Co., Quartzville Rd., near Green Peter Dam study site (Anderson 1974); Crabtree Cr., Mar 16/33, R. E. Dimick; Berlin, Apr 5/33, W. D. Edwards; & Trout Cr. F. C., 6 mi E Cascadia, May 18/40, H. A. Scullen (all det. Denning).

Distribution and Biology: *P. edwardsi* occurs in the mountain ranges from British Columbia to California (Schmid 1955). The Oregon records are concentrated westward from the Cascades. Wiggins and Anderson (1968) described the immature stages and made the association with Limnephilid Genus A of Ross (1959a). Life-history studies by Anderson

(1974) have demonstrated that *P. edwardsi* is locally abundant in very small permanent streams, seepage areas, and temporary streams of western Oregon. The larvae are primarily shredders of leaf detritus, and grow rapidly during the autumn at the time of leaf fall. They construct cylindrical cases of small stones. Adults emerge in early spring. Eggs are deposited within a few days of emergence on stones or wood, slightly above the water level. In a stream that had no surface water during August and September, larval development was markedly delayed. However, after the stream began flowing in October, the larvae grew rapidly and pupation and emergence the following spring occurred at the same time as in a nearby permanent stream.

Homophylax Banks 1900a

This rare and unusual genus was tentatively placed in the subfamily Pseudostenophylacinae by Schmid (1955). However, Denning (1949b), on the basis of adult morphology, and Wiggins (1973c), from studies of the immature stages, have suggested that the relationship of *Homophylax* to other genera of Limnephilidae is unclear. The nine known species occur in the montane region of western North America, with most species apparently quite localized in distribution (Denning 1964b). Only *H. andax* Ross has been previously recorded from Oregon. I have collected *Homophylax* sp. from eastern Oregon. Because of the scarcity of records, these are also included as generic records.

***H. andax* Ross 1941a.** Type locality: OREGON, CLACKAMAS Co., Mt. Hood, Swim, July 12/38, Gray & Schuh.

BENTON Co., Marys Peak Cpgd., July 18/63 (ROM). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., July 16/63 & Sept 28-29/66 (ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, May 8/65, May 29/69 & June 10-11/67 (col. & det. Jewett); same, May 29-30/64, June 8/63, & June 12-13/64 (ROM). DESCHUTES Co., Dutchman's Flat, Century Drive, Aug 11/50, K. M. Fender (Denning 1964b). LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning). LINN Co., near Cascadia, July 31/49, V. Roth (Denning 1964b).

Distribution: This is the most widely distributed species in the genus. Denning (1964b) records the known range as from southeastern Alaska through British Columbia, western Washington, and Oregon.

***Homophylax* sp(p).**

UMATILLA Co., Butcher Cr., near Huron, June 13/74 (larvae, emerged Aug/74), Anderson (det. ROM as *H. acutus-flavipennis*). WALLOWA Co., Granny Springs, Hat Point Rd., ca. 25 mi SE Imnaha, July 4/73 (larvae), Anderson (det. ROM, as *Homophylax* sp.).

Subfamily Limnephilinae

This subfamily is the largest and most varied of the limnephilid subfamilies, containing over 400 species or more than half of the entire family. It has a Holarctic distribution, with slight extensions into the tropical regions (Schmid 1955). Wiggins (1973a) has suggested that adaptive radiation has occurred within the Limnephilinae correlated with two behavioral changes from the more primitive subfamilies: (a) oviposition apart from water and (b) extension of larval habitats to include warm, lentic waters.

Limnephilus Leach 1815 (Figure 15)

According to Ross and Merkley (1952), McLachlan (1874) aptly characterized the genus as "most unruly." Efforts to subdivide *Limnephilus* into several genera have led to a confusing synonymy; the unit used for *Limnephilus* by Ross and Merkley includes species that were included in 15 or more genera by previous authors. The present listing is largely based on the genus as defined by Schmid (1955), but species are listed alphabetically rather than by species-groups.

According to Schmid (1955) this very large genus occurs through the northern hemisphere and is particularly abundant in arctic regions. There are 26 species from Oregon listed below.



Figure 15. Family Limnephilidae, Subfamily Limnephilinae. Larvae and cases of three species of *Limnephilus*.

***L. alconura* Ross & Merkley 1952.** Type locality: OREGON, KLAMATH CO., Pole Creek, Crater Lake, Aug 7/48, K. M. Fender.

The only other record is also from KLAMATH Co.: Aug 5/66, Goeden (det. Denning).

Note: Schmid's (1955) record for British Columbia is apparently an error.

***L. aretto* Ross 1938b.** Type locality: WASHINGTON, Pullman.

BENTON Co., temporary stream near Berry Cr., 9 mi N Corvallis, Apr/66 (pupa, reared), Anderson (det. ROM); same, all stages, 1968-70 (Tew 1971). KLAMATH Co., 20 mi W Keno, Rt. 66, June 10/75, Anderson (det. ROM). LAKE Co., Lakeview, Aug 1/68, Goeden (det. Denning). LINN Co., temporary stream near Crabtree, (larvae) (Tew 1971). UMATILLA Co., Milton-Freewater, Oct 7/64, & 10 mi W Pendleton, Oct 9/64, Goeden (det. Denning).

Biology and Distribution: *L. aretto* was one of six species of limnephilids studied by Tew (1971) in a temporary stream that contained surface water from about late October to mid-April. Eggs were deposited in the damp streambed in October, the larvae developed during the winter, and pupation occurred in mid-March and early April. I have reared *L. aretto* from egg masses collected in early November; emergence occurred in March. Under laboratory conditions, Tew found that adults lived for over 5 months, which suggests that they are inactive during the summer and only become active again in the autumn when eggs are deposited. The larvae occur in flowing, rocky areas of the stream and construct cylindrical cases of small stones or gravel.

L. aretto has been recorded from Washington, Oregon, and California (Ross & Merkley 1952).

***L. atercus* Denning 1965b.** Type locality: CALIFORNIA, DEL NORTE CO., Fort Dick.

LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning).

Distribution: The above are the only known records for this species. It is not listed in Fischer (1973).

***L. canadensis* Banks 1908.** Type locality: QUEBEC, LAVAL CO.

JEFFERSON Co., Metolius Riv., summer 1965 (F. Schmid *in lit.*).

Distribution: This species ranges from Maine to Alberta (Nimmo 1971). Dr. Schmid's record extends this range considerably, both to the south and west.

***L. catula* Denning 1965b.** Type locality: CALIFORNIA, MARIN Co., Inverness.

DOUGLAS Co., Smith Riv., 10 mi E Gardner, Apr 23/64, Vertrees & Schuh (allotype ♀, Denning 1966). LINCOLN Co., Newport, Sept 8/68, Goeden (det. Denning).

Distribution: *L. catula* is known only from the above records and is not listed in Fischer (1973).

***L. ectus* Ross 1941a.** Type locality: OREGON, LINCOLN Co., Boyer, July 15/34, M. L. H.

BENTON Co., MacFadden Pond, 12 mi S Corvallis, May/71 (larvae & pupae), E. D. Evans (det. ROM). MARION Co., Salem, Oct 9/61, Goeden (det. Denning).

Distribution: *L. ectus* is recorded only from western Oregon. Fischer (1968) cites Ross (1941a) for a record from Colorado, but this is an error as Ross only lists the holotype from Lincoln County, Oregon.

***L. externus* Hagen 1861.** Type locality: CANADA, North Red River.

This Holarctic species is recorded in North America from Great Slave Lake to California and Newfoundland (Nimmo 1971). It is abundant in Oregon, particularly in the western counties, with records from BENTON, CLATSOP, COOS, DOUGLAS, KLAMATH, LAKE, LANE, LINCOLN, LINN, MARION, UMATILLA, UNION, and YAMHILL counties.

Biology: Nimmo (1971) notes that adults are associated with smaller, sedge-fringed ponds and sloughs, with the flight period extending from July to October in Alberta. Oregon records for adults are for the same period, but extend from April to November.

***L. fagus* Ross 1941b.** Type locality: OREGON, BENTON Co., Oak Creek, Corvallis, May 19/38, Knight.

BAKER Co., Anthony Cr. source, Anthony Lakes, 7100 ft, July 13/64 (larvae, emerged Aug 8/64), Anderson (det. ROM). BENTON Co., Rock Cr., 5 mi SW Philomath, Apr 20/38, Millard, & May 10/38, L. Zumwalt (det. Ross). CLATSOP Co., Astoria, Oct 11/68, Goeden (det. Denning). GRANT Co., John Day, Sept 14/64, Goeden (det. Denning). KLAMATH Co., Chemult, Aug 3/66, Goeden (det. Denning). LINCOLN Co., Newport, Aug 1/66, Goeden (det. Denning). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning).

Distribution: *L. fagus* is recorded from Oregon, Idaho, and British Columbia (Ross & Merkley 1952).

***L. frijole* Ross 1944.** Type locality: TEXAS, Manzanita Spring, Frijole.

GRANT Co., John Day, Sept 15/65, Goeden (det. Denning). LAKE Co., 2 mi S Lakeview, Aug 13 & 15/69, Goeden (det. Denning). WHEELER Co., Rock Cr. E of Mitchell, May 31/70 (pupae), M. Tew (det. ROM).

Distribution: *L. frijole* has an unusual distribution pattern for the genus *Limnephilus*. It is recorded from Mexico, Texas, New Mexico, California, Oregon, and Washington (Fischer 1968, 1973) and is the only limnephilid recorded from Baja California (Denning 1964c).

***L. harrimani* Banks 1900b.** Type locality: ALASKA.

BENTON Co., Oak Cr. near Corvallis, Apr, June, Sept & Oct (Anderson & Wold 1972). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Aug 24/63, Sept 18-Nov 2/64, Oct 1 & 23/66 (col. & det. Jewett); Astoria, Nov 2/67, & 8 mi E Seaside, Sept 16/64, Goeden (det. Denning). HARNEY Co., Burns, July 15/65, Goeden (det. Denning).

Biology and Distribution: This species was collected in emergence traps set over lotic habitats in Oak Creek near Corvallis. Only four specimens were collected, emerging between April and October and from diverse areas of the stream (Anderson & Wold 1972). Schmid (1955) gives the distribution as the mountain ranges from Alaska to Oregon. Newell and Potter (1973) record it from Montana.

***L. hyalinatus* Hagen 1861.** Type locality: CANADA, North Red River.

This transcontinental species is recorded from Oregon by Nimmo (1971), but no localities were given.

***L. insularis* Schmid 1950.** Type locality: BRITISH COLUMBIA, Vancouver Island.

DOUGLAS Co., Diamond Lake, July 3/51, B. Malkin (det. ROM). KLAMATH Co., Chemult, Aug 3/66, Goeden (det. Denning). MARION Co., Salem, Oct 22/59, H. Foster (det. Jewett, & ROM). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning).

Distribution: This species has previously been recorded only from British Columbia (Fischer 1968).

***L. kalama* Denning 1968b.** Type locality: WASHINGTON, SKAMANIA Co., near head of Kalama River.

CLATSOP Co., 8 mi E Seaside, Sept 16/64, Goeden (det. Denning). LINCOLN Co., Newport, Sept 8/68, Goeden (det. Denning).

Distribution: *L. kalama* is known from the Cascade Range in southern Washington and along the Pacific coast in Oregon. It is not listed in Fischer (1973).

***L. kennecotti* Banks 1920.** Type locality: NORTHWEST TERRITORIES, Great Slave Lake.

GRANT Co., John Day, Oct 3/64, Goeden (det. Denning).

Distribution and Biology: This species has a northern distribution as it occurs from British Columbia to Greenland. Nimmo (1971) gives a

flight period of June to October with a possible peak in August and September in Alberta.

***L. lopho* Ross 1949b.** Type locality: OREGON, HOOD RIVER CO., Mt. Hood, Hood River Meadows, July 17/48, K. M. Fender.

The only other Oregon record is from CLACKAMAS Co., Mt. Hood, Still Cr. F. C., July 16-17/63 (ROM).

Distribution and Biology: This is an alpine species recorded from British Columbia, Alberta, and Oregon. Nimmo's (1971) records from Alberta are for adults collected adjacent to alpine pools or seepage slopes heavily clothed with sedges at 6600-6800 feet. He records a flight period from July 25 to August 5.

***L. lunonus* Ross 1941a.** Type locality: CALIFORNIA, Half Moon Bay.

BENTON Co., MacFadden Pond, 12 mi S Corvallis, May/71 (larvae, emerged June-July/71), E. D. Evans (det. ROM); Marys Peak, near Parker Cr., June 2-14/68, July 18/63, Sept 24/66 (ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Sept 16/67 & Oct 7-14/67 (col. & det. Jewett); Astoria, Oct 11/66, Goeden (det. Denning). GRANT Co., John Day, Oct 3/64, Goeden (det. Denning). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Aug 26/65 (Anderson 1967). LANE Co., Eugene, Sept 17/66, Goeden (det. Denning). MARION Co., Stayton, May 9/36, J. Schuh (paratype, Ross 1941a); Salem, Oct 4/68, R. Brown (det. Denning). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning). YAMHILL Co., Dayton, Oct 15/60, R. Albright (det. ROM).

Distribution and Biology: *L. lunonus* occurs from California to British Columbia. The Oregon records are from several areas of the state. With the exception of the paratype from Marion County, the records indicate a late-summer and autumn flight period.

***L. morrisoni* Banks 1920.** Type locality: NEVADA, Reno.

BENTON Co., Oak Cr., 5 mi NW Corvallis, Oct 1/67, E. D. Evans (det. Denning). CROOK Co., Marks Cr., 1 mi W Ochoco summit, Rt. 26, June 15/74, Anderson (det. Smith). GRANT Co., Mount Vernon, Sept 8/68, Goeden (det. Denning). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, Aug 27/65 (Anderson 1967). LAKE Co., Lakeview, Aug 11/68, Aug 13-15/69, Goeden (det. Denning). UNION Co., 20 mi W La Grande, Aug 19/65, Goeden (det. Denning). WHEELER Co., Whitetail Spring near Bull Prairie F. C., July 10/64 (pupae), Anderson (det. ROM). YAMHILL Co., Newberg, Oct 8/68, Goeden (det. Denning).

Distribution: *L. morrisoni* is recorded from Nevada, California, and Oregon (Ross & Merkle 1952). All of the Oregon records, except Benton and Yamhill counties, are from east of the Cascades. D. G. Denning's label on the Benton County specimen indicates that the genitalia are not typical, which may indicate that another species is involved.

***L. nogus* Ross 1944.** Type locality: OREGON, YAMHILL Co., McMinnville, Nov 2/37, K. M. Fender.

This is one of the most abundant caddisflies in western Oregon, with records from BENTON, CLACKAMAS, CLATSOP, COLUMBIA, LANE, LINN, MARION, POLK, WASHINGTON, and YAMHILL counties.

Distribution: Though the Oregon records are numerous, they are only from the high Cascades (Waldo Lake, Lane Co.) west to the Pacific. However, part of the type series is from Pullman, in eastern Washington (Ross 1944). Nimmo (1971) gives the geographical range as from British Columbia to California.

Biology: Tew (1971) studied the biology of *L. nogus* in a temporary stream near Corvallis and reared them in the laboratory from egg to adults. The adults emerged in March and April, and were inactive during the summer. Eggs are laid on stones in the damp streambed in the autumn. The larvae develop during the winter and early spring. Amongst the caddisflies, the larvae were second only to *Hesperophylax* sp. in abundance in this stream. They occurred in the backwater areas of the stream and constructed a tubular case of irregularly shaped pieces of leaves and other plant material. The gut contents were largely plant detritus but some mayfly fragments also were observed.

Adults have been collected in all months from February to November, with pronounced peaks in April-May and in October. This split flight period, also noted by Nimmo (1971), results from the adults being inactive during the summer while in ovarial diapause. Adults also have been collected in emergence traps during the summer in Mack Creek, Lane County, a permanent, cold, Cascade Range stream.

***L. occidentalis* Banks 1908.** Type locality: WASHINGTON, Tacoma.

BAKER Co., Spring Cr., Sept 7/63, J. H. Baker (det. Jewett). BENTON Co., temporary stream, 9 mi N Corvallis, mid-April (Tew 1971); Corvallis, many dates, Apr, May, Oct, Nov (det. Denning, Ross, & Smith). CLACKAMAS Co. Coulton, Oct 20/68, Goeden (det. Denning). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Oct 23/66 (col. & det. Jewett). CROOK Co., Ochoco Mtns, Hwy 26 near summit, July 31/65 (col. & det. Jewett). DESCHUTES Co., July 24/69, Goeden (det. Denning). GRANT Co., John Day, Sept 15/65, & Mount Vernon, Sept 8/68, Goeden (det. Denning). LANE Co., Waldo Lake, July 23/69, (Goeden & Shaefer), & emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, Aug 10/72, E. Grafius (both det. Denning). LINCOLN Co., Newport, Aug 1/61, Goeden (det. Denning). LINN Co., Willamette Riv., near Corvallis, many dates, Apr-May (OSU coll.); temporary stream near Crabtree (larvae) (Tew 1971). MARION Co., Aumsville, Sept 24/64, and Salem, Oct 25/68, R. Brown (both det. Denning). MULTNOMAH Co., Portland, Oct 29/61 (col. & det. Jewett). UMATILLA Co., 5 mi W Tollgate, July 11/64 (pupae), Anderson (det. ROM). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning).

Distribution and Biology: *L. occidentalis* is a rather small limnephilid that occurs from California north to British Columbia. Tew (1971) collected it in temporary streams in the Willamette Valley, but it was less common than *L. nogus*. The larvae build a curved, tapered case of fine sand grains. They occur in areas of the stream with mixed stone and grass substrate and with little current. The pupae were collected from mid-March until the stream dried up in April, in cases attached to the underside of stones.

L. occidentalis also has been collected from permanent streams in the Blue Mountains and the Cascades, with pupae or emergence occurring in July and August. A split spring and fall flight period, typical of temporary-habitat species, is evident for the Oregon collection records, at least from lower elevations.

(*L. pacificus* Banks 1899). See *L. sitchensis*.

***L. productus* Banks 1914.** Type locality: UTAH.

JACKSON Co., Grants Pass, Aug 4/66, Goeden (det. Denning).

Distribution: This species also is recorded from Utah and California (Schmid 1955).

***L. santanus* Ross 1949b.** Type locality: OREGON, KLAMATH Co., Odell Lake, Aug 1/48, K. M. Fender.

This type series for this species includes: DESCHUTES Co., Pringle Falls, June 7/35, V. E. Shelford, and LINN Co., Marion Lake, July 1/36, D. G. Denning. These records are from the Cascade Range, as is one new record: LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning).

Distribution: *L. santanus* is known only from Oregon.

***L. secludens* Banks 1914.** Type locality: SASKATCHEWAN.

GRANT Co., Seneca, July 11/35, J. Schuh (det. Ross). HARNEY Co., Steens Mtn., 17 mi SW Frenchglen, 7200 ft, July 15/64, Anderson (det. ROM).

Distribution: The collection sites for *L. secludens* are widely scattered. Banks (1914) described it from Saskatchewan and British Columbia; Ross and Merkley (1952) include Utah, and Denning (1956b) gives records for California.

***L. sericeus* (Say) 1824.** Type locality: "NORTHWEST TERRITORIES."

BAKER Co., Spring Cr., Sept 7/63 (ROM). BENTON Co., Corvallis, Apr 20/33, N. P. Larson (det. Denning).

Distribution and Biology: Nimmo (1971) lists the distribution as Alaska to Oregon and east to Quebec and the New England states. The

adults emerge from a range of habitats including ponds, lakes, sloughs, and small or large streams and rivers. Flint (1960) described the larvae from Ontario, and indicated that *L. sericeus* is Holarctic in distribution.

***L. sitchensis* (Kolenati) 1859.** Type locality: ALASKA.

This is a common species in Oregon. There is considerable confusion in the nomenclature between *sitchensis* and *L. pacificus* Banks 1899. Fischer (1958) includes both names, though Schmid (1955) considered them to be synonyms.

The records from the following Oregon counties include material identified as either *sitchensis* or *pacificus*: BENTON, CLACKAMAS, CLATSOP, CROOK, DOUGLAS, GRANT, LANE, MARION, UMATILLA, and YAMHILL counties.

Distribution and Biology: *L. sitchensis* occurs throughout the northwest, from Alaska to Oregon (Schmid 1955). Records indicate that adults occur in all months from March to November. The peak of flight activity is from August to October. Tew (1971) collected a pupa and an adult from a temporary stream near Corvallis in March. The summer records are chiefly from mountainous areas. Thus, it is possible that early emergence from low-altitude temporary habitats produces a bimodal flight period with ovarian diapause over the summer, whereas at high altitudes where larval development is slower, adults will emerge during the summer and have a shorter preoviposition period.

The larval case of *L. sitchensis* is tubular, slightly tapered towards the posterior, and constructed of grass and debris fastened in a circular pattern around the case (Tew 1971).

***L. spinatus* Banks 1914.** Type locality: UTAH, Vineyard.

DESCHUTES Co., Redmond, July 19/67, Goeden (det. Denning). GRANT Co., John Day, Sept 15/65, Goeden (det. Denning). HARNEY Co., Fish Lake, Steens Mtn., July 14-16/53, Roth & Beer, & July 16/57, J. D. Lattin; Borax Hot Lake near Fields, Sept 30/64, Goeden (det. Denning); Squaw Butte Exp. Sta., June 18/74, J. Todd (det. ROM). KLAMATH Co., Klamath Falls, July 17/38 (col. & det. Jewett), & Chemult, Aug 3/66, Goeden (det. Denning). LAKE Co., Lakeview, Aug 1/68, Aug 13/69, & Aug 31/69, Goeden (det. Denning); Chewaucan Riv., near Paisley, June 16/38, Gray & Schuh (det. Ross).

Distribution: Nimmo (1971) lists the range of this species from southwestern Alberta to California and Colorado. The Oregon records are all from the arid area east of the Cascade Range.

***L. sylviae* Denning 1949b.** Type locality: OREGON, UNION Co., Little Phillips Creek, 10 miles NW Elgin, 4000 feet, July 3/48, C. P. Alexander.

KLAMATH Co., Chemult, Aug 3/66 & Sept 3/66, Goeden (det. Denning).

Distribution: In addition to the Oregon records, *L. sylviae* is recorded from British Columbia (Ross & Spencer 1952).

***Grammotaulius Kolenati* 1848**

Fischer (1967) lists 10 species in this genus. Most species are boreal, some with Holarctic distribution and three restricted to North America. Several of the larvae have been described; they are often large, attaining 30 millimeters (Flint 1960).

***G. betteni* Hill-Griffin 1912.** Type locality: OREGON, BENTON Co., Corvallis, Hill-Griffin.

BENTON Co., Corvallis, Oct 8/04, Hill-Griffin (det. Betten); same, Apr 12/39, C. W. Lemons, Apr 15/39, R. E. Dimick, & Mar 25/39, W. Masson (all det. Ross); temporary stream 9 mi N Corvallis, Mar-Apr (Tew 1971); Oak Cr., 5 mi NW Corvallis, Oct 1/67, E. D. Evans (det. Denning). CLATSOP Co., Astoria, Sept 18/68, Sept 29/67, Sept 27/70, & Oct 3/67, Goeden (det. Denning). LANE Co., Horse Mtn., July 28/09 (det. Betten); Eugene, Sept 16/68, Oct 12/66, Goeden (det. Denning). LINCOLN Co., Fall Cr., May 21/41 (det. Ross). LINN Co., temporary stream near Crabtree (larvae) (Tew 1971); Willamette Riv. near Corvallis, Sept 28/68, H. Crowell (det. Denning). MARION Co., Salem, Oct 9/61, Goeden (det. Denning). MULTNOMAH Co., Portland, Oct 14/61, M. C. Jewett (det. Jewett). YAMHILL Co., Bald Mtn., Aug 5/42 (det. Denning).

Distribution and Biology: *G. betteni* has been recorded only from Oregon and British Columbia, though Schmid (1955) also lists a questionable record from China. The Oregon records are restricted to the Willamette Valley and the north coastal region.

In the first aquatic entomological study at Oregon Agricultural College, Hill-Griffin (1912) described the adult and larval case of *G. betteni* from specimens collected in small ponds and backwaters of slow streams in meadows. She recorded emergence of the large (body length, 13-17 mm) yellowish adults as occurring from mid-March to mid-April. The case was described as composed of bits of straw arranged longitudinally as a cylinder, with the straws usually forming a spiral with 1½ to 6 turns. Tew (1971) found the larvae in quiet pools in temporary streams. He demonstrated that the split spring-fall flight period resulted from adults being inactive during the summer, as adults lived over 200 days in the laboratory; thus there are not two broods per year as was suggested by Hill-Griffin (1912). The larval case was described by Tew as being composed of short sections of wide grass blades arranged lengthwise with the newly added sections overlapping the earlier sections.

***Nemotaulius* Banks 1906**

This genus contains six species restricted to the Holarctic region, with only *N. hostilis* (Hagen) in North America (Flint 1960).

***N. hostilis* (Hagen) 1873.** Type locality: SASKATCHEWAN.

CLATSOP Co., Astoria and Warrenton, July 31-Sept 16 (Denning 1971).

Distribution and Biology: Flint (1960) recorded *N. hostilis* as a species of widespread distribution in the northern states and Canada. He described the larvae, which are very large (30-35 mm long) and occur in marshy situations. The cases vary in architecture depending on age of the larvae; they are built of plant material and may be 70 millimeters long and 50 millimeters wide.

Denning (1971) stated that there were minor, but consistent, differences between eastern material and the coastal Oregon specimens, but until the larvae of the latter were collected he preferred to consider them conspecific. The flight period of the Oregon population is much later than the June-August period listed for Alberta by Nimmo (1971).

***Asynarchus* McLachlan 1880**

This genus, of about 15 species, is cold-adapted and circumboreal in distribution (Schmid 1955). It is very closely related to *Limnephilus*. Ross and Merkley (1952) included it within *Limnephilus*, but Schmid (1955) and Wiggins (1977) give it generic status. The larva of the eastern species *A. curtis* (Banks) is described by Flint (1960); he separates it from *Limnephilus* chiefly by color pattern, but Wiggins (1977) has found morphological differences between the two genera.

The larval habitat is given by Flint (1960) as ponds and seepage pools. The Oregon records are all from high mountain regions.

***A. aldinus* Ross 1941b.** Type locality: ALBERTA, Rowe Lakes, Waterton National Park.

The only Oregon locality for this species is: HARNEY Co., Fish Lake, Steens Mtn., July 16/57, J. D. Lattin (det. Denning) & July 17/73 (pupae), Anderson (det. ROM).

Distribution and Biology: Nimmo (1971) gives the geographical distribution as from Great Slave Lake to Idaho. He recorded the adults from alpine meadows and mountain passes, emerging from shallow quiet pools or streams in sedge meadows. At Fish Lake, I collected the pupae from a gravelly area of a small, slow-moving stream about 100 yards upstream from the lake.

A. cinnamoneus (Schmid) 1950. Type locality: BRITISH COLUMBIA.

LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning).

Distribution: This is another northern species, with the previous records only from British Columbia and Alaska (Ross & Spencer 1952).

A. pacificus (Banks) 1900a. Type locality: WASHINGTON, Pullman.

HARNEY Co., Blue Cr. Spring Cpgrd., NW Burns, May 31/68 (pupae, emerged June-July/68) (ROM); Fish Lake, Steens Mtn., 7200 ft, July 12/67, E. D. Evans (det. ROM). UMATILLA Co., Mt. Emily Rd., 18 mi NW La Grande, June 14/74, & 20 mi E Ukiah, Rt. 244, June 14/74, Anderson (det. ROM).

Distribution: *A. pacificus* is recorded from Washington and Idaho by Fischer (1969).

***Clistoronia* Banks 1916**

This is a genus of four known species, restricted to the mountain ranges from Alaska to Arizona (Schmid 1955). It was included as part of *Limnephilus* by Ross and Merkley (1952), but more recent studies have accorded it generic status. Wiggins (1977) used head color pattern and presence of dense spines on the head to distinguish larvae of *Clistoronia* from *Limnephilus*.

C. magnifica (Banks) 1899. Type locality: WASHINGTON, Olympia.

CLATSOP Co., Astoria, Sept 29/67, Goeden (det. Denning). JEFFERSON Co., pond by Rt. 20, 7.1 mi E jct. Rts. 20 & 22, June 18/68 (pupae, emerged July 6-12/68) (ROM). LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning). LINN Co., Fay Lake near Santiam jct. (reared from eggs col. July & Aug), J. Taylor (det. Denning).

Distribution and Biology: *C. magnifica* occurs from British Columbia to Oregon. Winterbourn (1971) studied the biology of this species at Marion Lake, British Columbia. The large egg masses (up to 33 mm dia.) occurred on plants or logs under water during August and September. The larvae completed the first four instars within about 10 weeks and then remained in the final instar over the winter. Pupae occurred from April to June and the adults emerged in early summer. Winterbourn classified the larvae as sediment feeders.

C. magnifica is very amenable to laboratory rearing as it will mate and oviposit under cage conditions. I have reared it through several generations starting with egg masses from Fay Lake, Linn County (Anderson 1976). Two generations per year can be obtained at 15.6°C; higher temperatures are unsuitable, especially for the final instars. Approximate

durations at 15.6°C are (in weeks): eggs, 2-2½; instar I, 2½-3; instar II, 2-2½; instar III, 2-2½; instar IV, 3-3½; instar V, 12-18; prepupa, 1; and pupa, 3. Males and females have about the same developmental time and are similar in size. The larvae are omnivorous. They feed as shredders on leaf detritus but, under laboratory conditions, a supplement of wheat grains and enchytraeid worms resulted in faster growth and heavier adults (Anderson 1976). Cases are built from a variety of materials. They usually are made of conifer needles or pieces of leaf arranged longitudinally. Mature final instar larvae usually switch to using sand grains, with pupation occurring in a tubular case of mineral material.

***Philarctus* McLachlan 1880**

This genus includes seven species, occurring in the boreal regions of Asia and North America. The species are characterized as cold stenotherms (Schmid 1955).

***P. quaeris* (Milne) 1935.** Type locality: BRITISH COLUMBIA, Quesnel Lake.

This is the only North American species. It is listed from Oregon by Schmid (1955) and Nimmo (1971), but I have no locality records.

Distribution and Biology: *P. quaeris* is recorded from Great Slave Lake south to Oregon and Colorado and east to Minnesota (Nimmo 1971). Wiggins (1963) described the larvae and pupae, which were very abundant in shallow ponds and sloughs on the Canadian prairies. The larval case is a tube composed of snail shells, rock fragments, or seeds. One of these materials may be used exclusively, or sometimes all will be used in the same case.

***Halesochila* Banks 1907**

This genus is monotypic, with the previous records only from British Columbia (Schmid 1955), but it is also known from Washington and Idaho (S. D. Smith, pers. comm.).

***H. taylori* (Banks) 1904a.** Type locality: BRITISH COLUMBIA, Vancouver Island, Wellington.

BENTON Co., Marys Peak, Nov 15/64, on snow, Anderson (det. ROM); Berry Cr., 9 mi N Corvallis, Oct 28-Nov 12/68 & Dec 3-4/69, E. D. Evans (det. Smith, & Denning). CLACKAMAS Co., Estacada & Colton, Oct 20/68, Goeden (det. Denning). CLATSOP Co., Astoria, Dec 2/67, Goeden (det. Denning); Gronnel Rd., 2 mi E Elsie, July 1-2/65, Oct 19/68, Oct 24-31/64, Nov 1/63, Jewett (det. ROM). LANE Co., Eugene, Oct 25/66, & Scott Lake, 5600 ft, Sept 21/66, Goeden (det. Denning); Lookout Cr., 8 mi NE Blue River, Aug/71, (larvae, emerged Oct 2/71), E. Grafus (det. ROM). MARION Co., Salem, Oct 25/68, R. Brown (det. Denning); 8 mi W Mill City, Oct

27/62, W. Nelson (det. ROM). WASCO Co., 25 mi SW The Dalles, Oct 1/69, Goeden (det. Denning). YAMHILL Co., Newberg, Oct 18/68, Goeden (det. Denning); Dayton, Oct 15/60, R. Albright (det. ROM).

Biology: *H. taylori* is a relatively common fall and winter species in western Oregon. Only one of the records is from east of the Cascade Range (Wasco Co.). Larvae, which make their cases of vegetative material, have been collected from backwater areas of a mountain stream in Lookout Creek, Lane County. Winterbourn (1971) found that at Marion Lake, British Columbia, the larvae were restricted to the vicinity of the inlet stream. He stated that the larvae had a short growth period in spring and summer, with final instars most abundant in July. The pupae occurred from July to September, partially buried in the sediment.

Lenarchus Martynov 1914

This genus is circumboreal in distribution with most species occurring in the arctic (Schmid 1955). *Lenarchus* is closely related to *Limnephilus*; five of the six species recognized by Schmid that occur in Oregon were originally described as *Limnephilus*.

L. brevipennis (Banks) 1899. Type locality: COLORADO.

Nimmo (1971) lists the range of this species as from Colorado and Oregon to southern Alberta, but he does not give specific localities in Oregon.

L. gravidus (Hagen) 1861. Type locality: CALIFORNIA.

LINCOLN Co., Newport, Aug 17/61, Goeden (det. Denning).

Distribution: Though older records (e.g., Banks 1900b) list *L. gravidus* as a widely distributed species, in Schmid's (1952) revision of the genus it is restricted to California. The above record for Oregon is thus a northward extension of the known range.

L. rho (Milne) 1935. Type locality: WASHINGTON, Olympia.

CLATSOP Co., Astoria, Aug 28/67-Oct 11/67, Sept 18/68, & Warrenton, July 20/68, Goeden (det. Denning); Gronnel Rd., 2 mi E Elsie, May 4/68, Sept 4-25/65 (col. & det. Jewett). LANE Co., Waldo Lake, July 29/69, Goeden (det. Denning). LINCOLN Co., Newport, Aug 1/67, Goeden (det. Denning).

Distribution: All of the Oregon records are from the coastal region in the northwest corner of the state, except for those from Waldo Lake in the high Cascades. *L. rho* is recorded from Oregon, Washington, and British Columbia (Schmid 1955).

***L. rillus* (Milne) 1935.** Type locality: NEVADA, Reno.

DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., July 2-4/71 (ROM). KLAMATH Co., Lake of the Woods, June 21/30, H. A. Scullen (Milne 1935, as holotype of *Limnephilus oreus*). LAKE Co., Elder Cr., ca. 25 mi SE Lakeview, July 13/65, Anderson (det. Smith). LANE Co., Waldo Lake, July 29/69, Goeden (det. Denning). LINCOLN Co., Newport, Aug 1/68, Goeden (det. Denning).

Distribution: The known range of *L. rillus* is in Nevada, Montana, and Oregon (Schmid 1952) and California (Denning 1956b). Schmid (1952) placed *L. oreus* (Milne), which was known only from the Oregon holotype, in synonymy with *L. rillus*. All Oregon records are for collections from mountainous areas, except for the collection from Newport, Lincoln County. As four species of *Lenarchus* have been identified by Denning from light-trap collections at this coastal site, there is a possibility of misidentification.

***L. vastus* (Hagen) 1861.** Type locality: ALASKA, Kenai Peninsula.

BENTON Co., Oak Cr., 5 mi NW Corvallis, Oct 1/67, E. D. Evans (det. Denning). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Aug 31/63, Jewett (det. ROM). JEFFERSON Co., pond near Rt. 20, 7.1 mi E jct. Rts. 20 & 22, June 5/69 (larvae), & June 18/68 (pupae) (ROM). KLAMATH Co., Lake of the Woods, 4950 ft, Aug 11-12/35, G. Ferguson (det. Denning). LANE Co., emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, Aug 14/72, E. Grafius (det. Denning); McKenzie Riv., Oct 5/37, L. Lambuth (det. Davis). LINCOLN Co., Newport, Aug 21/64, & Aug 20/68, Goeden (det. Denning). LINN Co., Lost Lake Cpgrd., Santiam Pass, June 5/69 (larvae) (ROM).

Biology and Distribution: Nimmo (1971) gives a flight period in Alberta from June to August and records adults near smaller mountain or alpine sloughs or ponds. Larvae collected by the ROM field parties were from ponds and lakes in the Cascade Range. However, adults also have been collected along the coast, so the species occurs from sea level to over 6000 feet. Nimmo (1971) gives the geographical range as Alaska and south to California.

***Hesperophylax* Banks 1916**

According to G. B. Wiggins (pers. comm.), this genus requires revision. Current specific determinations are unreliable and the ROM material has not been identified below the generic level. Schmid (1955) lists six species in the genus, all Nearctic, and mostly restricted to the western montane region. Nimmo (1971) provides a key and figures to distinguish three species.

Most of the Oregon material has previously been recorded under *H. incisus* Banks 1943 (type locality: IDAHO, Wallace), but other names

used are *consimilis* (Banks) 1900a, *minutus* Ling 1938, and *occidentalis* (Banks) 1908.

The adults of this genus are brown and have a longitudinal silvery line on the forewing. The larval case is large (up to 20 mm), tubular, and composed of small stones and gravel. According to Schmid (1955), the genus is unusual in the tribe Limnephilini as the larvae occur in lotic habitats.

Hesperophylax is a common genus in Oregon and is widely distributed throughout the state. County records include: BAKER, BENTON, CROOK, DESCHUTES, GRANT, LAKE, LANE, POLK, UMATILLA, UNION, and WHEELER.

Biology: *Hesperophylax* larvae are frequently the most abundant caddisfly in temporary streams in several areas of the state. The larvae are also common in some permanent streams in the Blue Mountains, with the life cycle being different in the two types of habitats. It is possible that these populations represent different species.

Tew (1971) reported that *Hesperophylax* (as *H. incisus*) was the most abundant caddisfly in his temporary stream study, north of Corvallis. He reared it from egg to adult in the laboratory. Egg masses were found under rocks in the damp streambed in early October, about a month before there was any surface water in the stream. Hatching occurred in early November, a few days after the stream began flowing. Under laboratory conditions (15.6°C) the approximate duration of the larval instars was (in days): I-10; II-10; III-18; IV-15; and V-150. Field development (at 4-9°C lower temperatures) was similar for the first four instars, but about 4 weeks less for the final instar. The larvae shortened and sealed off their cases for pupation in early March. The pupae aggregated on the undersides of large rocks. Adults emerged in April, slightly before or just after the stream dried up. Under laboratory conditions, adults lived for up to 6 months. Under long-day conditions the females were in ovarial diapause. Short days induced ovarial development. Thus, the adults are apparently inactive over the summer. They become active in the autumn, when decreasing day length occurs, and oviposit in streambeds when the rainy season begins.

Chyranda Ross 1944 (Figure 16a)

This genus is considered monotypic by Schmid (1955), though several species have been described and later synonymized. The distribution is restricted from the Rocky Mountains (Colorado and Utah) to the west coast (British Columbia to California), except for one record in Quebec. They are medium-sized (ca. 12 mm), light brown caddisflies with the males having exceptionally long maxillary palpi (Ross 1944). The species

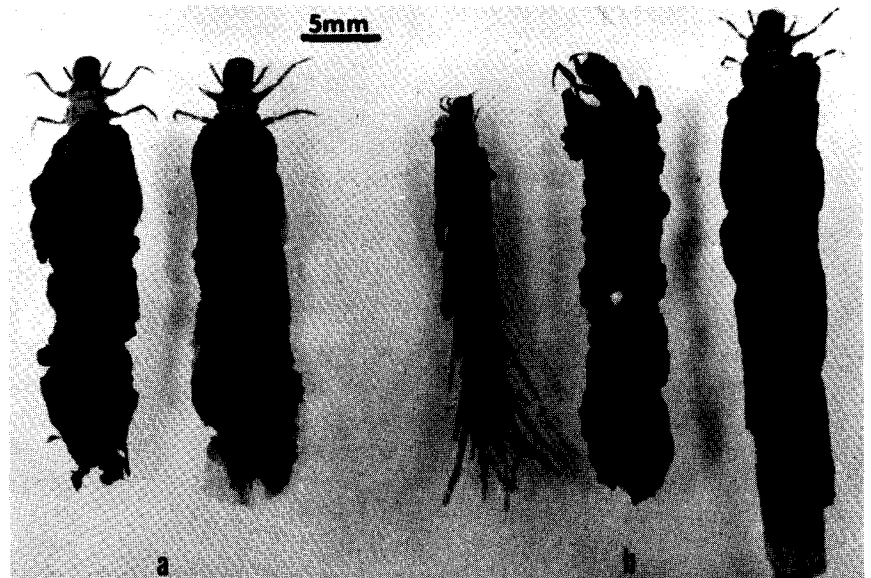


Figure 16. Family Limnephilidae, Subfamily Limnephilinae, larvae and cases. (a) *Chyranda centralis*; (b) *Psychoglypha* spp., cases of *Ranunculus* stems, mixed mineral vegetable material, and bark.

limits within the genus are still uncertain. S. D. Smith currently has material from the Willamette Valley that he considers to be either undescribed or a valid species other than *C. centralis* (Banks).

***C. centralis* (Banks) 1900a.** Type locality: COLORADO, Clear Creek, South Park.

BENTON Co., emergence traps, Oak Cr., 7 mi N Corvallis (Anderson & Wold 1972); Berry Cr., 9 mi N Corvallis, Nov 6 & 15/69, E. Evans (det. Smith). Marys Peak, Parker Cr., & several small streams, Apr-July (larvae) (ROM). CLACKAMAS Co., Mt. Hood, Beaver Cr., Aug 1/48, K. M. Fender (paratype of *C. cordon* Ross 1949b); West Linn, Oct 28/68, & Estacada, Oct 20/68, Goeden (det. Denning); Mt. Hood, N Fk. Iron Cr. near Government Camp, Sept 29/66 (adults), & streams below Timberline Lodge, Apr 18 & 20/64 (larvae) (ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Aug 24/63, Aug 19-20/67 (col. & det. Jewett). DESCHUTES Co., Todd Lake near Deschutes City, Aug 10/69, R. Brown (det. Denning). LANE Co., Limberlost Cpgrd., Rt. 242, W Sisters, June 10/68 (ROM). LINCOLN Co., Boyer near Rose Lodge, July 11/63 (larvae) (ROM). LINN Co., Tombstone Prairie, Rt. 20, June 18/68 (ROM). UMATILLA Co., Camas Cr., Rt. 395 near Ukiah, Sept 18/66 (ROM); 5 mi SW Tollgate, July 11/64, Anderson (det. ROM). UNION Co., 15 mi NE Elgin, July 9/68 (larva), & Grande Ronde F. C. Anthony Lakes, 7200 ft, July 13/64, Anderson (det. ROM). WALL-OWA Co., Hat Point, July 30/69, Goeden (det. Denning). WASCO

Co., Bear Springs, July 12/64, K. M. Fender (det. ROM). YAMHILL Co., Peavine Ridge, McMinnville, Sept 6/49, K. M. Fender (holotype of *C. cordon* Ross 1949b).

Biology: Nimmo (1971) gives a flight period of mid-July to October, and states that adults occur near mountain ponds and rapid streams and near valley seeps. Most Oregon records are from mountainous areas, but *Chyranda* larvae are also common in the Willamette Valley. Adults have been collected from June to November.

The larvae, which are a characteristic element of the fauna in cold spring brooks and small mountain streams, were described by Wiggins (1963). The distinctive case is composed of quadrate pieces of leaves and thin bark fastened together to form a tubular case with a prominent flangelike seam on each side. In cross section the case is broadly elliptical.

Hydatophylax Wallengren 1891 (Figure 17)

This genus contains 10 species distributed through the northern hemisphere, but is most common in Asia. Only one species occurs in western North America (Schmid 1955). Flint (1960) described the larval case as cylindrical, very large and bulky, and made of stems and sticks



Figure 17. Family Limnephilidae, Subfamily Limnephilinae. Larvae and cases of *Hydatophylax hesperus*; mid-instar case made of maple seed wings (left), and final-instar cases of sticks and twigs (right).

placed longitudinally; however, early-instar cases were markedly different, being flat cases made of leaf fragments.

***H. hesperus* (Banks) 1914.** Type locality: BRITISH COLUMBIA, Vancouver Island.

BENTON Co., emergence trap, Oak Cr., 6 mi NW Corvallis, Aug (Anderson & Wold 1972); Berry Cr., 9 mi N Corvallis, light trap, Sept-Nov (det. Smith); Marys Peak, Woods Cr., Apr 3/64 (larvae) (ROM). CLACKAMAS Co., Colton, Oct 20/68, & West Linn, Oct 22/68, Goeden (det. Denning). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, July-Oct (many dates), & S Fk. Klaskanine Riv., May 29/49, Jewett (det. ROM); Astoria, Sept 29 & Oct 11/67, & Seaside, Sept 16/64, Goeden (det. Denning). DESCHUTES Co., Indian Ford Cr., 6 mi NW Sisters, Apr 23/64 (larvae), & June 19/68 (pupae) (ROM). DOUGLAS Co., Bogus Creek Cpgd., Rt. 138, 19.4 mi E Idleyld Pk., June 10/68 (larvae) (ROM). LANE Co., Woahink Lake near Florence, Oct 22-23/60, J. Capizzi (det. ROM). LINCOLN Co., Newport, June 21/69, R. Brown (det. Denning); Needle Branch Cr., 10 mi S Toledo, July 10/63, Anderson (det. ROM). LINN Co., Sheep Cr., House Rock F. C., E Upper Soda, June 1/68 (larvae) (ROM); Roaring Riv., 1 mi W fish hatchery, Sept 5/68, E. Evans (det. Denning). TILLAMOOK Co., Neskowin, July 10/63 (pupae) (ROM). YAMHILL Co., Newberg, Oct 8/68, Goeden (det. Denning).

Biology and Distribution: *H. hesperus* has a flight period extending throughout the summer and fall; most records are from August to October. It is common in small streams and backwater areas from the Cascades to the Pacific, but there are no records from eastern Oregon. It has been recorded from British Columbia to California (Ross & Spencer 1952).

The mature larval case is elongate and crudely built of sticks and twigs; as the sticks normally extend much beyond the end of the case, one is surprised by the relatively small larva in a huge case. The cases of early instars are flat and made of leaf fragments, as was also demonstrated for *H. argus* by Flint (1960). The younger larvae of *H. hesperus* commonly use the wings of maple seeds for their cases.

***Philocasca* Ross 1941a**

This uncommon genus is restricted to western North America. It was reviewed by Wiggins and Anderson (1968); up to that time, published data on the four known species was based on five specimens. Three of the five species have been recorded from Oregon and the larvae are associated for two of these. The adults are moderately large (wing length, 12-17 mm) and usually light yellowish-brown. The larvae, which have the dorsum of the head abruptly flattened, appear to have more distinctive generic and specific characters than do the adults (Wiggins & Anderson 1968).

***P. demita* Ross 1941a.** Type locality: OREGON, LINCOLN Co., Boyer, Hood Craven Cabin, Sept 30/33, J. A. A.

BENTON Co., base of Marys Peak, 7 mi SW Philomath, larvae, & reared adults (emerged Oct 8/65) (Wiggins & Anderson 1968); near Lobster Cr., 15 mi SW Alsea, May 5/74 (larva), Anderson (det. ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Sept 16/67 & Oct 7-10/67 (col. & det. Jewett). TILLAMOOK Co., Tierra del Mar, larvae in dune forest litter, K. M. Fender (Wiggins & Anderson 1968).

Biology: Anderson (1967b) described the life cycle of this remarkable species. All larval instars were collected in pitfall traps or in leaf litter from the forest floor processed in Berlese funnels. No larvae were found in a nearby stream. Larval development occurs during the winter in saturated leaf litter. The mature larvae aestivate in the dry litter from June to September. The larval case is tubular, slightly curved, and made of small stones. *P. demita* has been collected only in western Oregon (Wiggins & Anderson 1968).

***P. oron* Ross 1949b.** Type locality: OREGON, CLATSOP Co., Bear Creek, Apr 12/47, S. G. Jewett.

This species has only been collected as adults in CLATSOP Co. Of the records listed by Wiggins and Anderson (1968), all specimens except the holotype were collected in September and October.

***P. rivularis* Wiggins 1968.** Type locality: OREGON, BENTON Co., Marys Peak, North Fork Rock Creek, emerged Aug 26/64, Wiggins & Scott.

Wiggins and Anderson (1968) record this species from BENTON, JACKSON, JOSEPHINE, LINCOLN, and MULTNOMAH counties in Oregon and also from HUMBOLDT County in northern California.

Additional Oregon records are CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Sept 16/67 (col. & det. Jewett). LINN Co., Quartzville Rd., E of Green Peter Dam, (larvae, emerged Aug 31-Sept 7/73, & June/74), Anderson (det. ROM); same, Aug 6/70, Anderson & Wold (det. Denning).

Biology: This would seem to be the most common species of *Philoscasca*. In restricted locations the larvae are common in small streams. Adults have been collected from August to October. The larval case is tubular, slightly curved, about 20 millimeters long, and composed of small stones or gravel. The pupae occur attached to moss clumps growing out from the stream bank. A 2-year life cycle was suggested by Wiggins and Anderson (1968) because two distinct size classes of larvae commonly occurred at the same time.

Some specimens collected from a hillside trickle at the Quartzville Road site in Linn County seem to intergrade between *P. demita* and *P. rivularis*, which indicates that further study of this group is required.

Clostoeca Banks 1943

This genus is restricted to the west coast, from Alaska to California. Flint (1966) synonymized *C. sperryi* (Banks) with *C. disjuncta* (Banks), so the genus is monotypic.

***C. disjuncta* (Banks) 1914.** Type locality: BRITISH COLUMBIA, Bon Accord.

BENTON Co., Corvallis, ditch near Oak Cr., Feb & Apr/42, J. E. Davis (det. Ross); seepage area near Oak Cr., 5 mi NW Corvallis, Apr 8/64 (larvae & pupae, emerged Apr 28/64) (ROM); Rock Cr., 5 mi SW Philomath, Apr 24/64 (ROM). CLACKAMAS Co., Mt. Hood, Robin Hood F. C., June 10-12/67 (ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Apr 26/63, May 8-July 10/65 & May 27-June 11/67 (col. & det. Jewett); S Fk. Klaskanine Riv., Mar 23/61 (pupa), R. J. Ellis (det. ROM). DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., June 30-July 2/61 (ROM). LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer (det. Denning). LINN Co., Yellowbottom Cpgrd., Quartzville Rd., June 16/68 (ROM). MARION Co., Aumsville, May 12/64, Goeden (det. Denning).

Biology: This is a spring-emerging species. All Oregon collections are from, or west of, the Cascade Range. Flint (1960) described the larva from Oregon material. The case is similar to that of *Chyranda centralis*. Wiggins (1977) describes it "of leaf pieces fastened together to form wing-like flanges at each side of a flattened tube."

Glyphopsyche Banks 1904a

There are only two species in this genus, both from North America (Schmid 1955). Most species that have been described in the genus were removed to *Psychoglypha* (Ross 1944). The larvae are similar to those of *Psychoglypha* but have gills in clusters of two or three, as compared with single filaments in *Psychoglypha* (Flint 1960).

***G. irrorata* (Fabricius) 1781.** Type locality: Unknown.

This transcontinental species is listed from British Columbia, Ontario, and Michigan by Schmid (1955). The Oregon record is from BAKER Co., Baker, Mar 3/67, Goeden (det. Denning).

Psychoglypha Ross 1944 (Figure 16b)

The revision by Denning (1970) has clarified the species concepts within this genus and renders many earlier identifications invalid. The species studied by Anderson (1967a), as *P. alaskensis* (Banks 1908), not *alascensis* (Banks 1900b), in the Metolius River, Jefferson County, has been identified by Denning as the widespread species *P. subborealis* (Banks). There are 15 species in this Nearctic genus and most of these are restricted to western North America.

Though Denning (1970) states that *Psychoglypha* adults are infrequently collected, I have found that the larvae are abundant during the summer months in mountain streams ranging from small trickles to rivers. The larvae are shredders of leaf detritus. They construct elongate cases of plant material or debris. Mature larval cases frequently include a considerable mineral component. Denning states that most species are cold-adapted, with the adults being found in late fall, winter, or early spring.

***P. alascensis* (Banks) 1900b.** Type locality: ALASKA.

CLACKAMAS Co., Mt. Hood, Still Cr. Cpgd., June 17/67, & Zigzag Riv. near Rhododendron, Feb 4/67 (det. Jewett as *P. ulla*). KLAMATH Co., Collier St. Pk., May 19/50, Jewett (Denning 1970).

Distribution: Most of the records for this species are under the name *P. ulla* which Denning (1970) synonymized with *P. alascensis*. It is known from Alaska to Oregon, and there is also a record from Wyoming (Milne 1935).

***P. avigo* (Ross) 1941a.** Type locality: OREGON, MULTNOMAH Co., Troutdale, Apr 15/39, S. G. Jewett.

This is a very common species in western Oregon. Denning (1970) records collections from BENTON, CLACKAMAS, DESCHUTES, JEFFERSON, LINCOLN, WASHINGTON, and YAMHILL counties. Additional records include CLATSOP, JOSEPHINE, LANE, LINN, UMATILLA, and WASCO counties.

Biology and Distribution: *P. avigo* is largely a fall and winter emerging species. Adults are recorded by Denning (1970) from September through June. In two consecutive years I have collected the larvae coexisting with those of *P. bella* (Banks) in a small roadside ditch at Quartzville Road near Green Peter Dam, Linn County. Both species were reared in the laboratory to mature pupae by late October. Cannibalism was very common, particularly by mature larvae that chewed through the sealed cases of prepupae and pupae. In the field, the pupal cases occur several centimeters into the substrates, probably as protection from predation and cannibalism.

Denning (1970) gives the geographical range of *P. avigo* as Utah, Oregon, and California (Plumas Co.). Because of its widespread distribution in Oregon, he expects that it also occurs in British Columbia and Washington.

***P. bella* (Banks) 1903.** Type locality: BRITISH COLUMBIA, Nanaimo.

BENTON Co., Oak Cr., 6 mi NW Corvallis, Oct-Nov/68 (Anderson & Wold 1972). DESCHUTES Co., Indian Ford Cr., 6 mi NW Sisters, Sept 20/66 (larvae) (ROM). GRANT Co., Beech Cr., 2 mi N Mount Vernon, June/74, (larvae, emerged Nov 24/74), Anderson (det. ROM). JOSEPHINE Co., Grants Pass, Mar 15/65, Goeden (det. Denning).

KLAMATH Co., Odell Lake, June 8/62 (Denning 1970). LANE Co., Cougar Reservoir, S Fk. McKenzie Riv., Mar 19/60, Jewett (det. ROM). LINCOLN Co., Trenholm Saddle Rd., 8 mi E Tidewater, June 15/67 (larvae) (ROM); Deer Cr., 8 mi S Toledo, July 10/63 (larvae), Anderson (det. ROM). LINN Co., Marion Forks, Mar 7/70, Goeden (det. Denning); Quartzville Rd., 2.5 mi E Rocky Top Rd. Bridge, July/73 (larvae, emerged Oct/73), & Sept/74 (prepupae), Anderson (det. ROM).

Distribution and Biology: Denning (1970) characterizes *P. bella* as a "large, strikingly colorful species apparently confined to an area extending from British Columbia to Oregon." As is noted above, I have collected the larvae from a roadside ditch coexisting with *P. avigo*. Both species are also attracted to black-light traps (Denning 1970).

***P. browni* Denning 1970.** Type locality: OREGON, KLAMATH Co., Crater Lake National Park, Oct 24/59, R. M. Brown.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66, & 3.3 mi below Timberline Lodge, July 17/63 (pupae), & Apr 18/64 (larvae, emerged Sept/64) (all ROM). KLAMATH Co., Crater Lake Nat. Pk. headquarters, & Annie Spring, several dates, Oct 19-Dec 9 (paratype series, Denning 1970); Annie Cr., Oct 1/66 (ROM). LANE Co., Mack Cr., Andrews For., 11 mi NE Blue River, Oct/73, Anderson (det. ROM).

Distribution and Biology: The above Oregon records, all in the Cascade Range, constitute the known distribution of *P. browni*. The cold adaptation of this species is apparent in that minimum temperatures at the time of collection of the type series ranged from 15 to 35°F (Denning 1970).

***P. klamathi* Denning 1970.** Type locality: CALIFORNIA, NEVADA Co., Sagehen Creek, 6300 feet.

KLAMATH Co., Williamson Riv., Collier St. Pk., May 12/50, S. G. Jewett (allotype) & Spring Cr., Apr 6/68 & May 8/57, J. Schuh (paratypes, Denning 1970); Crooked Cr., at Rt. 62, S of Fort Klamath, Oct 1/66 (pupae, emerged Oct 13-Nov 17/66) (ROM).

Distribution and Biology: As is indicated above, this species has been collected in California and southern Oregon. The male holotype and paratype series from California were collected in October, as was the reared material in the ROM collection. In contrast, the allotype and Oregon paratypes (25 specimens) were collected in April and May, and all were females. This could mean that the females are long-lived and overwinter before ovipositing.

***P. ormiae* (Ross) 1938a.** Type locality: UTAH, Southfield.

The only Oregon record is: WASCO Co., Bear Springs F. C., Rt. 216, Oct 6/40, K. M. Fender (det. Schmid, & ROM).

Distribution: *P. ormiae* is recorded only from a few males in Utah, Oregon, and California (Denning 1970).

P. prita (Milne) 1935. Type locality: ALBERTA, Banff.

WALLOWA Co., Rt. 204, E of Spout Springs, Sept 18/68 (pupae, emerged Sept 28-Oct 16/66) (ROM).

Distribution and Biology: *P. prita* was previously recorded from Alberta and Idaho (Denning 1970). Nimmo (1971) collected adults crawling on snow at 6300 feet, near a small alpine pool in Alberta.

P. subborealis (Banks) 1924. Type locality: ALASKA.

This is the most widespread species of the genus, as it occurs from Alaska to California and Utah in the west, and from Ontario and Michigan east to Maine (Denning 1970). The Oregon records, mostly from the ROM collection, include the following counties: BENTON, CLACKAMAS, CLATSOP, CROOK, DESCHUTES, GRANT, HOOD RIVER, JEFFERSON, LINCOLN, LINN, MULTNOMAH, TILLAMOOK, and WALLOWA.

Biology: Flint (1960) described the larvae (as *P. alaskensis*) and provided life-history data for the eastern population. He noted that pupae occurred along the margins of pools, buried several inches in sand and gravel substrates. Nimmo (1971) collected adults (as *alaskensis*) near every sort of aquatic habitat from small, slow creeks to very large mountain rivers, and from sedge-fringed ponds and sloughs. Flight dates ranged from September to May in Alberta. The Oregon records indicate a fall-winter flight period.

In the Metolius River, Jefferson County, *P. subborealis* larvae were abundant in *Ranunculus* beds as small larvae, whereas the mature larvae occurred in backwater regions (Anderson 1967a). Materials used in case construction by small larvae were longitudinally arranged *Ranunculus* leaves, but during the final instar the cases were a mixture of sand, conifer needles, and small pieces of bark. *P. subborealis* larvae were abundant in the drift, especially in April. They exhibited a day-active pattern, which suggests that feeding and dispersal occur during the day (Anderson 1967a).

Subfamily Goerinae

This is a small group of caddisflies that are either cold-adapted or occur in mountainous areas of warmer regions (Ross 1956). The systematic position of the goerids has been interpreted in various ways. *Goera* was initially placed in the Sericostomatidae, and many European workers still retain it as a subfamily of the Sericostomatidae (e.g., Hickin 1967). Ross (1944, 1956) and Schmid (1955) recognize it as a family closely related to the Limnephilidae, which is also the classification used

in Fischer's catalogue (1967). Unlike typical limnephilids, the adults lack ocelli. However, the larvae are similar to other limnephilid genera, though with distinctive modifications of the head and thorax, so the group is reduced to subfamily status (Flint 1960, Wiggins 1973b).

Flint (1960) suggests that there are about a dozen genera and 50 to 75 species in the Goerinae. They are widely distributed in the Holarctic region, with a few species in the East Indies and South Africa. He described the larva of *Goera* and *Goerita* from the eastern states. Three of the eight known North American species occur in Oregon.

***Goera* Curtis 1834**

This is the largest genus of the subfamily. It has a Holarctic distribution, with an extension in Indonesia as far as Java (Flint 1960). The North American fauna consists of three eastern species and *G. archaon* Ross, that has only been found in Oregon.

***G. archaon* Ross 1947.** Type locality: OREGON, (?) LINCOLN Co., Fall Creek, May 1/41, C. Whitmore.

BENTON Co., Rock Cr., 5 mi W Philomath, May 1/41, C. Whitmore (paratype, Ross 1947); same, June 9/49, Roth & Chiang (det. Denning); same, Apr 4/64 (larvae, emerged June/64) Wiggins & Anderson. CLATSOP Co., Gronnel Rd., 2 mi E Elsie, Aug 10/68 (col. & det. Jewett). DOUGLAS Co., 7 mi NW Roseburg, June 17/64, J. D. Vertrees (Denning 1968b); Coffee Cr., Rt. 138, S Kellogg, June 7/68 (larvae & pupae), Yamamoto & Smith (det. ROM); S Umpqua Falls, 20 mi NE Tiller, June 9/75 (pupae), Anderson (det. ROM). LINCOLN Co., Fall Cr., E of Tidewater, Apr 15/64 (larvae) (ROM); Siletz Riv., May 24/34, R. E. Dimick (det. Denning). LINN Co. (?), East Riv., May 26/34, G. Harry, (paratype, Ross 1947).

Note: The localities given for the type series are not precise. The closest Fall Creek to Corvallis is in the Coast Range, in Lincoln County, about 40 miles west. "Rock River" should be Rock Creek near Philomath, and "East River" is probably the branch of the Willamette River on the Linn County side, just upstream from Corvallis.

***Goeracea* Denning 1968b (Figure 18)**

This genus was erected to include the two western species previously assigned to the genus *Goerita*. Wiggins' (1973b) studies of the immature stages corroborate separation of the two genera. *Goeracea* adults have scales on the forewings, a phenomenon found in very few genera of caddisflies (Denning 1968b).

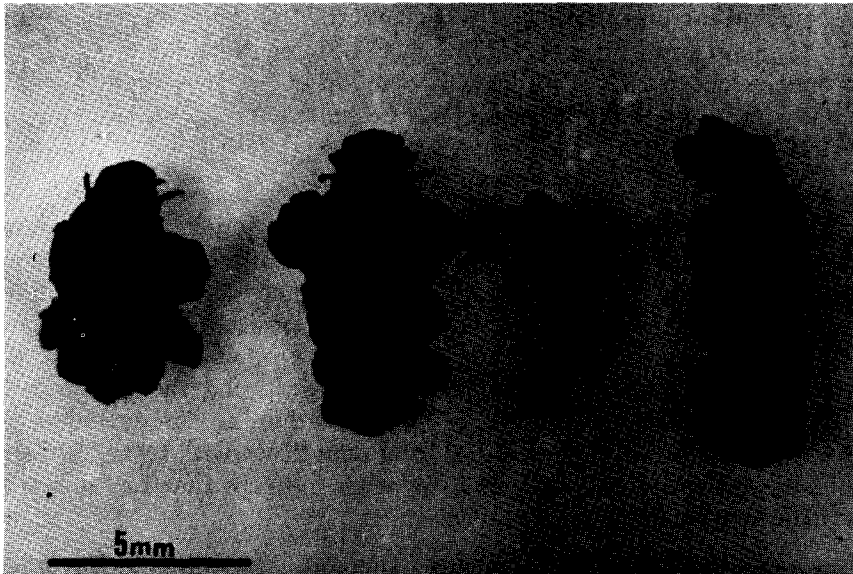


Figure 18. Family Limnephilidae, Subfamily Goerinae. Larvae and cases of *Goeracea genota*.

G. genota (Ross) 1941a. Type locality: OREGON, MULTNOMAH Co., Troutdale, Apr 15/39, S. G. Jewett.

Wiggins (1973b) gives extensive records for collections of *G. genota* from the following counties in western Oregon: BENTON, HOOD RIVER, JOSEPHINE, LINCOLN, LINN, and MULTNOMAH.

Distribution and Biology: *G. genota* occurs in the Pacific Northwest in southern British Columbia, Idaho, Washington, and Oregon (Wiggins 1973b). Newell and Potter (1973) also record it from Montana. The larvae occur in cool streams, sometimes in a film of water flowing over rocks and logs. Wiggins indicates that the life cycle requires 2 years and emergence occurs during March and April. At my study site on Quartzville Road, Linn County, the larvae are common in a hillside trickle and on the upper surface of stones in a roadside ditch. The larvae graze the periphyton film on stones. The case (up to 6 mm) is composed of gravel, with larger pieces along the sides. When the larva withdraws into its case, the head is concealed and the anterior opening of the case is blocked by the large flat pronotum.

G. oregona Denning 1968b. Type locality: OREGON, JACKSON Co., 16 miles SE Ruch, May 22/61, J. Schuh.

The type locality is the only Oregon record.

Distribution and Biology: Wiggins (1973b) gives several records for *G. oregona* from high elevations in the Sierra Nevadas of California. This species apparently also has a 2-year life cycle. It is slightly smaller and has a later season flight period than *G. genota*.

Lepania Ross 1941a

This is a monotypic genus known only from a few localities in Washington and Oregon. It was first placed in the subfamily Dicosmoecinae by Schmid (1955), but he later (1968a) assigned it to the Apataniinae. Wiggins (1973b) re-evaluated the systematic position based on characteristics of the immature and adult stages. He concluded that *Lepania* was of unusual phylogenetic significance in bridging the gap between the Goerinae and other subfamilies of Limnephilidae. He considers that the presence of ocelli in the adult, larval mandibles with teeth, and short basal seta of the larval tarsal claw together indicate that *Lepania* is the most primitive living taxon of the Goerinae.

L. cascada Ross 1941a. Type locality: OREGON, LINCOLN Co., Boyer, Apr 27/35, M. L. H.

BENTON Co., Marys Peak Cpgd., at Parker Cr., June 67, 68, & 69 (larvae, pupae, & adults) (Wiggins 1973b). HOOD RIVER Co., Mt. Hood, Barlow and Bennett passes, June 25/65 (Schmid 1968a). LINCOLN Co., Tidewater, Apr 21/35, J. Schuh (paratype, Ross 1941a).

Biology: Wiggins (1973b) described the larvae and pupae from Marys Peak and from the same habitat as another unusual limnephilid, *Moselyana comosa*. They occurred in the muck of a seepage area several feet from Parker Creek. The larval case is composed of small stones, curved, and strongly tapered.

Unplaced Genera

The western genera *Imania*, *Moselyana*, and *Manophylax* were regarded by Wiggins (1973c) as *incertae sedis* because they were difficult to assign to the existing limnephilid subfamilies as now constituted. *Imania* and *Moselyana* were placed in the Dicosmoecinae by Schmid (1955) and transferred to the Apataniinae (Schmid 1958a). Larval characteristics do not support their placement in either of these subfamilies (Wiggins 1973c).

Imania Martynov 1935

Fischer (1967) lists nine species in this genus; all of these are restricted to western North America except for the type species, *I. sichotalinensis* Martynov, which occurs in the South Ussuri region of the USSR.

More species have been described from Asia and North America since then. Ross (1950b) considered *Imania* to be one of the rarest genera of North American caddisflies, with only scattered collections in Alaska and from isolated, high altitude sites in the western mountains. According to Wiggins (1973c), the larvae described as "Limnephilid Genus D" by Ross (1959a) and Flint (1960) probably belong to *Imania*.

***I. acanthis* Ross 1950b.** Type locality: WASHINGTON, Mt. Rainier, along White River.

LANE Co., 20 mi SE Belknap Springs, 7000 ft (no date), Greene & Eppley (det. ROM).

Distribution: *I. acanthis* is known only from the Cascade Range in Washington and Oregon.

***I. cascadis* Ross 1950b.** Type locality: WASHINGTON, summit of Steven's Pass near Berne.

CLACKAMAS Co., Mt. Hood, Timberline Lodge, June 23/65 (Schmid 1968a).

Distribution: In addition to the above records, Newell and Potter (1973) record *I. cascadis* from Montana, and Nimmo (1971) from Banff, Alberta.

***I. cidoipes* Schmid 1968a.** Type locality: WASHINGTON, WHATCOM Co., Mt. Baker, Baker Lodge.

BENTON Co., Marys Peak, 3.7 mi from Rt. 34, Apr 22/66, June 5 & 15/68 (larvae), Anderson & ROM (det. ROM). CLACKAMAS Co., Mt. Hood, Timberline Lodge area, Mar 28/64, Jewett (det. ROM); same, Apr 18-19/64, (adults), June 20/68 & Sept 28-29/66 (larvae) (ROM). LINN Co., Quartzville Rd., E of Green Peter Dam, June-July/68 (larvae), Wold & Wiggins (det. ROM).

Distribution and Biology: The known range of this species extends from the Cascades of northern Washington to the Coast and Cascade ranges in Oregon. The records from Quartzville Road, Linn County, were from seeps and small streams below 500 meters, which is a low altitude for collections of *Imania*.

***I. scotti* Wiggins 1973c.** Type locality: OREGON, CLACKAMAS Co., Mt. Hood, 3.3 mi below Timberline Lodge, 4200 feet, Apr 20/64 (pupae, reared), Wiggins & Scott, and paratype adults, July 16/63, Wiggins.

In addition to the extensive series from the type locality, ROM field parties collected larvae and pupae from the South Fork of Iron Creek, also on Mt. Hood.

Biology: Wiggins (1973c) described the larva and pupa from a small, cold, alpine stream. The larvae occurred at the base of moss fronds

and pupal cases were attached to moss. Larvae of at least two other species of *Imania* were found in the same locality.

***Moselyana* Denning 1949b**

There is only one species in the genus. The larva and pupa were first described by Wiggins (1973c). Schmid (1968a) records the range as Oregon and Washington.

***M. comosa* Denning 1949b.** Type locality: OREGON, JACKSON Co., 22 miles N Prospect, June 8/41, Gray & Schuh.

Schmid (1968a) stated that this species (as *Moselyella comosa*) was locally abundant between 3000 and 6000 feet in June from CLACKAMAS, DOUGLAS, HOOD RIVER, JACKSON, KLAMATH, and LANE counties. Wiggins (1973c) added records for BENTON Co., Marys Peak, and CLACKAMAS Co., Mt. Hood, for June and July.

Biology: On Marys Peak, Wiggins (1973c) noted that the adults were abundant in June, flying over a spring seepage area about 2 meters from Parker Creek. The larvae and pupae were collected, together with those of *Lepania cascada*, in muck taken from the seepage area, but were not found in the stream itself. The larval cases of the two species could be distinguished though both were made of rock fragments and tapered and curved, because that of *M. comosa* was covered with a silken secretion which made the exterior very smooth (Wiggins 1973c).

FAMILY LEPIDOSTOMATIDAE

This family occurs in all faunal regions except the Neotropical and Australian (Wiggins 1977). Ross (1946) reviewed the Nearctic species. Lepidostomatid males are unusual for the diversity of secondary sexual characteristics, such as enlargement or folding of the wings, platelike expansion of some leg segments, oddly shaped basal antennal segment, and diverse kinds of maxillary palpi. These unusual male structures have been used as a basis for generic definition, but Ross (1944, 1946) demonstrated that neither the females nor the immature stages corroborated these generic divisions so only two Nearctic genera, *Lepidostoma* and *Theliopsyche*, are now recognized. Only the former occurs in Oregon.

***Lepidostoma* Rambur 1842 (Figure 19)**

Most of the 65 Nearctic species of this genus are placed in species-groups proposed by Ross (1946), based on characteristics of the genitalia of both sexes. In the present treatment, the species are listed alphabetically without considering the species-groups.

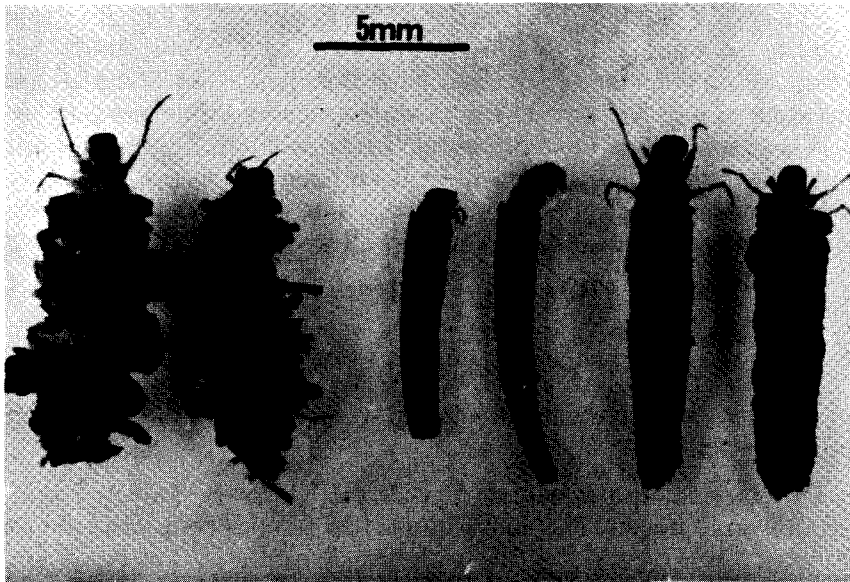


Figure 19. Family Lepidostomatidae. *Lepidostoma* spp., larvae and three case types: log cabin, tubular sand grain type, and chimney case.

Lepidostoma larvae occur primarily in streams in backwaters, pools, or quiet areas near shore. They are also found in ponds and small lakes. The larvae rarely exceed 10 millimeters in length. They are similar in appearance to limnephilids, but they can be recognized by the absence of a dorsal hump on the first abdominal segment and by the location of the antennae near the eyes. Larvae of several species have been reared (e.g., Ross 1944; Flint & Wiggins 1961), but morphological characters to separate the species have not been found.

There are three basic types of *Lepidostoma* cases: chimney-type, a four-sided case tapering towards the posterior and composed of quadrature pieces of leaf or bark; log-cabin type, composed of twigs and needles laid crosswise over the circular tube; and sand-grain type, which is tubular, slightly tapering, and composed of uniform mineral particles. Most species construct the chimney-type case, but within the *unicolor* species-group, at least, all three case types occur. Hansell (1972) described the case-building behavior of *L. hirtum* Curtis, a European species with a chimney case. As with many other species, the early instars have a tubular, sand-grain case. In the third instar the change to rectangular leaf panels is accomplished, producing a case that is square in section with one row of panels for each side.

The eggs of *Lepidostoma* are deposited in small (3-5 mm dia.) spherical masses containing 30 to 40 eggs in a tough gelatinous matrix. Large numbers of *L. unicolor* egg masses have been collected under stones in damp areas of a gravel bar. The eggs were green and the emerging larvae all had a greenish area in the foregut before feeding. Egg masses of this or other *Lepidostoma* spp. also have been collected in pool areas, in up to 2 feet of water, lying loose among the debris. Unlike limnephilid egg masses, those of *Lepidostoma* do not swell up greatly when submerged.

***L. calensis* Denning 1968a.** Type locality: CALIFORNIA, TUOLUMNE Co., Strawberry.

The only Oregon record for this species is mature pupae from POLK Co., Falls City, Aug 21/67 (det. ROM).

The data label indicates that they were "clogging the water supply from a covered spring."

Distribution and Biology: *L. calensis* has been collected only in California and Oregon. The above pupae had tubular cases of sand grains.

***L. cascadenae* (Milne) 1936.** Type locality: BRITISH COLUMBIA, Cultus Lake.

BAKER Co., Pine Cr., Baker, 4000 ft, July 14/67, Goeden (det. Denning). BENTON Co., Corvallis, Oct 10/55, J. D. Lattin (det. Denning). DESCHUTES Co., Tumalo Cr., near Bend, Aug 14/48 (Denning 1949a); Sparks Lake, July 24/69, Goeden (det. Denning). DOUGLAS Co., Muir Cr. Cpgd., Rogue Riv. Nat. For., July 2/61, & Bogus Cr. Cpgd., 14.4 mi E Idleyld Pk., June 10/68 (ROM). HARNEY Co., Fish Cr. near Fish Lake, Steens Mtn., Aug 20/69 (col. & det. Jewett). LANE Co., Waldo Lake, July 23/69, Goeden & Shaefer, & Mack Cr., Andrews For., 11 mi NE Blue River, June/73, Anderson (all det. Denning). LINCOLN Co., Trenholm Saddle Rd., 8 mi E Tidewater, June 15/67 (ROM).

Distribution and Biology: Denning (1954a) records *L. cascadenae* as a typically western species with a range from California northward into the Yukon Territory. The above records indicate that it is widely distributed in Oregon, especially in mountainous regions. The flight period extends from June to October. Ross (1946) records adults from near a wide variety of streams in the Rockies, all of them cold and rapid and most being true mountain cascades.

In studies at Mack Creek, Lane County, we have found this species to be first in a succession of *Lepidostoma* spp. to colonize deciduous leaf packs placed in the stream in the autumn. Early-instar larvae were collected in September and October, and final instars by February. Pupation occurred in June and the flight period extended from July to September. The larvae construct a cylindrical case of sand grains in all instars.

***L. fischeri* Denning 1968a.** Type locality: OREGON, KLAMATH Co., Crater Lake, July 31/64, Schuh & Vertrees.

This species is known only from the type locality, where it was collected in a sphagnum bog.

***L. goedeni* Denning 1971.** Type locality: OREGON, LINCOLN Co., Beverly Beach, Aug 2/69, K. Goeden.

This species is known only from the male holotype which was collected in a black-light trap near the Oregon coast.

***L. hoodi* Ross 1948b.** Type locality: OREGON, CLACKAMAS Co., Government Camp, 4000 feet, July 23/46, H. H. Ross.

BENTON Co., emergence traps, Oak Cr. near Corvallis, Aug-Sept (Anderson & Wold 1972). HOOD RIVER Co., Hood River Meadows, July 17/47, K. M. Fender (paratype, Ross 1948b).

Distribution and Biology: The emergence traps where this species was collected were in the upper reaches of Oak Creek, where the stream was 3 to 4 feet wide. Denning (1954b) recorded this species from a single locality in each of British Columbia, Washington, and Oregon.

***L. jewetti* Ross 1946.** Type locality: WASHINGTON, Ellsworth.

LINCOLN Co., Newport, July 12/68, R. Brown (det. Denning).

Distribution: *L. jewetti* is recorded from British Columbia, Washington, Oregon, and California (Fischer 1970).

***L. knowltoni* Ross 1938a.** Type locality: UTAH, Clinton.

HARNEY Co., Blitzen Riv. near Frenchglen, 4400 ft, July 12/64 (pupa, emerged Aug 13/64), Anderson (det. ROM).

Distribution and Biology: Previous records for *L. knowltoni* are from Utah, Colorado, and Montana (Fischer 1970). The Oregon site from which adults were reared was a fast, silty stream flowing over gravel and small stones. The pupal case is of the chimney type, made of pieces of thin bark.

***L. mira* Denning 1954b.** Type locality: CALIFORNIA, TUOLUMNE Co., Strawberry.

LANE Co., emergence trap, Mack Cr., Andrews For., 11 mi NE Blue River, July 13/73, E. Grafius (det. Denning); McKenzie Riv., at Buck Bridge, July 19/70, Evans & Wold (det. Denning). LINN Co., Parrish Lake Rd., 8.5 mi S Marion Forks, July 25/68, E. Evans (det. Denning). MARION Co., Hill Cr., Breitenbush, July/68, Anderson (det. Denning).

Distribution: This species was previously recorded only from California. All of the Oregon records are from the Cascade Range, in areas of cold, fast mountain streams.

***L. pluviale* (Milne) 1936.** Type locality: COLORADO, Creede, 8000 feet.

UNION Co., Meadow Cr., Rt. 244, June 14/74 (pupae), Anderson, & Gordon Cr., 2 mi NE Elgin, June 12/74, Anderson (det. ROM). WALLOWA Co., 8 mi N Imnaha, July 2/69, Goeden (det. Denning).

Distribution and Biology: Ross (1946) stated that *L. pluviale* is restricted to, and is the dominant *Lepidostoma* in, the eastern ranges of the western montane region (Colorado, Montana, Wyoming, and Utah). The above records from northeastern Oregon, are a westward extension of the known range. The larvae of *L. pluviale* construct a tubular case of sand grains.

Note: The paratypes of *L. pluviale* from British Columbia were re-described as *L. rayneri* by Ross (1941a).

***L. podager* (McLachlan) 1871.** Type locality: CALIFORNIA.

JOSEPHINE Co., Grants Pass, June 4/49, Jewett, & Grayback St. Pk., 12 mi E Cave Junction, June 13/63, Anderson (both det. Denning). LANE Co., Eugene, Sept 17/66, Goeden (det. Denning).

Distribution: Denning (1949a, 1954b) indicated that *L. podager* occurred in central California, possibly western Nevada, with a record from Wyoming. He stated that *L. podager* and *L. quercina* may be synonymous, but that their status would have to be determined from a study of the larvae or of individuals where the two populations overlap. Denning's records indicate a flight period in California from mid-April to early July. The Lane County record for September 17 is somewhat at variance with this.

***L. quercina* Ross 1938a.** Type locality: OREGON, BENTON Co., Oak Creek, Corvallis, Apr 2/35.

BENTON Co., emergence traps, Oak Cr. near Corvallis (Anderson & Wold 1972); Corvallis, many dates, March-Apr; Rock Cr., 5 mi SW Philomath, many dates, Apr-May; emergence traps, Berry Cr., 9 mi N Corvallis, March-May, Anderson (det. ROM); Lobster Cr., 15 mi SW Asea, Aug 4/74 (pupae, emerged Aug 15-21/74), Anderson (det. ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, June 3/67 (col. & det. Jewett); E Fk. Humbug Cr., May 3/64 & May 30/60 (col. & det. Jewett); N Fk. Klaskanine Riv., May 2/61, R. J. Ellis (det. ROM). LINN Co., S Fk. Crabtree Cr., Lacombe, Mar 21/34, R. E. Dimick (det. Denning) & Silver Cr. Falls, May 25/35, H. A. Scullen (det. Ross).

Distribution and Biology: *L. quercina* is a common spring-flying caddisfly near streams of the Willamette Valley and adjacent foothills. Denning (1954b) records it from Oregon, Washington, and Idaho, and Schmid and Guppy (1952) from Vancouver Island. Anderson and Wold (1972) collected it from emergence traps in Oak Creek from the headwaters down to the warmer valley floor; it was more common in the

lower reaches. The adults occurred in March and April, with a single specimen recorded in September. This late-season record is somewhat suspect, as most other Oregon records are from March to early June. However, a series from Lobster Creek, Benton County, that emerged in August were also identified as *L. quercina*. As was indicated above, *L. podager* and *L. quercina* are very similar so identification may be confused.

Life-history and feeding studies of *L. quercina* have been made at Berry Creek near Corvallis where the larvae are especially abundant in the autumn at the time of leaf-fall. Early-instar larvae occur in the shallow riffles in late summer. They build irregular sand cases but switch exclusively to vegetative material in the third instar. This behavior is similar to that reported for *L. hirtum* by Hansell (1972). Mid- and late-instar *L. quercina* larvae build a typical chimney case from quadrangle pieces of leaf or thin bark. In October, the Berry Creek population was predominantly instar IV, and by early November most had moulted to instar V. The larvae grow rapidly during this stadium. For example, on November 1 when the population was early final-instar, the mean dry weight was 1.2 mg, while by December 10 it had increased to 3.5 mg, which approached the maximum size. Laboratory studies indicated that food consumption decreased significantly between November and January. Late-instar larvae occur chiefly at the stream edge or in slow water at the tail of pools. They are most easily collected from branches, pieces of wood, or on individual leaves, rather than in thick accumulations of leaves. Pupae occur in February and March with their cases firmly attached to roots, pieces of wood, or stones near shore.

Feeding studies have demonstrated that *L. quercina* larvae are effective shredders of deciduous leaves (Anderson & Grafius 1975). They show a preference for alder, but also consume maple, poplar, ash, and oak. They do little feeding on conifer needles even when these are well conditioned by microbial flora.

L. rayneri Ross 1941a. Type locality: CALIFORNIA, MONO Co., Convict Creek.

BAKER Co., N Powder Riv., 10 mi E North Powder, July 13/64, Anderson (det. ROM). BENTON Co., Camp Adair, 10 mi N Corvallis, May 15/65 (col. & det. Jewett). CLACKAMAS Co., Mollala Riv., July 1/35, Jewett (paratype, Ross 1941a). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, July 14-26/63 & Sept 4-6/65, Nehalem Riv., May 8/65 & Aug 20/66, E Humbug Cr., May 9/65 (all col. & det. Jewett). CROOK Co., Marks Cr., Rt. 26, 1 mi W Ochoco summit, June 30/74 (pupa), Anderson (det. ROM). DOUGLAS Co., S. Umpqua Falls, 20 mi NE Tiller, June 9/75 (pupae), Anderson (det. ROM). HARNEY Co., Pueblo Mtns., Cottonwood Cr., SE Fields, May 25/65 (col. & det. Jewett). JOSEPHINE Co., Grants Pass, June 2/65, Goeden (det. Denning). LANE Co., Eugene, July 6/69, Goeden (det. Denning); Leaburg Dam,

McKenzie Riv., June 3/64, R. Rood (det. ROM). UNION Co., La Grande, July 1/64, Goeden (det. Denning).

Distribution and Biology: Ross (1946) indicates that *L. rayneri* is related to *L. pluviale* and appears to replace the former in the Coast and Cascade ranges. The above records indicate some overlap of the ranges in northeastern Oregon. Both species construct tubular sand-grain cases.

***L. recina* Denning 1954b.** Type locality: OREGON, YAMHILL Co., Peavine Ridge near McMinnville, June 29/50, K. M. Fender.

In addition to the holotype male, the only other records for this species are: CLATSOP Co., Gronnel Rd., 2 mi E Elsie, July 4-14/63 & July 22-23/67 (Jewett & ROM).

***L. roafi* (Milne) 1936.** Type locality: COLORADO, EAGLE Co., Sheephorn, 7900 feet.

BENTON Co., emergence traps, Oak Cr., near Corvallis, Aug-Sept (Anderson & Wold 1972); Berry Cr., 9 mi N Corvallis, Sept 12/73, Anderson (det. Denning). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., Sept 28-29/66 (ROM). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates June-July (col. & det. Jewett). CROOK Co., Ochoco Mtns., Hwy. 26 near summit, July 31/65 (col. & det. Jewett). LINN Co., Quartzville Rd., 2.5 mi E Rocky Top Rd. bridge, June 29/73 (larvae, emerged Sept/73), Anderson, & Parrish Lake Rd., N Santiam Riv., Sept 5/68, E. Evans (both det. Denning). MULTNOMAH Co., Wahkeena Falls, Sept 27/66 (ROM). UNION Co., La Grande, Sept 22/67, Goeden (det. Denning).

Distribution and Biology: This species is well distributed in the western half of the continent, extending east to South Dakota and north to the Yukon Territory (Denning 1949a, 1954b). Ross (1946) indicated that the Oregon paratype of *L. roafi* was actually *L. strophis*, so at that time there was no definite record of *L. roafi* from Oregon. The larval case is similar to that of *L. quercina*, the chimney type composed of quadrate pieces of leaves or thin bark.

***L. strophis* Ross 1938a.** Type locality: MICHIGAN, Beulah.

This transcontinental species is widely distributed in the west (Denning 1954b). In Oregon it is recorded from the following counties: BENTON, CLATSOP, CROOK, CURRY, DOUGLAS, GRANT, HARNEY, JACKSON, JEFFERSON, KLAMATH, LANE, LINCOLN, LINN, MARION, and UMATILLA.

Biology: *L. strophis* has an extended flight period in Oregon, being recorded from April 21 to October 28. The larvae construct a chimney-type case of leaves.

L. unicolor (Banks) 1911. Type locality: CALIFORNIA, Switzers Camp, San Gabriel Mountains.

This species occurs from Minnesota to the Pacific, and from California and Arizona to Saskatchewan (Denning 1954b). It is widespread in Oregon, having been recorded from the following counties: BENTON, CLACKAMAS, CROOK, DESCHUTES, DOUGLAS, GRANT, HARNEY, HOOD RIVER, JEFFERSON, LANE, MULTNOMAH, UMATILLA, and WALLOWA. Flight records range from April to October.

Biology: The larval case is of the log-cabin type (Anderson 1967a). The materials vary, depending on availability, and may include twigs, needles, or aquatic macrophytes. The case is short and broad, with irregular lengths of the twigs and stems laid crosswise.

A discrete univoltine life cycle with adult emergence occurring in August and September was reported by Anderson (1967a), based on drift-trap studies on the Metolius River, Jefferson County. However, adults have been collected at that site from April to September by ROM field parties, so the flight period is much longer than originally reported. Winterbourn (1971a) recorded the larvae from backwaters and pools of the inlet stream to Marion Lake, British Columbia, and the larger larvae also from the lake. He recorded final-instar larvae as present in all months but September, with the largest numbers occurring in June and July. Overwintering was primarily in the penultimate instar. Pupae occurred from mid-May to mid-August, and emergence continued from May to August.

Winterbourn (1971a) investigated the feeding habits of *L. unicolor* larvae under field and laboratory conditions. They fed almost exclusively on decaying deciduous leaves, with the associated microflora (bacteria, fungi, and some algae) being the assimilable material. He found no evidence of preference between maple, alder, and poplar leaves. However, the degree of decomposition was important, with the most decayed leaves being eaten first. When larvae were provided with discs of fresh leaves of *Potamogeton*, none was consumed; instead, the larvae ingested parts of their cases.

At Mack Creek, Lane County, this species occurred in leaf packs placed in the stream in the autumn. *L. unicolor* larvae first became abundant in the packs during the spring. They colonized both deciduous and conifer needle packs and appeared to be the primary shredder responsible for the disappearance of the latter (Anderson & Grafius 1975). Laboratory studies indicated that final-instar larvae would ingest more than their body weight per day of conifer needles, but growth did not occur unless the needles were well colonized with a microbial flora.

***L. valeda* Denning 1948c.** Type locality: WYOMING, ALBANY Co., SNOWY Range Mountains near Centennial.

BAKER Co., Baker, July 4/67, Goeden (det. Denning). GRANT Co., John Day, July 20/67, Goeden (det. Denning). UNION Co., Grande Ronde Riv., Hilgard Jct. St. Pk. near La Grande, June 11/74, Anderson (det. Smith).

Distribution: Denning (1948c, 1949a) recorded this species from Colorado and Wyoming. He indicated that it was collected only from clear, swiftly flowing mountain streams.

***L. veroda* Ross 1948b.** Type locality: OREGON, HOOD RIVER Co., Hood River Meadows, July 17/47, K. M. Fender.

This species is known only from the male holotype collected on Mt. Hood.

FAMILY BRACHYCENTRIDAE

There are 6 genera and about 30 Nearctic species in this Holarctic family. It is placed in the Limnephilid branch of the superfamily Limnephiloidea, but somewhat apart from the other families (Ross 1967). The prosternal horn, which is present on larvae in other families of the limnephilid line, is absent in most brachycentrids. The larvae are also unusual in the lack of dorsal and lateral humps on the first abdominal segment.

All brachycentrid larvae inhabit running water, but stream size preference varies between species. Species from rivers may emerge in large numbers, resulting in nuisance problems (Corbet et al. 1966).

***Amiocentrus* Ross 1938a (Figure 20a)**

Wiggins (1965) elevated this subgenus to generic status on the basis of larval and adult characters. The single known species, *A. aspilus* (Ross), is locally abundant in Oregon. Wiggins suggests that there may be other undescribed species of the genus in western North America. The genus has some characteristics of both *Brachycentrus* and *Micrasema* in both the larval and adult stages (Wiggins 1965).

***A. aspilus* (Ross) 1938a.** Type locality: WYOMING, Pinedale, along Green River.

BENTON Co., N Fk. Alsea Riv., E of Alsea, Sept 24/66 (ROM); Corvallis, Mar 15/35, J. Schuh (det. Ross); Camp Adair, 10 mi N Corvallis, May 15/65 & June 12-13/64 (col. & det. Jewett). CURRY Co., Gold Beach, June 30/67 & Sept 18/64, Goeden (det. Denning). DESCHUTES Co., Deschutes Riv., Bend, May 26/50, Fender & Jewett (det. Jewett); Redmond, June 1/39, Schuh & Gray (det. Ross). DOUGLAS Co., Muir Cr. Cpgd., Rogue Riv. Nat. For., July 1/61, &

Clearwater Riv., Boulder Flats Cpgrd., Rt. 138, June 9/68 (ROM). JEFFERSON Co., Deschutes Riv. at Warm Springs, June 5/64, & Palisade St. Pk., June 14/63 (col. & det. Jewett); Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, many dates, May-Sept (Anderson 1967a). KLAMATH Co., Crooked Cr., at Rt. 62, S of Fort Klamath, June 8/68 & Oct 1/66 (ROM). LANE Co., Eugene, Oct 12/66, Goeden (det. Denning). LINN Co., Tombstone Prairie, Santiam Pass, July 22/49, Roth & Beer (det. Denning). MARION Co., Aumsville, May 12/64, Goeden (det. Denning).

Distribution and Biology: *A. aspilus* is widely distributed in the west from British Columbia to California and east to Colorado and Montana (Wiggins 1977). The life cycle of *A. aspilus* in the Metolius River was discussed by Anderson (1967a). The larvae occurred at a density of up to 700 per square foot in benthos collections from *Ranunculus* beds and were also abundant in drift collections. Though a partial second generation was suggested at this site, it is probable that the species is univoltine with a long period of adult emergence and oviposition. Adults were common at the Metolius site from May through September. The entire flight period, based on Oregon records, is from March to October.

The larvae construct tubular cases that taper towards the posterior end (Figure 20a). The cases are made of a silken secretion, or pieces of plant material, wound tightly around the long axis (Wiggins 1965).

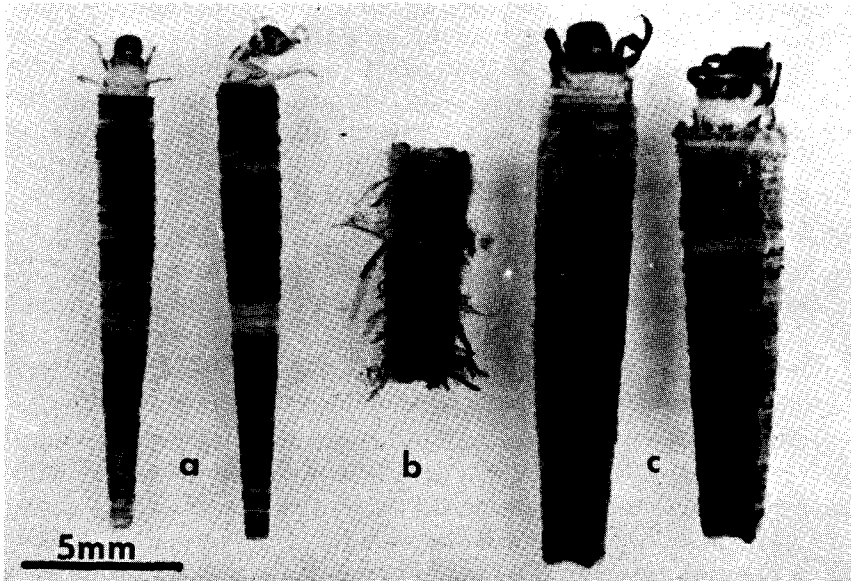


Figure 20. Family Brachycentridae, larvae and cases. (a) *Amiocentrus aspilus*; (b) *Eobrachycentrus gelidae*; (c) *Brachycentrus* sp.

Larvae occur in currents of moderate velocity, usually where there is some rooted vegetation. Aggregations of pupae are found in the larval habitat, usually with the posterior end firmly attached to a stone and the case projecting perpendicular to the surface (Anderson 1967a).

***Brachycentrus* Curtis 1834 (Figure 20c)**

This is a Holarctic genus with nine known species in North America (Wiggins 1977). The larvae are the typical chimney-case builders which can be very common in rapid, shallow, nonshaded streams. The larvae are common in diatom-rich streams east of the Cascades in Oregon. However, the larvae have not been identified to species, so the records below do not fully reflect the distribution or abundance of *Brachycentrus*.

***B. americanus* (Banks) 1899.** Type locality: NEW HAMPSHIRE.

DESCHUTES Co., Lava Lake and Sparks Lake, July 24/69, Goeden (det. Denning). DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., July 3/61 (ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, many dates, May-Oct (ROM, & Anderson 1967a). LAKE Co., Lakeview, Aug 6/68, Goeden (det. Denning).

Distribution and Biology: This is a widespread species, occurring from coast to coast through the northern part of the continent (Ross 1944).

Life-history studies, based on benthos and drift collections at the Metolius River site are given by Anderson (1967a). There is apparently only one generation per year, but adults occur from May to October. Overwintering occurs primarily as early-instar larvae, with mature larvae being present in late spring and summer. Eggs are laid in quiet areas near shore, and first-instar larvae (ca. 1 mm long) disperse by drifting to fast water where they complete development.

The larger larvae occur in fast water (over 2 ft/sec) with the case cemented to a stone so that the larva faces the unbroken current. They filter from the water column with specially adapted fringes of hairs and bristles on the legs (Mecom & Cummins 1964). These authors report that more than 95% of the diet is diatoms. Gallepp (1974a) indicates that the larvae also feed by scraping periphyton from the substrate.

B. americanus is a master builder, constructing a very symmetrical chimney-type case (Figure 20c). It is square in cross section with an interior cylindrical tube of silk. Small twigs, stems, plant fibers, or wood, cut to give smooth edges, are laid crosswise. The case tapers uniformly towards the posterior end. Ross (1944) records some cases that are round in cross section and composed of secretion, as well as the square case that is considered typical for the genus.

***B. occidentalis* Banks 1911.** Type locality: BRITISH COLUMBIA, Bon Accord.

DESCHUTES Co., 15 mi S Bend, May 2/53 (ROM). MARION Co., Santiam Riv., Jefferson, Apr 7/46, Jewett (det. Ross).

Distribution and Biology: Ross and Spencer (1952) record this as a widespread western montane species, but there are only two records from Oregon. Though primarily western in distribution, the species occurs as far east as Wisconsin (Gallepp 1974b).

B. occidentalis is univoltine. The eggs are laid in the spring; larvae reach the final instar by September and overwinter in that stage (Gallepp 1974b). The young larvae build a log-cabin-type case, but later change to a tubular case of sand grains (Gallepp 1974b).

***Eobrachycentrus* Wiggins 1965 (Figure 20b)**

This monotypic genus is considered by Wiggins (1965) to be the most primitive North American brachycentrid because of the wing venation, the complete tibial spur complement, and the presence of a very small prosternal horn. It is unusual for brachycentrid larvae to have a prosternal horn.

***E. gelidae* Wiggins 1965.** Type locality: OREGON, CLACKAMAS Co., Mt. Hood, streams crossing highway between Government Camp and Timberline Lodge, 4200 feet, Apr 18/64, Wiggins & Scott.

Biology: This species is known only from a restricted locality on Mt. Hood. Larvae, pupae, and adults were all collected in April from small, cold, spring streams. The adults were crawling actively on snowbanks on sunny days. Larvae occurred in clumps of moss either on submerged rocks or along the edge of the stream. Wiggins (1965) collected larvae ranging in size from 6 to 11 millimeters in April and suggested that the life cycle extends 2 or more years in these very cold waters.

The larval case is of the chimney type, but more ragged in appearance than that of *Brachycentrus* because of the trailing ends of moss and other plant materials from which it is made (Wiggins 1965).

***Micrasema* McLachlan 1876**

Lepneva (1964) indicates a Holarctic distribution for the genus. She describes the habitat as clear brooks and rivulets, and the larval case as smooth, conical, slightly curved, and made of sand grains with some silk secretion. The genus occurs in most parts of North America, with 18 known species (Wiggins 1977).

***M. bactro* Ross 1938b.** Type locality: OREGON, GRANT CO., Strawberry Camp, 5700 feet, July 17/46, R. Rieder.

BENTON Co., Oak Cr. near Corvallis, emergence traps, May-June (Anderson & Wold 1972) & May 15/65 (col. & det. Jewett). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, June 17/67 (col. & det. Jewett). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, July 16/65 (Anderson 1967a). LANE Co., Leaburg Dam, McKenzie Riv., June 30/74, R. Rood (det. ROM).

Distribution and Biology: Ross and Spencer (1952) record *M. bactro* as a widespread western montane species. The Oregon records are from scattered areas and each is based on very few specimens. The adults were collected from emergence traps in the headwater regions of Oak Creek from early May through June. The larvae are unknown.

***M. dimicki* (Milne) 1936.** Type locality: OREGON, LINN CO., South Fork Crabtree Creek, Lacombe, Mar 21/34, R. E. Dimick.

BENTON Co., Alder Cr., 7 mi E Alsea, Apr 15/64 (ROM); Rock Cr., 5 mi SW Philomath, Apr 16/38, E. Yoeman, & Apr 19/35, K. Grey (both det. Ross), & Apr 24/64 (ROM); Berry Cr., 9 mi N Corvallis, Apr 5/41, D. Dickey (det. Ross) & several dates Mar-Apr (Anderson, & ROM); Oak Cr. near Corvallis, Apr 13/34 (paratype, Milne 1936), emergence traps, Mar-Apr (Anderson & Wold 1972); same, Mar 16/34, E. Ball (det. Denning), Apr 6/39, C. H. Lemons, Apr 16/39, F. P. Larson, & Apr 27/37, H. Smith (all det. Ross). CLATSOP Co., Big Cr., Apr 16/49, Youngs Riv., Apr 17/49, Necanicum Riv., Apr 24/48, & Apr 25/65 (all col. Jewett, det. Denning). JOSEPHINE Co., Rogue Riv., mouth of Muir Cr., & Foster Cr., June 17/49, Jewett (det. Denning). LINN Co., Colorado Lake near Corvallis, Apr 2/38, Jewett (det. Ross).

Distribution and Biology: *M. dimicki* is an early-season flier that is relatively common in small Willamette Valley streams and adjacent Coast Range streams. The records from southern Oregon are 2 months later than those from further north. It is apparently restricted to Oregon. Wiggins (1965) described the larvae and pupae. The case is cylindrical and constructed of plant fibers wound tightly around the long axis of the case. Larvae occur in riffles and glides, frequently associated with patches of moss.

Note: Wiggins (1965) transferred this species from *Oligoplectrum* to *Micrasema* on the basis of larval characteristics though he recognized that the adult was not concordant with the generic concept of *Micrasema*.

***M. diteris* Ross 1947.** Type locality: UTAH, 6 miles S Monte Cristo.

CROOK Co., Marks Cr., Cougar F. C., 22 mi W Mitchell, July 9/64 (pupa), Anderson (det. ROM). MULTNOMAH Co., Wahkeena Falls, July 25/64, Anderson (det. ROM).

Distribution and Biology: *M. diteris* is listed only from Utah by Fischer (1970). The pupal case of the specimen from Crook County was tubular and built of sand grains.

***M. onisca* Ross 1947.** Type locality: CALIFORNIA, MONTEREY Co., Hastings Natural History Reserve.

CLACKAMAS Co., Mt. Hood, Still Cr. F. C. near Government Camp, June 21/68 (ROM). DOUGLAS Co., Muir Cr. Cpgrd., Rogue Riv. Nat. For., July 1/61 (ROM). JEFFERSON Co., Metolius Riv., Riverside F. C., 1 mi S Camp Sherman, June 18/68 (ROM). LINN Co., Quartzville Rd., ca. 1.4-1.6 mi E Yellowstone Guard Sta., June 16/68 (ROM).

Distribution: Ross (1947) recorded *M. onisca* from coastal California and several areas in Utah, with a flight period in May and June. The Oregon records are from the Cascade Range and Siskiyou Mountains, with adults from June 16 to July 1.

FAMILY SERICOSTOMATIDAE

Ross (1967) places the remaining families of caddisflies in the Leptocerid Branch. These have primitive pronotal characteristics in the larvae and loss of ocelli and part of the supratentorium in the adult. The Family Sericostomatidae, used in the restricted sense (e.g., Fischer 1970), is considered a relatively primitive offshoot of this line.

The Family Sericostomatidae (s.s.) is of nearly worldwide distribution. Until the recent study by Ross and Wallace (1974), all of the eight Nearctic species were placed in the genus *Sericostoma*. They have grouped the North American species into three genera, *Agarodes*, *Fattiga*, and *Gumaga*. Only the latter occurs in the west.

Gumaga Tsuda 1938

This genus has one species in Asia, plus two species in western North America that Ross and Wallace (1974) place in a separate subgenus, *Neogumaga*. Though the larvae of the latter have not been associated, there are two taxa of sericostomatid larvae known from the area that are probably *Gumaga*. Ross (1959a) used these for keying *Sericostoma*. He states that the larvae construct robust cases of small stones and live in cold, rapid streams.

As *Gumaga* is not common in Oregon, records for larvae are given at the generic level.

***G. griseola* (McLachlan) 1871.** Type locality: CALIFORNIA.

CURRY Co., Brush Cr., Humbug Mtn. St. Pk., June 6/63, Anderson (ROM); Gold Beach, June 30/67, Goeden (det. Denning). DES-

CHUTES Co., Todd Lake near Deschutes City, Aug 10/69, R. Brown (det. Denning). DOUGLAS Co., Days Cr., 1 mi E Days Creek, June 5/75 (larvae, emerged July 22/75), Anderson (det. ROM). JOSEPHINE Co., Galice Cr., near Galice, 470 ft, Aug 6/67 (pupa), J. & R. Wold (det. Ross). LAKE Co., Lakeview, Aug 1/68, Goeden (det. Denning).

Distribution: This species is recorded from Arizona, California, New Mexico, and Utah (Ross & Wallace 1974).

***G. nigricula* (McLachlan) 1871.** Type locality: CALIFORNIA.

The only record for this species in Oregon is: DOUGLAS Co., Diamond Lake, July 18/35, K. Gray (det. Denning, as *Sericostoma arizonica*).

Distribution: According to Ross and Wallace (1974), this species has been recorded only from California. However, *S. arizonica* (Banks) 1943, a synonym of *G. nigricula* (Fischer 1970), was described from Arizona.

***Gumaga* sp(p).**

CURRY Co., Loeb St. Pk., Chetco Riv., 8 mi E Brookings, June 1/63 (larva), Anderson (det. ROM). DOUGLAS Co., S Umpqua Falls, 20 mi NE Tiller, June 9/75 (larvae), Anderson (det. ROM). LAKE Co., Quartz Cr., E of Quartz Mtn. summit, ca. 25 mi W Lakeview, 5300 ft, Apr 1/68 (larva), E. D. Evans (det. ROM).

FAMILY HELICOPSYCHIDAE

Ross (1959a) records only the genus *Helicopsyche*, with four species from America north of Mexico. The widespread *H. borealis* (Hagen) is the only known species in Oregon. Larvae of this species are perhaps the best known of caddisflies because their curious snail-like case (Figure 21a) has attracted the attention of entomologists and natural history collectors (Ross 1944). Vorhies (1909) and Lloyd (1921) described the immature stages and life cycle. The larvae live on sand or gravel substrates. The case is in the form of a spiral coil (diameter to 5 mm) shaped like a snail shell and made of sand grains and small stones. For pupation they attach their cases to submerged logs and stones. As large numbers congregate within a small area in these stages, it is the prepupae and pupae that are most commonly collected.

***Helicopsyche* Hagen 1866 (Figure 21a)**

The immature stages of this genus are common in most rivers and streams of eastern and southern Oregon. The records listed below are only for adults identified to species.

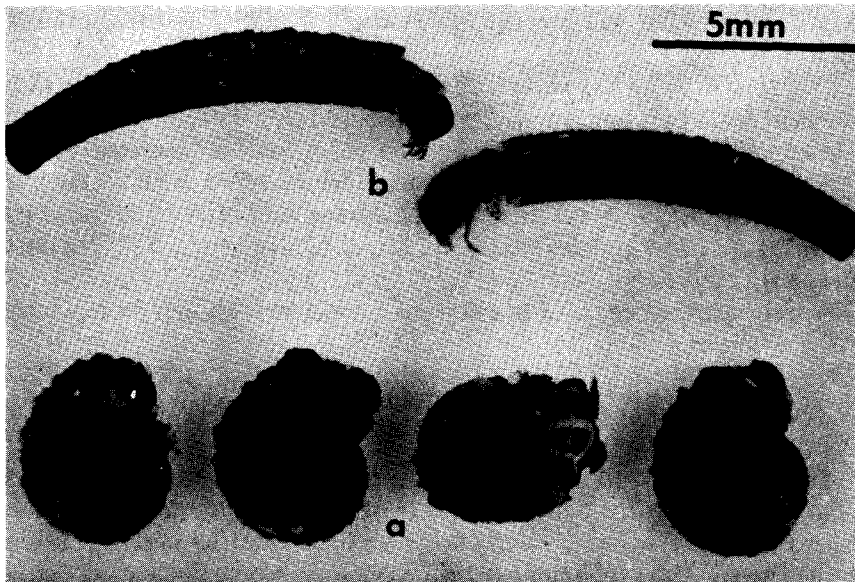


Figure 21. Families Helicopsychidae and Odontoceridae. (a) *Helicopsyche borealis* larva and cases; (b) *Parthina linea* larvae and cases.

***H. borealis* (Hagen) 1861.** Type locality: CANADA, St. Lawrence River.

CROOK Co., Marks Cr., Ochoco Mtns., July 26/63, Anderson (det. Denning). CURRY Co., Chetco Riv., Myrtle Grove, Aug 4/50, K. M. Fender (det. Jewett). DESCHUTES Co., Tumalo St. Pk. near Bend, July 19/61, G. Guyer (det. Denning). JACKSON Co., Medford, July 1/69, L. Gentner (det. Denning). MALHEUR Co., Three Forks, 40 mi S Jordan Valley, Oct 1/65, Goeden (det. Jewett).

Biology: According to Wiggins (1977), *H. borealis* occurs along wave-washed lake shores as well as in lotic situations. He indicates that the larvae have a broad temperature tolerance, occurring in thermal streams up to 35°C where no other caddis larvae are found.

FAMILY ODONTOCERIDAE

This is a small, diverse family represented in all faunal regions except the Ethiopian. Ross (1967) places it in the Leptocerid branch of the advanced caddisflies, but without any closely related families. Wiggins (1977) indicates that the 12 North American species are classified in 5 genera, 3 of which are monotypic. There are two subfamilies: the Pseudogoerinae, with a single genus *Pseudogoera*, and the Odontocerinae. He characterizes the odontocerids as typifying a senescent group that was

once widespread but has become increasingly confined in distribution and habitat.

Wiggins (1977) has shown that casemaking behavior in this family is different from that of other portable-case families. This may be related to the burrowing habits of the larvae. The cases lack an internal lining of silk and tend to have conspicuous mortar joints, often with small pieces of rock incorporated with the silk as a mosaic between larger pieces (Figure 21b). Most species occur in silty or sandy areas, with the larvae feeding on detritus.

Three species, each in a different genus, are known from Oregon. None is common.

Subfamily Odontocerinae *Namamyia* Banks 1905

This is a monotypic genus known only from California and Oregon. Though the larvae have not been positively associated, the presumed larva is almost certain to be *Namamyia* because all other Nearctic odontocerid larvae are known (Wiggins 1977).

***N. plutonis* Banks 1905.** Type locality: CALIFORNIA.

BENTON Co., Marys Peak, May 23/59, Jewett, & July/68, J. Wold (both det. ROM); Marys Peak, N. Fk. Rock Cr., July 5/63 (larvae) (ROM). DOUGLAS Co., No Name Cr., Oregon Caves Nat. Mon., June 14/63 (larva), Anderson (det. ROM). LANE Co., Watershed 10, Andrews For., 5 mi NE Blue River, several dates June-Sept (larvae) (det. ROM). MARION Co., Breitenbush, June 18/65 (Schmid 1968a).

Biology: Wiggins (1977) described the case of *N. plutonis* as made of small rock fragments, curved and somewhat tapered, and up to 30 millimeters long. He gives the habitat as gravel substrates of small, cool streams. We have collected several larvae from the Watershed 10 site in Lane County, which is a very small stream. The larvae occurred in core samples taken from areas of coarse gravel intermixed with silt and organic sediments.

Nerophilus Banks 1899

This genus contains a single species that has been recorded only from California and Oregon. The larva is slightly smaller than that of *Namamyia* and also differs from the latter in having gills on abdominal segment I (Wiggins 1977).

***N. californicus* (Hagen) 1861.** Type locality: CALIFORNIA.

BENTON Co., emergence trap, Oak Cr., 6 mi NW Corvallis, June/68 (Anderson & Wold 1972); spring run, Bellfountain Park, Apr 4/64 (larva), June 8/64 (pupa), Anderson & Wiggins (det. ROM). LINCOLN

Co., seepage area, Trenholm Saddle Rd., 8 mi E Tidewater, May 12/64 (larva, reared) (ROM); Needle Branch Cr., ca. 10 mi S Toledo, July/65 (larvae) (col. & det. Anderson).

Biology: The single adult taken in an emergence trap in Oak Creek was from a riffle in an open area where the stream was about 3 feet wide. Larvae have been collected in organic debris on sandy substrates of small streams. The larvae construct strong, smooth cases of sand grains and are about 20 millimeters long.

Parthina Denning 1954a (Figure 21b)

There are two known species in this genus, both restricted to western North America. Wiggins (1977) described the larva and gives the habitat as substrates of sand, silt, or gravel in small, cold springs. Larval cases are made of sand grains but are unique among North American odontocerids in appearing to be varnished because of the layer of silk applied to the exterior of the case (Wiggins 1977).

***P. linea* Denning 1954a.** Type locality: CALIFORNIA, TUOLUMNE Co., Strawberry.

BENTON Co., Marys Peak near Parker Cr., Oct 3/72 (larva in wet moss), D. Friese (det. ROM as *Parthina* sp.). CLACKAMAS Co., Mt. Hood, Still Cr. F. C., June 21/68 (ROM). JOSEPHINE Co., W of Selma, May 6/64, J. Schuh (det. Denning). LANE Co., hillside seep near Sea Lion Caves, N Florence, May 9/75 (larva), R. Hafele (det. Anderson). LINN Co., hillside seep, Quartzville Rd., 2.5 mi E Rocky Top Rd. bridge, Aug-Nov/73 (larvae), & Nov/74 (larvae, emerged May/75), Anderson (det. ROM). YAMHILL Co., Peavine Ridge near McMinnville, Aug 16/48, K. M. Fender (paratype, Denning 1954a); same, July 9/63 (larvae & adults) (ROM).

Distribution and Biology: *P. linea* is recorded from California, Arizona, and Oregon (Wiggins 1977).

Numerous larvae were collected from moss and other damp substrates on a wet hillside at the Quartzville Road site, Linn County. A mass of about 100 eggs was found in late July on the underside of a stone in a damp area. It was dome-shaped, but the gelatinous exterior was quite fluid. The mass became shapeless and oozed down the rock when kept in a saturated atmosphere. At 15.6°C in the laboratory, the duration of each of the first three instars was about 2 months; some larvae were in instar IV when the culture was lost in early March. A 2-year life cycle seems probable, based on the very slow lab growth rate and on the occurrence of several case sizes throughout the summer. The larvae construct smooth, slender cases of fine sand grains, 8 to 10 millimeters long. Early-instar larvae were observed to feed by rasping the surface layers of dead leaves, apparently consuming detrital material and associated

microorganisms. A mature larva was seen hollowing out a seed; it had cut through the husk and then fed on the interior portion by making a rapid series of up and down sweeps with the head and mouthparts.

FAMILY CALAMOCERATIDAE

This is a small family related to the Leptoceridae that chiefly occurs in subtropical regions with limited northward extensions. Lepneva (1964) gives the total number of species as 90. There are three genera and five species in America north of Mexico (Wiggins 1977). The Oregon fauna is restricted to a single common species, *Heteroplectron californicum* McLachlan.

Heteroplectron McLachlan 1871 (Figure 22)

This genus is restricted to the Nearctic region, with one eastern species, *H. americanum* (Walker), and the western species, *H. californicum*, that occurs from California to British Columbia (Wiggins 1977).

H. californicum McLachlan 1871. Type locality: CALIFORNIA.

This species has been collected from: BENTON, CLACKAMAS, CLATSOP, DESCHUTES, DOUGLAS, JEFFERSON, LANE, LINCOLN, and LINN counties. All of these counties are in, or west of, the Cascade Range. These records are based primarily on larval collections and may well not represent the range of the species. Adults are poorly represented in collections; it seems likely that they are not attracted to lights.

Biology: *H. californicum* is a medium-sized caddisfly that is readily recognized both as larvae and adults. The larvae do not build a case; they hollow out a twig or piece of wood and line the cavity with silk (Figure 22). The larvae are common in small woodland streams of western Oregon. They are frequently found clinging to fallen branches or other woody debris in backwater regions. Some mature larvae have been found in burrows in large pieces of wood. Presumably these were preparing to pupate because the larvae normally have transportable cases.

Emergence-trap collections from Oak Creek and Berry Creek, Benton County, and Mack Creek, Lane County, indicate that adults emerge in May and June. No detailed life-history studies have been made, but there is some suggestion that the life cycle requires 2 years. For example, the emergence period is restricted but several instars have been obtained in winter collections. Winterbourn (1971a) believed that the larvae had a short, summer growth period because final instar larvae were most abundant in August and September. However he gave no data on adults, eggs, or early instars so life-cycle inferences cannot be made.



Figure 22. Family Calamoceratidae. *Heteroplectron californicum*, larvae and stick cases. A stick is split open to show the silk-lined tunnel of the larva.

Winterbourn (1971a) reported that the larvae ingest dead leaves and decaying bark. Grafius (1974) demonstrated that the larvae have a marked preference for alder over bigleaf maple leaves as food. From both laboratory and field observations, we believe that *H. californicum* larvae play a significant role in the breakdown of woody materials in streams because they ingest large quantities of both leaves and wood and egest much of it as finely divided feces.

FAMILY LEPTOCERIDAE

This worldwide family is considered by Ross (1967) to be the most advanced family of Trichoptera. They are small to medium-sized caddisflies with slender bodies and extremely long antennae. The wings are frequently patterned with patches of hairs that are easily rubbed off. The larvae all make cases, usually quite slender. The cases are made of a variety of materials including sand, vegetation, or sometimes entirely of a secretion (Figure 23). The larvae mostly have long antennae located near the base of the mandibles. Their legs, too, are slender and elongate; in some forms there are hair fringes that enable the larvae to swim.

The pupal chamber has slits rather than mesh in the ends. As the pupa pushes the larval sclerites through the slits, it is not possible to use

the metamorphotype method (Milne 1938) of associating the larva and adult. The larval sclerites have to be collected from the rearing chamber rather than within the pupal case.

Leptocerids occur in a variety of habitats, but are most characteristic of lentic habitats and larger streams. There are about 100 species in North America. Many of these occur in abundance and can be a nuisance. Though several species occur in Oregon, they are not generally a dominant component of our fauna, such as is reported by Ross (1944) for this family near glacial lakes and large rivers in Illinois. However, most species have characteristic mating swarms over their habitat so they are readily seen.

According to Ross (1944), many leptocerid species are widespread in distribution, some of them Holarctic. Thus, even though this family has received little attention in Oregon, most species can be identified by referring to publications for other areas of the country. The family is divided into two subfamilies, but all North American genera are assigned to the Leptocerinae (Wiggins 1977). Five of the seven North American genera occur in Oregon. They are listed below in alphabetical order.

Subfamily Leptocerinae
Ceraclea Stephens 1829 (Figure 23b)

The North American species formerly assigned to *Athripsodes* Billberg 1820, have been transferred to *Ceraclea* (Morse 1975). This genus

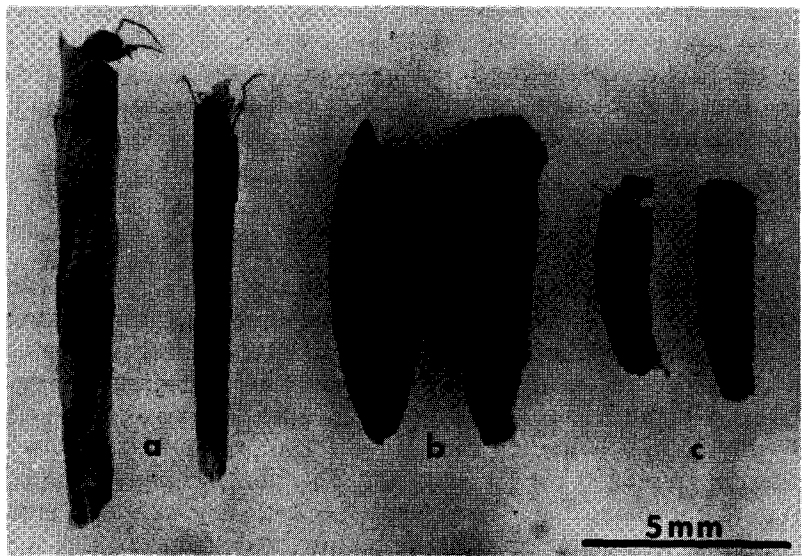


Figure 23. Family Leptoceridae larvae and cases. (a) *Triaenodes* sp.; (b) *Ceraclea resurgens*; (c) *Oecetis avara*.

has a Holarctic distribution and about 34 species in North America. Resh (1973) studied the biology of several eastern species and associated the immature stages with the adults. At least six species have been recorded from Oregon. Determinations by D. G. Denning indicate that there are also some undescribed *Ceraclea* in the area.

Ceraclea larvae are stout bodied. They build a tapering, horn-shaped case or one with lateral flanges. Materials used in case construction include sand grains, vegetative material, or a mixture of both (Ross 1944). Larvae occur in both lentic and lotic habitats, but several species are apparently restricted to streams and rivers. Many records indicate an association between *Ceraclea* and freshwater sponge (Ross 1944, Lepneva 1966, Resh 1972). Lehmkuhl (1970) and Resh (1973) demonstrated that some larvae feed on the sponges. The larvae of species associated with sponges make their cases from silk secretion, sometimes with pieces of sponge incorporated.

Two of the three *Ceraclea* species classified as nuisance species in the St. Lawrence River Shadfly project (Corbet et al. 1966) also occur in Oregon.

***C. annulicornis* (Stephens) 1836.** Type locality: BRITAIN.

BENTON Co., Marys Riv., Corvallis, May 26/40, M. Fleming (det. Ross). CURRY Co., Chetco Riv., Myrtle Grove, Aug 4/50, K. M. Fender (det. Jewett). DOUGLAS Co., Umpqua Riv., Rt. 138, S Kellogg, June 7/68 (ROM). MARION Co., 3 mi S Brooks, June 21/70, Brown & Goeden (det. Denning).

Distribution: Ross (1944) records this species as Holarctic, with the North American range extending from Alaska to New York.

***C. latahensis* (Smith) 1962.** Type locality: IDAHO, LATAH Co., Moscow.

DESCHUTES Co., Tumalo St. Pk. near Bend, July 19/61, G. Guyer (det. Denning). DOUGLAS Co., N Umpqua Riv. near Roseburg, Sept/64 (Denning 1966). HARNEY Co., 12 mi N Burns, July 15/65, Goeden (det. Denning). LANE Co., Eugene, July 24/68, Goeden (det. Denning). MARION Co., Brooks, June 13/68 & Woodburn, July 9/68, both Goeden (det. Denning).

Distribution: In addition to the Idaho type locality and Douglas County, Oregon, Denning (1966) recorded this species from Lake Tahoe, California.

***C. resurgens* (Walker) 1852.** Type locality: CANADA, Hudson Bay.

BENTON Co., Lobster Cr., ca. 15 mi SW Alsea, Sept-Oct/73 (larvae & prepupae, emerged Feb-Mar/74), Anderson (det. Resh). CLATSOP Co., Gronnel Rd., 2 mi E Elsie, many dates, June 10-Aug 4, Jewett (det. ROM, & Resh); Nehalem Riv., at mouth Cow Cr., 3 mi NE Elsie, Oct 1/69 (larvae & prepupae in freshwater sponge), Jewett (det. Resh).

Biology and Distribution: Ross (1944) gives the range of this species as the northeast, but the Oregon records indicate a transcontinental distribution, as was also indicated by Smith (1965). Larvae of several instars and prepupae and empty pupal cases were common in mats of freshwater sponge in Lobster Creek, Benton County, in September and October 1973. The larvae are stout, sluggish, and green in color. The tough brown case is a broad horn shape, composed of silk secretion.

Though Jewett's records from Clatsop County indicate a flight period from June to early August, *C. resurgens* apparently has two types of overwintering stages. The numerous empty pupal cases in the autumn indicate emergence of a summer brood that presumably overwinters as eggs or early-instar larvae. Laboratory rearing demonstrated that another brood diapauses as prepupae. Generally, earlier emergence was obtained from prepupae given a cold treatment for a month (7°C) than from those kept continuously at 15.6°C. The former emerged in late February and March, whereas the latter emerged in April. Resh (1973) reported two modes of overwintering for *Ceraclea* in Kentucky.

***C. tarsipunctata* (Vorhies) 1909.** Type locality: WISCONSIN.

HARNEY Co., Burns, July 15/65, Goeden (det. Denning). KLAMATH Co., Miller Cr., 7 mi NE Lorella, July 22/65 (larva), Anderson (det. Resh).

Biology: Ross (1944) described the larvae. They are abundant in the glacial lakes of northern Illinois and in cool, rapid streams. The case is about 7 millimeters long, horn-shaped, and composed of sand grains with some vegetable fragments. Ross gave the distribution as widespread throughout the eastern half of the continent. *C. tarsipunctata* commonly swarms at lights (Marshall 1939), and was classified as a nuisance species by Corbet and others (1966) in their study at Montreal.

***C. transversa* (Hagen) 1861.²** Type locality: DISTRICT OF COLUMBIA.

KLAMATH Co., Olene, July 3/65, Goeden (det. Denning), and Olene, Lost Riv. Canal, July 28/65 (pupae), Anderson (det. Resh).

Biology and Distribution: Resh (1972) reared this species in Kentucky. The larvae feed on bacteria. They drift freely as first instars but later they become sessile and attach their cases to stones. This widespread species generally occurs in large streams and rivers (Ross 1944).

***C. vertreesi* (Denning) 1966.** Type locality: OREGON, DOUGLAS Co., North Umpqua River, 7 miles NW Roseburg, July 18/64, J. D. Vertrees.

MARION Co., Woodburn, July 9/68, Goeden (det. Denning).

Distribution: This species is known only from the above records.

²Dr. V. Resh informed me that the correct identification for these specimens, based on Morse (1975), is *C. maculata* (Banks) 1899.

***Mystacides* Berthold 1827**

Yamamoto and Wiggins (1964) provide a detailed study of all stages of the three North American species in this predominantly Holarctic genus. The adults are recognizable in the field by their long antennae and the steely blue-black or dark brown color of the wings and body. The males are active in early morning and evening, flying close to the water in small aggregations. *Mystacides* adults are inactive during the night and are uncommon in light-trap collections.

The larvae occur in lakes and ponds and sluggish streams. Their slender, tapered cases are constructed of sand grains, sometimes with shell fragments or plant material incorporated, and typically with small twigs or conifer needles fastened along one side and protruding beyond the end (Yamamoto & Wiggins 1964). Larvae and pupae are not secretive, and they can frequently be collected in abundance.

***M. alafimbriata* Hill-Griffin 1912.** Type locality: OREGON, LINN Co., Permelia (= Pamelia?) Lake, Mt. Jefferson, July 16/09, J. C. Bridwell.

M. alafimbriata has been recorded from BENTON, CLACKAMAS, CLATSOP, COOS, CROOK, DESCHUTES, DOUGLAS, HARNEY, JOSEPHINE, KLAMATH, LAKE, LANE, LINN, MARION, MULTNOMAH, and POLK counties.

Distribution and Biology: This is the only *Mystacides* in Oregon. It is our most common leptocerid and occurs in abundance in ponds, reservoirs, and lakes ranging from near sea level to the high mountain lakes. Yamamoto and Wiggins (1964) give extensive distribution records in Oregon, as well as for the total range. It occurs from Alaska and the Yukon to northern Baja California, and from the Pacific, east to Montana and Wyoming. The Oregon flight period extends from May to September.

Annie L. Hill-Griffin (1912) described the adult and immature stages of this species in the earliest aquatic entomology studies at Oregon Agricultural College. She notes that swarms of adults at Colorado Lake, Linn County near Corvallis, appear about 5 or 6 p.m. and dance and hover above the water "with dizzying pertinacity." She described the larvae as small (nearly full-grown, 6 mm), slender, and extremely active. They feed on grass and various water plants. The case was described as a slender cylinder of reeds, straw, and sticks, placed lengthwise with one or two very long straws that extended beyond the front of the case. Sand grains or other miscellaneous material are also occasionally incorporated into the case. Pupal cases are similar to those of the larvae and were found attached to floating logs or snags in late June.

***Nectopsyche* Müller 1879**

Flint (1974) recently established the synonymy of *Leptocella* with *Nectopsyche*; the latter now includes all previous records under *Lepto-*

cella. As currently recognized, *Nectopsyche* is restricted to the New World, with about a dozen species occurring in America north of Mexico (Wiggins 1977).

Adults of *Nectopsyche* are long and slender (to 16 mm), and white or grey, frequently with a conspicuous pattern (Ross 1944). The larval case is also slender and often further elongated by having a twig cemented to each side. Cases may be composed of vegetative material, sand grains, or silk secretions. Several species with buoyant vegetative cases are equipped with brushes on the metathoracic legs that are used for swimming (Ross 1944, Hickin 1967).

All but one of the Oregon records for the genus are based on females or larvae that were not identified to species, so these records are given at the generic level.

***N. intervena* (Banks) 1914.** Type locality: TEXAS.

DOUGLAS Co., Cow Cr., Riddle, June 9/75, Anderson (det. ROM).

Distribution: In both Ross (1944) and Fischer (1966), this species is listed only from Texas.

***Nectopsyche* sp(p).**

BENTON Co., ponds near Willamette Riv., Corvallis, Jan 24/68 (larvae), Anderson (det. Resh). CLATSOP Co., slough, 5 mi N Gearhart, June 28/65 (larvae), Anderson (det. Resh). DOUGLAS Co., Umpqua Riv., Rt. 138, S of Kellogg, June 7/58 (♀♀) (ROM). KLAMATH Co., Lost Riv., Olene, July 28/65 (♀♀), Anderson (det. ROM); Sprague Riv. near Chiloquin, June 10/75 (larvae), Anderson (det. ROM).

***Oecetis* McLachlan 1877 (Figure 23c)**

This genus is represented in all faunal regions of the world. There are about 20 species known in America north of Mexico (Wiggins 1977). The two species that occur in Oregon are among the most widely distributed caddisflies in North America and are species that can be abundant in diverse situations (Ross 1944). *Oecetis* is of unusual interest because of the predaceous habit of the larvae and for the elongate, grasping type of mouthparts that have developed for predation (Ross 1944).

***O. avara* (Banks) 1895.** Type locality: CANADA.

COOS Co., 5 mi E Myrtle Point, Aug 1/68, E. Evans (det. Denning). CURRY Co., Chetco Riv., Myrtle Grove, Aug 4/50, K. M. Fender (det. Jewett). DOUGLAS Co., Umpqua Riv., S of Kellogg, June 7/68 (ROM). JACKSON Co., Applegate Riv. near Provolt, Aug 10/50, K. M. Fender (det. Jewett), & Medford, June 29-July 1/69, L. Gentner (det. Denning). LINN Co., 3.5 mi E Crabtree, July 5/68, E. Evans, & Santiam Riv. near Jefferson, July 15/48, Jewett (both det. Denning). MULTNOMAH Co., Sandy Riv. near Corbett, July 25/64, Anderson

(det. Resh). LAKE Co., Chewaucan Riv., Paisley, 4500 ft, Sept 26/32, R. Dimick (det. Ross); Lakeview, Aug 14/66, Goeden (det. Denning). MARION Co., Woodburn, July 1/65, F. P. Larson (det. Denning). UMATILLA Co., Pendleton, July 11/64 (pupa), Anderson (det. Resh).

Distribution and Biology: Ross (1944) gives the range of *O. avara* as most of the United States, southern Canada, and Mexico. He described the larvae, and the case as 7 millimeters, horn-shaped, and made of large sand grains cemented to form a fairly smooth exterior. The larvae occur in fairly rapid streams of various sizes.

***O. inconspicua* (Walker) 1852.** Type locality: GEORGIA.

CLATSOP Co., Warrenton, July 20-Aug 15/68, & Astoria, July 3 & 31/68, Goeden (det. Denning); Gronnel Rd., 2 mi E Elsie, July 26/63, Aug 20/66, Sept 4-6/65 (col. & det. Jewett). DESCHUTES Co., Aug 11/68, Goeden (det. Denning). HARNEY Co., Fish Lake, Steens Mtn., 18 mi E Frenchglen, July 17/73, Anderson (det. Denning) & Aug 14/50, K. M. Fender (det. Jewett). KLAMATH Co., Klamath Falls, July 26/65, C. Hazel (det. ROM); Olene, July 3/65, Goeden (det. Denning). LAKE Co., Lakeview, June 18/52, V. Roth, & Aug 1 & 11/68, Goeden (all det. Denning). LINN Co., Yellowbottom Cpgrd., Quartzville Rd., July 16/68 (ROM).

Distribution and Biology: This is another very widespread species, which Ross (1944) states appears to be fairly rare only in the Northwest. Elsewhere, it may occur as a nuisance species in immense numbers. The flight period is given by Ross as May to early October.

The larvae occur in ponds, lakes, and streams. The case is described by Ross (1944) as 9 millimeters, constructed of stones and sand grains, frequently irregular and not very rigid in construction. Winterbourn (1971a) confirmed the predaceous habits of the larvae. He found that mid- and final-instars were present in most months in Marion Lake, British Columbia. This suggested either a prolonged egg-hatching period or a variable larval growth rate. The larvae were well distributed throughout this shallow lake (max. depth, 7 m). Pupae were present from mid-June to late August.

***Triaenodes* McLachlan 1865 (Figure 23a)**

This genus is predominantly Holarctic, but extends into the Ethiopian and Oriental regions (Wiggins 1977). Most of the 25 North American species occur in the eastern or southern parts of the United States and only two have been recorded from Oregon.

The cases of *Triaenodes* spp. are up to 30 millimeters long, composed of vegetative material, and constructed in a spiral pattern similar to that of phryganeids. Larvae swim with their cases, propelled by their meta-

thoracic legs. This enables them to move freely within the beds of aquatic plants, their usual habitats. The larvae feed on green plants, and may even be pests of rice (Wiggins 1977).

***T. grisea* Banks 1899.** Type locality: COLORADO.

The only Oregon record is LAKE Co., Lakeview, Aug 11/68, Goeden (det. Denning).

Distribution: Ross (1944) gives the range as Colorado, Manitoba, and Saskatchewan, where this genus frequents ponds.

***T. tardus* Milne 1934.** Type locality: ONTARIO, Toronto.

BENTON Co., 12 mi N Corvallis, Aug 23/64, Anderson (det. ROM). CLATSOP Co., Astoria, July 31-Sept 5/68, Goeden, & Warrenton, Sept 1/70, Brown & Goeden (det. Denning). JACKSON Co., Medford, July 1/69, L. Gentner (det. Denning). JOSEPHINE Co., Grants Pass, Sept 5/68, Goeden (det. Denning).

Distribution and Biology: This species is transcontinental in distribution but more common in the midwest and east than in the west. Ross (1944) described the larvae, which are abundant in weed beds in lakes. The slender case is of vegetative material, constructed on a spiral pattern quite similar to that of some phryganeids.

END PIECE:

"I have held you too long about these caddis"
Izaak Walton (1653)

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