Warrego River

River description

The Warrego River has its source in the Buckland Tableland, Carnarvon National Park in South Western Queensland. The Warrego River is 993 km long and has a catchment area of 6,635 km^2. In conjunction with several other rivers in this region, the Warrego River forms a major component of the headwaters of the Murray Darling Basin.

The Warrego River has a total of 43 listed water barriers, of which only one, the Cunnamulla town weir at 4.5 m high, is on the main stem. The Warrego River remains largely un-impounded while the main river channel is characterised by natural pools. Pools typically have steep banks with overhanging vegetation, are deep and those included for study represent permanent water bodies. In flood the Warrego River can spread as wide as 20 km and include the main river channels of the Paroo and Neebine Rivers (Figure 66).

Surrounding land use is predominantly dedicated to grazing with none or very little irrigated cropping at the present time. Good bank side access and deep pools offered abundant sites suitable for sampling (Figure 67). Random site selection on the Warrego River resulted in a relatively even spread of sites downstream of Augathella to the New South Wales border.

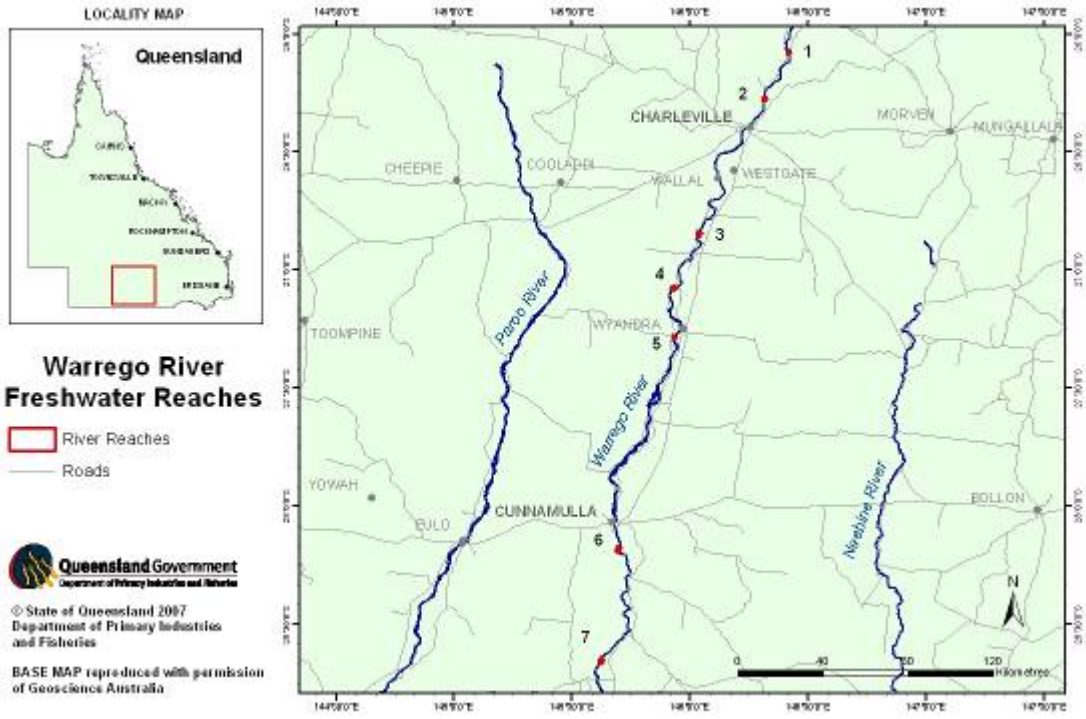


Figure 66. Location of the reaches sampled annually within the Warrego River.

Figure 67. Typical bank habitat sampled within the Warrego River.

Habitat

Riparian habitat of the Warrego River had an average of low to moderate disturbance ratings throughout the years of survey apart from 2004 where a high percent frequency rating of undisturbed was recorded (Figure 68). This high recording may not be a true reflection of stream bank disturbance but may be attributed to the qualitative technique used to assess habitat condition. Snag habitat is the most prominent in-stream habitat type within this system (Figure 69).

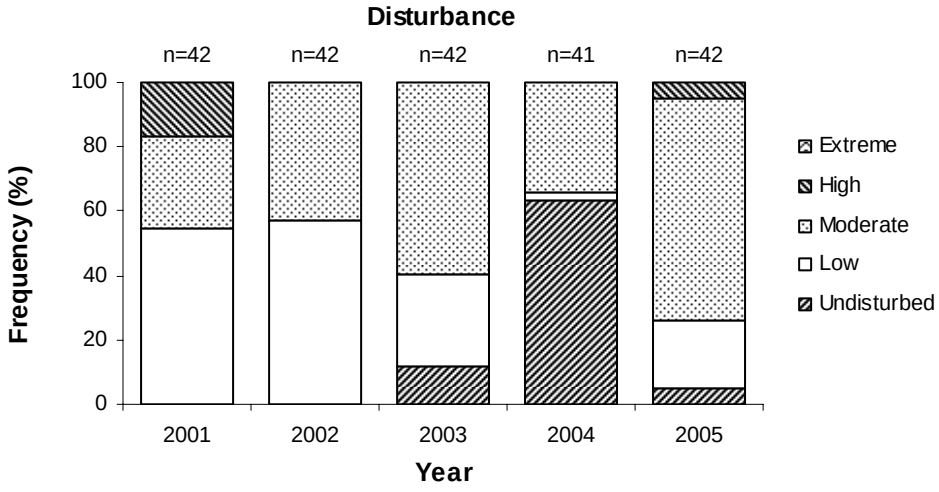


Figure 68. Stream bank disturbance ratings for the Warrego River between 2001 and 2005. The number of shot samples (n) are shown for each year.

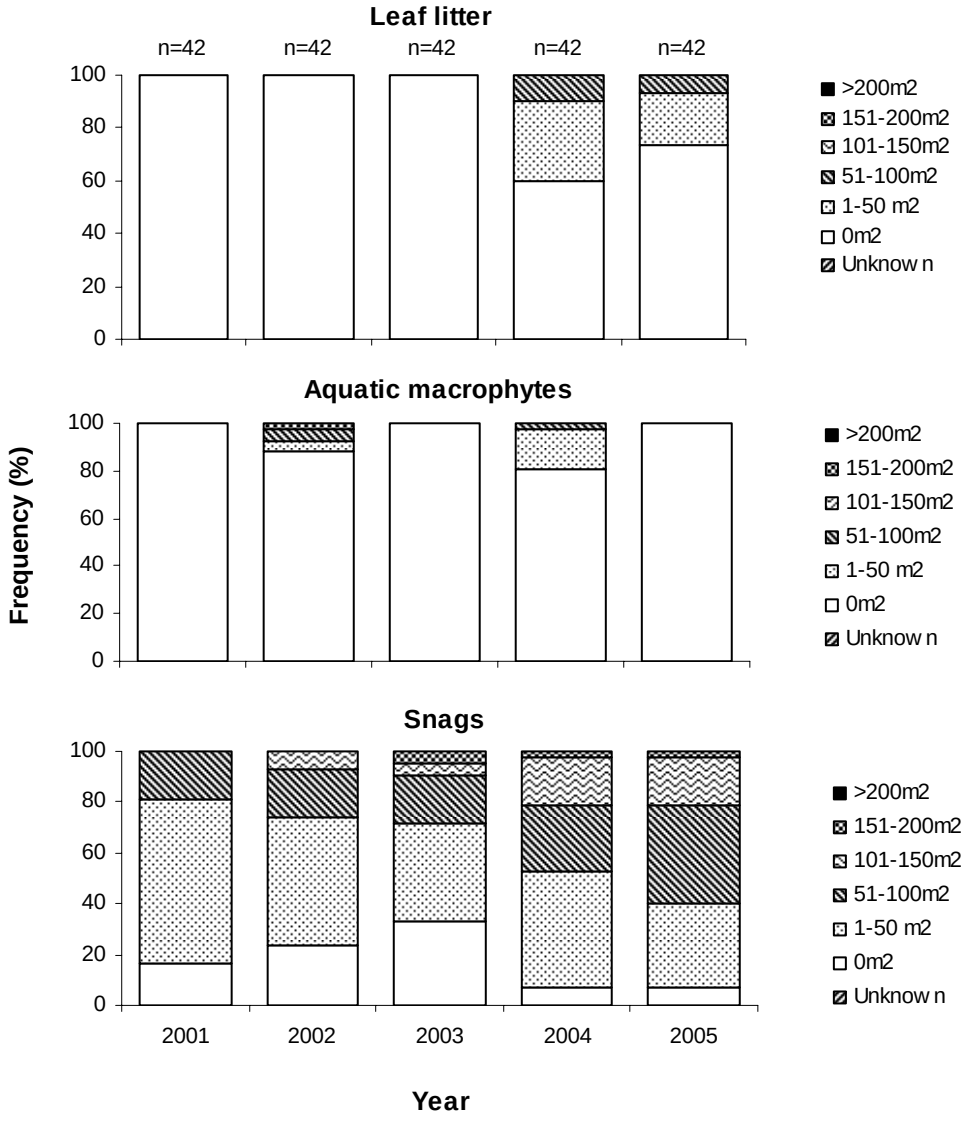


Figure 69. In-stream habitat parameters for the Warrego River, including leaf litter, aquatic macrophytes and snag coverage. The number of shot samples (n) are provided for each year.

Water quality

Visibility in the Warrego River was poor with a mean visibility of 4.6 cm in 2002 (Figure 70). This may have had some influence on total catch for abundant species but does not seem to have influenced total species count observed using the boat mounted electrofishing apparatus. The large variation in Secchi depth in 2004 was the result of good visibility from 30 to 50 cm depth in reaches 1 and 2 compared with poor visibility of up to 10 cm in downstream reaches. The high conductivity reading in 2004 can possibly be attributed to low flows experienced in this catchment (Figure 70).

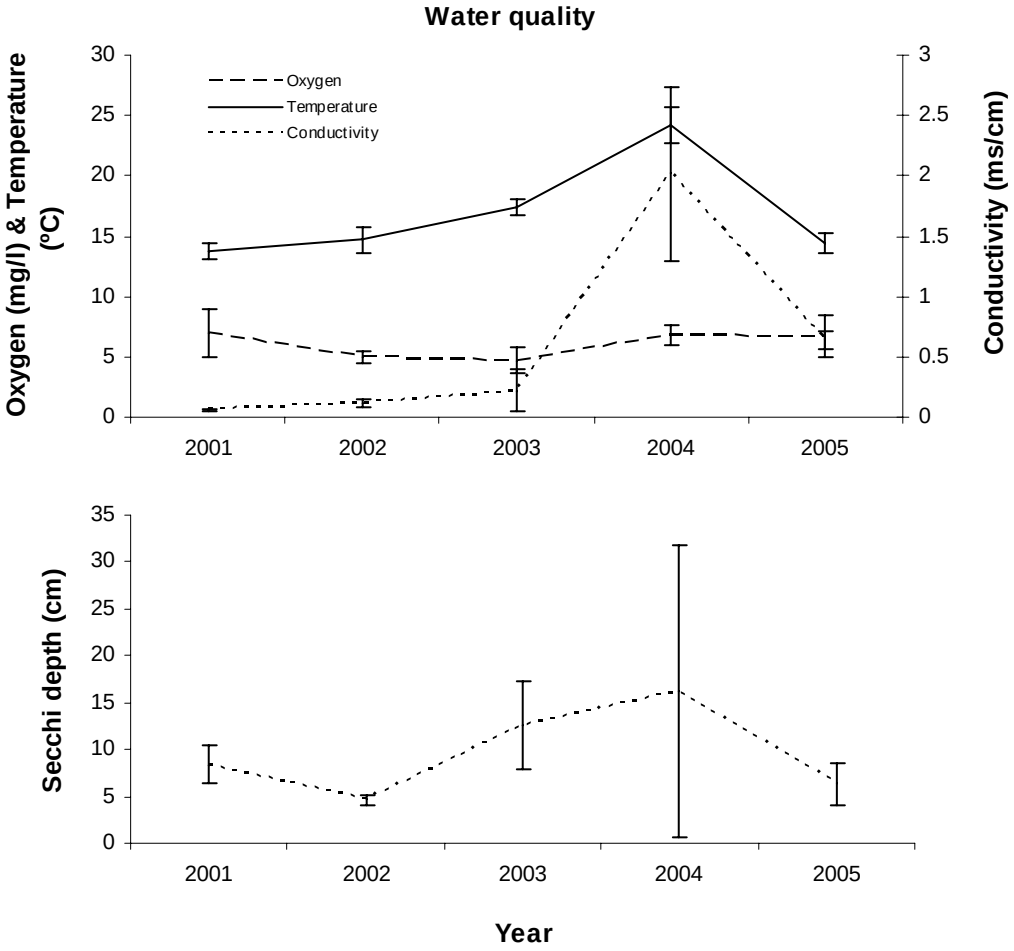
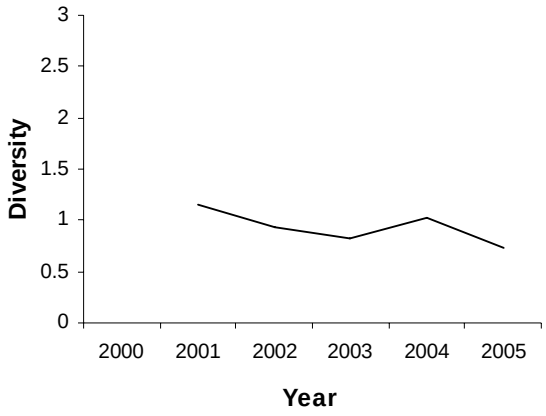


Figure 70. Water quality parameters for the Warrego River, including temperature, oxygen and conductivity (top) and Secchi depth measurements (bottom) between 2001 and 2005. Ninety-five percent confidence intervals are shown.

Fish fauna

Golden perch had the highest catch rate of any species, possibly an indication of fish stocking practices (Table 12). The catch rate of European carp was high, reflecting the high abundance of this introduced species. The introduced species goldfish had a high catch rate in 2001 and subsequent very low catch rates in the following years, indicating that this species may be highly susceptible to drought conditions within this catchment (Table 12). Species diversity is



low in the Warrego River (
Figure 71). Three of the 16 species encountered are introduced species.

Table 12. Fish catch rates (CPUE) in the Warrego River. Target species are highlighted in bold.

Scientific name	Common name	Year				
		2001	2002	2003	2004	2005
Bidyanus bidyanus	silver perch	0.14			0.28	0.29
Carassius auratus	**goldfish**	**9.32**	**0.86**	**0.14**	**0.14**	**0.29**
Cyprinus carpio	**European carp**	**12.05**	**8.02**	**5.72**	**7.69**	**6.03**
Gambusia holbrooki	Eastern gambusia		0.14	0.14	1.28	0.14
Hypseleotris galii	firetail gudgeon	0.29				
Hypseleotris klunzingeri	Western carp gudgeon		0.72	2.15	1.71	0.57
Hypseleotris sp.1 [in Allen *et al*., 2002]	Midgley's carp gudgeon	0.72	0.86	3.58	1.57	
Hypseleotris spp	a gudgeon			0.14		0.57
Leiopotherapon unicolor	**spangled perch**	**5.59**	**0.14**	**3.58**	**13.81**	**1.01**
Maccullochella peeli peeli	**Murray cod**	**0.14**		**0.14**	**0.14**	**0.14**
Macquaria ambigua	golden perch	12.62	12.17	8.58	6.27	11.78
Melanotaenia fluviatilis	Murray River rainbowfish	0.57	1.00	1.86	2.71	0.29
Nematalosa erebi	bony bream	6.02	5.87	5.15	5.84	6.03
Retropinna semoni	Australian smelt	2.58	2.43	2.15	1.14	2.73
Tandanus tandanus	**freshwater catfish**	**2.15**	**1.15**	**0.43**	**0.57**	**0.14**

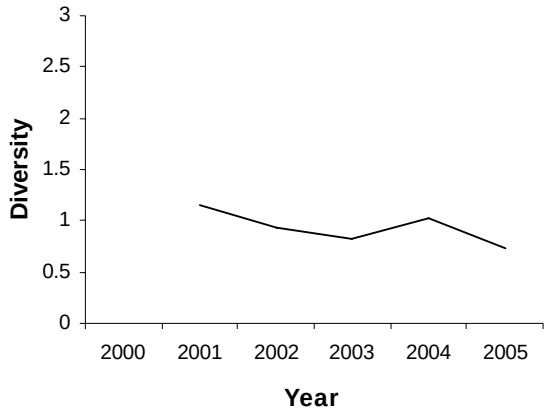


Figure 71. Species diversity in the Warrego River.

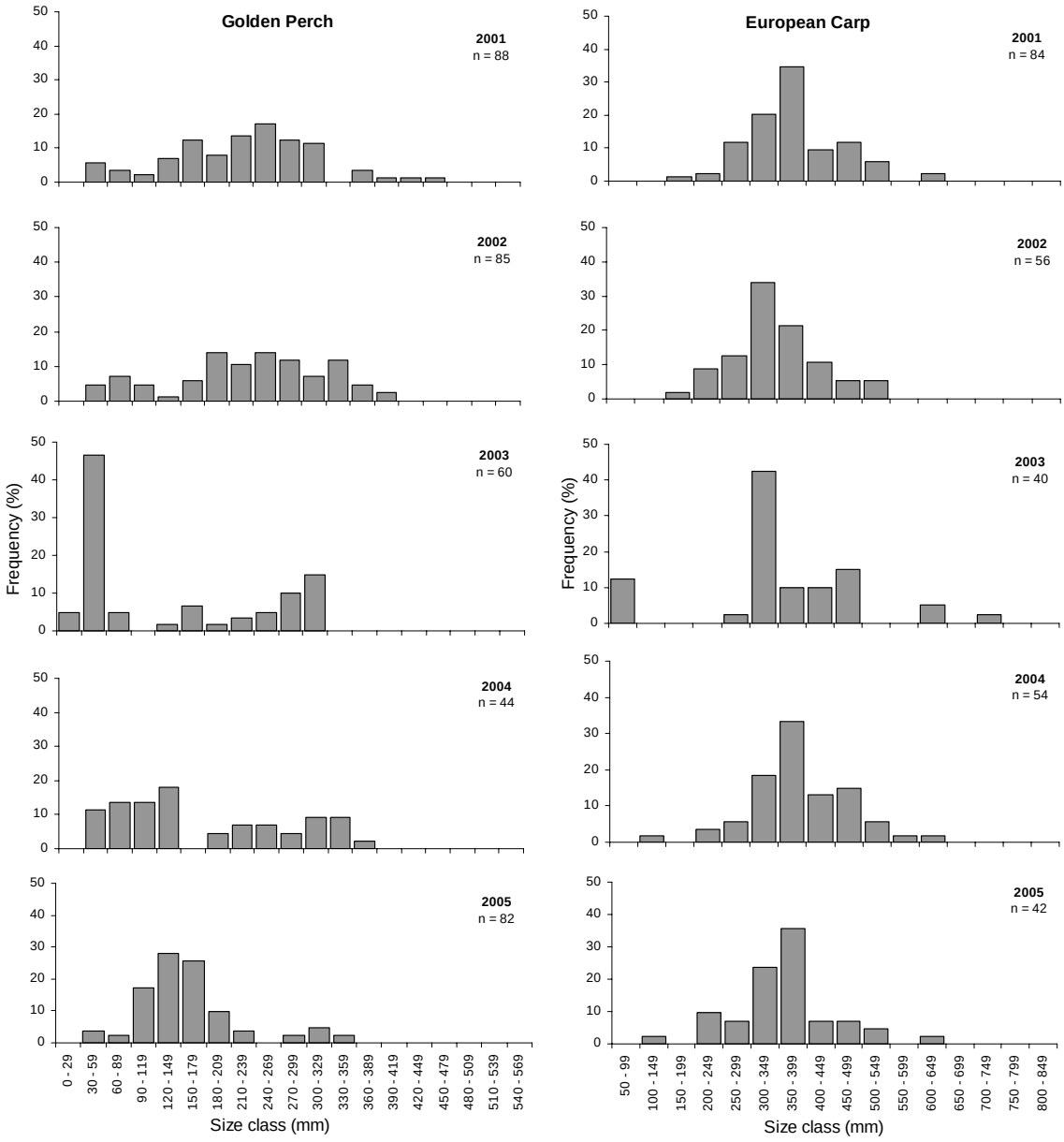


Figure 72. Length frequency distribution of golden perch and European carp in the Warrego River between 2001 and 2005.

Conclusions

The six years of sampling has been successful in obtaining a baseline dataset of fish resources for the ten rivers monitored under the freshwater component of the LTMP.

Species diversity in most rivers has remained fairly stable throughout the period of the study. Species diversity was notably lower in inland rivers west of the Great Dividing Range as opposed to the rivers of the east coast and Gulf of Carpentaria. The occurrence of marine vagrant fish species that are captured within the downstream reaches of the eastern and gulf drainages contribute significantly to the species diversity of these river systems.

Sampling efficiency of the electrofishing equipment was reduced in bodies of water where there were high readings of conductivity. Salt wedges in tidal reaches, higher concentration of ions in periods of low flow or drought, or naturally high conductivity due to the geomorphology of the region are some of the contributing factors to higher conductivity readings. The reduced efficiency of the equipment, smaller effective electric field, results in fewer fish being drawn to the anodes for capture. This however tends only to affect the total number of fishes being captured and not the species diversity.

Six exotic fish species have been encountered with goldfish, European carp and tilapia being of major concern to state agencies. The occurrence of exotic fish species will continue to be monitored, as the potential for the introduction of species such as tilapia into new catchments poses a significant threat to the stability of native ecosystems.

A review of the LTMP freshwater sampling program is being undertaken by the University of the Sunshine Coast to assess the data for their effectiveness to identify changes within populations and the relevance of collected data.

This program also has linkages with other monitoring programs. Surveys of the Condamine-Balonne and the Warrego Rivers parallel broader ecosystem health monitoring of freshwater fish being undertaken for the Murray Darling Basin Commission's Sustainable Rivers Audit. The tagging data collected during these monitoring surveys informs various stocking programs and survey data has also been included in fish biodiversity assessments (e.g. Hogan and Vallance 2005).

References

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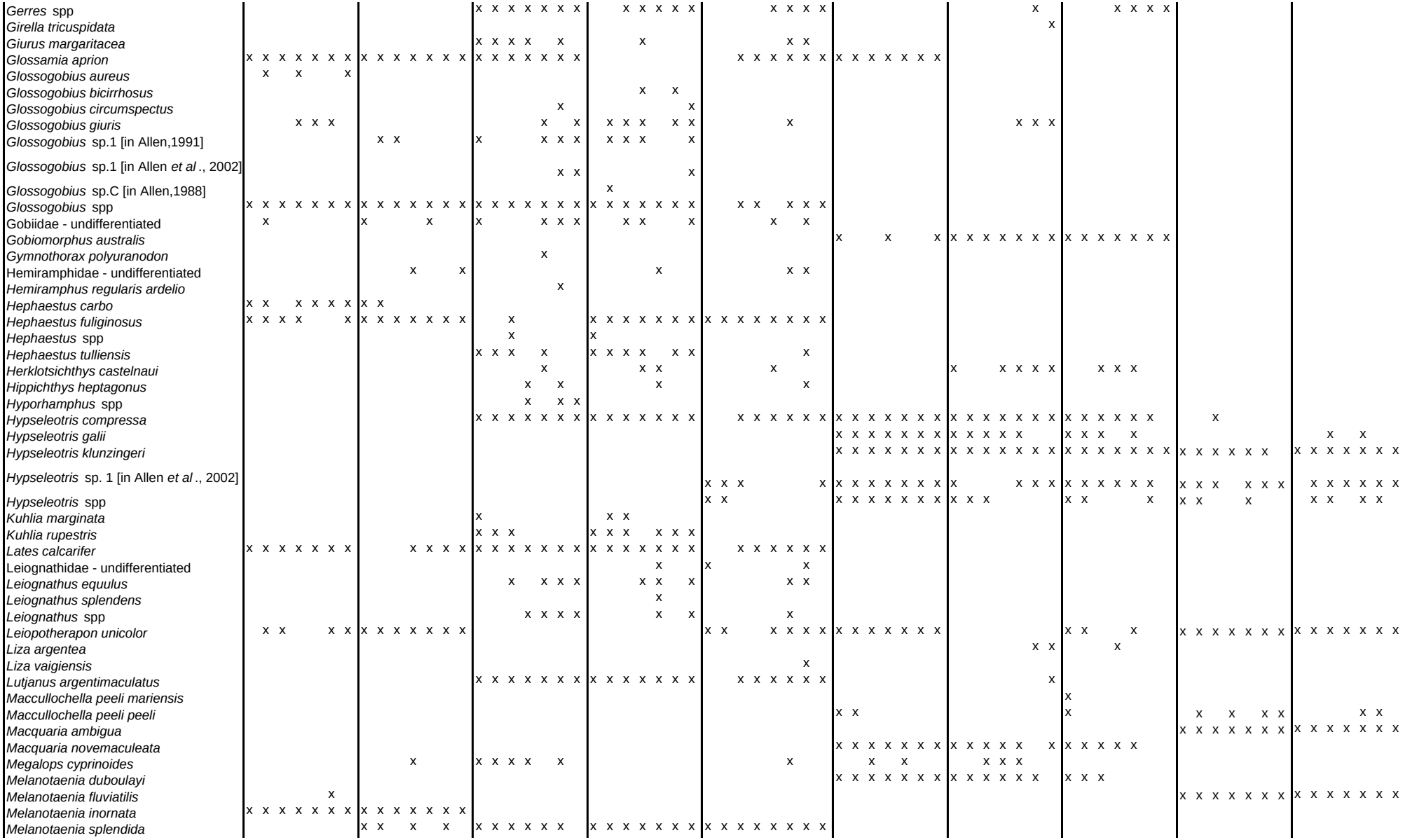
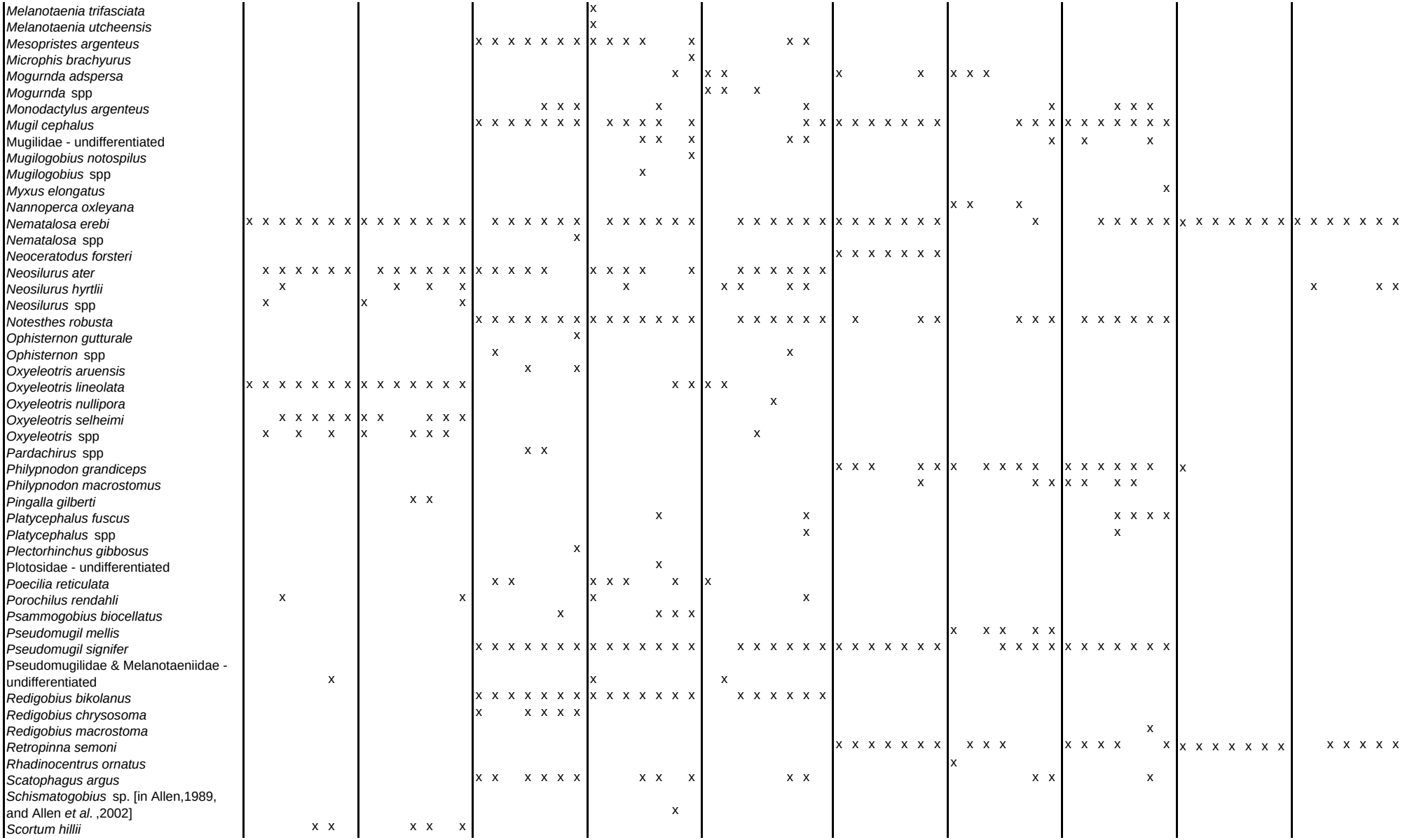
Scientific Name	Gregory River							Mitchell River							Daintree River							Johnstone River							Herbert River							
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
Acanthopagrus australis																				x	x					x									x	
Acanthopagrus berda																			x	x	x				x	x									x	
Ambassis agassizi					x									x															x	x						
Ambassis agrammus					x				x													x						x								
Ambassis interrupta																		x	x	x	x				x	x							x	x		
Ambassis macleayi	x	x	x	x	x	x	x	x	x	x	x	x	x	x																						
Ambassis miops															x		x	x	x	x	x	x			x	x		x							x	
Ambassis spp	x	x	x	x		x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Amniataba caudavittata																					x															
Amniataba percoides	x	x	x	x	x	x	x	x	x	x	x	x	x	x																	x	x	x	x	x	x
Anguilla australis																								x												
Anguilla obscura															x		x	x	x	x					x	x	x	x						x		
Anguilla reinhardtii															x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Anguillidae - undifferentiated																									x	x	x									
Anodontiglanis dahli								x	x		x	x	x	x																						
Arius berneyi							x		x	x	x	x	x	x																						
Arius graffei							x	x	x	x	x	x	x	x																						
Arius leptaspis						x								x																						
Arius midgleyi								x	x	x	x	x	x	x																						
Arius spp								x	x		x			x																						
Arrhamphus sclerolepis												x		x			x	x	x	x	x				x	x		x				x		x		x
Arrhamphus spp																																				
Awaous acritosus															x	x	x	x	x	x	x	x	x	x	x		x	x			x	x	x	x	x	x
Belonidae - undifferentiated		x					x						x																							
Bidyanus bidyanus																																				
Brachirus selheimi							x	x	x		x	x	x	x																						
Brachirus spp								x	x			x	x						x	x																
Bunaka gyrinoides															x	x	x	x	x	x	x		x	x	x	x		x			x	x		x	x	
Butis butis																		x	x	x	x				x	x		x						x		
Carangidae - undifferentiated																			x																	
Caranx sexfasciatus																x	x	x	x	x	x			x	x	x		x						x	x	
Carassius auratus																																				
Carcharhinus leucas																																				
Chaetodontidae - undifferentiated																												x								
Chanos chanos															x		x									x		x								
Clupeidae - undifferentiated														x						x	x															
Conger wilsoni																																				
Craterocephalus amniculus																																				
Craterocephalus marjoriae																																				
Craterocephalus spp																															x					
Craterocephalus stercusmuscarum	x	x	x	x	x	x	x	x	x	x	x	x	x	x								x	x	x			x		x	x	x	x	x	x	x	x
Craterocephalus stramineus	x	x	x	x	x	x																														
Cyprinus carpio																																				
Dasyatidae - undifferentiated																		x																		
Eleotris fusca																				x					x											
Eleotris melanosoma							x								x			x		x	x							x						x		
Eleotris spp																	x	x	x	x	x		x		x	x		x						x	x	
Gambusia holbrooki																							x	x					x					x		
Gerres filamentosus															x	x	x	x	x	x	x		x	x	x	x	x	x			x		x	x	x	x

Scientific Name	Mary River							Noosa River							Logan River							Condamine River							Warrego River						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Acanthopagrus australis							x				x	x	x	x			x	x	x	x	x														
Acanthopagrus berda																																			
Ambassis agassizi																				x															
Ambassis agrammus																																			
Ambassis interrupta																																			
Ambassis macleayi																																			
Ambassis miops																																			
Ambassis spp	x	x		x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x														
Amniataba caudavittata																																			
Amniataba percoides																																			
Anguilla australis		x								x		x	x			x	x	x			x														
Anguilla obscura																																			
Anguilla reinhardtii	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x														
Anguillidae - undifferentiated																																			
Anodontiglanis dahli																																			
Arius berneyi																																			
Arius graffei		x	x	x		x													x	x	x														
Arius leptaspis																																			
Arius midgleyi																																			
Arius spp	x	x	x	x	x	x	x						x	x			x	x	x	x	x														
Arrhamphus sclerolepis	x	x	x	x	x	x	x						x	x				x	x	x	x														
Arrhamphus spp														x																					
Awaous acritosus																																			
Belonidae - undifferentiated																																			
Bidyanus bidyanus																													x	x		x		x	
Brachirus selheimi																																			
Brachirus spp																																			
Bunaka gyrinoides																																			
Butis butis														x			x	x	x	x	x														
Carangidae - undifferentiated																																			
Caranx sexfasciatus																																			
Carassius auratus															x							x		x	x	x	x	x	x	x	x	x		x	x
Carcharhinus leucas																			x																
Chaetodontidae - undifferentiated																																			
Chanos chanos																																			
Clupeidae - undifferentiated																																			
Conger wilsoni																		x																	
Craterocephalus amniculus																							x												
Craterocephalus marjoriae	x	x	x	x	x	x	x																												
Craterocephalus spp																																			
Craterocephalus stercusmuscarum	x	x	x	x	x	x	x	x														x													
Craterocephalus stramineus																																			
Cyprinus carpio															x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Dasyatidae - undifferentiated																																			
Eleotris fusca																																			
Eleotris melanosoma																																			
Eleotris spp																										x									
Gambusia holbrooki	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Gerres filamentosus																																			


Gerres spp
Girella tricuspidata
Giurus margaritacea
Glossamia aprion
Glossogobius aureus
Glossogobius bicirrhosus
Glossogobius circumspectus
Glossogobius giuris
Glossogobius sp.1 [in Allen,1991]
Glossogobius sp.1 [in Allen *et al* ., 2002]
Glossogobius sp.C [in Allen,1988]
Glossogobius spp
Gobiidae - undifferentiated
Gobiomorphus australis
Gymnothorax polyuranodon
Hemiramphidae - undifferentiated
Hemiramphus regularis ardelio
Hephaestus carbo
Hephaestus fuliginosus
Hephaestus spp
Hephaestus tulliensis
Herklotsichthys castelnaui
Hippichthys heptagonus
Hyporhamphus spp
Hypseleotris compressa
Hypseleotris galii
Hypseleotris klunzingeri
Hypseleotris sp. 1 [in Allen *et al* ., 2002]
Hypseleotris spp
Kuhlia marginata
Kuhlia rupestris
Lates calcarifer
Leiognathidae - undifferentiated
Leiognathus equulus
Leiognathus splendens
Leiognathus spp
Leiopotherapon unicolor
Liza argentea
Liza vaigiensis
Lutjanus argentimaculatus
Maccullochella peeli mariensis
Maccullochella peeli peeli
Macquaria ambigua
Macquaria novemaculeata
Megalops cyprinoides
Melanotaenia duboulayi
Melanotaenia fluviatilis
Melanotaenia inornata
Melanotaenia splendida


Melanotaenia trifasciata
Melanotaenia utcheensis
Mesopristes argenteus
Microphis brachyurus
Mogurnda adspersa
Mogurnda spp
Monodactylus argenteus
Mugil cephalus
Mugilidae - undifferentiated
Mugilogobius notospilus
Mugilogobius spp
Myxus elongatus
Nannoperca oxleyana
Nematalosa erebi
Nematalosa spp
Neoceratodus forsteri
Neosilurus ater
Neosilurus hyrtlii
Neosilurus spp
Notesthes robusta
Ophisternon gutturale
Ophisternon spp
Oxyeleotris aruensis
Oxyeleotris lineolata
Oxyeleotris nullipora
Oxyeleotris selheimi
Oxyeleotris spp
Pardachirus spp
Philypnodon grandiceps
Philypnodon macrostomus
Pingalla gilberti
Platycephalus fuscus
Platycephalus spp
Plectorhinchus gibbosus
Plotosidae - undifferentiated
Poecilia reticulata
Porochilus rendahli
Psammogobius biocellatus
Pseudomugil mellis
Pseudomugil signifer
Pseudomugilidae & Melanotaeniidae - undifferentiated
Redigobius bikolanus
Redigobius chrysosoma
Redigobius macrostoma
Retropinna semoni
Rhadinocentrus ornatus
Scatophagus argus
Schismatogobius sp. [in Allen,1989, and Allen et al. ,2002]
Scortum hillii

Scortum ogilbyi		x	x		x		x		x	x	x	x	x	x																																																									
Scortum spp	x					x		x			x	x	x	x																																																									
Selenotoca multifasciata																																																						x	x		x														
Sillago spp																				x	x																																																		
Stenogobius psilosinionus																				x																																																			
Strongylura krefftii	x	x	x	x	x	x	x	x	x	x			x	x																	x		x	x	x																																				
Syngnathidae - undifferentiated																		x		x	x																																																		
Tandanus tandanus																x						x	x	x			x										x	x	x	x	x	x	x	x	x					x	x								x						x	x	x	x	x	x	
Thryssa scratchleyi						x	x					x	x																																																										
Tilapia mariae																							x	x	x	x	x	x																																											
Toxotes chatareus	x	x	x	x	x	x	x	x	x	x	x	x	x	x					x	x	x				x	x									x																																				
Toxotes jaculatrix											x								x	x	x					x																																													
Toxotidae - undifferentiated		x			x																					x																																													
Trachystoma petardi																																								x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x														
Unidentified larval fish																																																															x								
Unknown species																											x								x																																				
Xiphophorus maculatus																							x															x	x																																
Zenarchopterus dispar								x																																																															
Zenarchopterus spp								x																																																															

Information Series
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