Chapter 16
Perciformes
Chapter 16

Order Perciformes

Number of suborders 18 (Percoidei, Ellassomatoidei, Labroidei, Zoarcoidei, Notothenioidei, Trachinoidei, Blennioidei, Icysteoidae, Gobiesocoidei, Callionymoidei, Gobioidae, Kurioidae, Acanthuroidei, Scombrablaracoidei, Scombroidei, Stromateoidei, Anabantoidei, Channoidei; in recent years two additional suborders have been recognized: Pholidichthyoidei, the convict blennies, were removed from Trachinoidei, and Caproidei, the boarfishes, were removed from Zeiformes; perciform classification remains unsettled and will undoubtedly change further, e.g., Nelson 2006).

Number of families 160

Number of genera approx. 1539

Number of species > 10,033

GENERAL LIFE HISTORY

Distribution

World-wide in all seas, widely distributed in fresh and brackish water; three suborders, Ellassomatoidei, Anabantoidei, and Channoidei occur exclusively in freshwater.

Relative abundance

Numerous abundant species; many are important in subsistence, sport, and commercial fisheries; the order includes some of the world’s most highly prized sport species and most valuable commercial species.

Adult habitat

Benthic to epipelagic, marine taxa occur in all depth zones but are predominantly in the epipelagic zone, on continental shelves, and associated with reefs, with highest diversity in tropical and subtropical waters.

EARLY LIFE HISTORY

Mode of reproduction

Predominantly oviparous, predominantly with planktonic eggs and larvae but many taxa with demersal eggs; some viviparous taxa.

Knowledge of ELH

Eggs and larvae known for numerous species, but still only a fraction of the total.

ELH Characters:

Eggs: both demersal and planktonic eggs range from spherical to spindle-shape, ca. 0.5–5.0 mm, often with 1 or more oil globule(s); planktonic eggs commonly are spherical, near 1 mm, with 1 oil globule; demersal eggs commonly are hemispherical to oval, approx. 0.5–2 mm, with > 1 oil globules, and commonly are attached to the nest or substrate via adhesive filaments.

Larvae: highly diverse, ranging from elongate to deep-bodied, strongly compressed to depressed, with preanal length ranging from near one-quarter to near three-quarters of body length; spines commonly are pres-
ent on at least some bones of the head and pectoral girdle, most often the preopercle, at least; the head spines may become very large or numerous in some species, but are entirely lacking in others; fin spines and/or rays may become very elongate, and may become variously ornamented in some species; myomere counts range from approx. 20 to approx. 160; pigmentation ranges from nearly absent to nearly complete; metamorphosis occurs from as small as approx. 5 mm to > 60 mm; a “typical” perciform larva is moderately slender to moderately deep-bodied, somewhat compressed, with preanal length approx. 40–60%BL, small to moderate preopercular spines, approx. 22–40 myomeres, pigment dorsally on the head, on the dorsal margin, on the gut, and on the ventral margin of the tail, and metamorphosis in about the 10–25 mm size range.

Example species:

**PERCIFORMES:**

**Percoidei:** Caranx sexfasciatus (Carangidae).
**Labroidei:** Halichoeres semicinctus (Labridae).
**Zoarcoidei:** Plectobranchus evides (Stichaeidae).
**Notothenioidei:** Bovichtus angustifrons (Bovichtidae).
**Trachinoidei:** Ammodytes hexapterus (Ammodytidae).
**Blennioidei:** Hypsoblennius brevipinnis (Blenniidae).
**Icosteoidei:** Icosteus aenigmaticus (Icosteidae).
**Gobiesocoidei:** Gobiesox maeandricus (Gobiesocidae).
**Callionymoidei:** Callionymus decoratus (Callionymidae).
**Gobioidei:** Ilypnus gilberti (Gobiidae).
**Kurtoidei:** Kurtus gulliveri (Kurtidae).
**Acanthuroidei:** Chaetodipterus zonatus (Ephippidae).
**Scombrolabracoidei:** Scombrolabrax heterolepis (Scombrolabracidae).
**Scombroidei:** Sarda chiliensis (Scombridae).
**Stromateoidei:** Icichthys lockingtoni (Centrolophidae).

**REFERENCES**

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**Caranx**
*Caranx sexfasciatus* 4.0 mm  
(Watson et al. 1996)

**Halichoeres**
*Halichoeres semicinctus* 5.4 mm  
(Watson 1996j)

**Plectobranchus**
*Plectobranchus evides* 16.9 mm  
(Matarese et al. 1989)

**Bovichtus**
*Bovichtus angustifrons* 10.2 mm  
(Sutton and Bruce 1998)
Order Perciformes

Perciformes/Trachinoidei/Ammodytidae

*Ammodytes*
*Am. hexapterus* 16.0 mm
(Stevens et al. 1984a)

Perciformes/Blennioidei/Blenniidae

*Hypsoblennius*
*H. brevipinnis* 4.6 mm
(Watson 1996r)

Perciformes/Icosteoidei/Icosteidae

*Icosteus*
*I. aenigmaticus* 10.2 mm
(Watson 1996s)

Perciformes/Gobiesocoidei/Gobiesocidae

*Gobiesox*
*G. maeandricus* 7.0 mm
(Matarese et al. 1989)
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Perciformes/Callionymoidei/Callionymidae

*Callionymus*
*C. decoratus* 2.5 mm
(Miller et al. 1979)

Perciformes/Gobiodei/Gobiidae

*Ilypnus*
*I. gilberti* 5.7 mm
(Watson 1996u)

Perciformes/Kurtoidei/Kurtidae

*Kurtus*
*K. gulliveri* 6.7 mm
(Berra and Neira 2003)

Perciformes/Acanthuroidei/Ephippidae

*Chaetodipterus*
*C. zonatus* 4.3 mm
(Ambrose 1996p)
Order Perciformes

**Perciformes/Scombrolabracidae**

*Scombrolabrax*
*S. heterolepis* 5.0 mm  
(Collette et al. 1984b)

**Perciformes/Scombridae**

*Sarda*
*S. chiliensis* 8.0 mm  
(Ambrose 1996q)

**Perciformes/Stromateidae/Centrolophidae**

*Icichthys*
*I. lockingtoni* 10.4 mm  
(Watson 1996v)
Chapter 16

Order Perciformes

Suborder Percoidei

Family Lutjanidae (Snappers, Fusiliers) (Percoid larvae with precocious, very long fin spines and extensive larval head spination).

Number of genera 21 genera (in 5 subfamilies).

Number of species about 125

GENERAL LIFE HISTORY

Distribution Circumtropical and warm temperate, primarily marine, a few freshwater.

Relative abundance Often abundant. Of considerable commercial and artisanal importance.

Adult habitat Found mostly on reefs, but caesionines are semi-pelagic and etelines and apsilines are found in 100–300 m depths. Prominent medium-sized carnivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs known for few species, and larvae well known for many species.

ELH Characters Eggs: planktonic, 0.7–1.0 mm.

Larvae: head and body compressed, elongate to deep with gut coiled early in development. Preanal length 40–67%BL. 24 myomeres. Moderate to large head with extensive spination, especially preopercular spines (head spines smooth in most species). Largest head spine at angle of preopercle. Other spines on P1 girdle, including small postcleithral spine. Mouth large, horizontal to oblique. Notochord flexion at 4–5 mm. First fin elements to form (at 2–3 mm) are D spine 2 and P2 spine. These become very elongate, and vary from extremely long and terete to robust and serrate. Dsp2 may reach 96%BL in some species. Some rays of P2 as long or longer than P2 spine. Full ray complements attained by 8 mm in all but P1 (to 14 mm). Scales begin to form at 6 to > 25 mm, depending on species. Pigment initially limited to gut and ventral melanophore series on tail, later on head, fins and portions of dorsal midline. Larvae settle at 10 to 40 mm, depending on species.

Example species: Lutjanus malabaricus (Lutjaniae), Paracaesio sp (Apsilinae).


REFERENCES Allen 1985, Carpenter 1988, Kojima and Mori 1988, Leis and Bray 1995,
Order Perciformes/Percoidei


Perciformes/Percoidei/Lutjanidae
from: Leis and Rennis 2000f

**Lutjanus malabaricus** 5.4 mm

**Paracaesio sp.** 4.5 mm
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Order Perciformes

Suborder Percoidei

Family Girellidae (Nibblers) (Percoid larvae with minimal head spination) nb: Nelson (1994) considers Girellidae a Kyphosidae subfamily.

Number of genera 2 (Girella and Graus)
Number of species about 17

GENERAL LIFE HISTORY

Distribution Pacific and E. Indian oceans, marine temperate to subtropical.
Relative abundance Locally abundant. Of minor commercial and artisanal importance.
Adult habitat Mostly on shallow reefs, kelp forests and sea grass meadows in estuaries and bays. Medium-sized, mostly herbivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.
Knowledge of ELH Eggs and larvae known for some Girella spp. Graus is being described by F. J. Neira.
ELH Characters Eggs: planktonic, ca. 1.0 mm.

Larvae: head and body compressed, elongate to moderate in depth, with gut coiled very early in development: compact and rounded thereafter. Preanal length 30–50% BL. Large gap between anus and origin of anal fin that closes following flexion. 27 (Girella) or 34 (Graus) myomeres. Moderate size, rounded head with limited spination: a few, very small preopercular spines, weak opercular spine and very small supracleithral spines. Mouth moderate in size, horizontal to oblique. Notochord flexion at 4–8 mm. Fins begin to form during flexion. Soft rays form first, and no elongate elements. Fin spines remain weak and smooth. Full fin complements attained by about 8–10 mm. Scales begin to form at settlement at 12–25 mm, depending on species. Pigment initially on gut, top of head, and dorsal, ventral and lateral midlines of trunk and tail. Pigment spreads markedly from about 10 mm.

Example species: Girella tricuspidata.


Order Perciformes/Percoidei

Perciformes/Percoidei/Girellidae

*Girella tricuspidata*

from: Miskiewicz and Trnski 1998

4.1 mm

5.0 mm

6.9 mm
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<table>
<thead>
<tr>
<th>Suborder</th>
<th>Labroidei</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>Labridae (Wrasses) (many authors include Scaridae and Odacidae in this family).</td>
</tr>
<tr>
<td>Number of genera</td>
<td>68</td>
</tr>
<tr>
<td>Number of species</td>
<td>485 (2nd largest family of marine fishes – after gobiids).</td>
</tr>
</tbody>
</table>

GENERAL LIFE HISTORY

Distribution
Marine, tropical to temperate.

Relative abundance
Very abundant. Of some commercial and artisanal importance.

Adult habitat
Mostly on reefs, kelp forests and sea grass meadows in shallow water, but some on deep reefs or on sandy habitat. Small to large carnivores.

EARLY LIFE HISTORY

Mode of reproduction
Oviparous.

Knowledge of ELH
Eggs and larvae known for many species, but this constitutes a small proportion of this very speciose family.

ELH Characters

**Eggs:** planktonic, ca. 0.7–1.0 mm, except demersal in some species of N. Atlantic temperate subfamily Labranae.

**Larvae:** diverse larval morphology. Head and body moderately to strongly compressed, elongate to moderate in depth, with a deep caudal peduncle. Gut initially straight, but coils at mid preflexion to late postflexion stage. Preanal length 50–80 %BL prior to gut coiling, and 37–74 %BL thereafter. 23–28 myomeres in tropical species, up to 40 in temperate species. Head small to moderate and rounded to pointed, usually with no spination: a very few species have very small preopercular spines. Mouth small to moderate, horizontal to moderately oblique. Some species with narrow eyes. Notochord flexion at 3–6 mm. In most species, fins begin to form during flexion or shortly thereafter, but in a few species dorsal fin anterior spines form before flexion, and become especially elongate. Otherwise, soft rays form first, and no fin elements are particularly elongate. Fin spines weak and smooth. Full fin complements attained by 6–7 mm in most species. P2 fins often form later, or even following settlement. In most species, scales begin to form after settlement. Pigment limited in vast majority of tropical species, usually confined to a few melanophores on fins, and often entirely lacking. Temperate species more heavily pigmented, and may have extensive pigment over most of body. Settlement usually at 8–12 mm, but some species remain pelagic to twice that size.
Example species: *Achoerodus viridis*, *Julidin labrid; Xyrichthys sp.*

Meristics (*A. viridis*):

REFERENCES

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Order Perciformes/Labroidei

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*Achoerodus viridis* (Leis and Hay 2004)

*Julidin labrid* (Leis and Rennis 2000g)

*Xyrichthys sp.* (Richards and Leis 2000g)
Chapter 16

Order Perciformes

Suborder Labroidei

Family Pomacentridae (Damselfishes) Nb: there is some doubt that this family belongs in the Labroidei (see Watson 1996i).

Number of genera 28
Number of species about 350

GENERAL LIFE HISTORY

Distribution Marine, primarily tropical.

Relative abundance Very abundant. Of very limited artisanal importance, but important in the aquarium trade.

Adult habitat Mostly on shallow reefs. Small carnivores and herbivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs or larvae known for about 15% of species in the family.

ELH Characters Eggs: demersal and oblong, ca. 0.7–4.0 by 0.4–1.2 mm.

Larvae: this speciose family has less diverse larval morphology than Labridae. Head and body compressed, elongate to deep, gut coiled, compact. Preanal length 30–68% BL. 26–27 myomeres. Gap between anus and anal fin small to absent. Head small to large: short snout becomes relatively larger following flexion. Mouth moderate in size, horizontal to slightly oblique. Head spination weak in most species: small spines form prior to flexion on preopercle, opercle, interopercle and supracleithrum. Some species of Chromis have more extensive head spination (Kavanagh et al. 2000). Notochord flexion at 2.5–4.4 mm. In most species, fins begin to form during or shortly after flexion, but in a few species P2 fin and anterior D spines are first to form (prior to flexion). Otherwise, soft rays form first, and no fin elements very elongate. Fin spines weak and smooth. Full fin complements attained by 4–7 mm. Scales form prior to settlement, as early as 3 mm in some species. Pigment present over the brain, over the gut and on ventral and often lateral midlines of tail. Some species become more heavily pigmented abruptly during flexion. Settlement at 8–20 mm.

Example species: Pomacentrus amboinensis.

Order Perciformes/Labroidei

Perciformes/Labroidei/Pomacentridae

*Pomacentrus amboinensis*

from: Murphy et al. 2007

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Order Perciformes

Suborders | Zoarcoidei (Northern Blennioids)
---|---
Number of Families | 9 (Bathymasteridae, Zoarcidae, Stichaeidae, Cryptacanthodidae, Pholididae, Anarhichadidae, Ptilichthyidae, Zaproridae, Scytaliniidae).
Number of genera | 98
Number of species | 318

**GENERAL LIFE HISTORY**

Distribution | Worldwide, but found primarily in colder marine waters of the Northern Hemisphere; most in N. Pacific with some in the N. Atlantic.
Relative abundance | Some families contain species that can be abundant locally (e.g., Bathymasteridae and Stichaeidae) or at various depths (Zoarcidae), while other families are quite rare (e.g., Scytaliniidae and Ptilichthyidae). None of commercial value.
Adult habitat | Generally, little is known of adult habits. Most are found from intertidal areas to the deepest waters. Zoarcids occur from the intertidal zone to depths of almost 2,000 m. Pholids inhabit areas from tidepools to depths of 75 m. Bathymasterids, stichaeids, and most zoarcids are bottom-dwelling, occupying a variety of habitats from subtidal to shelf floors. Anarhichadids and zaprorids inhabit shallow to moderately deep waters. Several taxa bury in the sand/mud: cryptacanthodids, scytaliniids, and ptilichthyids.

**EARLY LIFE HISTORY**

Mode of reproduction | Oviparous; demersal eggs, paired spawning, nest guarding and parental care. *Zoarcus* spp. (3) are ovoviviparous; other zoarcids are oviparous, some showing parental care. Pholids and anarhichadids are noted for paired spawning and subsequent guarding; one or both partners may guard eggs during incubation by coiling around them.
Knowledge of ELH | Eggs and larvae known for many (except zoarcids and *Scytalina cerdalen*).
ELH Characters: Eggs: demersal, often deposited in adhesive masses. Can be large (up to 9.0 mm bathymasterids 0.9–1.1 mm, pholids 1.4–3.0 mm, and zoarcids 1.7–9.0 mm) typically with an oil globule. Long incubation periods (14–20 days). Zoarcid eggs are adhesive, spherical, and have one oil globule.
Larvae: generally elongate and slender with long dorsal and anal-fin bases. Several taxa are highly pigmented (*Cryptacanthodes* spp. and
Zaprora silenus) while most others are identified by subtle differences in postanal pigment patterns. Bathymasterids are most commonly confused with stichaeids, but can be separated by myomere counts. Newly-hatched zoarcid larvae have large yolk sacs, but are otherwise quite advanced and strongly resemble adult zoarcids; they probably become demersal or semi-demersal soon after hatching because they are virtually never collected in plankton nets. Larvae of only five zoarcid taxa have been illustrated.

Example species: 

Ronquilus jordani (Bathymasteridae), Lumpenus sagitta (Stichaeidae), Cryptacanthodes aleutensis (Cryptacanthodidae), Zaprora silenus (Zaproridae).

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Perciformes/Zoarcoidei/Bathymasteridae

Ronquilus
*R. jordani* 10.4 mm
(Matarese et al. 1989)

Perciformes/Zoarcoidei/Stichaeidae

Lumpenus
*L. sagitta* 35.1 mm
(Matarese et al. 1989)

Perciformes/Zoarcoidei/Cryptacanthodidae

Cryptacanthodes
*C. aleutensis* 16.0 mm
(Matarese et al. 1989)

Perciformes/Zoarcoidei/Zaproridae

Zaprora
*Z. silemus* 17.3 mm
(Haryu and Nishiyama 1981)
Order Perciformes

Suborder Zoarcoidei

Family Stichaeidae (Pricklebacks)

Number of genera 36
Number of species 65

GENERAL LIFE HISTORY

Distribution Primarily N. Pacific demersal fishes, temperate to boreal with some extending into the Arctic and N. Atlantic.

Relative abundance Some can be abundant locally while others are quite rare or inadequately sampled (e.g., Chirolphis tarsodes, Allolumpenus hypocromis).

Adult habitat Bottom-dwelling, occupying a variety of habitats from intertidal and subtidal to depths of 250 m on the outer shelf floor.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs and larvae are poorly known.

ELH Characters: Eggs: demersal, spherical, about 1.5–2.5 mm in diameter, with one or more oil globules. Form adhesive masses that are cared for by one or both parents.

Larvae: generally elongate and slender with long dorsal and anal-fin bases. Short preanal length. Several taxa are moderately pigmented (Stichaeus punctatus, Bryozoichthys spp., Plectobranchus evides), while most others are identified by subtle differences in postanal pigment patterns. Most commonly confused with pholids and bathymasterids, but can be separated by myomere counts.

Example species: Anoplarchus purpurescens.


REFERENCES

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Perciformes/Zoarcoidei/Stichaeidae

*Anoplarchus purpureascens*

from: Matarrese et al. 1989

6.1 mm

9.0 mm

12.0 mm

12.0 mm

12.0 mm
Order Perciformes

Suborder

Families

5 (Bovichtidae, Nototheniidae, Harpagiferidae, Bathydraconidae, Channichthyidae; some authors differ in the composition of the Nototheniidae and status of subfamilies and families within the suborder, with 8 families currently recognized, e.g., Anderson, N.C. 1984, Dewitt et al. 1990, Eakin 1990, Balushkin 2000, Nelson 2006).

Number of genera approx. 47
Number of species approx. 125

GENERAL LIFE HISTORY

Distribution Mostly marine, southern ocean, primarily Antarctic, some estuarine and freshwater species.
Relative abundance Relatively abundant, some commercially important.
Adult habitat Most are benthic and benthopelagic, primarily on shelf but some range to ≥ 800 m depth, some pelagic to ca. 2,600 m.

EARLY LIFE HISTORY

Mode of reproduction Oviparous, with planktonic or demersal eggs, planktonic larvae.
Knowledge of ELH Eggs known for all families except Bovichtidae, larvae known for all families (22 genera).
ELH characters: Eggs: spherical, ca. 0.8–5 mm diameter; demersal, sticky, adhering to one another and to substrate; no oil globule.

Larvae: hatch at ca. 6–14 mm with pigmented eyes, open mouth, large yolk sac; notochord flexion at ca. 9–40 mm, settlement at ca. 18– > 60 mm; elongate, compressed, slender, becoming deep-bodied in some genera; gut straight or coiled, ca. 30–70% BL, commonly ≤ 50% BL; head moderate with bluntly acute to long, pointed snout, small to large mouth, moderate to large eyes; head spines lacking except in some Bovichtidae, Bathydraconidae and Channichthyidae; myomeres ca. 34–65, commonly 40’s–50’s; pigmentation commonly moderate to heavy, primarily on head, gut, dorsal and/or ventral margins, often laterally and on P1, P2.

REFERENCES

Chapter 16

Perciformes/Notothenioidei/Bovichtidae

*Bovichtus*
*B. angustifrons* 10.2 mm (Sutton and Bruce 1998)

*Pseudaphritis*
*P. urvillii* 15.9 mm (Sutton and Bruce 1998)
[Currently considered a separate family, Pseudapritidae]

Perciformes/Notothenioidei/Nototheniidae

*Aethotaxis*
*A. mitopteryx* 38.5 mm (Efremenko 1983)

*Dissostichus*
*D. eleginoides* 55.5 mm (Efremenko 1983)

*Lepidonotothen*
*L. squamifrons* 30.5 mm (Efremenko 1983)

*Notothenia*
*N. coriiceps* 28.8 mm (Efremenko 1983)
Order Perciformes/Notothenioidei

Pleuragramma
P. antarcticum 53.7 mm
(Efremenko 1983)

Trematomus
T. eulepidotus 40.5 mm
(Efremenko 1983)

Perciformes/Notothenioidei/Harpagiferidae

Artedidraco
A. mirus 24.0 mm
(Efremenko 1983)
[Currently considered a separate family, Artedidraconidae]

Harpagifer
H. bispinis 24.5 mm
(Efremenko 1983)

Pogonophryne
P. marmorata 25.5 mm
(Efremenko 1983)
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Perciformes/Notothenioidei/Bathydraconidae

**Gymnodraco**
*G. acuticeps* 33.7 mm
(Efremenko 1983)

**Parachaenichthys**
*P. georgianus* 55.5 mm
(Efremenko 1983)

**Psilodraco**
*P. breviceps* 30.5 mm
(Efremenko 1983)

Perciformes/Notothenioidei/Channichthyidae

**Chaenocephalus**
*C. aceratus* 46.0 mm
(Efremenko 1983)

**Chaenodraco**
*C. wilsoni* 43.5 mm
(Efremenko 1983)

**Champsocephalus**
*C. gunnari* 47.5 mm
(Efremenko 1983)
Chionodraco
C. hamatus 43.5 mm
(Efremenko 1983)

Cryodraco
C. antarcticus 34.6 mm
(Efremenko 1983)

Neopagetopsis
N. ionahi 32.5 mm
(Voskoboinikova and Skura 1996)

Pagetopsis
P. macropterus
54.5 mm
(Efremenko 1983)

Pseudochaenichthys
P. georgianus 35.0 mm
(Efremenko 1983)
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Order Perciformes

Suborder Trachinoidei

Families 12 (Chiasmodontidae, Pholidichthyidae [currently placed in its own suborder, Pholidichthyoidei], Trichodontidae, Pinguipedidae, Cheimarrhichthyidae, Trichonotidae, Creediidae, Percophidae, Leptoscopidae, Ammodytidae, Trachinidae, Uranoscopidae; composition of the suborder is unsettled, with several families perhaps belonging elsewhere, e.g., Mooi and Johnson 1997, Springer and Johnson 2004, Nelson 2006).

Number of genera 53
Number of species approx. 237

GENERAL LIFE HISTORY

Distribution Primarily tropical and subtropical marine fishes, some temperate and boreal marine and freshwater.

Relative abundance Uncommon to abundant; includes some commercially important species, primarily ammodytids and trachinids.

Adult habitat Small to medium size (generally < 75 cm) shallow subtidal to bathypelagic residents, some demersal; cheimarrichthyids inhabit freshwater streams and some leptoscopids and uranoscopids may be estuarine.

EARLY LIFE HISTORY

Mode of reproduction All known or presumed to be oviparous (except perhaps pholidichthyids), with planktonic or demersal eggs, planktonic larvae (pholidichthyids may lack a planktonic phase).

Knowledge of ELH Eggs known for all families except Cheimarrhichthyidae, Percophidae, and Pholidichthyidae, larvae known for all families except Cheimarrichthyidae.

ELH characters:

Eggs: planktonic (Chiasmodontidae, Creediidae, Leptoscopidae, Pinguipedidae, Trachipteridae, Uranoscopidae, perhaps Ammodytoides), spherical, ca. 0.7–2.5 mm in diameter, with unornamented chorion (except Uranoscopus), homogeneous yolk, 0–many oil globules ca. 0.01–0.28 mm; demersal adhesive (Trichodontidae, Trichonotidae, most Ammodytidae, possibly Pholidichthyidae) approximately spherical, 0.6–3.5 mm in diameter, with unornamented chorion, 0–1 oil globule up to ca. 0.5 mm.

Larvae: hatch at 2–4 mm with unpigmented eyes (partially to fully pigmented in Trachinidae), unformed mouth, moderate yolk sac (taxa with planktonic eggs), or 3–15 mm with pigmented eyes, functional mouth, small yolk reserve (taxa with demersal eggs); elongate to robust, preanal
Example Species: Chiasmodontidae: *Chiasmodon subniger*, Ammodytidae: *Ammodytoides gilli*.

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Perciformes/Trachinoidei/Chiasmodontidae

**Chiasmodon**
*C. subniger* 10.0 mm  
(Watson and Sandknop 1996e)

**Kali**
*K. normanni* 7.2 mm  
(Watson and Sandknop 1996e)

**Pseudoscopelus**
*P. sp.* 7.4 mm  
(Watson and Sandknop 1996e)

Perciformes/Trachinoidei/Pholidichthyidae

**Pholidichthys**
*P. leucotaenia* 7.1 mm  
(Trnski et al. 2000b)

Perciformes/Trachinoidei/Trichodontidae

**Arctoscopus**
*A. japonicus* 14.2 mm  
(Okiyama 1988c)
Order Perciformes/Trachinoidei

**Trichodon**
*T. trichodon* 14.5 mm
(Marliave 1981)

**Parapercis**
*P. haackei* 4.3 mm
(Neira 1998b)

**Prolatilus**
*P. jugularis* 6.5 mm
(Velez et al. 2003a)

**Trichonotus**
*T. filamentosus* 8.3 mm
(Kojima and Mori 1988c)
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Perciformes/Trachinoidei/Creediidae

**Creedia**
*C. haswelli* 7.3 mm
(Reader and Neira 1998a)

**Crystallodytes**
*C. cookie* 7.8 mm
(Leis 1982)

**Limnichthys**
*L. fasciatus* 5.9 mm
(Reader and Neira 1998a)

**Schizochirus**
*S. insolens* 5.6 mm
(Reader and Neira 1998a)

**Tewara**
*T. cranwellae* 16.7 mm
(Crossland 1982)
Acanthaphritis
A. unoorum 4.2 mm
(Mori 1988a)

Bembrops
B. curvatura 10.3 mm
(Okiyama 1997)

Chironema
C. sp. 16.3 mm
(Okiyama 1997)

Enigmapercis
E. reducta 6.4 mm
(Reader and Neira 1998b)

Heterocoetes
H. sp. 16.0 mm
(Watson et al. 1984)

Percophis
P. brasiliensis 9.0 mm
(Matsuura and Suzuki 2000)
Chapter 16

Perciformes/Trachinoidei/Leptoscopidae

Lesueurina
*L. platycephala* 7.4 mm
(Neira and Gaughan 1989)

Ammodytoides
*A. gilli* 6.1 mm
(Watson 1996p)

Bleekeria
*B. viridianguilla* 4.8 mm
(Okiyama et al. 2000)

Emblichthys
*E. mitsukurii* 17.2 mm
(Okiyama 1988d)

Perciformes/Trachinoidei/Ammodytidae

Ammodytes
*A. hexapterus* 16.0 mm
(Stevens et al. 1984a)

Embolichthys
*E. mitsukurii* 17.2 mm
(Okiyama 1988d)

Astro:
*A. gut* (Pears)

Ichthy:
*I. sp.* (Trans 2000a)

Kathe:
*K. ave* (Wats)
Order Perciformes/Trachinoidei

Perciformes/Trachinoidei/Uranoscopidae

*Astroscopus*
*A. guttatus* 4.9 mm
(Pearson 1941)

*Ichthyoscopus*
*L. sp.* 5.3 mm
(Trnski and Leis 2000a)

*Kathetostoma*
*K. averruncus* 6.8 mm
(Watson 1996r)
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**Uranoscopus**
U. sp. 4.1 mm  
(Trnski and Leis 2000a)

**Xenocephalus**
X. elongatus  
7.8 mm  
(Mori 1988c)
Order Perciformes

Suborder Trachinoidei

Family Chiasmodontidae (Swallowers)

Number of genera 4 (*Chiasmodon, Dysalotus, Kali, Pseudoscopelus*)

Number of species approx. 15

GENERAL LIFE HISTORY

Distribution Marine, world-wide mainly in tropical and subtropical waters, but some range into subarctic and subantarctic waters.

Relative abundance Apparently not abundant.

Adult habitat Meso- and bathypelagic.

EARLY LIFE HISTORY

Mode of reproduction Oviparous, with planktonic eggs and larvae.

Knowledge of ELH Eggs known for *Chiasmodon*, larvae known for all genera except *Dysalotus*.

ELH Characters: Eggs: spherical, ca. 1.1–1.2 mm in diameter; homogeneous yolk; 1 to several oil globules 0.01–0.28 mm in diameter, condensing to 1.

Larvae: moderately elongate with coiled gut, preanal length < 50% BL (commonly near 33% BL); snout elongates and mouth becomes large by postflexion stage; small preopercular spines form by flexion stage (none in *Kali*); all genera except *Kali* develop spinules on body by late preflexion stage; *Kali* develops very large P1 and P2, with rays forming during preflexion stage; myomeres 33–46; pigmentation commonly light, predominantly on head and gut, and in distinct patches on dorsal and/or ventral margins in some species.


Chapter 16

Perciformes/Trachinoidei/Chiasmodontidae

Chiasmodon subniger
from: Watson and Sandknop 1996e

3.2 mm
6.5 mm
10.0 mm
14.0 mm
22.9 mm
Order Perciformes

Suborder Trachinoidei

Family Ammodytidae (Sand Lances)

Number of genera 8

Number of species approx. 23

GENERAL LIFE HISTORY

Distribution Marine, boreal to tropical, Arctic, Pacific, Indian, Atlantic oceans.

Relative abundance Common forage fishes; some commercially important.

Adult habitat Shallow subtidal to deep shelf, usually associated with soft bottom, some epipelagic.

EARLY LIFE HISTORY

Mode of reproduction Oviparous, with demersal, adhesive eggs (possibly planktonic eggs in Ammodytoides), and planktonic larvae.

Knowledge of ELH Eggs known for Ammodytes and larvae known for all genera.

ELH Characters:

- **Eggs**: approximately spherical, 0.7–1.2 mm in diameter, single oil globule 0.2–0.4 mm in diameter.

- **Larvae**: elongate, compressed, with straight gut and preanal length approx. 60–70% BL; snout short initially, becoming moderately elongate and more or less pointed with projecting lower jaw by postflexion stage; eyes moderate to small; no spines on head (except small preopercular spines in Bleekeria and some Ammodytoides); myomeres approx. 49–69; pigmentation light, primarily on gut and ventrum, with some on head and/or posteriorly on dorsum and/or laterally in some species, dorsal and lateral pigment may spread forward with larval development.

Example species: *Ammodytoides gilli* (Eastern Pacific, Baja California Sur, Mexico, to Panama).

Meristics: 


REFERENCES 

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Perciformes/Trachinoidei/Ammodytidae

_Ammodytoides gilli_
from: Watson 1996p

3.3 mm

6.1 mm

7.6 mm

13.1 mm
Order Perciformes

Suborder Blennioidei

Families 6 (Tripterygiidae, Blenniidae, Dactyloscopidae, Chaenopsidae, Clinidae, Labrisomidae; the systematic position of the suborder and interrelationships of the families are not settled, see Springer 1993, Hastings and Springer 2009).

Number of genera approx. 151
Number of species approx. 883

GENERAL LIFE HISTORY

Distribution Temperate to tropical waters of all oceans, some estuarine.
Relative abundance Uncommon to common, depending on species.
Adult habitat Most are small, benthic inhabitants of intertidal to shallow reef, algal, or mangrove habitats, some on soft bottom.

EARLY LIFE HISTORY

Mode of reproduction Most are oviparous, with demersal, attached eggs brooded by one or both parents; many clinids (Clinini and Ophiclinini) and some labrisomids (Starksimii) are live-bearers; larvae are planktonic.
Knowledge of ELH Eggs and larvae known for many genera of all families.
ELH characters: Eggs: elliptical or spherical to hemispherical, approx. 0.5–1.5 mm in diameter; chorion ornamented in some; attachment is via adhesive filaments or pads, commonly at one pole; yolk commonly granular, colorless to red, brown, or green; 0–100 or more oil globules (commonly > 1), usually ≤ 0.3 mm in diameter.

Larvae: hatch at ca. 2–7 mm with pigmented eyes, open mouth, small yolk sac; elongate, somewhat compressed body; most with coiled gut extending to ca. 30–50% BL; head spines lacking to large and/or numerous, depending on taxon, when present usually consisting of supraocular and opercular series spines; myomeres 28–135, commonly approx. 30–50; pigmentation light to heavy, commonly light, primarily on gas bladder, gut and ventral margin of tail.

Example species: Heterostichus rostratus (Clinidae), Hypsoblemnis jenkinsi (Blenniidae).

Order Perciformes/Blennioidei

Perciformes/Blennioidei/Tripterygiidae

Enneanectes
*E. carminalis* 4.4 mm (Brogan 1992)

Enneapterygius
*E. atriceps* 5.8 mm (Miller et al. 1979)

Forsterygion
*F. varium* 6.1 mm (Ruck 1980)

Gilloblennius
*G. tripennis* 5.9 mm (Ruck 1980)

Grahamina
*G. capito* 5.1 mm (Ruck 1973)

Ruanoho
*R. decemdigitatus* 5.8 mm (Ruck 1980)

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**Springerichthys**  
*S. bapturus* 9.4 mm  
(Shiogaki and Dotsu 1988)

Perciformes/Blennioidei/Blenniidae

**Atrosalarias**  
*A. fuscus* 7.4 mm  
(Watson 2000a)

**Blennius**  
*B. ocellaris* 8.5 mm  
(Ford 1922)

**Chasmodes**  
*C. saburrae* 3.8 mm  
(Peters 1981)

**Cirripectes**  
*C. sp.* 19.0 mm  
(Kojima and Shiogaki 1988)
Order Perciformes/Blennioidei

**Enchelyurus**
*E. ater* 5.4 mm  
(Watson 2001)

**Entomacrodus**
*E. chiostictus* 6.6 mm  
(Watson 1996r)

**Exallias**
*E. brevis* 4.6 mm  
(Watson 2000a)

**Istiblennius**
*I. zebra* 11.0 mm  
(Miller et al. 1979)

**Laiphognathus**
*L. multimaculatus* 5.9 mm  
(Kubo and Sasaki 2000)

**Lupinoblennius**
*L. nicholsi* 4.1 mm  
(Peters 1985)
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Meiacanthus
M. nigrolineatus 4.9 mm
(Fishelson 1976)

Omobranchus
O. rotundiceps 5.2 mm
(Watson and Miskiewicz 1998)

Ophioblennius
O. steindachneri 4.7 mm
(Watson 1996r)

Parablennius
P. postoculomaculatus
6.8 mm
(Watson and Miskiewicz 1998)

Petroscirtes
P. lupus 5.2 mm
(Watson and Miskiewicz 1998)

Plagiotremus
P. rhinorhynchos 4.6 mm
(Watson 2000a)
Order Perciformes/Blennioidei

**Scartella**  
*S. cristata* 6.2 mm  
(Kojima and Shiogaki 1988)

**Stanulus**  
*S. seychellensis* 10.1 mm  
(Kojima and Shiogaki 1988)

**Xiphasia**  
*X. setifer* 10.5 mm  
(Kojima and Shiogaki 1988)

**Dactylagnus**  
*D. mundus* 4.1 mm  
(Brogan 1992)

**Dactyloscopus**  
*D. pectoralis* 4.6 mm  
(Brogan 1992)

**Gillellus**  
*G. semicinctus* 6.4 mm  
(Watson 1996r)
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Myxodagnus
M. opercularis 9.0 mm
(Watson 1996r)

Acanthemblemaria
A. crockeri 6.4 mm
(Brogan 1992)

Chaenopsis
C. alepidota 5.3 mm
(Brogan 1992)

Coralliozetus
C. sp. (micropes)
6.5 mm
(Brogan 1992)

Emblemaria
E. hypacanthus 3.5 mm
(Brogan 1992)

Neoclinus
N. stephensae 7.0 mm
(Watson 1996r)

Stathmonotus
S. sinuscalifornici
6.4 mm
(Brogan 1992)
Order Perciformes/Blennioidei

Perciformes/Blennioidei/Clinidae

**Gibbonsia**
*G. elegans* 7.5 mm
(Watson 1996r)

**Heteroclinus**
*H. perspicillatus* 5.4 mm
(Gunn and Thresher 1991)

**Heterostichus**
*H. rostratus* 11.4 mm
(Watson 1996r)

Perciformes/Blennioidei/Labrisomidae

**Allocinus**
*A. holderi* 8.7 mm
(Watson 1996r)

**Cryptotrema**
*C. corallinum* 8.6 mm
(Watson 1996r)

**Dialommus**
*D. fuscus* 8.4 mm
(Herrera and Lavenberg 1999)
Chapter 16

**Exerpes**  
*E. asper* 9.2 mm  
(Brogan 1992)

**Labrisomus**  
*L. xanti* 6.8 mm  
(Watson 1996r)

**Malacoctenus**  
*M. zonogaster* 7.0 mm  
(Herrera and Lavenberg 1999)

**Paraclinus**  
*P. integripinnis* 6.7 mm  
(Watson 1996r)

**Starksia**  
*S. galapagensis* 11.6 mm  
(Herrera and Lavenberg 1999)
Order Perciformes

Suborder Blennioidei

Family Blenniidae (Combtooth Blennies)

Number of genera 57
Number of species 387

GENERAL LIFE HISTORY

Distribution
Marine, temperate to tropical (predominantly subtropical to tropical) waters worldwide, some are estuarine and may enter freshwater.

Relative abundance
Uncommon to abundant, depending on species.

Adult habitat
Most species demersal, on intertidal to shallow subtidal hard bottom including reefs, pilings, buoys, etc., saber-tooth blennies (tribe Nemophini) commonly hover above reefs.

EARLY LIFE HISTORY

Mode of reproduction
Oviparous, with demersal, attached eggs brooded by parent(s); planktonic larvae.

Knowledge of ELH
Eggs known for several genera (e.g., Blennius, Hypsoblennius, Omobranchus, Parablennius, Petroscirtes), larvae known for many genera (e.g., Atrosalarias, Blennius, Chasmodes, Hypsoblennius, Istiblennius, Meiacanthus, Parablennius, Stanulus, Xiphasia).

ELH characters:
Eggs: slightly flattened to hemispherical, ca. 0.4–0.8 mm by 0.6–1.1 mm; adhesive filaments or pad at basal pole; granular yolk, commonly yellow to red, with ≥ 1 oil globule.

Larvae: hatch at ca. 2–5 mm, notochord flexes at ca. 4–8 mm, settlement at ca. 15–70 mm; moderately to very elongate, slightly to moderately compressed, some become moderately deep-bodied; gut coiled at hatching in some, initially straight but coiling during preflexion stage in others, extends to ca. 35–60% BL (usually < 50% BL); gas bladder anterior, usually not very conspicuous; head moderate; snout short to moderate, rounded to somewhat pointed; mouth small to moderate; large, hooked teeth form anteriorly in some Salarini, large canine teeth form anteriorly in some Nemophini; preopercular, and often supraocular, spines form in preflexion or flexion stage except in Nemophini and some Salarini, preopercular spines may become very large in some Omobranchini; pectoral-fin rays form early, usually beginning at, or soon after hatching, except in some Nemophini; myomeres ca. 28–135, approx. 30–40 in most species, commonly ca. 8–12 preanal myomeres; pigmentation light to nearly complete, commonly moderately light, on
head (primarily dorsally), gas bladder, gut, ventral margin of tail, and commonly on pectoral fins.

Example species: *Hypsoblennius jenkinsi* (N.E. Pacific, coastal central California to Baja California Sur, Mexico, and upper Gulf of California).


REFERENCES

Order Perciformes/Blennioidei

Perciformes/Blennioidei/Blenniidae

*Hypsoblennius jenkinsi*

From: Watson 1996r

4.7 mm

4.7 mm

5.3 mm

10.2 mm

18.6 mm
Chapter 16

Order Perciformes

Suborder Blennioidei

Family Clinidae (Clinid Kelpfishes)

Number of genera 26

Number of species 85

GENERAL LIFE HISTORY

Distribution Marine, temperate to tropical Atlantic, Pacific and Indian oceans, most in temperate waters.

Relative abundance Many common, some locally abundant.

Adult habitat Benthic, intertidal to shallow subtidal on rocky reefs and algal beds, some on sandy bottom.

EARLY LIFE HISTORY

Mode of reproduction Clinini and Ophiclinini genera are ovoviviparous, myxodin genera (*Clinitrachus, Gibbonsia, Heterostichus, Myxodes, Ribetroclinus*) are oviparous, with demersal, attached eggs; larvae are planktonic.

Knowledge of ELH Eggs known for *Heterostichus rostratus*, larvae known for myxodin genera *Clinitrachus, Heterostichus, Gibbonsia*, and the clinin genus *Heteroclinus*.

ELH characters: Eggs: spherical, 1.2–1.4 mm diameter; cluster of long filaments at basal pole; yolk green to purple, with 1 oil globule ca. 0.3 mm.

Larvae: myxodin larvae hatch at ca. 5–6 mm, notochord flexes at ca. 6–10 mm, settlement is at ca. 15–45 mm; clinin larvae are born at postflexion stage, ca. 8–10 mm; all are elongate, slender, compressed; gut uncoiled through flexion stage, coils during postflexion stage, reaches to ca.45–50%BL; gas bladder initially anterior to midgut, shifts posteriorly with development; no spines on head or pectoral girdle; myomeres ca. 38–75 (commonly 40’s–50’s), usually ca. 15–20 preanal myomeres; pigmentation light, usually only on gas bladder, gut, and ventral margin of tail until late postflexion stage.

Example species: *Heterostichus rostratus* (N.E. Pacific, coastal British Columbia, Canada, to Baja California Sur, Mexico).


Order Perciformes/Blennioidei/Clinidae

Heterostichus rostratus
from: Watson 1996

21.2 mm

11.4 mm

6.5 mm

5.4 mm

1.2-1.3 mm
Chapter 16

Order Perciformes


Families Gobiesocidae (Clingfishes)

Number of genera 43
Number of species approx. 140

GENERAL LIFE HISTORY

Distribution Primarily marine, temperate–tropical Atlantic, Pacific, and Indian oceans; some freshwater species.

Relative abundance Relatively common.

Adult habitat Small, demersal fishes, mostly intertidal to shallow subtidal but a few are deeper and a few enter freshwater; most occur in hard bottom, mangrove, or algal habitats, some associated with invertebrates.

EARLY LIFE HISTORY

Mode of reproduction Oviparous, with demersal, attached eggs usually guarded by parent, usually with planktonic larvae (larvae of some species may be demersal).

Knowledge of ELH Eggs known for 15 genera, larvae known for 16 genera.

ELH characters:

Eggs: oval to hemispherical, ca. 0.7–1.9 mm in diameter; yolk granular, often yellow to orange (pink to purple, or green in some); 1–100 oil globules, usually condensing to 1, ca. 0.5 mm in diameter.

Larvae: hatch at ca. 2–7 mm with pigmented eyes, open mouth, small yolk sac; notochord flexes at ca. 4–8 mm, settlement at ca. 10 mm; moderately elongate and cylindrical to slightly compressed in preflexion stage, becoming broader by postflexion stage; broad, straight gut, extending to ca. 50–75% BL; gas bladder anterior, may be prominent in preflexion stage; small to moderate head, becomes ventrally flattened in postflexion stage; pelvic disc forms during preflexion to early flexion stage; no spines on head or pectoral girdle, no fin-spines; myomeres ca. 24–78, commonly high 20’s to mid-30’s; pigmentation absent to heavy, commonly light to moderate initially, primarily on gut, often dorsally on head and trunk, or ventrally on tail, or laterally on trunk and/or anterior postanal myomeres, or in all locations, generally increasing to cover most of body in postflexion stage in most species, but disappearing in some.
Example Species: *Gobiesox rhessodon* (coastal Eastern Pacific from central California to southern Baja California Peninsula).


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Perciformes/Gobiesocoidei/Gobiesocidae

**Apletodon**
*A. microcephalus* 4.5 mm
(Allen 1984)

**Aspasma**
*A. minima* 6.8 mm
(Shiogaki and Dotsu 1971a)

**Aspasmichthys**
*A. ciconinae* 6.9 mm
(Shiogaki and Dotsu 1972)

**Conidens**
*C. laticephalus* 5.5 mm
(Shiogaki and Dotsu 1971c)

**Diplectogaster**
*D. bimaculata* 6.5 mm
(Allen 1984)

**Diplocrepis**
*D. puniceus* 7.7 mm
(Allen 1984)

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Discotrema
d. crinophila 5.3 mm
(Shiogaki et al. 1988)

Gastrocyanthus
G. gracilis 6.9 mm
(Allen 1984)

Gastrocyphus
G. hectoris 5.4 mm
(Allen 1984)

Gobiesox
G. eugrammus 7.5 mm
(Watson 1996c)

Lepadichthys
L. frenatus 7.3 mm
(Shiogaki et al. 1988)

Lepadogaster
L. lepadogaster 6.0 mm
(Allen 1984)
Chapter 16

**Leucanogaster**
*L. chrysea* 5.4 mm  
(Olivar 1987b)

**Rimicola**
*R. eigenmanni* 4.4 mm  
(Watson 1996c)

**Sicyases**
*S. sanguineous*  
7.2 mm  
(Perez 1981)

**Trachelochismus**
*T. melobesia* 7.8 mm  
(Allen 1984)
Order Perciformes/Gobiesocoidei

Perciformes/Gobiesocoidei/Gobiesocidae
*Gobiesox rhessodon*
from: Watson 1996c

3.9 mm

5.5 mm

6.9 mm

7.5 mm

12.0 mm
Chapter 16

Order Perciformes

Suborder Callionymoidei (phylogenetic position is not settled; the callionymoids sometimes are placed in a perciform suborder Gobiesocoidei, or in a separate order, Gobiesociformes, but currently most authors treat Callionymoidei and Gobiesocoidei as separate perciform suborders).

Number of Families 2 (Callionymidae, Draconettidae)

Number of genera approx. 22 (currently about 12 genera are recognized, e.g., Nelson 2006).

Number of species approx. 194

GENERAL LIFE HISTORY

Distribution Marine, warm temperate to tropical waters of all seas but primarily Indo-Pacific, some may enter estuaries.

Relative abundance Rare to common, depending on species.

Adult habitat Benthic, primarily on soft bottom, to ca. 900 m depth.

EARLY LIFE HISTORY

Mode of reproduction All are known or assumed to be oviparous, with planktonic eggs and larvae.

Knowledge of ELH Eggs known for four genera (all callionymids), larvae known for six genera representing both families (most information is for Callionymidae).

ELH characters:

- **Eggs:** spherical, ca. 0.5–1.0 mm in diameter; chorion with polygonal sculpturing or unornamented, depending on species; yolk may be weakly segmented; no oil globule.

- **Larvae:** cylindrical to compressed in cross-section, becoming somewhat flattened in postflexion stage (Draconettidae remain compressed); gut coiled, reaching to approx. 50–70% BL; head moderately large, with rounded snout (more pointed in Draconettidae), small mouth, moderate to large eyes; spines on one or more of opercular series bones by postflexion stage; myomeres 18–25, commonly 20–22; pigmentation light to heavy (moderate to heavy in most), commonly on head, gut, dorsal and ventral margins, and on lateral midline of tail.

Example species: *Synchiropus atrilabiatus* (Callionymidae).

Callionymus
* C. decoratus
4.1 mm
(Miller et al. 1979)

Diplogrammus
* D. pauciradiatus
2.5 mm
(Olney and Sedberry 1983)

Eleutherochir
* E. mirabilis
6.1 mm
(Takita and Kojima 1988)

Paracallionymus
* P. costatus 2.3 mm
(Brownell 1979)
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*Synchiropus*
*S. atrilabiatu*s
4.1 mm
(Watson 1996)

**Perciformes/Callionymoidei/Draconettidae**

*Centrodraco*
*C. acanthopoma*
8.6 mm
(Hartel and Nakabo 2002)
Order Perciformes

Suborder Callionymoidei

Family Callionymidae (Dragonets)

Number of genera approx. 20 (number of genera and placement of species in genera are not settled; currently 10 genera are recognized, e.g., see Fricke 1983, 2002, Nakabo 1982, Nelson 2006).

Number of species approx. 182

GENERAL LIFE HISTORY

Distribution Marine, warm temperate to tropical waters of all seas, some enter estuaries; most species are in the Indo-West Pacific.

Relative abundance Relatively common; some are popular in the aquarium trade.

Adult habitat Small, demersal residents primarily of soft bottom but also may occur on coral rubble or rocky bottom, to ca. 900 m depth (most < 400 m depth).

EARLY LIFE HISTORY

Mode of reproduction Oviparous, with planktonic eggs and larvae.

Knowledge of ELH Eggs known for Callionymus, Calliurichthys, Paradiplogrammus, Repomucenus; larvae known for Callionymus, Diplogrammus, Eleutherochir, Paracallionymus, Synchiropus.

ELH characters: Eggs: spherical, ca. 0.5–1.0 mm in diameter; chorion with polygonal sculpturing or unornamented, depending on species; yolk may be weakly segmented; no oil globule; Paradiplogrammus eggs initially in buoyant mass that breaks up before hatching, others with single eggs.

Larvae: hatch at 1–2 mm with large yolk sac, unpigmented eyes, lacking functional mouth, notochord flexes at 2–5 mm, settlement at ca. 8–12 mm; cylindrical to compressed in cross-section, becoming somewhat flattened in postflexion stage; head moderately large, with rounded snout, small mouth, moderate to large eyes; prominently elongated notochord tip is conspicuous through early postflexion stage; prominent preopercular spine forms during flexion or early postflexion stage and may develop accessory hooks or other ornamentation in postflexion stage; myomeres 18–25; pigmentation usually moderate to heavy, nearly always present on at least head, gut, dorsal and ventral margins, and lateral midline, usually increases with larval development.

Example species: Synchiropus atrilabiatus (coastal eastern Pacific from southern Baja California Peninsula to Ecuador).
Meristics:


REFERENCES

Order Perciformes/Callionymoidei

Perciformes/Callionymoidei/Callionymidae

*Synchiropus atrilabiatu*s

from: Watson 1996t

2.5 mm

3.6 mm

4.1 mm

5.6 mm

8.3 mm
Order Perciformes

Suborder

Gobioidei (gobioid monophyly is accepted but relationships and placement of taxa within the suborder are not settled, e.g., Birdsong et al. 1988, Hoese and Gill 1993, Nelson 2006, Winterbottom 1993).

Families

9 (Rhyacichthyidae, Odontobutidae, Eleotridae, Gobiidae, Kraemeriidae, Xenisthmidae, Microdesmidae, Ptereleotridae, Schindleriidae)

Number of genera approx. 274

Number of species approx. 2211

GENERAL LIFE HISTORY

Distribution Temperate-tropical seas, intertidal to deep shelf, estuarine and freshwater.

Relative abundance Many species are abundant; larvae commonly are abundant in coastal ichthyoplankton samples.

Adult habitat Primarily benthic on soft to hard bottom, mangrove, and algal habitats.

EARLY LIFE HISTORY

Mode of reproduction Oviparous; at least most with demersal, attached eggs; larvae are planktonic.

Knowledge of ELH Eggs and larvae known for numerous taxa, primarily gobiids; ELH stages unknown for Rhyacichthyidae.

ELH characters:

Eggs: spherical to elliptical, often club- or pear-shaped, length ca. 0.4–5.8 mm (most < 2 mm long), diameter ca. 0.2–1.3 mm; adhesive filaments usually present at basal pole, but lacking in some; commonly one to several oil globules, but some lack oil globules.

Larvae: commonly hatch with partially to fully pigmented eyes, open mouth, and small yolk sac, but some hatch with unpigmented eyes, unformed mouth, moderately large yolk sac; slightly to moderately compressed, somewhat to very elongate; gut initially straight in most, subsequently coils or folds in eleotrids and some gobiids, ca. 40–70% BL initially (commonly ca. 50–60% BL); gut coiled throughout development in ambylopine gobiids and xenisthmids, may be as short as 33% BL in amblyopines; gas bladder typically prominent, near mid-gut, moves posteriorly with larval development in some; head commonly moderate to small, with short, rounded snout that elongates and becomes more acute, mouth small to moderate, eye moderate to large, becoming relatively smaller in postflexion stage of some taxa; no spines on head or pectoral girdle except in Xenisthmidae; myomeres ca. 24–76, commonly 20’s–30’s; pigmentation absent to heavy, commonly light, with mel-
anophores on gas bladder, gut, and ventral margin of tail, often on isthmus, internally on head, and on dorsal margin, most commonly posteriorly.

Example species: 

*Clevelandia ios* (Gobiidae), *Xenisthmus* sp. (Xenisthmidae), *Microdesmus* sp. (Microdesmidae), *Schindleriapraematura* (Schindleriidae).

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Perciformes/Gobioidei/Odontobutidae

**Odontobutis**  
*O. obscura* 7.0 mm  
(Dotsu et al. 1988)

Perciformes/Gobioidei/Eleotridae

**Calumia**  
*C. godeffroyi* 7.4 mm  
(Leis and Carson-Ewart 2000b)

**Dormitator**  
*D. latifrons* 3.5 mm  
(Watson 1996u)

**Eleotris**  
*E. sp.* 7.9 mm  
(Leis and Carson-Ewart 2000b)

**Hypseleotris**  
*H. sp.* 5.6 mm  
(Gehrke and Neira 1998)

---

*Aca*  
A. f.  
(Dö)

**Astu**  
*A. s.*  
3.6  
(Do)

**Cler**  
*C. i.*  
(Wa)

**Evio**  
*E. sp.*  
(Dot)

**Gilli**  
*G. m.*  
(Wa)

**Gob**  
*G. ci.*  
(Wal)
Order Perciformes/Gobioidei

Perciformes/Gobioidei/Gobiidae

**Acanthogobius**
*A. flavimanus* 4.9 mm
(Dōtō and Mito 1955)

**Asterropteryx**
*A. semipunctatus*
3.6 mm
(Dotsu et al. 1988)

**Clevelandia**
*C. ios* 5.1 mm
(Watson 1996u)

**Eviota**
*E. storhtynx* ca. 2 mm
(Dotsu et al. 1988)

**Gillichthys**
*G. mirabilis* 4.6 mm
(Watson 1996u)

**Gobulus**
*G. crescentalis* 3.9 mm
(Watson 1996u)
Chapter 16

Istiogobius
*I. hoshinonous* 3.9 mm
(Dotsu et al. 1988)

Lepidogobius
*L. lepidus* 6.4 mm
(Watson 1996u)

Lythrypnus
*L. zebra* 5.0 mm
(Watson 1996u)

Priolepis
*P. boreus* 2.5 mm
(Dotsu et al. 1988)

Quietula
*Q. y-cauda* 5.3 mm
(Watson 1996u)

Rhinogobiops
*R. nicholsii* 5.6 mm
(Watson 1996u)
Order Perciformes/Gobioidae

*Sicyopterus*
*S. japonicus*
c. 2 mm  
(Dotsu et al. 1988)

*Taenioides*
*T. cirratus* 9.3 mm  
(Dotsu et al. 1988)

*Trypauchen*
*T. sp.* 6.2 mm  
(Leis and Rennis 2000k)

*Typhlogobius*
*T. californiensis* 5.8 mm  
(Watson 1996u)
Chapter 16

Perciformes/Gobioidei/Kraemiidae

*Kraemeria*
*K. samoensis* 10.2 mm
(Dufour and Iglesias 2000)

Perciformes/Gobioidei/Xenisthmidae

*Allomicrodesmus*
*A. sp.* 3.4 mm
(Leis et al. 1993)

*Xenisthmus*
*X. sp.* 3.3 mm
(Leis et al. 1993)

Perciformes/Gobiodei/Microdesmidae

*Cerdale*
*C. floridana* 3.6 mm
(Watson et al. 2006)

*Clarkichthys*
*C. bilineatus* 4.0 mm
(Watson 1996u)
Gunnellichthys
G. sp. 4.3 mm
(Leis and Rennis 2000l)

Microdesmus
M. longipinnis 4.6 mm
(Watson et al. 2006)

Nemateleotris
N. sp. 15.7 mm
(Leis and Rennis 2000l)

Ptereleotris
P. microlepis 4.3 mm
(Leis and Rennis 2000l)

Schindleria
S. praematura
2.9 mm
(Watson 2000b)
Chapter 16

Order Perciformes

Suborder  Gobioidi  

Family  Gobiidae (Gobies)  

Number of genera  > 210  

Number of species  > 1950  

GENERAL LIFE HISTORY

Distribution  Worldwide in temperate to tropical waters, predominantly tropical and subtropical, predominantly marine.  

Relative abundance  Many species are abundant; some are utilized in artisanal fisheries; larvae often are common in coastal ichthoplankton samples.  

Adult habitat  Benthic on soft to hard bottom, intertidal to deep shelf, in algal and mangrove habitats, many estuarine and freshwater species.  

EARLY LIFE HISTORY

Reproduction  Oviparous, with demersal, attached eggs and planktonic larvae.  

Knowledge of ELH  Eggs and larvae known for many genera, e.g., eggs: Acanthogobius, Clevelandia, Gillichthys, Ilymus, Lythrypnus, Rhinogobius, Tridentiger; larvae: Acentrogobius, Coryphopterus, Eucyclogobius, Favonigobius, Gobius, Luciogobius, Microgobius, Pseudogobius, Redigobius.  

ELH characters:  Eggs: elliptical, ca. 0.2–1.3 mm X 0.4–5.8 mm; adhesive filaments at basal pole; 1–several oil globules. 

Larva: elongate, slightly to moderately compressed; gut straight in most taxa but fold forms posteriorly in some, gut coiled in amblyopines, ca. 45–60% BL in most gobids but ca. 33% BL in amblyopines; prominent gas bladder over mid-gut vicinity; small to moderate head with short, rounded snout that elongates somewhat, usually becomes more acute; moderate to large eyes, become relatively small in postflexion stage of some taxa; no spines on head or pectoral girdle; myomeres ca. 24–38, commonly mid-20’s in subtropical-tropical taxa and 30’s in temperate taxa; pigmentation light to heavy, commonly light to moderate, primarily on gas bladder, gut, and ventrum, many taxa with melanophores dorsally on trunk and/or tail, some with melanophores internally and/or externally on head, laterally on body.  

Example species: Clevelandia ios (coastal Eastern Pacific, British Columbia to southern Baja California Peninsula).  


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Order Perciformes/Gobioidei

15+21–22=36–37, C: 8–11, 8+7, 7–11.

REFERENCES


Perciformes/Gobioidei/Gobiidae

*Clevelandia ios*

from: Watson 1996u

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**3.8 mm**

**5.1 mm**

**12.0 mm**

**14.9 mm**

---

**2.5 mm**

---
Order Perciformes

Suborder Gobioidei

Family Xenisthmidae (Wrigglers)

Number of genera 6 (Allmicroodesmus, Kraemericus, Paraxenisthmus, Rotuma, Tyson, Xenisthmus).

Number of species 13

GENERAL LIFE HISTORY

Distribution Indo-Pacific, marine.

Relative abundance Apparently rare to common, depending on species.

Adult habitat Benthic, on sandy bottom near reefs and reef rubble, dive into sand.

EARLY LIFE HISTORY

Mode of reproduction Spawning mode unknown, planktonic larvae.

Knowledge of ELH Eggs unknown, larvae known for Allmicroodesmus and Xenisthmus.

ELH characters:

**Eggs**: unknown.

**Larvae**: elongate, compressed; gut typically just under 50% BL in preflexion stage, lengthening to just over 50% BL in postflexion stage, single coil posteriorly; gas bladder prominent, moves from mid-gut vicinity initially to near posterior end of gut by postflexion stage; head moderate with short snout, strongly oblique mouth, large eyes that become relatively smaller with development; many head spines, all ventral: on quadrates, cleithra, branchiostegal rays; dorsal- and anal-fin pterygiophores with prominent, triangular blades; dorsal- and anal-fin rays form early, during preflexion or early flexion stage; myomeres 26–27, 9–11 preanal, except 41–44 total and 16–19 preanal in Allmicroodesmus; pigmentation light, near cleithral symphysis, on gas bladder, hindgut, ventral margin of tail, and in diagonal bar posteriorly on tail.

Example species: Xenisthmus sp. (specimens from Australia, Great Barrier Reef vicinity).


Order Perciformes/Gobioidei

Xenisthmidae

*Xenisthmus* sp.
from: Leis et al. 1993

2.4 mm

3.3 mm

7.6 mm
Chapter 16

Order Perciformes

Suborder Gobioidae

Family Microdesmidae (Wormfishes)

Number of genera 5 (Cerdale, Clarkichthys, Gunnellichthys, Microdesmus, Paragunnellichthys)

Number of species approx. 30

GENERAL LIFE HISTORY

Distribution Warm temperate to tropical seas.

Relative abundance Some species are locally abundant.

Adult habitat Benthic, near and on soft bottom, burrow into sediment; primarily in shallow coastal waters but occasionally estuarine.

EARLY LIFE HISTORY

Mode of reproduction Oviparous, eggs are demersal in at least two genera, larvae are planktonic.

Knowledge of ELH Eggs known for Clarkichthys and Gunnellichthys, larvae known for all genera.

ELH characters: Eggs: spherical to oval, 0.2–0.3 mm; demersal, but lack basal filaments.

Larvae: hatch near 2 mm with pigmented eyes, open mouth, small yolk sac, undergo notochord flexion at ca. 3–5 mm, settle at ca. 20–35 mm; somewhat compressed and elongate, becoming more elongate with development; gut straight, extending to ca. 50–60% BL; prominent gas bladder, moves from anteriorly above gut early in preflexion stage to near terminus by late postflexion stage; moderate head with short, rounded snout and large eyes initially, becomes relatively small with larger, moderately acute snout and relatively small eyes by postflexion stage; lower jaw extends beyond snout, becomes bulbous in postflexion stage; no spines on head or pectoral girdle; myomeres ca. 44–71; pigmentation light, on gas bladder, gut, and ventral margin of tail, often some posteriorly on dorsal margin, commonly spreading anteriorly through flexion stage, then retracting to caudal peduncle, commonly some on horizontal septum of caudal peduncle in postflexion stage.

Example species: Microdesmus bahianus (Western Atlantic and Caribbean, Puerto Rico to Brazil).

REFERENCES

Perciformes/Gobioidei/Microdesmidae
Microdesmus bahianus
from: Watson et al. 2006u
Chapter 16

Order Perciformes

Suborder Gobioidaei

Family Schindleriidae (Infantfishes; Schindler’s Fishes)

Number of genera 1 (Schindleria)

Number of species 3 (plus > 1 undescribed species).

GENERAL LIFE HISTORY

Distribution Marine, eastern Pacific through Indo-West Pacific.

Relative abundance Can be locally very abundant around islands.

Adult habitat Neritic, primarily around islands, common in coral reef lagoons, epibenthic during the day.

EARLY LIFE HISTORY

Mode of reproduction Mode of reproduction unknown, larvae planktonic.

Knowledge of ELH Ovarian eggs known for all described species, larvae known for S. pietschmanni and S. praematura.

ELH characters: Eggs: oval, > 0.3 mm by > 0.4 mm, up to ca. 1.3 mm long; no oil globule.

Larvae through adults: paedomorphic, adults closely resemble postflexion stage larvae; compressed and elongate to very elongate; gut straight, ca. 50–70% BL, depending on species; gas bladder often prominent, moves posteriorly from over or anterior to mid-gut in preflexion stage to behind mid-gut in adults of S. pietschmanni and praematura; head small, initially with short, rounded snout that elongates somewhat, moderately large eyes that become relatively smaller; no spines on head or pectoral girdle; myomeres 31–44, 12–25 preanal; pigmentation absent to light, commonly on gas bladder and near terminus of gut, larvae often with a few additional melanophores more anteriorly along gut, often 1–few on ventral margin of tail in larvae, 0–1 in adults.

Example species: Schindleria praematura (S. E. Pacific and Indo-Pacific).


Order Perciformes/Gobioidae

*Schindleriidae*

*Schindleria praematura*

from: Watson 2000b

2.8 mm

2.9 mm

3.7 mm

11.2 mm

15.4 mm

19.9 mm
Chapter 16

Order Perciformes

Suborder Acanthuroidei

Family Acanthuridae (Surgeonfishes)

Number of genera 6
Number of species about 75

GENERAL LIFE HISTORY

Distribution Marine, all tropical and subtropical seas except Mediterranean.

Relative abundance Locally very abundant. Of great artisanal and some commercial importance.

Adult habitat Mostly on shallow reefs. Medium-sized herbivores, detritivores and carnivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs and larvae known for some species.

ELH Characters Eggs: planktonic, 0.6–0.8 mm.

Larvae: Head and body very deep and very compressed, with coiled and compact gut. Body becomes kite-shaped at about flexion (body may become nearly as deep as long - D and A spines accentuate this). Preanal length 44–61% BL. 21–23 myomeres. Head moderate to large, long snout, brain case vaulted. Mouth small and horizontal. Head spination extensive, includes serrate ridges, but no elongate spines, on many bones of the head, pectoral and pelvic girdles. Notochord flexion at 3.5–4.5 mm. D sp 2, and P2 spine first fin elements to form at about 2.3 mm. Fin spines become elongate and strongly serrate, reaching maximum relative length at 12–17 mm. Soft fin rays form following flexion, with full fin complements present by 5–6 mm, except P2 at about 8 mm. Scales in the form of specialized lamina arrayed in vertical rows from about 5 mm. So-called acronurus stage begins with formation of caudal peduncle spine (a modified scale) at about 17 mm. Generally lightly pigmented, but localized areas of heavy pigment on brain and gut: following flexion, pigment spreads. Settlement at 20–60 mm.

Example taxon: Acanthurus sp.

Order Perciformes/Acanthuroidei

REFERENCES


Perciformes/Acanthuroidei/Acanthuridae
Acanthurus sp.
from: Leis and Richards 1984

6.0 mm
Chapter 16

Order Perciformes

Suborder Scombroidei

Family Sphyraenidae (Barracudas)

Number of genera 1

Number of species 21

GENERAL LIFE HISTORY

Distribution Marine, tropical and subtropical.

Relative abundance Locally abundant. Of artisanal and commercial importance.

Adult habitat Mostly in shallow, coastal waters: pelagic over reefs and nearby waters. Medium to large carnivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs and larvae known for some species.

ELH Characters Eggs: planktonic, 0.7–1.6 mm.

Larvae: head and body elongate and slightly compressed to round in cross section, with straight, long gut. Preanal length 60–80% BL. 24 myomeres. Head initially of moderate size, but becomes large after 3 mm, and very large after flexion. Snout long and pointed. Mouth large to very large and horizontal with prominent teeth. Head spination limited to 1–2 small preopercular spines and a few small interopercular spines. Notochord flexion at 4.8–5.9 mm. Soft rays of D and A fins form at 5–6 mm, but weak spines of well separated D fin not formed until about 8 mm. Full complements of rays are present in all fins by about 16 mm. Scales form at about 23 mm. Moderate pigment usually consisting of prominent lines of melanophores on dorsal, ventral and often lateral surfaces of trunk, gut and tail. Pigment intensifies with growth.

Example taxon Sphyraena sp.


Order Perciformes/Scombroidei

Perciformes/Scombroidei/Sphyraenidae
*Sphyraena sp.*

from: Leis and Rennis 2000n

4.5 mm

7.2 mm
Chapter 16

Order Perciformes

Suborder Scombroidei

Family Scombridae (Mackerels, Tunas)

Number of genera 15
Number of species 49

GENERAL LIFE HISTORY

Distribution Marine, tropical to temperate.

Relative abundance Abundant. Of immense artisanal and commercial importance.

Adult habitat Epipelagic in coastal to oceanic marine waters, mainly tropical and subtropical. Medium to large carnivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs and larvae known for most species.

ELH Characters Egg: planktonic, 0.8–1.9 mm.

Larvae: larval morphology, especially the head, varies among tribes. Head and body moderate to deep and compressed. Gut coiled, triangular to ovoid. Preanal length 38–65% BL in preflexion larvae and 53–81% BL in postflexion larvae. 31–64 myomeres. Gap between anus and anal fin moderate, not closing until late in postflexion stage. Head moderate to large, becoming relatively larger with BL. The snout and mouth vary greatly among species. In Scombrini moderate sized snout is rounded, and mouth moderate in size with medium-sized teeth. In Thunnini and Scomberomorini, large snout is pointed and mouth is large to very large with prominent teeth. Head spination absent in Scombrini, but in other tribes, preopercular spines well developed (but smooth), and other head spination may be present. Notochord flexion at 4.2–6.8 mm. In Scombrini, soft rays of D and A fins form first (following flexion), but in other tribes, D spines in first fin form either simultaneously or prior to the soft rays. Full rays complements present in all fins by 10–13 mm. Fin spines remain slender and smooth. Pigment light to moderate: usually melanophores on dorsal surfaces of head and gut, often with melanophores on ventral surface of tail, and in some species on dorsal surface as well. Pigment intensifies with growth.

Example species: Scomber japonicus.

Order Perciformes/Scombroidei


REFERENCES

Perciformes/Scombroidei/Scombridae
Scomber japonicus
from: Ambrose 1996q

4.0 mm

7.8 mm
Chapter 16

Order Perciformes

Suborder Stromateoidei

Family Nomeidae (Driftfishes)

Number of genera 3

Number of species 15

GENERAL LIFE HISTORY

Distribution Oceanic, marine, tropical to temperate.

Relative abundance Limited abundance. Of little artisanal or commercial importance.

Adult habitat Epi- to bathy pelagic in oceanic waters. Medium-sized carnivores.

EARLY LIFE HISTORY

Mode of reproduction Oviparous.

Knowledge of ELH Eggs and larvae known for some species.

ELH Characters: Eggs: planktonic, 0.7–1.3 mm.

Larvae: head and body compressed, initially elongate, becoming moderate to deep. Gut initially straight, becomes coiled and triangular by 3 mm. Preanal length 32–65% BL. 30–42 myomeres. Head moderate to large and rounded. Mouth moderate in size and obliquity. Head spination limited to, at most, tiny preopercular spines. Notochord flexion at 3.7–6.0 mm. In Nomeus and Psenes, P2 is first fin to form at about 3.5 mm, becomes large, extending at least to anus, and moves anteriorly with development. In Cubiceps, P2 last fin to form, remaining small. Soft rays of D and A form during or shortly after flexion, and fin spines shortly thereafter. Full complements of rays are present in all fins by 7–8 mm. Fin spines slender and smooth. Pigment moderate, including melanophores dorsally on head and gut, and on early-forming P2 fin. Usually, melanophores on ventral surface of tail, and in some species on dorsal and lateral surface as well. Pigment intensifies with growth, spreading from these areas.

Example species: Psenes sio.


Order Perciformes/Stromateoidei

Perciformes/Stromateoidei/Nomeidae

*Psenes sio*

from: Ahlstrom et al. 1976a

5.6 mm

7.6 mm
Chapter 16

Order Perciformes

Suborder Stromateoidei

Family Tetragonuridae (Squaretails)

Number of genera 1
Number of species 3

GENERAL LIFE HISTORY

Distribution Oceanic, marine, tropical to temperate.
Relative abundance Limited abundance. Of no artisanal or commercial importance.
Adult habitat Epipelagic, oceanic waters. Small to medium-sized salp-eaters.

EARLY LIFE HISTORY

Mode of reproduction oviparous.
Knowledge of ELH Eggs and larvae known for all species.
ELH Characters:

Eggs: planktonic, 1.1–1.3 mm.

Larvae: head and body compressed, initially elongate, depth becoming moderate. Gut initially straight, becoming coiled during flexion, remaining considerably longer than deep. Preanal length 52–72% BL. 40–58 myomeres. Head initially small, becoming moderate to large and rounded. Mouth moderate in size and obliquity. Head spination limited to small to moderate preopercular spines. Notochord flexion at 7–10 mm. D and A soft rays form just prior to or during flexion, and fin spines later. Fin spines remain short, slender and smooth. Fewer soft D rays than spines. Full complements of rays not present in all fins until 8–15 mm. Pigment initially largely limited to ventral surfaces, except a pigment patch posteriorly on dorsal midline of tail. Pigment intensifies with growth, spreading from these areas.

Example species: Tetragonurus cuvieri.


Order Perciformes/Stromateoidei

Perciformes/Stromateoidei/Tetragonuridae

*Tetragonurus cuvieri*

from: Ahlstrom et al. 1976a

7.6 mm

10.1 mm
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Perciformes: William Watson
Percoidei: Jeffrey M. Leis
   Lutjanidae: Lutjanus malabaricus, Paracaesio sp.
   Girellidae: Girella triscupidata
Labroidei: Jeffrey M. Leis
   Labridae: Achoerodus viridis, Julidin labrid, Xyrichtys sp.
   Pomacentridae: Pomacentrus amboinensis
Zoarcoidei: Ann C. Matarese
   Stichaeidae: Anoplarchus purpurescens
Notothenoidei: William Watson
Trachinoidei: William Watson
   Chiasmodontidae: Chiasmodon subniger
   Ammodytidae: Ammodytoides gilli
Blennioidei: William Watson
   Clinidae: Heterostichus rostratus
   Blenniidae: Hypsoblennius jenkinsi
Gobiesoicoidei: William Watson
   Gobiesocidae: Gobiesox rhessodon
Callionymioidei: William Watson
   Callionymidae: Synchiroopus atrilabiatns
Gobioidae: William Watson
   Gobiidae: Clevelandia ios
   Microdesmidae: Microdesmus sp.
   Schindleriidae: Schindleria praematura
Acanthuroidei: Jeffrey M. Leis
   Acanthuridae: Acanthurus sp.
Scombroidei: Jeffrey M. Leis
   Sphyraenidae: Sphyraena sp.
   Scombridae: Scomber japonicus
Stromateoidei: Jeffrey M. Leis
   Nomeidae: Psenes sio
   Tetragonuridae: Tetragonurus cuvieri

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Pleuronectiformes: Ann C. Matarese and Morgan S. Busby
Psettoidei
   Psettodidae: Psettodotes erumei
Pleuronectoidei
   Bothidae: Bothus leopardinus
   Paralichthyidae: Citharichthys stigmaeus, Syacium ovale
   Pleuronectidae: Elytocephalus zachirus, Microstomus pacificus
   Cynoglossidae: Symphurus atricaudus

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Tetraodontiformes: William Watson
   Balistidae: unidentified: Jeffrey M. Leis
   Tetraodontidae: unidentified: Jeffrey M. Leis

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