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**Early Stages of Fishes
in the
Western North Atlantic Ocean**

**(Davis Strait, Southern Greenland
and Flemish Cap to Cape Hatteras)**

Volume One

Acipenseriformes through Syngnathiformes

Michael P. Fahay

Dedication

This monograph is dedicated to those highly skilled
larval fish illustrators whose talents and efforts
have greatly facilitated the study of fish ontogeny.

The works of many of those fine illustrators grace these pages.

Preface

The contents of this monograph are a revision and update of an earlier atlas describing the eggs and larvae of western Atlantic marine fishes occurring between the Scotian Shelf and Cape Hatteras, North Carolina (Fahay, 1983). The three-fold increase in the total number of species covered in the current compilation is the result of both a larger study area and a recent increase in published ontogenetic studies of fishes by many authors and students of the morphology of early stages of marine fishes. It is a tribute to the efforts of those authors that the ontogeny of greater than 70% of species known from the western North Atlantic Ocean is now well described.

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In addition to the above reviewers, Greg Glassner provided unpublished observations and notes on *Prionotus evolans* preflexion larval pigmentation; Karsten Hartel provided a list of larval fish holdings at the MCZ and called the author's attention to several rarely collected larval or juvenile specimens; Jack Javech provided excellent illustrations vital to describing the ontogeny of selected species; Tom Munroe provided distributional data for several flatfishes; Donna Johnson helped with file management and other important editorial tasks, including the retrieval of larval specimens and occurrence data; Geoff Moser loaned a specimen and illustration of *Barathrites parri*; Jørgen Nielsen kindly gave his permission to use illustrations from his book co-authored with Peter Munk on eggs and larvae of North Sea fishes. Thanks also to Muneo Okiyama for correspondence regarding the early stages of many taxa, most recently related to the Ophidiiformes, to Sergei Evseenko for information on several taxa in the Gadiformes and Pleuronectiformes and to Bill Richards for help with illustrations and data during the preparation of his own Atlas on the early development of the tropical fish fauna of the western Central North Atlantic.

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In the preparation of this monograph, I have drawn freely from notes and morphological data acquired during a course on ichthyoplankton taxonomy taught by E. H. Ahlstrom and H. G. Moser at the NMFS laboratory in La Jolla, California from 1971 to 1977. One of the themes of that course was that proper identification and description of larval fishes was dependent on ontogenetic series rather than character states of individual specimens. Therefore, the change in a larval structure (sequence of formation of parts, loss or acquisition of transitory features) during development becomes as much a character as the simple presence or absence of that structure. During this course, many summary tables were also assembled, based on larval fishes worldwide. For example, data on caudal fins and their rays is often omitted in published revisions of taxa, and original species descriptions also often omit these data. Many of the caudal fin ray counts, as well as format, content and extent of coverage included in this guide are based on the content of Ahlie Ahlstrom and Geoff Moser's comprehensive larval fish course.

Finally, a very appreciative thank you to the excellent illustrators who have contributed so much to the larval taxonomy literature and to the science of ontogenetic analysis. These include (but are not limited to) Nancy Arthur, Margeret Bradbury, B. D. Bruce, S. Bullock, C. Darter, Mary Fuges, Michael Greene, Bon Harriott, Jack Javech, Susan Kaiser, Wayne Laroche, Jeff Leis, George Mattson, Geoff Moser, Bruce Mundy, Francisco Neira, Henry Orr, Sally Reader, Birgitte Rubæk, N. Strekalovsky, Barbara Sumida, Tom Trnski, Bev Vinter, Mary T. Vona, H. J. Walker, Jr., Robert C. Walker, Betsy Washington and Bill Watson.

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Introduction

Historical background

The early life history stages of fishes have interested fisheries biologists and ichthyologists since the days of Aristotle, who is often credited (albeit undeservedly) with the description of the leptocephalus of *Anguilla*. (Credit for the latter should be given to L.T. Gronovius, a.k.a. Gronow (1763) who published the first description of the eel's larva.) During the ensuing 250 years, the study of fishes' ontogeny has served as the basis for critical research into population fluctuations of important species, as well as providing the basis for better understanding systematic relationships among taxa. Studies of "modern" ichthyoplankton research can probably be traced back to the mid-1880s when a unique monitoring program was initiated along the Norwegian Skagerrak coast as a result of a controversy between the founder of the Flødevigen Marine Research Station, Gunder Mathiesen Dannevig (1841–1911), and the great pioneer in marine research, Johan Hjort (1869–1948). Dannevig argued for a deterministic relationship between the number of yolk-sac codfish larvae and the number of recruits to the population, whereas Hjort argued that it was the environmental conditions during the critical phases of development which played the essential role in determining recruitment strength. Studies in the early 21st century continue to examine the interplay between these concepts.

In the western North Atlantic Ocean, a rich history of studies on eggs and larvae of fishes exists, and this legacy includes a wealth of published records and pioneering research, much of which persists today. Cruises of the "Blake" and "Albatross" in the 1880s concentrated on adult stages (e.g. Goode and Bean, 1896), but also provided information on early stages of fishes in the western North Atlantic. Since then, other government-sponsored expeditions have contributed a wealth of ontogenetic material, some of which has yet to be analyzed (Table 1).

Gunder Mathiesen Dannevig's son Alf Dannevig published the results of an extensive survey of Atlantic Canada's marine waters (1914–1915) and this study provided many early descriptions of larval fishes from this region (Dannevig, 1919). Another early study occurred in the 1920's when Oscar E. Sette and associates began an exhaustive study of the early life history of *Scomber scombrus* (Atlantic mackerel). Workers involved in this study may have focused on the mackerel, but they also made an effort to identify all the larval fishes (and some eggs) they collected, leaving behind an unpublished record of illustrations of larvae occurring in the Gulf of Maine-Georges Bank region (Fig. 1 and 2). This collection of illustrations has been deposited in the United

States National Museum and a selection is presented in Fig. 3 and 4.

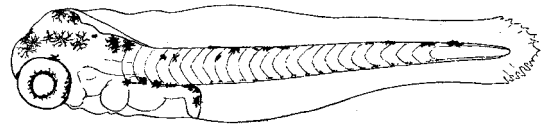


Figure 1. *Scomber scombrus* preflexion larva, labeled "July 5, 1928, 20249 Surface". Illustrator unknown, possibly O.E. Sette.

Sette's studies (and drawings) were also the inspiration behind the publication of another "larval fish guide" (Colton and Marak, 1969), a study focusing on the Georges Bank-Gulf of Maine region, featuring data on egg and larval development of 27 species. Sette was a reviewer of this atlas, prior to its publication as a technical report.



Figure 2. *Gadus morhua* egg, labeled "20265 Surface Cod?" Illustration attributed to O.E. Sette.

In order to use ichthyoplankton for fisheries, ecological or systematics research, it is obviously essential that eggs and larvae be correctly identified. Correct identification, in turn, relies on systematic analyses of characters which can only be undertaken after examining those characters in all related larvae of a group, whether at the level of genus, family or order, thus gaining an appreciation for the value of certain characters. Although this dependence on correct identification appears to be an obvious requirement, a previous publication (Fahay, 1983) revealed several critical gaps in our knowledge of early stages, some of which included commercially important taxa. The previous publication covered 255 species in 92 families, likely to be collected in coastal waters of the western North Atlantic Ocean between Nova Scotia and Cape Hatteras. The present atlas covers the ontogeny of 760 species in 196 families. The increase is due in part to an expanded study area, and in part to an increase in ontogenetic studies, inspired to a certain extent by the recent publication of several key studies.

TABLE 1. Important expeditions and surveys (listed chronologically) that have collected early life history stage material and contributed to studies of the ontogeny of fishes within (or near) the present study area. Many other, less extensive, cruises and surveys (not listed here) have also yielded critically important material.

Institution/Sponsor	Dates	Ships	Area Covered
U.S. Fish Commission	1883–1887	Albatross	Western North Atlantic
Danish Oceanographical Expeditions	1905–1912	Thor, others	Mediterranean, North Atlantic
University of Bergen, Norway Govt.	1910	Michael Sars	North Atlantic
Canadian Govt.	1914–1915	Various	Gulf of St. Lawrence, Scotian Shelf, Newfoundland
Carlsberg Foundation	1920	Dana II	North Atlantic, Caribbean, Gulf of Mexico, Panama Bay
Yale University, Bingham Oceanographic collection	1926–1927	Pawnee	Caribbean Sea
Carlsberg Foundation	1928–1930	Dana II	North Atlantic and Circum tropical, Worldwide
New York Zoological Society	1929–1931	Gladisfen	Off Bermuda
Wood Hole Oceanographic Institution	1928–1940	Chance, Atlantis	Western North Atlantic (Gulf Stream)
University of Copenhagen	1950–1952	Galathea	Circumtropical
U.S. Fish and Wildlife Service	1948–1955	Oregon, Caryn	Atlantic, Caribbean, Gulf of Mexico
U.S. Bureau of Sport Fish and Wildlife	1965–1967	Dolphin	Continental Shelf, east coast of U.S.
Canadian Govt., ICNAF	1966–1981	E.E. Prince, others	Gulf of St. Lawrence, Scotian Shelf, Flemish Cap
Wood Hole Oceanographic Institution	1972–1976	Alcoa Seaprobe, Gosnold, Chain, Knorr, Atlantis II, Oceanus	Continental Slope, Continental Rise off New England (283–4,986 m)
Various (Sulak, 1982)	1973–1978	Delaware II, Columbus Iselin, James M. Gilliss, Advance II	Continental Slope and Continental Rise off Middle Atlantic Bight (1,142–4,879 m)
Canadian Govt., SSIP	1976–1982	Various	Scotian Shelf, Georges Bank
U.S. National Marine Fisheries Service, MARMAP	1977–1987	Delaware II, Albatross IV, others	Continental Shelf, Nova Scotia to Cape Hatteras, North Carolina
Various (Snelgrove and Haedrich, 1985)	1980–1982	Gadus Atlantica, Oceanus	Continental Slope off Newfoundland (204–2,325 m)

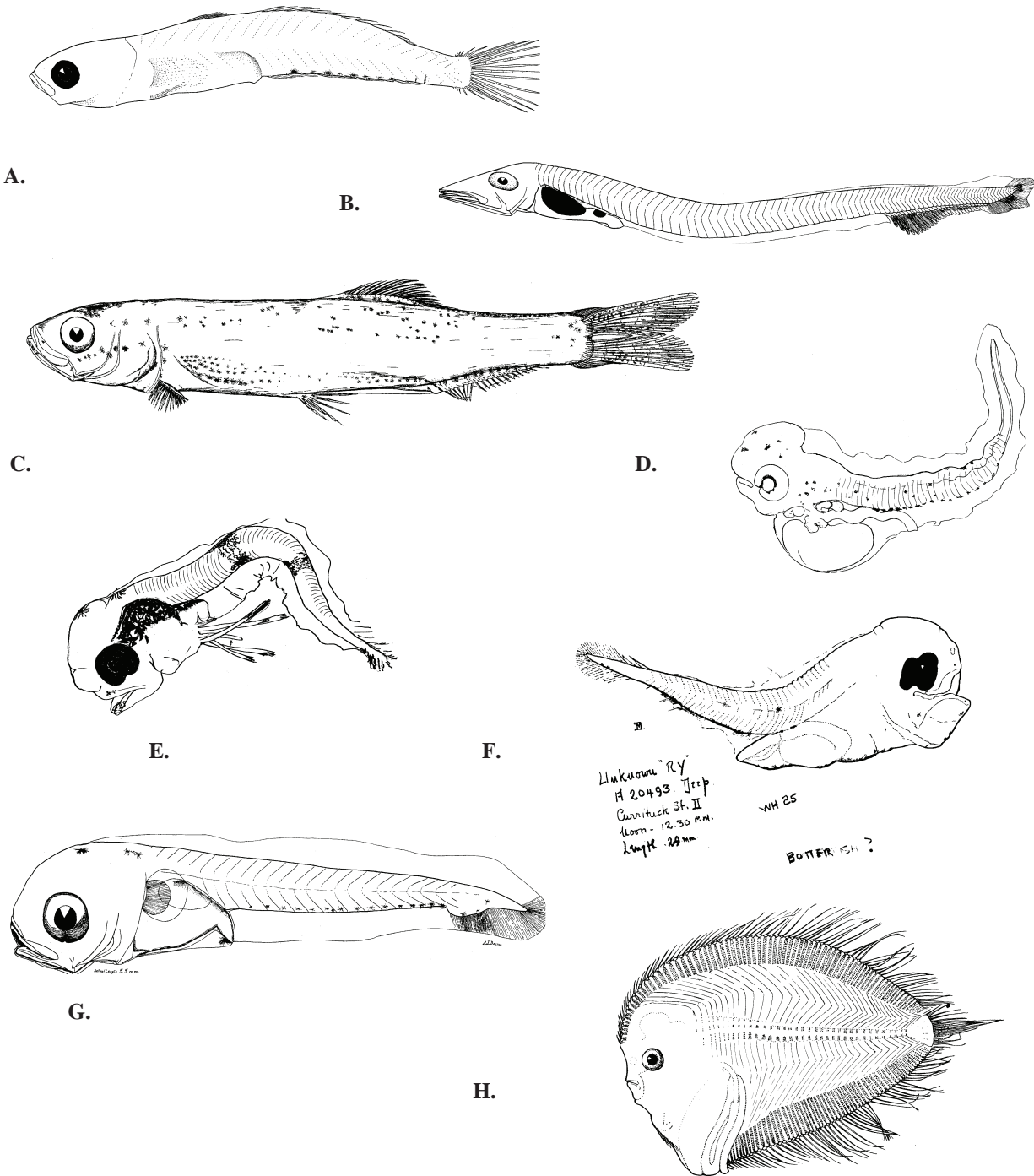


Figure 3. Details of unpublished illustrations rendered by O. E. Sette and associates, followed by presumed identity. **A:** Illustrator: O. E. Sette, "Unknown SR", 8.5 mm, July 18, 1929, Cape May, NJ, A20569 (*Ctenogobius boleosoma*); **B:** Illustrator unknown, "Unknown R", 19 mm, A20459 (*Arctozenus risso*); **C:** Illustrator unknown (possibly A. J. Dalton), "menhaden", 22.5 mm (reversed), (*Brevoortia tyrannus*); **D:** Illustrator unknown, "*Limanda ferruginea*", newly hatched, Sta. 20222, Bottom IV, (*Limanda ferruginea*); **E:** Illustrator unknown, "cusk", 3.2 mm, Aug. 6, 1928, (*Brosme brosme*); **F:** Illustrator TM or JM, "Unknown "RY", 2.9 mm, Currituck St. II, A20493 (*Pepilus triacanthus*); **G:** Illustrator: A. J. Dalton, "*Stenotomus chrysops*", 5.5 mm, W20526 (*Stenotomus chrysops*); **H:** Illustrator: O.E. Sette, "Unknown RW", 10 mm, July 24, 1929, Offing of Montauk Point, A20586 surface, Vert $35 \pm$ (*Bothus ocellatus*).

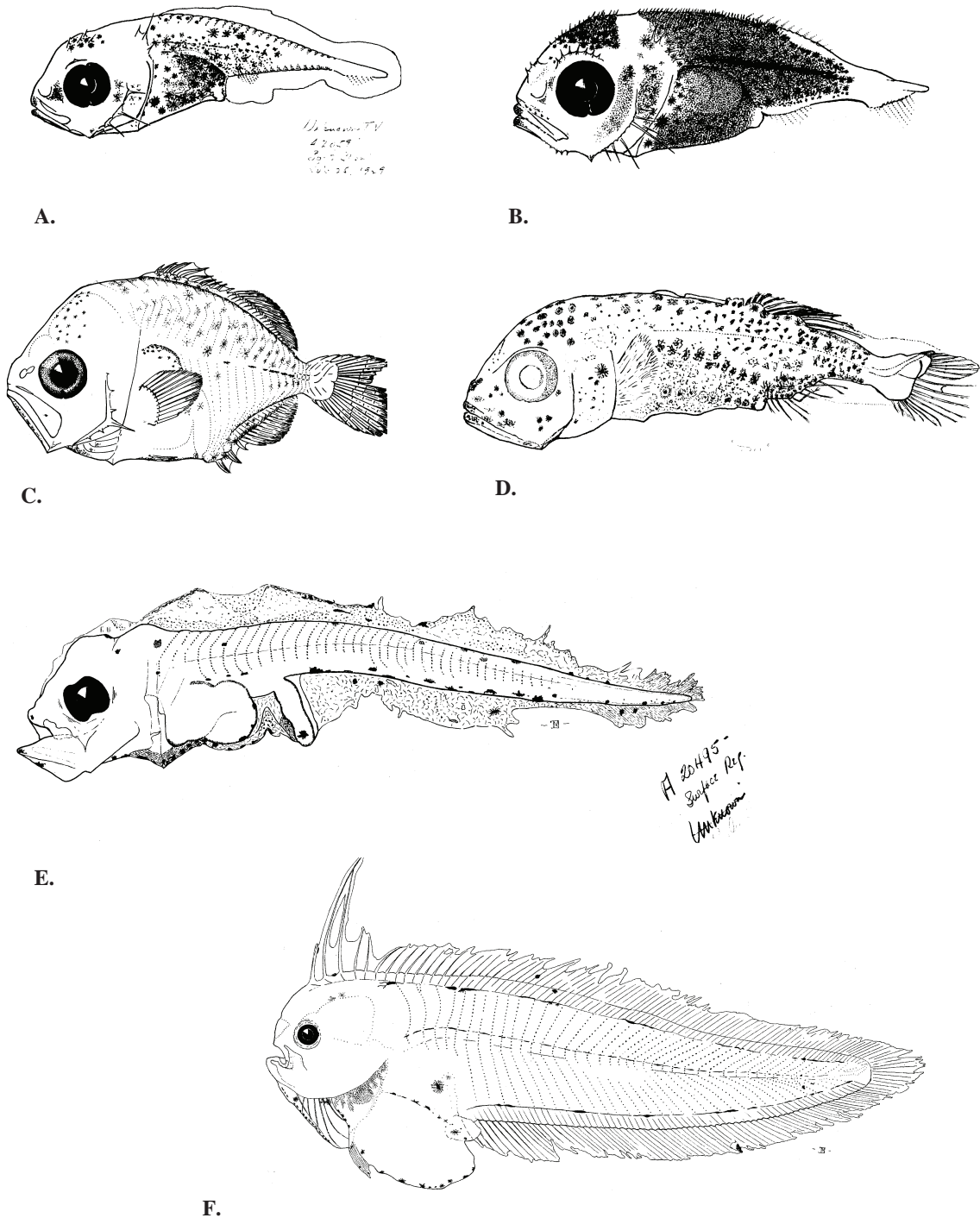


Figure 4. Details of unpublished illustrations rendered by O. E. Sette and associates, followed by presumed identity. **A** and **B**: Illustrator unknown, "Unknown TV", July 25, 1929, South Shoal, A20591, (*Lopholatilus chamaeleonticeps*); **C**: Illustrator unknown, "Carangidae or *Chaetodipterus faber*", 5.5 mm, Sta. 20563, (faint supraoccipital crest), (*Caranx* sp.); **D**: Illustrator unknown, "Unknown 'RU'", 9 mm, July 24, 1929, Montauk V, Sta A20586 Surf, (Unidentified); **E**: Illustrator TM or JM, "Paralichthys sp.", Surface Rep. A20495, (*Paralichthys dentatus*); **F**: Illustrator TM or JM, "Unknown 'SS'", 9.5 mm, A20558, Surface, (*Symphurus plagiusa*).

In the past 20 years, several important ontogenetic compendia have been published (Table 2). These range from species by species larval fish identification guides, to family-level analyses of ontogenetic characters, to examples of the use of ontogeny to better understand the phylogenetic relationships of fishes.

All of these important publications have inspired, or benefitted from, a series of more detailed studies that document the anatomical changes that occur during a fish's early development. It is important to note that all of these studies are applicable to any region of the world's oceans and are useful to investigators working in any of these regions or oceans. However, students of fish ontogeny should be aware that early fish development is subject to vagaries induced by geographic variation and that characters might not be consistent between regions.

When all past studies are considered, including all areas of the world's oceans, it is instructive to note how thorough is our knowledge concerning the early life history of fishes. Table 3 lists the major contributions related to the ontogeny of fishes by area. Similar summaries have been published by Richards (1985) and Kendall and Matarese (1994) who have also analyzed the contribution by taxon or by important authors, respectively. The percentage of species whose larvae are well described is obviously related to the species diversity of the area, but it is also directly related to the span of time covering research in the area. Thus, both sides of the North Atlantic Ocean (and Mediterranean Sea) have enjoyed a long history of research into early life history stages, partly because of the relevance of those studies to important commercial fisheries that have existed there for centuries.

TABLE 2. Publications appearing since the publication of a larval atlas covering the present study area (Fahay, 1983).

Authors	Area	Emphasis
Leis and Rennis, 1983	Indo-Pacific Ocean	Larval coral reef fishes
Moser, <i>et al.</i> , 1984	Worldwide	Ontogeny and Systematics
Ozawa, 1986	Western North Pacific Ocean	Oceanic larvae
Okiyama, 1988	Japanese waters	Larval taxonomy
Leis and Trnski, 1989	Indo-Pacific Ocean	Larval shorefishes
Matarese <i>et al.</i> , 1989	Northeastern Pacific Ocean	Larval taxonomy
Olivar and Fortuño, 1991	Southeast Atlantic Ocean	Larval taxonomy
Moser 1996	California Current	Larval taxonomy
Neira <i>et al.</i> , 1997	Australia (temperate)	Larval taxonomy
Leis and Carson-Ewart, 2004	Indo-Pacific Ocean (Tropical)	Family level ontogeny (n=149)
Munk and Nielsen, 2005	North Sea	Larval taxonomy
Richards, 2006	Western Central Atlantic Ocean	Larval taxonomy

TABLE 3. Status of early life history descriptions of marine fishes worldwide. Most tallies from Kendall and Matarese (1994).

Ocean Regions	FAO or NAFO Areas	Number of Species	Larvae Described	Percent Described	Primary Sources
NE Pacific	FAO 67	592	263	44	Matarese <i>et al.</i> , 1989
Eastern Pacific ²	FAO 77 (NE)	800	586	73	Moser <i>et al.</i> , 1996
NW Pacific (Japanese waters)	FAO 61	3,500	1,181	34	Okiyama, 1988; Ozawa, 1986
NE Atlantic (UK)	FAO 27 (Part)	131	108	82	Russell, 1976
North Sea	FAO 27 (Part)	260	96 ⁵	37	Munk and Nielsen, 2005
SE Atlantic	FAO 47	239	141	59	Olivar and Fortuño, 1991
Western Central Atlantic	FAO 31	2,235 ¹	901 ¹	40	Richards, 2006
NW Atlantic	NAFO 4, 5, 6	317	222	71	Fahay, 1983
NW Atlantic	FAO 21	1,075	760	71	Present Study
Southern Ocean (Antarctica)	FAO 48, 58, 88	158	80	51	Kellerman, 1989
Indo-Pacific (Tropical)	FAO 51, 61, 71, 77 (W), 87 ⁴	3,921	394	10	Leis and Rennis, 1983; Leis and Trnski, 1989
Temperate Australia (coastal)	FAO 57, 81	645	116	18	Neira <i>et al.</i> , 1998
Mediterranean Sea	FAO 37	569	360	63	d'Ancona <i>et al.</i> , 1933; Aboussouan, 1989
World (Totals to 1985)	All Areas	20,423	1,932	10	Richards, 1985 ³

¹ Totals do not include Cyprinodontiformes

² California Current and adjacent waters

³ See Richards, 1985, for percent known by taxon. Note totals (species and larvae described) calculated prior to 1985.

⁴ Easter Island

⁵ Larvae of additional species known, but not included

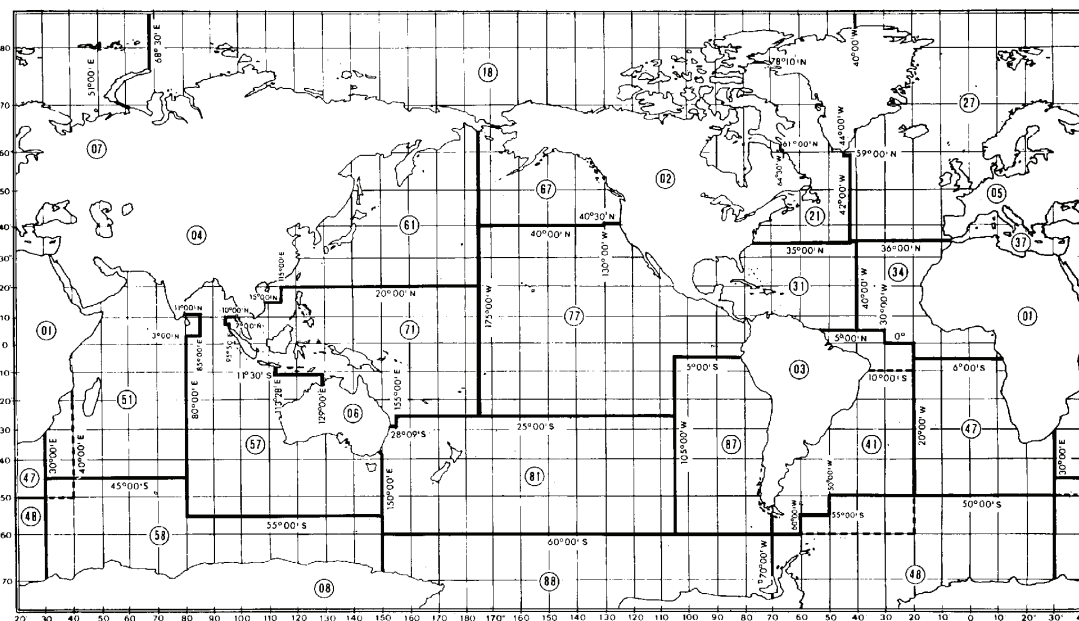


Figure 5. FAO oceanic areas. Numbers in circles refer to FAO areas in table above.

Study Area and Habitats

The present study concerns fishes occurring in that part of the western North Atlantic Ocean north of 35°N and west of 40°W. The southern limit to the study area occurs in the region of a faunal boundary (at Cape Hatteras) dividing Virginian from Carolinian biogeographic provinces. This limit also co-occurs with the northern limit of a recently published atlas of larval fish development focusing on a more tropical fauna (Richards, 2006). The eastern boundary parallels the Mid-Atlantic Ridge, and is also the eastern boundary of the NAFO Convention Area and, coincidentally, the boundary of FAO Fisheries Area 21. Other biogeographic provinces found within the study area include the Boreal (Arctic Ocean to Newfoundland) and Acadian (Newfoundland to Cape Cod). Cape Cod represents a very significant boundary between waters to the south, which experience extreme seasonal temperature fluctuations (Virginian Province) and waters to the north, which are cold year round (Acadian Province). In general species diversity is lower in the Acadian Province. Important place names used in the text are located on the study area maps (Figs. 6 and 7).

Important habitats in this area include tidal rivers, bays and estuaries, neritic waters associated with the coasts of continents, canyons defining the edges of continental shelves, offshore submarine banks, ridges and seamounts, benthic habitats associated with the continental slope, continental rise or the abyss, the Gulf Stream and northern limits of the Sargasso Sea.

Tidal rivers, bays and estuaries: Major rivers with tidally influenced lower portions include: St. Lawrence, Connecticut, Hudson, Delaware, and Susquehanna. These empty into major estuarine bays including Gulf of St. Lawrence, Long Island Sound, Raritan Bay, Delaware Bay and Chesapeake Bay.

Neritic waters: Fishes occurring in continental shelf depths (to an approximate maximum of 200 m) are a well-known group and their eggs and larvae are well known as well. Important fishing areas occurring on continental shelves include Grand Bank, Scotian Shelf, Georges Bank and the Middle Atlantic Bight.

Submarine canyons: A series of canyons occur along the edge of the continental shelf (Fig. 7), one of which is deep enough to penetrate the adjacent shelf for a distance inshore (Hudson Canyon). The fish fauna in these canyons often differs from that of adjoining shelves or continental slopes, and their exploration (as it applies to early life history stages of fishes) should be considered preliminary at this date.

Deep-water banks, ridges and seamounts: These habitats are perhaps the least-explored in the study area. An exception is Bear Seamount (Fig. 7), the study of which has resulted in a number of recent range extensions (Moore *et al.*, 2003). A valuable resource is the recently published checklist and bibliography of seamount fishes (Froese and Sampang, 2004).

The Benthos: The distribution of demersal fishes is better understood in shallow depths, where more sampling has taken place, than in slope or abyssal depths. This lack of data is especially problematic when one considers early life history stages. In the macrourids, for example, recent data suggest that "alevin" (larval) stages typically occur near-bottom in depths >200 m, an area where ichthyoplankton or juvenile fish sampling has rarely occurred (Merrett, 1989). This is doubtless the case in other benthopelagic species about which we know little, such as *Hoplostethus atlanticus*, the orange roughy (Zeldis *et al.*, 1995).

The Slope Sea: This large oceanic area is situated between the edge of the continental shelf and the shoreward boundary of the Gulf Stream, and is termed the "Slope Sea" (*sensu* Csanady and Hamilton, 1988) largely because it lies over continental slope depths. It is often divided into "west" and "east" components (Fig. 6). The area is interesting because its hydrography is characterized by a mixing of currents from the adjacent continental shelf and the Gulf Stream. Warm-core rings often traverse the area (in a NE to SW direction) after separating from the Gulf Stream, and these serve as habitat for early stages of fishes transported into the study area from the Carolinian Province (or more tropical areas) and also serve as mechanisms for the provision of these stages into continental shelf or coastal nursery habitats (e.g. Hare *et al.*, 2001).

The Gulf Stream: This major oceanic current is important as a transporter of early life history stages from the Carolinian Province south of the study area. In some cases the transport is accidental and provides "waifs" from more tropical areas. But in other cases the transport is a regular component of a complex recruitment mechanism, as in the case of *Pomatomus saltatrix*, bluefish, where larvae spawned south of the study area are transported to estuarine nursery areas in the Middle Atlantic Bight and Gulf of Maine via this current or in gyres spun off the current in the area of the Slope Sea (Fig. 6) (Hare and Cowen, 1996; Hare *et al.*, 2001). Bluefish and other more southern species that demonstrate this pattern either return to habitats south of the study area after completing a summer here (e.g. *Caranx hippos*), or perish as winter temperatures prevail (e.g. *Chaetodon* spp.) (M^cBride and Able, 1998; M^cBride and M^cKown, 2000).

Study Area

Sargasso Sea: The northern limits of this major oceanic gyre occurs within the limits of the study area. Several mesopelagic or bathypelagic species (and others) reach their northernmost limits in this area, and their biology is reason-

ably well described. See Gibbs and Krueger (1987) and several papers contained therein, for complete studies (including early stages) of several of these taxa.



Figure 6. Boundaries of study area. Note that Bermuda is situated south of the southern border of study area (35°N), but is included as a point of reference. The "Middle Atlantic Bight", the term used in many reports cited in this study, is that portion of the continental shelf between Cape Cod and Cape Hatteras.

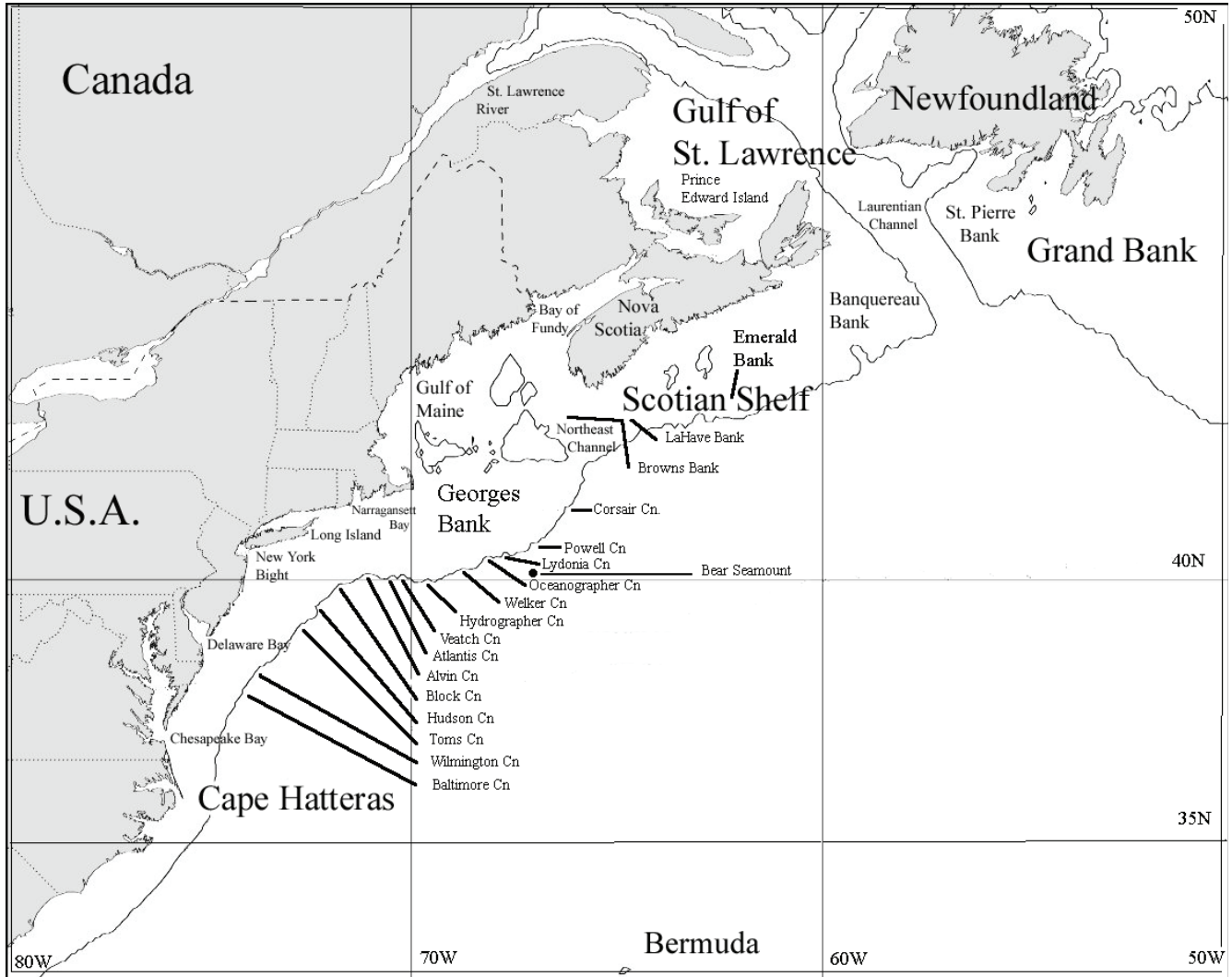


Figure 7. Map of southwestern part of study area showing locations of major fishing banks and submarine canyons along the edge of the continental shelf.

Checklist of fishes occurring in study area

The list that follows contains the names of Actinopterygian and Teleostean fishes occurring north of 35°N latitude, west of 40°W longitude (approximately NAFO Convention Area or FAO Fishing Area 21). Classification of higher taxa follows Eshmeyer (1990) with a few exceptions explained in the species accounts. Classification and sequence of Aulopiformes follows Baldwin and Johnson (1996), Pleuronectiformes follows Chapleau (1993) and Cooper and Chapleau (1998). Use of suborders in this list restricted to the Perciformes. Families within perciform suborders are listed alphabetically. Common names are listed if available. Major authorities for inclusion of most taxa are listed at end of table. Records in this checklist that might be questioned are often based on an early life history stage and are documented more fully in the species accounts, either with a published source, or a museum record.

ACTINOPTERYGII

Acipenseriformes

ACIPENSERIDAE

Acipenser brevirostrum Lesueur, 1818 – Shortnose sturgeon

Acipenser oxyrinchus Mitchill, 1814 – Atlantic sturgeon

TELEOSTEI

Elopiformes

ELOPIDAE

Elops saurus Linnaeus, 1766 – Ladyfish

MEGALOPIDAE

Megalops atlanticus Valenciennes, 1847 – Tarpon

ALBULIDAE

Albula vulpes (Linnaeus, 1758) – Bonefish

Notacanthiformes

HALOSAURIDAE

Aldrovandia affinis (Günther, 1877)

Aldrovandia gracilis Goode and Bean, 1896

Aldrovandia oleosa Sulak, 1977

Aldrovandia phalacra (Vaillant, 1888)

Halosauropsis macrochir (Günther, 1878)

Halosaurus guentheri Goode and Bean, 1896

NOTACANTHIDAE

Notacanthus bonapartei Risso, 18403

Notacanthus chemnitzii Bloch, 1788 – Spiny eel

Polyacanthonotus challengerii (Vaillant, 1888)

Polyacanthonotus merretti Sulak, Crabtree and Hureau, 1984

Polyacanthonotus rissoanus (de Filippi and Vérany, 1859)

LIPOGENYIDAE

Lipogenys gillii Goode and Bean, 1895 – Backfin tapirfish

Anguilliformes

ANGUILLIDAE

Anguilla rostrata (Lesueur, 1817) – American eel

Anguilla anguilla (Linnaeus, 1758) – European eel

MORINGUIDAE

Moringua edwardsi (Jordan and Bollman, 1889)

– Spaghetti eel

Neoconger mucronatus Girard, 1859 – Ridged eel

MURAENIDAE¹

Anarchias similis (Lea, 1913) – Pygmy moray

Gymnothorax funebris Ranzani, 1840 – Green moray

Gymnothorax miliaris (Kaup, 1856) – Goldentail moray

Gymnothorax moringa (Cuvier, 1829) – Spotted moray

Gymnothorax ocellatus Agassiz, 1831 – Ocellated moray

Gymnothorax vicinus (Castelnau, 1855)

– Purplemouth moray

Monopenchelys acuta (Parr, 1930) – Redface eel

Uropterygius macularius (Lesueur, 1825) – Marbled moray

SYNAPHOBRANCHIDAE¹

Dysomma anguillare Barnard, 1923

Ilyothis brunneus Gilbert, 1891 – Ooze eel

Leptocephalus dolichorhynchus Lea, 1913

Leptocephalus proboscideus Lea, 1913

Simenchelys parasiticus Gill, 1879 – Snubnose eel,

Pugnose eel

Synaphobranchus affinis Günther, 1877

Synaphobranchus bathybius Günther, 1877

– Deepwater cutthroat eel

Synaphobranchus capensis Barnard, 1923

Synaphobranchus kaupii Johnson, 1862

– Northern cutthroat eel

OPHICHTHIDAE¹

Ahlia egmontis (Jordan 1884) – Key worm eel

Aplatopthis chauliodus Böhlke, 1956 – Tusky eel

Apterichtus ansp (Böhlke 1968) – Academy eel

Apterichtus kendalli (Gilbert, 1891) – Finless eel

Bascanichthys bascanium (Jordan, 1884) – Sooty eel

Bascanichthys scuticaris (Goode and Bean, 1880)

– Whip eel

Callechelys guineensis (Osorio, 1894) – Shorttail snake eel

Callechelys muraena Jordan and Evermann, 1886

– Blotched snake eel

Gordiiichthys irretitus Jordan and Davis, 1891

– Horsehair eel

Gordiiichthys leibyi M^cCosker and Bohlke 1984 – String eel

Ichthyapus ophioneus (Evermann and Marsh, 1902)

– Surf eel

Letharchus aliculatus M^cCosker, 1974 – Striped sailfin eel

Letharchus velifer Goode and Bean, 1882 – Sailfin eel

Myrichthys breviceps (Richardson, 1848) – Sharptail eel

Myrophis platyrhynchus Breder, 1927)

– Broadnose worm eel

Myrophis punctatus (Lütken, 1851) – Speckled worm eel

Ophichthus cruentifer (Goode and Bean, 1896)

– Margined snake eel

Ophichthus gomesi (Castelnau, 1855) – Shrimp eel

Ophichthus melanoporus Kanazawa, 1963 – Blackpored eel

Ophichthus menezesi M^cCosker and Böhlke, 1984

– Blotchside snake eel

Ophichthus puncticeps (Kaup, 1860) – Palespotted eel

Phaenomonas longissima (Cadenat and Marchal, 1963)

– Short-maned sand eel

Quassiremus ascensionis (Studer, 1889) – Blackspotted snake eel

CONGRIDAE¹

Acromycter perturbator (Parr 1932) –

Ariosoma balearicum (Delaroche, 1809)

– Bandtooth conger

Ariosoma anale (Poey, 1860) – Longtrunk conger

Ariosoma selenops Reid, 1934

Bathyroconger vicinus (Vaillant, 1888)

Conger oceanicus (Mitchell, 1818) – Conger eel

Conger triporiceps Kanazawa, 1958 – Manytooth conger

Gnathophis bethytopos Smith and Kanazawa, 1977

– Blackgut conger

Heteroconger halis (Böhlke, 1957) – Brown garden eel

Heteroconger luteolus Smith, 1989 – Yellow garden eel

Pseudophichthys splendens (Lea, 1913)

Rhechias dubia (Breder, 1927)

Rhynchoconger flavus (Goode and Bean, 1896) –

Rhynchoconger gracilior (Ginsburg, 1951)

– Whiptail conger

Uroconger syringinus Ginsburg, 1954) – Threadtail conger

Xenomystax congroides Smith and Kanazawa, 1989

– bristletooth conger

DERICHTHYIDAE

Derichthys serpentinus Gill, 1884 – Narrowneck eel

Nessorhamphus ingolfianus (Schmidt, 1912) – Spoonbill eel

NEMICHTHYIDAE

Avocettina infans (Günther, 1878)

Labichthys carinatus Gill and Ryder, 1883

Nemichthys scolopaceus Richardson, 1848

– Slender snipe eel

Nemichthys curvirostris

CHLOPSIDAE

Chlopsis bicolor Rafinesque, 1810

Chlopsis dentatus (Seale, 1917)

Chilorhinus suensoni Lütken, 1852

Kaupichthys hyoproroides (Strömman, 1896)

Kaupichthys nuchalis Böhlke, 1967

Robinsia catherinae Böhlke and Smith, 1967

SERRIVOMERIDAE

Serrivomer beanii Gill and Ryder, 1883 - Stout sawpalate

Serrivomer brevidentatus Roule and Bertin, 1929

– Short-tooth sawpalate

Serrivomer lanceolatus (Schmidt, 1916)

NETTASTOMATIDAE¹

Facciolella sp.

Hoplunnis tenuis Ginsburg, 1951 – Spotted pike-conger

Hoplunnis diomediana Goode and Bean, 1896

Hoplunnis macrura Ginsburg, 1951

Nettastoma melanura Rafinesque, 1810

Nettenchelys inion Smith and Böhlke, 1981

Nettenchelys pygmaea Smith and Böhlke, 1981

Saurenchelys cognita Smith, 1989

Venefica procera (Goode and Bean, 1883)

Saccopharyngiformes

CYEMATIDAE

Cyema atrum Günther, 1878

MONOGNATHIDAE

Monognathus jespersenii (Bertin, 1936)³

SACCOPHARYNGIDAE

Saccopharynx ampullaceus (Harwood, 1827)

EURYPHARYNGIDAE

Eurypharynx pelecanoioides Vaillant, 1882

– Pelican gulper eel

Clupeiformes

CLUPEIDAE

Alosa aestivalis (Mitchill, 1815) – Blueback herring

Alosa mediocris (Mitchill, 1814) – Hickory shad

Alosa pseudoharengus (Wilson, 1811) – Alewife

Alosa sapidissima (Wilson, 1811) – American shad

Brevoortia tyrannus (Latrobe, 1802) – Atlantic menhaden

Clupea harengus Linnaeus, 1758 – Atlantic herring

Dorosoma cepedianum (Lesueur) – Gizzard shad

Dorosoma petenense (Günther) – Threadfin shad

Etrumeus teres (DeKay, 1842) – Round herring

Harengula jaguana Poey – Scaled sardine

Opisthonema oglinum (LeSueur, 1818)

– Atlantic thread herring

Sardinella aurita Valenciennes, 1847 – Spanish sardine

ENGRAULIDAE

Anchoa hepsetus (Linnaeus, 1758) – Striped anchovy

Anchoa mitchilli (Valenciennes, 1848) – Bay anchovy

Engraulis eurystole (Swain and Mek, 1885)

– Silver anchovy

Siluriformes

ICTALURIDAE

Ameiurus nebulosus (Lesueur, 1819) – Brown bullhead

ARIIDAE

Arius felis (Linnaeus, 1766) – Hardhead catfish

Bagre marinus (Mitchill, 1815) – Gafftopsail catfish

Salmoniformes

ARGENTINIDAE

Argentina silus Ascanius, 1775 – Atlantic argentine

Argentina striata Goode and Bean, 1896 – Striated argentine

MICROSTOMATIDAE

Microstoma microstoma (Risso, 1810)

Nansenia groenlandica (Reinhardt, 1839)

– Large-eyed argentine

Nansenia longicauda Kawaguchi and Butler, 1984

Nansenia oblita (Facciolella, 1887)

BATHYLAGIDAE

Bathylagichthys greyae (Cohen, 1958)

Bathylagus compsus Cohen, 1958

Bathylagus euryops Goode and Bean, 1896

– Goiter blacksmelt

Dolicholagus longirostris (Maul, 1948)

Melanolagus bericoides (Borodin, 1929)

OPISTHOPROCTIDAE

Dolichopteryx binocularis Beebe, 1932

- Opisthoproctus grimaldii* Zugmayer, 1911 – Barreleye
Opisthoproctus soleatus Vaillant, 1888
Rhynchohyalus natalensis (Gilchrist and von Bonde, 1924)³
ALEPOCEPHALIDAE
Alepocephalus agassizi Goode and Bean, 1883 – Agassiz' smoothhead
Alepocephalus australis Barnard, 1923
Alepocephalus bairdii Goode and Bean, 1879
 – Baird's smoothhead
Alepocephalus productus Gill, 1883 – Smalleye smoothhead
Bajacalifornia megalops (Lütken, 1898)
 – Bigeye smoothhead
Bathylaco nigricans Goode and Bean, 1896 – Black warrior
Bathyprion danae Marshall, 1966 – Fangtooth smoothhead
Bathytroctes microlepis Günther, 1878
 – Smallscale smoothhead
Bathytroctes squamosus Alcock, 1890
Bellocia koefoedi Parr, 195
Bellocia michaelsarsi (Koefoed, 1927)
Conocara macropterum (Vaillant, 1888)
Conocara murrayi (Koefoed, 1927)
Einara edentula (Alcock, 1892)³
Einara macrolepis (Koefoed, 1927)³
Mirognathus normani Parr, 1951
Narctes stomias (Gilbert, 1890) – Blackhead salmon
Photostylus pycnopterus Beebe, 1933 – Starry smoothhead
Rouleina attrita (Vaillant, 1888) – Softskin smoothhead
Rouleina maderensis (Maul, 1948) – Madeiran smoothhead
Xenodermichthys copei (Gill, 1884)
 – Bluntnout smoothhead
PLATYTROCTIDAE (= SEARSIIDAE)
Barbantus curvifrons (Roule and Angel, 1931)
 – Palebelly searsid
Holtbyrnia anomala Krefft, 1980 – Bighead searsid
Holtbyrnia innesi (Fowler, 1934)
Holtbyrnia macrops Maul, 1957 – Bigeye searsid
Maulisia microlepis Sazonov and Golovan, 1976
 – Smallscale searsid
Mentodus rostrata (Günther, 1878)
Normichthys operosus Parr, 1951 – Multipore searsid
Platytroctes apus Günther, 18783
Sagamichthys cf. schnakenbecki (Krefft, 1953)
Searsia koefoedi Parr, 1937– Koefoed's searsid
OSMERIDAE
Mallotus villosus (Müller, 1777) – Capelin
Osmerus mordax (Mitchill, 1815) – Rainbow smelt
SALMONIDAE
Oncorhynchus kisutch (Walbaum, 1792) – Coho salmon
Salmo salar Linnaeus, 1758 – Atlantic salmon
Stomiiformes
GONOSTOMATIDAE
Bonapartia pedaliota Goode and Bean, 1896
Cyclothone acclinidens Garman, 1899
Cyclothone alba Brauer, 1906
Cyclothone braueri Jespersen and Tøning, 1926 – Brauer's bristlemouth
Cyclothone microdon (Günther, 1878) – Veiled bristlemouth
Cyclothone pallida Brauer, 1902 – Bicolored bristlemouth
Cyclothone pseudopallida Mukhacheva, 1964
Diplophos taenia Günther, 1873
Gonostoma atlanticum Norman, 1930
Gonostoma denudatum Rafinesque, 1810
Manducus maderensis (Johnson, 1890)
Margrethia obtusirostrata Jespersen and Tøning, 1919
Sigmops bathyphilum (Vaillant, 1888)
Sigmops elongatum (Günther, 1878)
 – Longtooth anglemouth
STERNOPTYCHIDAE
Argyrolepeus aculeatus Valenciennes, 1849
 – Atlantic silver hatchetfish
Argyrolepeus affinis Garman, 1899 – Deepsea hatchetfish
Argyrolepeus gigas Norman, 1930
 – Greater silver hatchetfish
Argyrolepeus hemigymnus Cocco, 1829
 – Short silver hatchetfish
Argyrolepeus sladeni Regan, 1908 – Silvery hatchetfish
Argyripnus atlanticus Maul, 1952
Maurolicus weitzmani Parin and Kobylansky, 1993
 – Weitzman's Pearlside
Polyipnus clarus Harold, 1994 – Slope hatchetfish
Polyipnus laternatus Garman, 1899
Sternoptyx diaphana Hermann, 1781
 – Transparent hatchetfish
Sternoptyx pseudobscura Baird, 1971
Valencienneleus tripunctatus (Esmark, 1871)
PHOSICHTHYIDAE
Ichthyococcus ovatus (Cocco, 1838)
Pollichthys maui (Poll, 1953) – Stareye lightfish
Polyetme thaeocoryla Parin and Borodulina, 1990
Vinciguerria attenuata (Cocco, 1838)
Vinciguerria nimbaria (Jordan and Williams, 1895)
Vinciguerria poweriae (Cocco, 1838)
Yarrella blackfordi Goode and Bean, 1896
CHAULIODONTIDAE
Chauliodus danae Regan and Trewavas, 1929
 – Dana viperfish
Chauliodus sloani Bloch and Schneider, 1801
 – Sloan's viperfish
STOMIIDAE
Stomias affinis Günther, 1887
Stomias boa ferox Reinhardt 1842 – Boa dragonfish
Stomias brevibarbatus Ege, 1918 – Shortbarbel dragonfish
Stomias longibarbatus (Brauer, 1902)
ASTRONESTHIDAE
Astronesthes gemmifer Goode and Bean, 1896
Astronesthes gudrunae Parin and Borodulina, 20023
Astronesthes leucopogon Regan and Trewavas, 1929
Astronesthes macropogon Goodyear and Gibbs, 1970
Astronesthes micropogon Goodyear and Gibbs, 1970
Astronesthes neopogon Regan and Trewavas, 1929

Astronesthes niger Richardson, 1844
Astronesthes similis Parr, 1927
Borostomias antarcticus (Lönnerberg, 1905)
 – Straightline dragonfish
Heterophotus ophistoma Regan and Trewavas, 1929
Neonesthes capensis (Gilchrist and van Bonde, 1924)
Rhadinesthes decimus (Zugmayer, 1911)³
 MELANOSTOMIIDAE
Bathophilus altipinnis Beebe, 1933
Bathophilus brevis Regan and Trewavas, 1930
Bathophilus digitatus (Welsh, 1923)
Bathophilus longipinnis (Pappenheim, 1914)
Bathophilus pawneeii Parr, 1927
Bathophilus proximus? Regan and Trewavas, 1930
Bathophilus vaillanti (Zugmayer, 1911)
Chirostomias pliopterus Regan and Trewavas, 1930
Echiostoma barbatum Lowe, 1843
Eustomias achirus Parin and Pokhilskaya, 1974
Eustomias bibulbosus Parr, 1927
Eustomias borealis Clarke, 2000
Eustomias enbarbatus Welsh, 1923
Eustomias filifer (Gilchrist, 1906)
Eustomias fissibarbis Pappenheim, 1914
Eustomias furcifer Regan and Trewavas, 1930
Eustomias jimcraaddocki Sutton and Hartel, 2004
Eustomias macrurus Regan and Trewavas, 1930
Eustomias obscurus Vaillant, 1888
Eustomias polyaster Parr, 1927
Eustomias satterleei Beebe, 1933
Eustomias schiffi Beebe, 1932
Eustomias schmidti Regan and Trewavas, 1930
Flagellostomias boureei (Zugmayer, 1913)
Grammatostomias circularis Morrow, 1959
Grammatostomias dentatus Goode and Bean, 1896
Grammatostomias flagellibarba Holt and Byrne, 1910
Leptostomias bilobatus (Koefoed, 1956)
Leptostomias gladiator (Zugmayer, 1911)
Leptostomias longibarba Regan and Trewavas, 1930
Melanostomias bartonbeani Parr, 1927
Melanostomias biseriatus Regan and Trewavas, 1930
Melanostomias margaritifera Regan and Trewavas, 1930
Melanostomias melanopogon Regan and Trewavas, 1930
Melanostomias melanops Brauer, 1902
Melanostomias tentaculatus (Regan and Trewavas, 1930)
Melanostomias valdiviae Brauer, 1902
Pachystomias microdon (Günther, 1878)
Photoneustes braueri (Zugmayer, 1913)
Photoneustes dinema Regan and Trewavas, 1930
Photoneustes margarita (Goode and Bean, 1896)
Photoneustes mirabilis Parr, 1927
Photoneustes parvimanus Regan and Trewavas, 1930
Photoneustes phyllopogon Regan and Trewavas, 1930
Trigonolampa miriceps Regan and Trewavas, 1930
 MALACOSTEIDAE
Aristostomias lunifer Regan and Trewavas, 1930

Aristostomias grimaldii Zugmayer, 1913
Aristostomias photodactylus Beebe, 1933
Aristostomias polydactylus Regan and Trewavas, 1930
Aristostomias tittmanni Welsh, 1923
Aristostomias xenostoma Regan and Trewavas, 1930
Malacosteus niger Ayres, 1848 – Lightless loosejaw
Photostomias atrox (Alcock, 1890)³
Photostomias goodei Kenaly and Hartel, 2005
Photostomias guernei Collett, 1889
 IDIACANTHIDAE
Idiacanthus fasciola Peters, 1877 – Ribbon sawtailfish
Ateleopodiformes
 ATELEOPODIDAE
Ijimaia antillarum Howell Rivero, 1935
Aulopiformes
 SYNODONTIDAE
Synodus foetens (Linnaeus, 1766) – Inshore lizardfish
Synodus synodus (Linnaeus, 1758) – Red lizardfish
Synodus poeyi Jordan, 1887 – Offshore lizardfish
Trachinocephalus myops (Forster, 1801) – snakefish
 CHLOROPHTHALMIDAE
Chlorophthalmus agassizi Bonaparte, 1840
 – Shortnose greeneye
Parasudis truculenta (Goode and Bean, 1896)
 – Longnose greeneye
 NOTOSUDIDAE
Ahliasaurus berryi Bertelsen, Krefft and Marshall, 1976
Scopelosaurus argenteus (Maul, 1954)
Scopelosaurus lepidus (Krefft and Maul, 1955)
Scopelosaurus maui Bertelsen, Krefft and Marshall, 1976
Scopelosaurus smithii Bean, 1925
 IPNOPIDAE
Bathypterois dubius Vaillant, 1888 – Spiderfish
Bathypterois grallator (Goode and Bean, 1886) – Tripodfish
Bathypterois longipes Günther, 1878
Bathypterois phenax Parr, 1928 – Blackfin spiderfish
Bathypterois quadrifilis Günther, 1878
Bathypterois viridensis (Roule, 1916)
Bathyptherops marionae Mead, 1959
Ipnopterus murrayi Günther, 1878 – Grildeye fish
 ALEPISAUROIDAE
Alepisaurus brevirostris Gibbs, 1960 – Shortnose lancetfish
Alepisaurus ferox Lowe, 1833 – Longnose lancetfish
Omosudis lowei Günther, 1887 – Hammerjaw, Halterfish
 PARALEPIDIDAE
Anotopterus pharao Zugmayer, 1911 – Daggertooth
Arctozenus risso (Bonaparte, 1841) – White barracudina
Lestidiops affinis (Ege, 1930)
Lestidiops jayakari (Boulenger, 1889)
Lestidium atlanticum Borodin, 1928
Lestrolepis intermedia (Poey, 1868)
Macroparalepis affinis Ege, 1933
Macroparalepis brevis Ege, 1933
Magnisudis atlantica (Krøyer, 1868) – Duckbill barracudina
Paralepis brevirostris (Parr, 1928)

- Paralepis coregonoides* Risso, 1820
Paralepis elongata (Brauer, 1906)
Stemonosudis intermedia (Ege, 1933)
Stemonosudis rothschildi Richards, 1967
Sudis atrox Rofen, 1963
Sudis hyalina Rafinesque, 1810
Uncisudis advena (Rofen, 1963)
- EVERMANNELLIDAE
Coccorella atlantica (Parr, 1928) – Atlantic sabretooth
Evermannella balbo (Risso, 1820) – Balbo sabretooth
Evermannella indica Brauer, 1906 – Indian sabretooth
Odontostomops normalops (Parr, 1928)
– Undistinguished sabretooth
- SCOPELARCHIDAE
Benthalbella infans Zugmayer, 1911
Scopelarchoides danae Johnson, 1974
Scopelarchus analis (Brauer, 1902) – Shortfin pearleye
Scopelarchus michaelsarsi Koefoed, 1955 – Bigfin pearleye
- BATHYSAURIDAE
Bathysaurus ferox Günther, 1878 – Deepsea lizardfish
Bathysaurus mollis Günther, 1878
- GIGANTURIDAE
Gigantura chuni Brauer, 19013
Gigantura indica Brauer, 1901
- Myctophiformes**
NEOSCOPELIDAE
Neoscopelus macrolepidotus Johnson, 1863
Neoscopelus microchir Matsubara, 1943
- MYCTOPHIDAE
Benthoosema glaciale (Reinhardt, 1837) – Glacier lanternfish
Benthoosema suborbitale (Gilbert, 1913)
Bolinichthys indicus (Nafpaktitis and Nafpaktitis, 1969)
Bolinichthys photothorax (Parr, 1928)
Bolinichthys supralateralis (Parr, 1928)
Centrobranchus nigroocellatus (Günther, 1873)
Ceratoscopelus maderensis (Lowe, 1839)
– Horned lanternfish
Ceratoscopelus warmingi (Lütken, 1892)
Diaphus brachycephalus Täning, 1928
Diaphus dumerili (Bleeker, 1856)
Diaphus effulgens (Goode and Bean, 1896)
Diaphus fragilis Täning, 1928
Diaphus garmani Gilbert, 1906
Diaphus lucidus (Goode and Bean, 1896)
Diaphus luetkeni (Brauer, 1904)
Diaphus metopoclampus (Cocco, 1829)
Diaphus mollis Täning, 1928
Diaphus perspicillatus (Ogilby, 1898)
Diaphus problematicus Parr, 1928
Diaphus rafinesquii (Cocco, 1838)
Diaphus splendidus (Brauer, 1904)
Diaphus subtilis Nafpaktitis, 1968
Diaphus taaningi Norman, 1930
Diaphus termophilus Täning, 1928
Diogenichthys atlanticus (Täning, 1928)
- Electrona risso* (Cocco, 1829)
Gonichthys cocco (Cocco, 1829)
Hygophum benoiti (Cocco, 1838)
Hygophum hygomii (Lütken, 1892)
Hygophum macrochir (Günther, 1864)
Hygophum reinhardti (Lütken, 1892)
Hygophum taaningi Bekker, 1965
Lampadena anomala Parr, 1928
Lampadena luminosa (Garman, 1899)
Lampadena speculigera Goode and Bean, 1896
– Mirror lanternfish
Lampadena urophaos Maul 1969
Lampanyctus ater Täning, 1928
Lampanyctus alatus Goode and Bean, 1896
Lampanyctus crocodilus (Risso, 1810)
– Crocodile lanternfish
Lampanyctus festivus Täning, 1928
Lampanyctus intricarius Täning, 1928
Lampanyctus macdonaldi (Goode and Bean, 1896)
Lampanyctus nobilis Täning, 1928
Lampanyctus photonotus Parr, 1928
Lampanyctus pusillus (Johnson, 1890)
Lampanyctus tenuiformis Brauer, 1906
Lepidophanes gaussi (Brauer, 1906)
Lepidophanes guentheri (Goode and Bean, 1896)
Lobianchia dofleini (Zugmayer, 1911)
Lobianchia gemellarii (Cocco, 1838)
Loweina interrupta (Täning, 1928)
Loweina rara (Lütken, 1892)
Myctophum affine (Lütken, 1892) – Metallic lanternfish
Myctophum asperum Richardson, 1845
Myctophum nitidulum Garman, 1899
Myctophum obtusirostre Täning, 1928
Myctophum punctatum Rafinesque, 1810
– Spotted lanternfish
Myctophum selenops Täning, 1928
Nannobranchium atrum (Täning, 1928)
Nannobranchium cuprarium (Täning, 1928)
Nannobranchium lineatum Täning, 1928
Notolychnus valdiviae (Brauer, 1904)
Notoscopelus bolini Nafpaktitis, 1975
Notoscopelus caudispinosus (Johnson, 1863)
Notoscopelus elongatus kroeyeri (Malm, 1861)
Notoscopelus resplendens (Richardson, 1845)
– Patchwork lanternfish
Protomyctophum arcticum (Lütken, 1892)
Symbolophorus rufinus (Täning, 1928)
Symbolophorus veranyi (Moreau, 1888)
– Largescale lanternfish
Taaningichthys bathyphilus (Täning, 1928)
Taaningichthys minimus (Täning, 1928)
- Gadiformes**
BREGMACEROTIDAE
Bregmaceros atlanticus Goode and Bean, 1886 Antenna
codlet

Bregmaceros cantori Milliken and Houde, 1984

Bregmaceros sp.

Bregmaceros houdei Saksena and Richards, 1986

– Stellate codlet

BATHYGADIDAE

Bathygadus favosus Goode and Bean, 1886

Gadomus dispar (Vaillant, 1888) – Longbeard grenadier

Gadomus longifilis (Goode and Bean, 1886)

MACROURIDAE

Caelorinchus caribbeus (Goode and Bean, 1886)

– Blackfin grenadier

Caelorinchus coelorhynchus (Risso, 1810)

– Hollowsnout grenadier

Caelorinchus occa (Goode and Bean, 1885)

– Swordsnout grenadier

Coryphaenoides alateralis Marshall and Iwamoto, 1973

Coryphaenoides armatus (Hector, 1875)

– Abyssal grenadier

Coryphaenoides brevibarbis (Goode and Bean, 1896)

Coryphaenoides carapinus Goode and Bean, 1883

– Carapine grenadier

Coryphaenoides guentheri (Vaillant, 1888)

– Günther's grenadier

Coryphaenoides leptolepis Günther, 1877

Coryphaenoides rupestris Gunnerus, 1877

– Roundnose grenadier

Hymenocephalus italicus Giglioli, 1884

– Glasshead grenadier

Macrourus berglax Lacepède, 1810 – Onion-eye grenadier

Malacocephalus occidentalis Goode and Bean, 1885

– Western softhead grenadier

Nezumia aequalis (Günther, 1878)

– Common Atlantic grenadier

Nezumia bairdii (Goode and Bean, 1877) – Marlinspike

Nezumia cyrano Marshall and Iwamoto, 1973

Nezumia longebarbata (Roule and Angel, 1933)

– Bluntnose grenadier

Nezumia sclerorhynchus (Valenciennes, 1838)

Nezumia suilla Marshall and Iwamoto, 1973

Sphagemacrurus grenadae (Parr, 1946) – Pugnose grenadier

Trachonurus sulcatus (Goode and Bean 1885)

– Bristly grenadier

Trachyrincus murrayi Günther, 1887 – Roughnose grenadier

MORIDAE

Antimora rostrata (Günther, 1878)

– Blue hake, flatnose codling

Gadella imberbis (Vaillant, 1888) – Beardless codling

Halargyreus johnsonii Günther, 1862

– Dainty mora, Slender codling

Laemonema barbatulum Goode and Bean, 1883

– Smallscale mora

Laemonema goodebeanorum Melendez and Markle, 1998

Laemonema melanurum Goode and Bean, 1896

Lepidion eques (Günther, 1887)

Physiculus fulvus Bean, 1884 – Metallic codling

MELANONIDAE

Melanonus zugmayeri Norman, 1930 Pelagic cod

GADIDAE

Arctogadus glacialis (Peters, 1874) – Arctic cod

Boreogadus saida (Lepechin, 1774) – Polar cod

Gadus morhua Linnaeus, 1758 Atlantic cod

Gadus ogac Richardson, 1836 – Greenland cod

Melanogrammus aeglefinus (Linnaeus, 1758) – Haddock

Microgadus tomcod (Walbaum, 1792) – Atlantic tomcod

Micromesistius poutassou (Risso, 1826) – Blue whiting

Pollachius virens (Linnaeus, 1758) – Pollock

LOTIDAE

Brosme brosme (Ascanius, 1772) – Cusk, Tusk

Molva dypterygia (Pennant, 1784) – Blue ling

Molva molva (Linnaeus, 1758) – European ling

PHYCIDAE

Enchelyopus cimbrius (Linnaeus, 1766)

– Fourbeard rockling

Gaidropsarus argentatus (Reinhardt, 1837) Silver rockling

Gaidropsarus ensis (Reinhardt, 1838) – Threebeard rockling

Urophycis chesteri (Goode and Bean, 1878) – Longfin hake

Urophycis chuss (Walbaum, 1792) – Red hake

Urophycis cirrata (Goode and Bean, 1896) – Gulf hake

Urophycis earlii (Bean, 1880) – Carolina hake

Urophycis floridana (Bean and Dresel, 1884)

– Southern hake

Urophycis regia (Walbaum, 1792) – Spotted hake

Urophycis tenuis (Mitchill, 1814) – White hake

MERLUCCIIDAE

Lyconus brachycolus Holt and Byrne, 1906 – Winged hake

Merluccius albidus (Mitchill, 1818) – Offshore hake

Merluccius bilinearis (Mitchill, 1814) – Silver hake

STEINDACHNERIIDAE

Steindachneria argentea Goode and Bean, 1896

– Luminous hake

Ophidiiformes

OPHIDIIDAE

Abyssobrotula galathea Nielsen, 1977

Acanthonus armatus Günther, 1878

Barathrites parri Nybelin, 1957

Barathrodemus manatinus Goode and Bean, 1883

Bassogigas gilli Goode and Bean, 1896

Bassozetus compressus (Günther, 1878)

Bassozetus normalis Gill, 1884

Benthocometes robustus (Goode and Bean, 1886)

Brotulotaenia crassa Parr, 1934

Brotulotaenia nigra Parr, 1933

Brotulotaenia brevicauda Cohen, 1974

Dicrolene intronigra Goode and Bean, 1883

Dicrolene kanazawai Grey, 1958

Lamprogrammus brunswigi (Brauer, 1906)

Lamprogrammus niger Alcock, 1891

Lamprogrammus shcherbachevi Cohen and Rohr, 1993

Lepophidium brevibarbe (Cuvier, 1829)

– Blackedge cusk-eel

- Lepophidium jeannae* Fowler, 1941 – Mottled cusk-eel
Lepophidium profundorum (Gill, 1863) – Fawn cusk-eel
Luciobrotula corethromycter Cohen, 1964
Monomitopus agassizi (Goode and Bean, 1896)
Neobythites marginatus Goode and Bean, 1886
Ophidion josephi Girard, 1858 – Crested cusk-eel
Ophidion marginatum (DeKay, 1842) – Striped cusk-eel
Ophidion robinsi Fahay, 1992 – Checkered cusk-eel
Ophidion selenops Robins and Böhlke, 1959
 – Mooneye cusk-eel
Otophidium omostigma (Jordan and Gilbert, 1852)
 – Polka-dot cusk-eel
Parophidion schmidti (Woods and Kanazawa, 1951)
 – Dusky cusk-eel
Penopus microphthalmus (Vaillant 1888)
Porogadus miles Goode and Bean, 1886
Spectrunculus grandis (Günther, 1877)
Xyelacyba myersi Cohen, 1961
 CARAPIDAE
Carapus bermudensis (Jones, 1874)
Echiodon dawsoni Williams and Shipp, 1982
 – Chain pearlfish
Echiodon drummondi Thompson, 1837
 BYTHITIDAE
Diplacanthopoma brachysoma Günther, 1887
Thalassobathia pelagica Cohen, 1963
 APHYONIDAE
Barathronus unicolor Nielsen, 1984
 PARABROTULIDAE²
Parabrotula plagiophthalmus Zugmayer, 1911
Batrachoidiformes
 BATRACHOIDIDAE
Opsanus tau (Linnaeus, 1766) – Oyster toadfish
Porichthys plectrodon Jordan and Gilbert, 1882
 – Atlantic midshipman
Lophiiformes
 LOPHIIDAE
Lophius americanus Valenciennes, 1837
 – Goosefish, Monkfish
Lophius gastrophysus Ribeiro, 1915 – Blackfin goosefish
Lophius piscatorius Linnaeus, 1758
 ANTENNARIIDAE
Antennarius radiosus
Antennarius ocellatus (Bloch and Schneider, 1801)
 – Ocellated frogfish
Antennarius striatus (Shaw and Nodder) – Striated frogfish
Histrio histrio (Linnaeus, 1758) – Sargassumfish
 CHAUNACIDAE
Bathychaunax roseus (Barbour, 1941)
Chaunax stigmaeus Fowler, 1946 – Redeye gaper
Chaunax suttkusi Caruso, 1989
 OGCOCEPHALIDAE
Dibranchius atlanticus Peters, 1875 – Atlantic batfish
Dibranchius tremendus Bradbury, 1999
Haliutichthys aculeatus (Mitchill, 1818) – Pancake batfish
Ogcocephalus corniger Bradbury, 1980 – Longnose batfish
 CAULOPHYRYNIDAE
Caulophryne jordani Goode and Bean, 1896 – Fanfin angler
 NEOCERATIIDAE
Neoceratias spinifer Pappenheim, 1914
 MELANOCETIDAE
Melanocetus johnsoni Günther, 1864
Melanocetus murrayi Günther, 1887
 HIMANTOLOPHIDAE
Himantolophus albinares Maul, 1961
Himantolophus brevisrostris Regan, 1925
Himantolophus groenlandicus Reinhardt, 1837
 – Atlantic footballfish
Himantolophus maui Bertelsen and Krefft, 1988
 ONEIRODIDAE
Chaenophryne draco Beebe, 1932
Chaenophryne longiceps Regan, 1925
Danaphryne nigrifilis (Regan and Trewavas, 1932)
Dolopichthys allector Garman, 1899
Dolopichthys danae Regan, 19263
Dolopichthys karsteni Leipertz and Pietsch, 1987
Dolopichthys longicornis Parr, 19273
Dolopichthys pullatus Regan and Trewavas, 1932
Pentherichthys atratus (Regan and Trewavas, 1932)
Leptacanthichthys gracilispinis (Regan, 1925)
Lophodolus acanthognathus Regan, 1925
Microlophichthys microlophus (Regan, 1925)
Oneirodes eschrichtii Lütken, 1871
Oneirodes macrosteus Pietsch, 1974
Oneirodes posti Bertelsen and Grobecker, 19803
Oneirodes schmidti – group Bertelsen, 1951
Phyllorhinichthys balushkini Pietsch, 20043
Spiniphryne gladisfenae (Beebe, 1932)
 THAUMATICHTHYIDAE
Lasiognathus beebei Regan and Trewavas, 1932
Lasiognathus intermedius Bertelsen and Peitsch, 1996
 CERATIIDAE
Ceratias holboelli Kröyer, 1845 – Northern seadevil
Ceratias uranoscopus Murray, 1877 – Stargazing seadevil
Cryptopsaras couesi Gill, 1883 – Triplewart seadevil
 GIGANTACTINIDAE
Gigantactis gibbsi Bertelsen, Pietsch and Lavenberg, 19813
Gigantactis ios Bertelsen, Pietsch and Lavenberg, 19813
Gigantactis longicirra Waterman, 1939
Gigantactis perlatus Beebe and Crane, 1947
Gigantactis vanhoeffeni Brauer, 1902
 LINOPHYRYNIDAE
Edriolychnus schmidti Regan, 1925
Haplophryne mollis (Brauer, 1912)
Linophryne algibarbata Waterman, 1939
Linophryne arborifera Regan, 1925
Linophryne bicornis Parr, 1927
Linophryne brevibarbata Beebe, 1932
Linophryne coronata Parr, 1927 – Blacktail netdevil
Linophryne lucifer Collett, 1886 – Forkbarbel netdevil

- Linophryne macrodon* Regan, 19253
Linophryne macrorhinus (Brauer, 1902) A "group name" for
 7 species
Atheriniformes
 ATHERINOPSIDAE
Membras martinica (Valenciennes, 1835)
 – Rough silverside
Menidia beryllina (Cope, 1867) – Tidewater silverside
Menidia menidia (Linnaeus, 1766) – Atlantic silverside
Cyprinodontiformes
 CYPRINODONTIDAE
Cyprinodon variegatus Lacepède, 1803
 – Sheepshead minnow
 FUNDULIDAE
Fundulus confluentus Goode and Bean – Marsh killifish
Fundulus diaphanus (Lesueur, 1817) – Banded killifish
Fundulus heteroclitus (Linnaeus, 1758) – Mummichog
Fundulus luciae (Baird, 1855) – Spotfin killifish
Fundulus majalis (Walbaum, 1792) – Striped killifish
Lucania parva (Baird and Girard, 1855)
 – Rainwater killifish
 POECILIIDAE
Gambusia holbrooki Girard, 1859 – Eastern mosquitofish
Beloniformes
 SCOMBERESOCIDAE
Scomberesox saurus (Walbaum, 1792) – Atlantic saury
 BELONIDAE
Ablennes hians (Valenciennes, 1846) – Flat needlefish
Strongylura marina (Walbaum, 1792) – Atlantic needlefish
Tylosurus acus (Lacepède, 1803) – Agujon
Tylosurus crocodilus (Peron and Lesueur, 1821)
 – Houndfish
 HEMIRHAMPHIDAE
Euleptorhamphus velox Poey, 1868 – Flying halfbeak
Hemiramphus balao (Lesueur, 1823) –
Hemiramphus brasiliensis (Linnaeus, 1758)
 – Ballyhoo halfbeak
Hyporhamphus meeki Banford and Collette, 1993
 – Meek's halfbeak
Oxyporhamphus micropterus (similis) Bruun, 1935
 – Atlantic smallwing flyingfish
 EXOCOETIDAE
Cheilopogon cyanopterus (Valenciennes, 1847)
 – Marginated flyingfish
Cheilopogon exsiliens (Linnaeus, 1771)
 – Bandwing flyingfish
Cheilopogon furcatus (Mitchill, 1815) – Spotfin flyingfish
Cheilopogon melanurus (Valenciennes, 1847)
 – Atlantic flyingfish
Cypselurus comatus (Mitchill, 1815) – Clearwing flyingfish
Exocoetus obtusirostris Günther, 1866
 – Oceanic two-wing flyingfish
Exocoetus volitans Linnaeus, 1758
 – Tropical two-wing flyingfish
Hirundichthys affinis (Günther, 1866) – Fourwing flyingfish
Hirundichthys rondeletii (Valenciennes, 1847)
 – Blackwing flyingfish
Hirundichthys speculiger (Valenciennes, 1846)
 – Mirrorwing flyingfish
Parexocoetus hillianus (Gosse, 1851) – Sailfin flyingfish
Prognichthys occidentalis Parin, 1999 – Bluntnose flyingfish
Lampridiformes
 LAMPRIDIDAE
Lampris guttatus (Brünnich, 1788) – Opah
 STYLOPHORIDAE
Stylophorus chordatus Shaw, 1791 – Tube eye
 LOPHOTIDAE
Lophotus lacepede Giorna, 1809 – Crested oarfish
Eumecichthys fiski (Günther, 1890)
 RADIICEPHALIDAE
Radiicephalus elongatus Osório, 1917
 TRACHIPTERIDAE
Desmodema polystictum (Ogilby, 1898)
 – Polka-dot ribbonfish
Trachipterus arcticus (Brünnich, 1788)
Zu cristatus (Bonelli, 1819) – Scalloped ribbonfish
 REGALECIDAE
Regalecus glesne Ascanius, 1772 – Oarfish
Polymixiiformes
 POLYMIXIIDAE
Polymixia lowei Günther, 1859 – Beardfish
Polymixia nobilis Lowe, 1838 – Barbudo
Beryciformes
 TRACHICHTHYIDAE
Gephyroberyx darwini (Johnson, 1866) – Big roughy
Hoplostethus atlanticus Collett, 1889 – Orange roughy
Hoplostethus mediterraneus sonodae Kotlyar, 1986
 – Silver roughy
Hoplostethus occidentalis Woods 1973 – Western roughy
 DIRETMIDAE
Diretmichthys parini (Post and Quero, 1981) Black spinyfin
Diretmus argenteus Johnson, 1863 – Discfish
 ANOPLOGASTRIDAE
Anoplogaster cornuta (Valenciennes, 1833)
 – Fangtooth, Ogresfish
 BERYCIDAE
Beryx decadactylus Cuvier, 1829 – Alfonsino, Red Bream
Beryx splendens Lowe, 1834 – Slender alfonsino
 HOLOCENTRIDAE
Holocentrus adscensionis (Osbeck, 1765)
Sargocentron bullisi (Woods, 1955)
 – Deepwater squirrelfish
Sargocentron vexillarium (Poey, 1860) – Dusky squirrelfish
Ostichthys trachypoma (Günther, 1859) – Bigeye soldierfish
Stephanoberyciformes
 STEPHANOBERYCIDAE
Acanthochaenus luetkenii Gill, 1884
Stephanoberyx monae Gill, 1883
 MELAMPHAEIDAE
Melamphaes longivelis Parr, 1933

- Melamphaes microps* (Günther, 1878)
Melamphaes pumilus Ebeling, 1962
Melamphaes simus Ebeling, 1962
Melamphaes suborbitalis (Gill, 1883)
Melamphaes typhlops (Lowe, 1843)
Poromitra capito Goode and Bean, 1883
Poromitra crassiceps (Günther, 1878) – Crested bigscale
Poromitra megalops (Lütken, 1877)
Scopeloberyx opisthopterus (Parr, 1933)
Scopeloberyx robustus (Günther, 1887)
Scopeloberyx rubriventer (Koefoed, 1953)
Scopeloberyx sp.
Scopelogadus beanii (Günther, 1887)
Scopelogadus mizolepis mizolepis (Günther, 1878)
GIBBERICHTHYIDAE
Gibberichthys pumilus Parr, 1933
RONDELETIIDAE
Rondeletia bicolor Goode and Bean, 1895
Rondeletia loricata Abe and Hotta, 1963
BARBOURISIIDAE
Barbourisia rufa Parr, 1945 – Red velvet whalefish
CETOMIMIDAE
Cetomimus gilli Goode and Bean, 1896
Cetostoma regani Zugmayer, 1914
Ditropichthys storeri (Goode and Bean, 1896)
Gyrinomimus myersi group
Gyrinomimus bruuni group
Gyrinomimus sp.
Rhamphocetichthys cf. *savagei* Paxton, 1989³
MIRAPINNIDAE
Parataeniophorus gulosus Bertelsen and Marshall, 1956
MEGALOMYCTERIDAE
Ataxolepis apus Myers and Freihof, 1966
Zeiformes
PARAZENIDAE
Parazen pacificus Kamohara, 1935
MACRUROCYTTIDAE
Zenion hololepis (Goode and Bean, 1896)
ZEIDAE
Cyttopsis rosea (Lowe, 1843) – Red dory
Zenopsis conchifera (Lowe, 1852) – Buckler dory
OREOSOMATIDAE
Neocyttus helgae (Holt and Byrne, 1908)
Pseudocyttus maculatus Gilchrist, 1906
GRAMMICOLEPIDIDAE
Grammicolepis brachiusculus Poey, 1873
– Thorny tinselfish
Xenolepidichthys dalgleishi Gilchrist, 1922
– Spotted tinselfish
CAPROIDAE
Antigonia capros Lowe, 1843 – Deepbody boarfish
Antigonia combatia Berry and Rathjen, 1958
– Shortspine boarfish
Gasterosteiformes
GASTEROSTEIDAE
Apeltes quadracus (Mitchill, 1815) – Fourspine stickleback
Gasterosteus aculeatus Linnaeus, 1758
– Threespine stickleback
Gasterosteus wheatlandi Putnam, 1866
– Blackspotted stickleback
Pungitius pungitius occidentalis (Linnaeus, 1758)
– North American ninespine stickleback
Syngnathiformes
FISTULARIIDAE
Fistularia petimba Lacepède – Red cornetfish
Fistularia tabacaria Linnaeus, 1758
– Bluespotted cornetfish
CENTRISCIDAE
Macroramphosus scolopax (Linnaeus, 1758)
– Longspine snipefish
SYNGNATHIDAE
Amphelikturus dendriticus (Barbour, 1905) – pipehorse
Bryx dunckeri (Metzelaar, 1919) – Pugnose pipefish
Cosmocampus elucens (Poey, 1868) – Shortfin pipefish
Hippocampus erectus Perry, 1810 – Lined seahorse
Hippocampus reidi Ginsburg, 1933 – Longsnout seahorse
Oostethus brachyurus lineatus (Kaup, 1856)
– Opossum pipefish
Syngnathus floridae (Jordan and Gilbert) Dusky pipefish
Syngnathus fuscus Storer, 1839 – Northern pipefish
Syngnathus louisianae Günther – Chain pipefish
Syngnathus pelagicus Linnaeus, 1758 – Sargassum pipefish
Syngnathus springeri Herald, 1942 – Bull pipefish
Scorpaeniformes
SCORPAENIDAE
Ectreposebastes imus Garman, 1899 – Scaly hedgehogfish
Helicolenus dactylopterus (Delaroche, 1809)
– Blackbelly rosefish
Neomerinthe hemingwayi Fowler, 1935
– Spinycheek scorpionfish
Pontinus longispinis Goode and Bean, 1896
– Longspine scorpionfish (need AMNH acc. #)
Pontinus rathbuni Goode and Bean, 1896
– Highfin scorpionfish
Pterois volitans (Linnaeus, 1758) – Lionfish
Scorpaena bergi Evermann and Marsh, 1900
– Goosehead scorpionfish
Scorpaena brasiliensis Cuvier, 1829 – Barbfish
Scorpaena calcarata Goode and Bean, 1882
– Smoothhead scorpionfish
Scorpaena inermis Cuvier, 1829 – Mushroom scorpionfish
Scorpaena plumieri Bloch, 1789 – Spotted scorpionfish
Sebastes fasciatus Storer, 1854 – Acadian redfish
Sebastes mentella Travin, 1951 – Deepwater redfish
Sebastes norvegicus (Ascanius, 1772) – Golden redfish
Sebastes viviparus (Krøyer, 1845) – Small redfish
Setarches guentheri Johnson, 1862
– Deepwater scorpionfish
Trachyscorpia cristulata (Goode and Bean, 1896)
– Atlantic thornyhead

TRIGLIDAE

- Bellator egretta* (Goode and Bean, 1896)
– Streamer searobin
- Bellator militaris* (Goode and Bean, 1896)
– Horned searobin
- Peristedion ecuadorensis* Teague, 1961
- Peristedion gracile* Goode and Bean, 1896
– Slender searobin
- Peristedion greyae* Miller, 1967 – Prickly searobin
- Peristedion miniatum* Goode, 1880 – Armored searobin
- Peristedion thompsoni* Fowler, 1952 – Rimspine searobin
- Peristedion truncatum* Günther, 1880
- Prionotus alatus* Goode and Bean, 1883 – Spiny searobin
- Prionotus carolinus* (Linnaeus, 1771) – Northern searobin
- Prionotus evolans* (Linnaeus, 1766) – Striped searobin
- Prionotus scitulus* Jordan and Gilbert, 1882
– Leopard searobin
- Prionotus tribulus* Cuvier, 1829 – Bighead searobin
- DACTYLOPTERIDAE
- Dactylopterus volitans* (Linnaeus, 1758) – Flying gurnard
- COTTIDAE
- Artediellus atlanticus* Jordan and Evermann, 1898
– Atlantic hookear sculpin
- Artediellus uncinatus* (Reinhardt, 1833)
– Snowflake hookear sculpin
- Gymnocephalus tricuspis* (Reinhardt, 1832)
– Arctic staghorn sculpin
- Hemitripterus americanus* (Gmelin, 1789) – Sea raven
- Icelus bicornis* (Reinhardt, 1841) – Twohorn sculpin
- Icelus spatula* Gilbert and Burke, 1912 – Spatulate sculpin
- Myoxocephalus aeneus* (Mitchill, 1815) – Grubby
- Myoxocephalus octodecemspinosus* (Mitchill, 1815)
– Longhorn sculpin
- Myoxocephalus quadricornis* (Linnaeus, 1758)
– Fourhorn sculpin
- Myoxocephalus scorpioides* (Fabricius, 1780)
– Arctic sculpin
- Myoxocephalus scorpius* (Linnaeus, 1758)
– Shorthorn sculpin
- Triglops murrayi* Günther, 1888 – Moustache sculpin
- Triglops nybelini* Jensen, 1944 – Bigeye sculpin
- Triglops pingeli* Reinhardt, 1832 – Ribbed sculpin
- PSYCHROLUTIDAE
- Cottunculus microps* Collett, 1875 – Polar sculpin
- Cottunculus thompsoni* (Günther, 1882) – Pallid sculpin
- AGONIDAE
- Aspidophoroides monopterygius* (Bloch, 1786)
– Alligatorfish
- Leptagonus decagonus* (Schneider, 1801) – Atlantic poacher
- Ulcina olriki* (Lütken, 1876) – Arctic alligatorfish
- CYCLOPTERIDAE
- Cyclopterus lumpus* Linnaeus, 1758 – Lumpfish
- Eumicrotremus derjugini* Popov, 1926 – Leatherfin
- Eumicrotremus spinosus* (Fabricius, 1776)
– Atlantic spiny lumpsucker

Eumicrotremus terraenovae Myers and Böhlke, 1950 –
LIPARIDAE

- Careproctus ranula* (Goode and Bean, 1879)
– Flatdisk snailfish
- Careproctus reinhardti* (Krøyer, 1862) – Sea tadpole
- Careproctus* sp. (Baffin Bay) (cf. *C. merretti*)
- Liparis atlanticus* (Jordan and Evermann, 1898)
– Atlantic snailfish
- Liparis coheni* Able, 1976 – Gulf snailfish
- Liparis fabricii* Krøyer, 1847 – Gelatinous snailfish
- Liparis gibbus* Bean, 1881 – Dusky snailfish
- Liparis inquilinus* Able, 1973 – Inquiline snailfish
- Liparis tunicatus* Reinhardt, 1836 – Kelp snailfish
- Paraliparis bathybius* (Collett, 1879)
- Paraliparis calidus* Cohen, 1968 – Lowfin snailfish
- Paraliparis copei* Goode and Bean, 1896
– Blacksnout snailfish
- Paraliparis garmani* Burke, 1912 – Pouty snailfish
- Paraliparis hystrix* Merrett, 1983
- Paraliparis liparina* (Goode, 1880)
- Paraliparis vaillanti* Chernova, 2004 – Vaillant's snailfish
- Psednos barnardi* Chernova, 2001
– Blackchin dwarf snailfish
- Psednos christinae* Andriashev, 1992
– European dwarf snailfish
- Psednos delawarei* Chernova and Stein, 2002
- Psednos groenlandica* Chernova, 2001
- Psednos harteli* Chernova, 2001 – Hartel's dwarf snailfish
- Psednos melanocephalus* Chernova and Stein, 2002
- Psednos mirabilis* Chernova, 2001
– Marvelous dwarf snailfish
- Psednos rossi* Chernova and Stein, 2004
- Rhodichthys regina* (Collett, 1879) – Threadfin seasnail
- Perciformes – Percoidei**
(Families are listed alphabetically)
- ACROPOMATIDAE
- Bathysphyraenops simplex* Parr, 1933
- Synagrops bellus* (Goode and Bean, 1896)
– Blackmouth bass
- Synagrops spinosus* Schultz, 1940 – Keelcheek bass
- APOGONIDAE
- Apogon maculatus* (Poey, 1861) – Flamefish
- Apogon pseudomaculatus* Longley, 1932
– Twospot cardinalfish
- BATHYCLUPEIDAE
- Bathyclupea argentea* Goode and Bean, 1896
- BRAMIDAE
- Brama brama* (Bonnaterre, 1788) – Atlantic pomfret
- Brama caribbea* Mead, 1972 – Caribbean pomfret
- Brama dussumieri* Cuvier, 1831 – Lowfin pomfret
- Pteraclis carolinus* Valenciennes, 1833 – Fanfish
- Pterycombus brama* Fries, 1837 – Atlantic fanfish
- Taractes asper* Lowe, 1843 – Rough pomfret
- Taractichthys longipinnis* (Lowe, 1843) – Bigscale pomfret

CARANGIDAE

- Alectis ciliaris* (Bloch, 1787) – African pompano
Caranx bartholomaei Cuvier, 1833 – Yellow jack
Caranx crysos (Mitchill, 1815) – Blue runner
Caranx hippos (Linnaeus, 1766) – Crevalle jack
Caranx latus Agassiz, 1831 – Horse-eye jack
Chloroscombrus chrysurus (Linnaeus) – Atlantic bumper
Decapterus macarellus (Cuvier, 1833) – Mackerel scad
Decapterus punctatus (Cuvier, 1829) – Round scad
Elagatis bipinnulata (Quoy and Gaimard, 1825)
 – Rainbow runner
Naucrates ductor (Linnaeus, 1758) – Pilotfish
Oligoplites saurus (Bloch and Schneider, 1801)
 – Leatherjacket
Selar crumenophthalmus (Bloch, 1793) – Bigeye scad
Selene setapinnis (Mitchill, 1815) – Atlantic moonfish
Selene vomer (Linnaeus, 1758) – Lookdown
Seriola dumerili (Risso, 1810) – Greater amberjack
Seriola fasciata (Bloch, 1793) – Lesser amberjack
Seriola rivoliana Valenciennes, 1833 – Almaco jack
Seriola zonata (Mitchill, 1815) – Banded rudderfish
Trachinotus carolinus (Linnaeus, 1766) – Florida pompano
Trachinotus falcatus (Linnaeus, 1758) – Permit
Trachinotus goodei Jordan and Evermann, 1896 – Palometa
Trachurus lathami Nichols, 1920 – Rough scad
Uraspis secunda (Poey, 1860) – Cottonmouth jack

CARISTIIDAE

- Caristius groenlandicus* Jensen, 1942 – Greenland manefish
Caristius japonicus Gill and Smith, 1905
Caristius macropus (Beloitti, 1903)
Caristius maderensis Maul, 1949
Platyberyx opalescens Zugmayer, 1911

CIRRHITIDAE

- Amblycirrhites pinos* (Mowbray, 1927)

– Redspotted hawkfish

CORYPHAENIDAE

- Coryphaena equiselis* Linnaeus, 1758 – Pompano dolphin
Coryphaena hippurus Linnaeus, 1758 – Dolphin

ECHENEIDAE

- Echeneis naucrates* Linnaeus, 1758 – Sharksucker
Echeneis neucratooides Zouiev, 1796 – Whitefin sharksucker
Remora australis (Eschmeyer and Herald, 1983)
 – Whalesucker

- Remora brachyptera* (Lowe, 1839) – Spearfish remora
Remora osteochir (Cuvier, 1829) – Marlinsucker
Remora remora (Linnaeus, 1758) – Remora
Remorina albescens (Temminck and Schlegel, 1845)

– White suckerfish

EPIGONIDAE

- Epigonus denticulatus* Dieuzeide, 1950 – Pencil cardinal
Epigonus pandionis (Goode and Bean, 1881)
Epigonus pectinifer Mayer, 1974
Epigonus telescopus (Risso, 1810)

GERREIDAE

- Diapterus auratus* Ranzani, 1842 – Irish pompano

- Eucinostomus argenteus* Baird and Girard, 1855

– Spotfin mojarra

- Eucinostomus gula* (Quoy and Gaimard, 1824)

– Silver jenny

- Eucinostomus harengulus* Goode and Bean, 1879

– Tidewater mojarra

- Eucinostomus jonesii* (Günther, 1879) – Slender mojarra

- Eucinostomus melanopterus* (Bleeker, 1863)

– Flagfin mojarra

HAEMULIDAE

- Haemulon aurolineatum* Cuvier, 1830 – Tomtate

- Haemulon plumieri* (Lacepède, 1801) – White grunt

- Orthopristis chrysoptera* (Linnaeus, 1766) – Pigfish

HOWELLIDAE

- Howella brodiei* Ogilby, 1899 – Pelagic basslet

KYPHOSIDAE

- Kyphosus incisor* (Cuvier, 1831) – Yellow chub

- Kyphosus sectatrix* (Linnaeus, 1766) – Bermuda chub

LOBOTIDAE

- Lobotes surinamensis* (Bloch, 1790) – Tripletail

LUTJANIDAE

- Etelis oculatus* (Valenciennes, 1828) – Queen snapper

- Lutjanus analis* (Cuvier, 1828) – Mutton snapper

- Lutjanus apodus* (Walbaum, 1792) – Schoolmaster

- Lutjanus buccanella* (Cuvier, 1828) – Blackfin snapper

- Lutjanus campechanus* (Poey, 1860) – Red snapper

- Lutjanus cyanopterus* (Cuvier, 1828) – Cubera snapper

- Lutjanus griseus* (Linnaeus, 1758) – Gray snapper

- Lutjanus jocu* (Bloch and Schneider, 1801) – Dog snapper

- Lutjanus synagris* (Linnaeus, 1758) – Lane snapper

- Ocyurus chrysurus* (Bloch, 1791) – Yellowtail snapper

- Pristipomoides aquilonaris* (Goode and Bean, 1896)

– Wenchman

- Rhomboplites aurorubens* (Cuvier, 1829)

– Vermillion snapper

MALACANTHIDAE

- Caulolatilus microps* Goode and Bean, 1878 – Grey tilefish

- Lopholatilus chamaeleonticeps* Goode and Bean, 1879

– Tilefish

MORONIDAE

- Morone americana* (Gmelin, 1788) – White perch

- Morone saxatilis* (Walbaum, 1792) – Striped bass

MULLIDAE

- Mullus auratus* Jordan and Gilbert, 1882 – Red goatfish

- Pseudupeneus maculatus* (Bloch, 1793) – Spotted goatfish

- Upeneus parvus* Poey, 1853 – Dwarf goatfish

POLYPRIONIDAE

- Polyprion americanus* (Bloch and Schneider, 1801)

– Wreckfish

POMATOMIDAE

- Pomatomus saltatrix* (Linnaeus, 1758) – Bluefish

PRIACANTHIDAE

- Cookeolus japonicus* (Schneider, 1801) – Bulleye

- Heteropriacanthus cruentatus* (Lacepède, 1801)

– Glasseye snapper

- Priacanthus arenatus* Cuvier, 1829 – Bigeye
Pristigenys alta (Gill, 1862) – Short bigeye
 RACHYCENTRIDAE
Rachycentron canadum (Linnaeus, 1766) – Cobia
 SCIAENIDAE
Bairdiella chrysoura (Lacepède, 1802) – Silver perch
Cynoscion nebulosus (Cuvier, 1830) – Spotted seatrout
Cynoscion nothus (Holbrook, 1855) – Silver seatrout
Cynoscion regalis (Bloch and Schneider, 1801) – Weakfish
Larimus fasciatus Holbrook, 1855 – Banded drum
Leiostomus xanthurus Lacepède 1802 – Spot
Menticirrhus americanus (Linnaeus, 1758)
 – Southern kingfish
Menticirrhus littoralis (Holbrook, 1855) – Gulf kingfish
Menticirrhus saxatilis (Bloch and Schneider, 1801)
 – Northern kingfish
Micropogonias undulatus (Linnaeus, 1766)
 – Atlantic croaker
Pareques acuminatus Bloch and Schneider, 1801 – High hat
Pareques umbrosus (Jordan and Eigenmann, 1889)
 – Cubbyu
Pogonias cromis (Linnaeus, 1766) – Black drum
Sciaenops ocellata (Linnaeus, 1766) – Red drum
Stellifer lanceolatus (Holbrook, 1855) – Star drum
Umbrina coroides Cuvier, 1830 – Sand drum
 SERRANIDAE (All subfamilies)
Anthias nicholsi Firth, 1933 – Yellowfin bass
Centropristis philadelphica (Linnaeus, 1758)
 – Rock sea bass
Centropristis striata (Linnaeus, 1758) – Black sea bass
Diplectrum formosum (Linnaeus, 1766) – Sand perch
Epinephelus itajara (Lichtenstein, 1822) – Jewfish
Epinephelus morio (Valenciennes, 1828) – Red grouper
Epinephelus nigritus (Holbrook, 1855) – Warsaw grouper
Epinephelus niveatus (Valenciennes, 1828)
 – Snowy grouper
Gonioplectrus hispanus (Cuvier, 1828) – Spanish flag
Hemanthias aureorubens (Longley, 1935) – Streamer bass
Hemanthias vivanus (Jordan and Swain, 1884)
 – Red barbier
Jeboehlkia gladiifer Robins, 1967
Mycteroperca bonaci (Poey) – Black grouper
Mycteroperca microlepis (Goode and Bean) – Gag
Mycteroperca phenax Jordan and Swain, 1884 – Scamp
Pronotogrammus martinicensis (Guichenot, 1868)
Serraniculus pumilio Ginsburg, 1952
Serranus phoebe Poey, 1851
Serranus sublingarius (Cope, 1870)
 SPARIDAE
Archosargus probatocephalus (Walbaum, 1792)
 – Sheepshead
Archosargus rhomboidalis (Linnaeus, 1758) – Sea bream
Diplodus holbrooki (Bean, 1878) – Spottail pinfish
Lagodon rhomboides (Linnaeus, 1766) – Pinfish
Pagrus pagrus (Linnaeus 1758) – Red porgy
Stenotomus chrysops (Linnaeus, 1766) – Scup
 SYMPHYSANODONTIDAE (Per Eschmeyer, 1990)
Symphysanodon berryi Anderson, 1970 – Slope bass
Perciformes – Mugiloidei
 MUGILIDAE
Mugil cephalus Linnaeus, 1758 – Striped mullet
Mugil curema Valenciennes, 1836 – White mullet
Perciformes – Polynemoidei
 POLYNEMIDAE
Polydactylus octonemus (Girard) – Atlantic threadfin
Polydactylus virginicus (Linnaeus) – Barbu
Perciformes – Labroidei
 LABRIDAE
Decodon puellaris (Poey, 1860) – Red hogfish
Doratonotus megalepis Günther, 1862 – Dwarf wrasse
Halichoeres sp.
Lachnolaimus maximus (Walbaum, 1792) – Hogfish
Tautoga onitis (Linnaeus, 1758) – Tautog
Tautogolabrus adspersus (Walbaum, 1792) – Cunner
Thalassoma bifasciatum (Bloch, 1791) – Bluehead
Xyrichtys novacula (Linnaeus, 1758) – Pearly razorfish
 SCARIDAE
Nicholsina usta (Valenciennes, 1839) – Emerald parrotfish
Scarus coeruleus (Bloch, 1786) – Blue parrotfish
Scarus iseri (Bloch, 1789) – Striped parrotfish
Sparisoma rubripinne (Valenciennes, 1840)
 – Redfin parrotfish
 POMACENTRIDAE
Abudefduf saxatilis (Linnaeus, 1758) – Sergeant major
Perciformes – Zoarcoidei
 (Families are listed alphabetically)
 ANARHICHIDAE
Anarhichas denticulatus Krøyer, 1845 – Northern wolffish
Anarhichas lupus Linnaeus, 1758 – Atlantic wolffish
Anarhichas minor Olafsen, 1772 – Spotted wolffish
 CRYPTACANTHODIDAE
Cryptacanthodes maculatus Storer, 1839 – Wrymouth
 PHOLIDAE
Pholis fasciata (Bloch and Schneider, 1801)
 – Banded gunnel
Pholis gunnellus (Linnaeus, 1758) – Rock gunnel
 STICHAEIDAE
Anisarchus medius (Reinhardt, 1838) – Stout eelblenny
Chirolophis ascanii (Walbaum, 1792) – Atlantic warbonnet
Eumesogrammus praecisus (Krøyer, 1837)
 – Fourline snakeblenny
Leptoclinius maculatus (Fries, 1837) – Spotted snakeblenny
Lumpenella longirostris (Evermann and Goldsborough, 1907)
 – Longsnout prickleback
Lumpenus fabricii (Valenciennes, 1836) – Slender eelblenny
Lumpenus lampretaeformis (Walbaum, 1792) – Snakeblenny
Lumpenus maculatus (Fries, 1837) – Daubed shanny
Stichaeus punctatus (Fabricius, 1780) – Arctic shanny
Ulvaria subbifurcata (Storer, 1839) – Radiated shanny

ZOARCIDAE

- Gymnelus retrodorsalis* Le Danois, 1913 – Aurora pout
Gymnelus viridis (Fabricius, 1780) – Fish doctor
Lycenchelys alba Vaillant, 1888
Lycenchelys paxillus (Goode and Bean, 1879)
 – Common wolf eel
Lycenchelys sarsi (Collett, 1871)
Lycenchelys verrilli (Goode and Bean, 1877) – Wolf eelpout
Lycodes atlanticus Jensen, 1902 – Atlantic eelpout
Lycodes esmarki Collett, 1875 – Greater eelpout
Lycodes eudipleurostictus Jensen, 1901
Lycodes frigidus Collett, 1878
Lycodes lavalaei Vladykov and Tremblay, 1936
 – Newfoundland pout
Lycodes luetkeni Collett, 1880
Lycodes pallidus Collett, 1879 – Pale eelpout
Lycodes polaris (Sabine, 1824) – Polar eelpout
Lycodes reticulatus Reinhardt, 1835 – Arctic eelpout
Lycodes seminudus Reinhardt, 1837
Lycodes terranova Collett, 1896
Lycodes vahlii Reinhardt, 1838 – Checker eelpout
Lycodonus mirabilis Goode and Bean, 1883
Melanostigma atlanticum Koefoed, 1952
 – Atlantic soft pout
Pachycara bulbiceps (Garman, 1899)
Zoarces americanus (Schneider, 1801) – Ocean pout
- Perciformes – Notothenoidei**
 NOTOTHENIIDAE
Dissostichtus eleginoides Smitt, 1898 – Patagonian toothfish
- Perciformes – Trachinoidei**
 (Families are listed alphabetically)
 AMMODYTIDAE
Ammodytes americanus DeKay, 1842
 – American sand lance
Ammodytes dubius Reinhardt, 1838 – Northern sand lance
- CHIASMODONTIDAE
Chiasmodon bolengeri Osorio, 1909
Chiasmodon niger Johnson, 1863
Dysalotus alcocki MacGilchrist, 1905
Kali indica Lloyd, 1909
Kali macrodon (Norman, 1929)
Kali macrura (Parr, 1951)
Kali normani (Parr, 1931)
Pseudoscopelus sp.
Pseudoscopelus altipinnis Parr, 1933
Pseudoscopelus scriptus Lütken, 1842
Pseudoscopelus scutatus Kreff, 1971
- PERCOPHIDAE
Bembrops anatrostris Ginsburg, 1955 – Longnose duckbill
Bembrops gobioides (Goode, 1880) – Goby duckbill
- URANOSCOPIDAE
Astroscopus guttatus Abbott – Northern stargazer
Astroscopus y-graecum (Cuvier, 1829) – Southern stargazer
Gnathagnus egregius (Jordan and Thompson, 1905)
 – Freckled stargazer

Perciformes – Blennioidei

BLENNIIDAE

- Chasmodes bosquianus* (Lacepede) – Striped blenny
Hypleurochilus geminatus (Wood) – Crested blenny
Hypsoblennius hentz (Lesueur, 1825) – Feather blenny
Parablennius marmoratus (Poey, 1876) – Seaweed blenny

Perciformes – Gobioidae

GOBIOSOCIDAE

- Gobiesox strumosus* Cope, 1870 – Skilletfish

Perciformes – Callionymoidei

(Families are listed alphabetically)

CALLIONYMIDAE

- Diplogrammus pauciradiatus* (Gill, 1865)
 – Spotted dragonet
Foetorepus agassizii (Goode and Bean, 1888)
 – Spotfin dragonet
Foetorepus goodenbeani Nakabo and Hartel, 1999
 – Palefin dragonet

- Paradiplogrammus bairdi* (Jordan, 1888)

– Lancer dragonet

DRACONETTIDAE

- Centrodraco acanthopoma* (Regan, 1904)

– "Deepwater draconett"

Perciformes – Acanthuroidei

(Families are listed alphabetically)

ACANTHURIDAE

- Acanthurus bahianus* Castelnau, 1855 – Ocean surgeon
Acanthurus chirurgus (Bloch, 1787) – Doctorfish
Acanthurus coeruleus Schneider, 1801 – Blue tang

CHAETODONTIDAE

- Chaetodon capistratus* Linnaeus, 1758
 – Four-eye butterflyfish
Chaetodon ocellatus Bloch, 1787 – Spotfin butterflyfish
Chaetodon striatus Linnaeus, 1758 – Banded butterflyfish

EPHIPPIDAE

- Chaetodipterus faber* (Broussonet, 1782)

– Atlantic spadefish

LUVARIDAE

- Luvatus imperialis* Rafinesque, 1810 – Louvar

POMACANTHIDAE

- Pomacanthus arcuatus* (Linnaeus, 1758) – Gray angelfish

Perciformes – Gobioidae

(Families are listed alphabetically)

GOBIIDAE

- Coryphopterus* sp.
Ctenogobius boleosoma (Jordan and Gilbert, 1882)
 – Darter goby
Ctenogobius saepepallens (Gilbert and Randall, 1968)
 – Dash goby
Ctenogobius shufeldti (Jordan and Eigenmann, 1886)
 – Freshwater goby
Evorthodus lyricus (Girard, 1858) – Lyre goby
Gnatholepis thompsoni Jordan, 1902 – Goldspot goby
Gobionellus oceanicus (Pallas, 1770) – Highfin goby
Gobiosoma bosc (Lacepede, 1800) – Naked goby

Gobiosoma ginsburgi Hildebrand and Schroeder, 1928
– Seaboard goby

Gobiosoma parri Ginsburg, 1933
(N.B. possibly extralimital)

Microgobius thalassinus (Jordan and Gilbert) – Green goby

Ptereleotris calliurus Bean, 1882 – Blue goby
ELEOTRIDAE

Dormitator maculatus (Bloch, 1785) – Fat sleeper
MICRODESMIDAE

Microdesmus longipinnis (Weymouth, 1910)
– Pink wormfish

Perciformes – Sphyraenoidei
SPHYRAENIDAE

Sphyraena barracuda (Edwards, 1771) – Great barracuda

Sphyraena borealis DeKay, 1842 – Sennet

Sphyraena guachancho Cuvier, 1829
– Guachanche barracuda

Perciformes – Scombroidei
SCOMBROLABRACIDAE

Scombrolabrax heterolepis Roule, 1922 – Black mackerel
GEMPYLIDAE

Diplospinus multistriatus Maul, 1948 – Striped escolar

Gempylus serpens Cuvier, 1829 – Snake mackerel

Lepidocybium flavobrunneum (Smith, 1843) – Escolar

Nealotus tripes Johnson, 1865 – Black snake mackerel

Neopinnula americana (Grey, 1953) – American sackfish

Nesiarchus nasutus Johnson, 1862 – Black gemfish

Promethichthys prometheus (Cuvier, 1832) – Roudi escolar

Ruvettus pretiosus Cocco, 1833 – Oilfish

TRICHIURIDAE

Aphanopus carbo Loew, 1839 – Black scabbardfish

Aphanopus intermedius Parin, 1983

– Intermediate scabbardfish

Benthodesmus simonyi (Steindachner, 1891)

– Simony's frostfish

Benthodesmus tenuis (Günther, 1877) – Slender frostfish

Evoxymetopon taeniatus Gill, 1863 – Channel scabbardfish

Lepidopus altifrons Parin and Collette, 1993

– Crested scabbardfish

Trichiurus lepturus Linnaeus, 1758 – Largehead hairtail

XIPHIIDAE

Xiphias gladius Linnaeus, 1758 – Swordfish

ISTIOPHORIDAE

Istiophorus albicans (Latreille, 1804) – Atlantic sailfish

Makaira nigricans Lacepède, 1802 – Blue marlin

Tetrapterus albidus Poey, 1860 – Atlantic white marlin

Tetrapterus pfluegeri Robins and deSylva, 1963

– Longbill spearfish

SCOMBRIDAE

Acanthocybium solandri (Cuvier, 1832) – Wahoo

Auxis rochei (Risso, 1810) – Bullet tuna

Auxis thazard (Lacepède, 1800) – Frigate tuna

Euthynnus alletteratus (Rafinesque, 1810) – Little tunny

Katsuwonus pelamis (Linnaeus, 1758) – Skipjack tuna

Sarda sarda (Bloch, 1793) – Atlantic bonito

Scomber colias Gmelin, 1789 – Atlantic chub mackerel

Scomber scombrus Linnaeus, 1758 – Atlantic mackerel

Scomberomorus cavalla (Cuvier, 1829) – king mackerel

Scomberomorus maculatus (Mitchill, 1815)

– Atlantic spanish mackerel

Scomberomorus regalis (Bloch, 1793) – Cero

Thunnus alalunga (Bonnaterre, 1788) – Albacore

Thunnus albacares (Bonnaterre, 1788) – Yellowfin tuna

Thunnus atlanticus (Lesson, 1831) – Blackfin tuna

Thunnus obesus (Lowe, 1839) – Bigeye tuna

Thunnus thynnus (Linnaeus, 1758) – Atlantic bluefin tuna

Perciformes – Stromateoidei

CENTROLOPHIDAE

Centrolophus niger (Gmelin, 1788) – Black ruff

Schedophilus medusophagus (Cocco, 1839) – Brown ruff

Hyperoglyphe perciformis (Mitchill, 1818) – Barrelfish

NOMEIDAE

Cubiceps capensis (Smith, 1849) – Cape cigarfish

Cubiceps gracilis Lowe, 1843 – Common cigarfish

Cubiceps pauciradiatus Günther, 1872 – Bigeye cigarfish

Nomeus gronovii (Gmelin, 1788) – Man-of-war fish

Psenes cyanophrys Valenciennes, 1833 – Freckled driftfish

Psenes maculatus Lütken, 1880 – Silver driftfish

Psenes pellucidus Lütken, 1880 – Bluefin driftfish

ARIOMMATIDAE

Ariomma bondi Fowler, 1930 – Silver-rag

Ariomma melanum (Ginsburg, 1954) – Brown driftfish

Ariomma regulus (Poey, 1868) – Spotted driftfish

TETRAGONURIDAE

Tetragonurus atlanticus Lowe, 1839 – Bigeye squaretail

Tetragonurus cuvieri Risso, 1810 – Smalleye squaretail

STROMATEIDAE

Peprilus paru (Linnaeus, 1758) – Harvestfish

Peprilus triacanthus (Peck, 1804) – Butterfish

Pleuronectiformes

SCOPHTHALMIDAE

Scophthalmus aquosus (Mitchill, 1815) – Windowpane

PARALICHTHYIDAE

Ancylopsetta quadrocellata Gill, 1884 – Ocellated flounder

Citharichthys arctifrons Goode, 1880

– Gulf Stream flounder

Citharichthys cornutus (Günther, 1880) – Horned whiff

Citharichthys dinoceros Goode and Bean, 1886

Citharichthys gymnorhinus Gutherz and Blackman, 1970

– Anglefin whiff

Citharichthys spilopterus Günther, 1862 – Bay whiff

Cyclopsetta fimbriata (Goode and Bean, 1885)

– Spotfin flounder

Etropus crossotus Jordan and Gilbert, 1881

– Fringed flounder

Etropus cyclosquamus Leslie and Stewart, 1986

– Shelf Flounder

Etropus microstomus (Gill, 1864) – Smallmouth flounder

Etropus rimosus Goode and Bean, 1885 – Gray flounder

Hippoglossina oblonga (Mitchill, 1815)

- Fourspot flounder
 - Paralichthys albigutta* Jordan and Gilbert, 1882
 - Gulf flounder
 - Paralichthys dentatus* (Linnaeus, 1766) – Summer flounder
 - Paralichthys lethostigma* Jordan and Gilbert, 1884
 - Southern flounder
 - Syacium micrurum* Ranzani, 1840 – Channel flounder
 - Syacium papillosum* (Linnaeus, 1758) – Dusky flounder
 - BOTHIDAE**
 - Bothus lunatus* (Linnaeus, 1758) – Peacock flounder
 - Bothus ocellatus* (Agassiz, 1831) – Eyed flounder
 - Bothus robinsi* Topp and Hoff, 1972 – Spottail flounder
 - Chascanopsetta danae* Bruun, 1937
 - Angry pelican flounder
 - Engyophrys senta* Ginsburg, 1933 – Spiny flounder
 - Monolene antillarum* Norman, 1933 – Slim flounder
 - Monolene sessilicauda* Goode, 1880 – Deepwater flounder
 - Trichopsetta orbisulcus* Anderson and Gutherz, 1967
 - Furrowed sash flounder
 - Trichopsetta ventralis* (Goode and Bean, 1885)
 - Sash flounder
 - PLEURONECTIDAE**
 - Glyptocephalus cynoglossus* (Linnaeus, 1758)
 - Witch flounder
 - Hippoglossoides platessoides* (Fabricius, 1780)
 - American plaice
 - Hippoglossus hippoglossus* (Linnaeus, 1758)
 - Atlantic halibut
 - Limanda ferruginea* (Storer, 1839) – Yellowtail flounder
 - Liopsetta putnami* (Gill, 1864) – Smooth flounder
 - Pleuronectes putnami* (Gill, 1864) – Smooth flounder
 - Pseudopleuronectes americanus* (Walbaum, 1792)
 - Winter flounder
 - Reinhardtius hippoglossoides* (Walbaum, 1792)
 - Greenland halibut
 - POECILOPSETTIDAE**
 - Poecilopsetta beanii* (Goode, 1880) – Deepwater dab
 - ACHIRIDAE**
 - Achirus lineatus* Linnaeus, 1758 – Lined sole
 - Gymnachirus melas* (Nichols, 1916) – Naked sole
 - Trinectes maculatus* Bloch and Schneider, 1801
 - Hogchoker
 - CYNOGLOSSIDAE**
 - Symphurus billykrietei* Munroe, 1998 – Kriete's tonguefish
 - Symphurus civitatum* Ginsburg, 1951 – Offshore tonguefish
 - Symphurus marginatus* (Goode and Bean, 1886)
 - Margined tonguefish
 - Symphurus minor* Ginsburg, 1951 – Largescale tonguefish
 - Symphurus nebulosus* (Goode and Bean, 1883)
 - Freckled tonguefish
 - Symphurus plagiusa* (Linnaeus, 1766)
 - Blackcheek tonguefish
 - Symphurus pusillus* (Goode and Bean, 1885)
 - Northern tonguefish
 - Tetraodontiformes**
 - TRIACANTHODIDAE**
 - Parahollardia lineata* (Longley, 1935) – Jambeau
 - BALISTIDAE**
 - Balistes capriscus* Gmelin, 1789 – Gray triggerfish
 - Balistes vetula* Linnaeus, 1758 – Queen triggerfish
 - Canthidermis maculata* (Bloch, 1786)
 - Spotted oceanic triggerfish
 - Canthidermis sufflamen* (Mitchill, 1815)
 - Ocean triggerfish
 - MONACANTHIDAE**
 - Aluterus heudelotii* Hollard, 1855 – Dotterel filefish
 - Aluterus monoceros* (Linnaeus, 1758) – Unicorn filefish
 - Aluterus schoepfi* (Walbaum, 1792) – Orange filefish
 - Aluterus scriptus* (Osbeck, 1765) – Scrawled filefish
 - Cantherhines pullus* (Ranzani, 1842)
 - Orangespotted filefish
 - Monacanthus ciliatus* (Mitchill, 1818) – Fringed filefish
 - Stephanolepis hispidus* (Linnaeus, 1766)
 - Planehead filefish
 - Stephanolepis setifer* (Bennett, 1830) – Pygmy filefish
 - OSTRACIIDAE**
 - Acanthostracion polygonius* Poey, 1876
 - Honeycomb cowfish
 - Acanthostracion quadricornis* (Linnaeus, 1758)
 - Scrawled cowfish
 - Lactophrys trigonus* (Linnaeus, 1758) – Buffalo trunkfish
 - Rhinosomus triqueter* (Linnaeus, 1758) – Smooth trunkfish
 - TETRAODONTIDAE**
 - Lagocephalus laevigatus* (Linnaeus, 1766) – Smooth puffer
 - Lagocephalus lagocephalus* (Linnaeus, 1758)
 - Oceanic puffer
 - Sphoeroides maculatus* (Bloch and Schneider, 1801)
 - Northern puffer
 - Sphoeroides pachygaster* (Müller and Troschel, 1848)
 - Blunthead puffer
 - Sphoeroides spengleri* (Bloch, 1785) – Bandtail puffer
 - Sphoeroides testudineus* (Linnaeus, 1758)
 - Checkered puffer
 - DIODONTIDAE**
 - Chilomycterus reticulatus* (Linnaeus, 1758)
 - Spotted burrfish
 - Chilomycterus schoepfi* (Walbaum, 1792) – Striped burrfish
 - Diodon holocanthus* Linnaeus, 1758
 - Long-spine porcupinefish
 - Diodon hystrix* Linnaeus, 1758 – Spot-fin porcupinefish
 - MOLIDAE**
 - Masturus lanceolatus* (Liénard, 1840) – Sharptail sunfish
 - Mola mola* (Linnaeus, 1758) – Ocean sunfish
 - Ranzania laevis* (Pennant, 1776) – Slender mola
-

Footnotes:

¹ As this monograph was in press, a report was published that presented results of sampling for eel leptocephali off North Carolina (Ross *et al.*, in press). One of three Gulf Stream stations sampled was located within the limits of the present study area and the other two were located nearby. The results of this study require that the following 16 eel species be added to this checklist based on their occurrence as larvae:

MURAEINIDAE:	<i>Gymnothorax miliaris</i> <i>G. moringa</i> <i>G. saxicola</i>
OPHICHTHIDAE:	<i>Gordiichthys ergodes</i> <i>Pseudomyrophis fugesae</i> <i>P. nimius</i>
CONGRIDAE:	<i>Bathycongrus dubius</i> <i>Conger esculentus</i> <i>Gnathophis bracheatopos</i> <i>Paraconger caudilimbatus</i>
NETTASTOMATIDAE:	<i>Hoplunnis similis</i> <i>Nettastoma syntresis</i> <i>Nettenchelys exoria</i> <i>Saurenchelys stylura</i>
SYNAPHOBRANCHIDAE:	<i>Dysommia rugosa</i> <i>Synaphobranchus brevidorsalis</i>

See Ross *et al.*, (in press) for collection details for these species. Morphological characters allowing identification of leptocephali of these species (if available) may be found in Smith (1989b).

² The placement of the family Parabrotulidae is still in question with some authors allying it with the Zoarcidae (Nelson, 1994; Nielsen *et al.*, 1999.)

³ Species recently added to the deep-sea fauna south of New England based on recent sampling. See Hartel, Kenaly and Galbraith (in press) for details of these occurrences.

Checklist of Fishes; primary sources and the areas emphasized:

- CARPENTER, (Ed.) 2002a; 2002b. Western Central Atlantic Ocean
- COLLETTE AND HARTEL, 1988. Massachusetts Bay
- COLLETTE AND KLEIN-M^{AC}PHEE, 2002a. Gulf of Maine and Georges Bank, estuary to 200 m
- FAHAY, 1983. Southern Scotian Shelf to 35°N
1993. New Jersey waters, estuary to 200 m
- GREY, 1956. Deep-abyssal fishes (>2,000 m)
- HAEDRICH AND MERRETT, 1988. Deep-demersal, North Atlantic Basin
- HARE *et al.*, 2001. Slope Sea, upper slope between 35°N and 40°N plankton and neuston
- HARTEL, K., C.P. KENALY and J. K. GALBRAITH, In Press. Deep-sea fishes (>200 m) collected off southern New England (primarily Bear Seamount)
- MARKLE AND MUSICK, 1974 Upper Slope off Middle Atlantic Bight
- MARKLE *et al.*, 1988 Upper Slope off Nova Scotia, Newfoundland
- M^CKENNEY, 1981. Neuston and bongo nets...DWD 106 (near Hudson Canyon)
- MOORE *et al.*, 2003. Deepwater fishes (>200 m) north of 38°N, off New England and Scotian Shelf (Primarily Bear Seamount)
- MUNROE, 1998. Cynoglossidae, Western North Atlantic
- MURDY *et al.*, 1997. Rare records from Chesapeake Bay
- MUSEUM OF COMPARATIVE ZOOLOGY: records of larval fish holdings
- NIELSEN *et al.*, 1999. Ophidiiformes worldwide
- OKAMURA *et al.*, 1995. Greenland
- QUATTRINI *et al.*, 2004. Hard bottom habitats off North Carolina and Gulf of Mexico
- SCOTT AND SCOTT, 1988. Canada, estuary to upper continental slope, northern tip of Labrador to Georges Bank

Glossary and Abbreviations (see Explanatory Figures)

> More than; greater than

< Less than; fewer than

≤ Less than or equal to

≥ More than or equal to

= Equal to; same as

μ Micron

~ Approximately; almost; about

% Percent

\bar{x} Mean value of a series of data

A Anal fin

A(1–3) Anal fins (1st to 3rd)

Adhesive Sticking, clinging; an adhesive egg adheres to substrate or other eggs

Adipose fin Fleishy fin-like structure located on dorsum behind the dorsal fin (as in salmonids, osmerids, and myctophids) or farther anterior (as in *Lopholatilus chamaeleonticeps*)

Air bladder Sac filled with air or other gases lying in the gut cavity beneath the backbone and either attached or not to the walls of the gut cavity

Aliform Wing-shaped; pertains to pectoral fin in certain scorpaenid fishes where upper rays are longer than lower

Anal Refers to anus or vent. Also a median fin situated on the ventral edge of body, posterior to the anus (see explanatory figures)

Anal fin origin Point where first anal fin spine or ray joins the body

Angle (of lower jaw) Bony prominence behind gape on ventral part of head; the junction of angular, articular, and quadrate bones

Anlage Rudimentary form of an anatomical structure; primordium; plural = anlagen

ANSP Academy of Natural Sciences of Philadelphia; acronym for museum holding several larvae illustrated or referred to in this atlas

Ant Anterior

Anterior Front portion of body or body parts; in front (see explanatory figures)

Antorse Turned toward the front (anterior)

Aorta Main artery carrying blood from left ventricle of heart to other arteries

Apr April

ARC Atlantic Reference Center; acronym for museum holding several larvae illustrated or referred to in this atlas

Atl Atlantic

Aug August

Autogenous Remaining separate, discrete, not fusing with neighboring structure or structures

Barbel Slender, tactile process on the snout, lips or chin of certain fishes (see explanatory figures)

Basipterygium Basal bone or process extending from pelvic girdle, forming a support for the pelvic fins

Bathypelagic Living in deep waters of the oceans, especially those layers >1,000 m below the surface

BD Body depth

Bight A curve or large embayment in a coastline, river, bay, etc.; usually a crescent-shaped indentation

Branchiostegal (rays) Struts or ray-like bones, usually in series, attached to hyoid arch and connected to each other by membrane (see explanatory figures)

Bud Base of one of the paired fins before ray formation (see explanatory figures)

C Caudal fin

C₁ Principal fin rays of caudal fin

C₂ Procurrent (= secondary) fin rays of caudal fin

Ca About, approximately

Caruncles Naked, fleshy outgrowths

Caudal fin Median fin situated at the posterior end of fish (see explanatory figures)

Caudal keels Short, longitudinal, fleshy thickenings lying at the base of caudal fin (1 per side) in many scombroid fishes; lacking in most percoid fishes

Caudal peduncle Narrow portion of fish's body between the posterior ends of dorsal and anal fins and base of caudal fin (see explanatory figures)

Chorion Outer membrane of egg; synonym: shell

Choroid tissue Mass of vascular tissue underlying the eye in certain myctophids and other fishes (see explanatory figures)

Clavus A caudal end structure in fishes of the family Moliidae where a true caudal fin and supporting structures are lacking. The notochord tip atrophies during larval development in molids, and a series of fin rays and pterygiophores extend from the dorsal and anal fins and meet each other in the gap created by lack of caudal fin rays. Also termed "pseudocaudal". See detailed description of this structure in Tyler (1980); Leis (1977); Johnson and Britz (2005)

Cleithral symphysis Ventral junction of the cleithral bones (see explanatory figures)

Cleithrum Vertical bone in pectoral girdle, considered the posterior limit of the "head length" in early larvae (see explanatory figures)

Commensal Two organisms living in a relationship in which

one derives food or other benefits from the other without causing it harm

Concave Hollow and curved, e.g. the inside of a hollow ball

Confluent Flowing or running together, as in certain fishes where dorsal and anal fins are continuous with the caudal fin

Convex Curving outwards, e.g. the surface of a hemisphere

Convolutions A twisting, coiling or winding together; a coiled appearance in the gut of some clupeid larvae due to muscle bands overlying the intestine

Crown Dorsalmost margin of head

D Dorsal fin

D(1–3) Dorsal fins (1st to 3rd)

D₁ First dorsal fin (if 2 present); usually refers to the spinous dorsal

D₂ Second dorsal fin (if 2 present); usually refers to soft dorsal fin, composed of fin rays (not spines)

DAH Days after hatching

Dec December

Demersal Living on or near bottom substrates

Dendritic melanophore A black pigment spot exhibiting obvious branching

Dentary Major long bone of lower jaw; usually bears teeth

Diaphanous Translucent; veil-like

Distal Part of a structure that is remote from point of attachment or origin; opposite of proximal

Dorsal Back or upper part of body; a median fin situated on upper part of body (see explanatory figures)

Dorsal fin origin Point where first fin spine or fin ray of dorsal fin joins the body

Dorsolateral Of, relating to, or involving both the back and sides of body

Dorsum Refers to dorsal, or upper, portion of body or body part

Duckbilled Refers to a snout that is shaped like a duck's bill; usually flattened vertically and sometimes with a concave upper outline

E East; eastern

Elongate Stretched out; length greatly exceeding depth or width

Elver Early stage, cylindrical in shape, of any of several species of anguilliform eels; more advanced than leptocephalus stage

Embryo Organism in early stage of growth and differentiation, prior to hatching

Epibenthic Fauna and flora of the sea bottom, between low-water level and the mesobenthos; maximum depth about

100 m

Epipelagic Occurring in close association with the surface of the ocean

Erythrophores Pigment cells; red or orange chromatophores, when present in larval fishes generally not surviving most preservation methods

Eyestalks Movable peduncles bearing eyes at their tips; see Myctophidae or *Idiacanthus* for examples

Feb February

Fig Figure(s)

Finfold Median fold of integument extending along body of larva, and within which dorsal, caudal and anal fins are developed (see explanatory figures)

Fin formulae Method of enumerating elements in fins; spines expressed as roman numerals; fin rays expressed as arabic numerals. Thus XIV, 24 indicates the presence of 14 spines followed by 24 soft rays.

Finlets Small fins, usually in series, sometimes limited to a single, small fin, generally situated on dorsal and/or ventral midlines posterior to dorsal and anal fins

Fin rays Segmented fin supports, bilaterally paired, often branched (see explanatory figures)

Fin spines Unsegmented fin supports; unpaired, unbranched and usually stiff and sharp

Flexion Upward bending of urostyle concurrent with development of hypural bones and other caudal fin-supporting structures

Flexion stage A stage in larval development during which the process of flexion has begun, but has not been completed

Forebrain Anterior of 3 primary divisions of the vertebrate brain (see explanatory figures)

Foregut Anterior part of primitive alimentary canal

Foreshortened preceding ray Refers to condition in certain acanthopterygian fishes where the base of the ventral procurrent ray immediately anterior to the posteriormost ventral procurrent ray is shortened and overlaps less with haemal spine or other supporting bone than do its neighbors. See "procurrent spur"

FL Fork Length; length of fish measured from tip of snout to end of middle caudal fin ray

Gape Median margin-to-margin length of open mouth

Generic Relating to or descriptive of all members of a genus

Globoid Spheroid or ball-shaped

Gill Cover Opercular; a complex of flat bones in cheek region comprised of opercle, interopercle, subopercle and preopercle bones

GR Gill rakers

Explanatory Figures

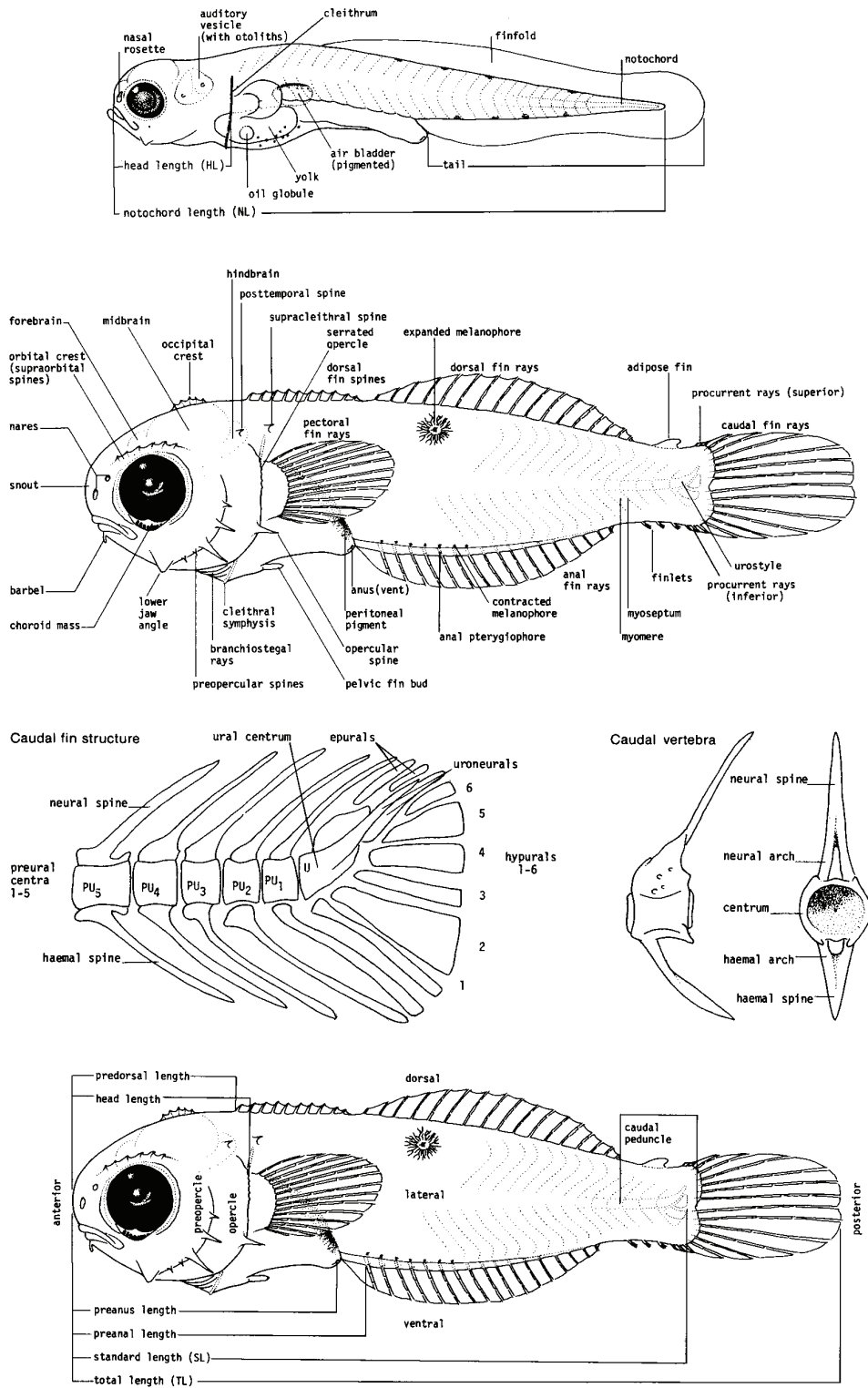


Fig. 8. Body parts, measurements and terminology used throughout this monograph.

Explanatory Figures

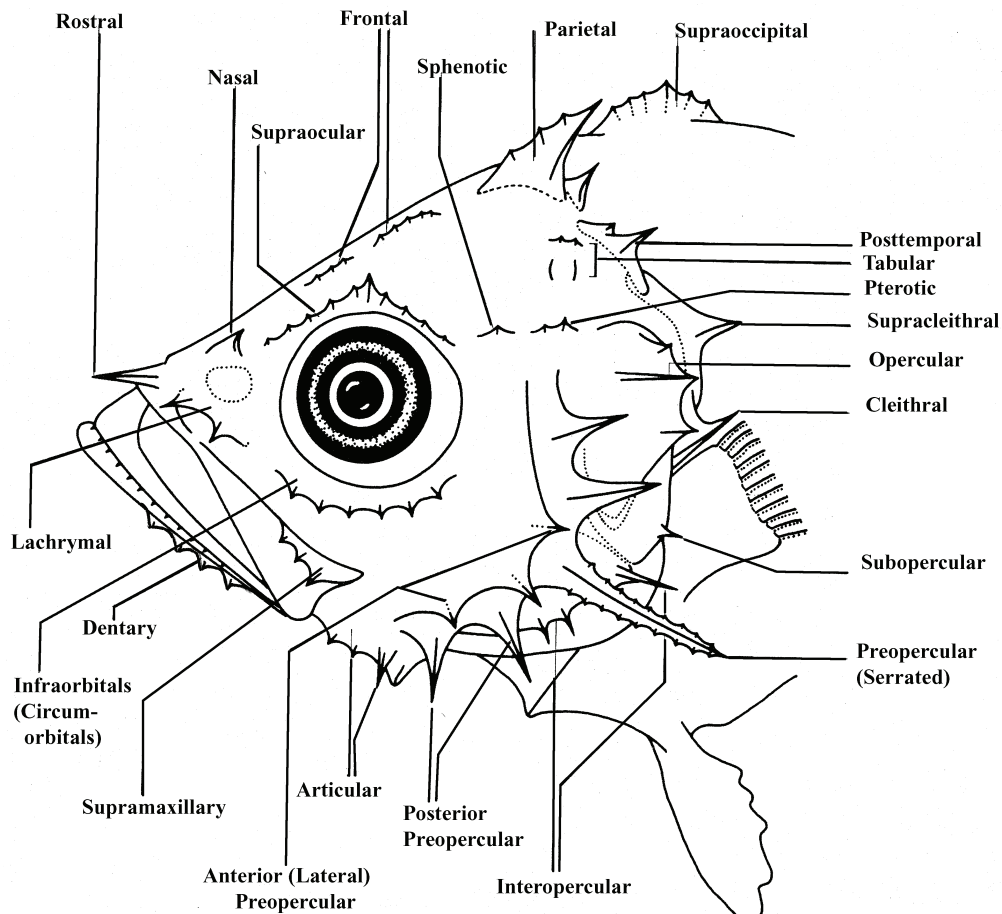


Figure 9. Head spines are usually labeled according to the bone from which they originate. The presence of head spines ranges from absent to extensive in larval fishes, but are present to some degree in almost all perciforms.

Figure modified from Neira *et al.* (1998).

Caudal fin terminology:

EP	epural	PH	parahypural
H (1–6)	hypural (1 st to 6 th)	PU (1–2)	preural centra (1 st to 2 nd)
HS	haemal spine	U (1–2)	ural centra (1 st to 2 nd)
NS	neural spine		

Photophore terminology

See Myctophidae, Gonostomatidae and Sternoptychidae chapters for these abbreviations

Meristic Characters

Myomeres, vertebrae and fin rays: self-explanatory. See Glossary

Caudal fin rays: 5–7+9+8+6–7 (indicates there are 5 to 7 dorsal procurrent rays, 9 + 8 principal rays, and 6 to 7 ventral procurrent rays)

Supraneurals: See explanation of formulae in Glossary

Gular Refers to a membrane on venter of the lower jaw, situated between the limbs of the dentary bones

Gut Ventral portion of the fish's body containing internal organs

Gut loop A loop, fold or curve found along the axis of the gut or intestine

Haemal Refers to spines and arches attached to ventral aspect of vertebral centra; a haemal arch forms when the tips of 2 haemal spines become fused

Hindbrain Posterior of 3 primary divisions of the vertebrate brain (see explanatory figures)

Hindgut Posterior part of the alimentary canal

HL Head length, usually measured from tip of snout to posterior edge of opercle; replaces SL or TL in certain fishes where postanal regions taper off to fine, finless tips, and are often broken or lost (e.g. Carapidae, Macrouridae)

Homogeneous Uniform composition throughout

Hymandibular Bone or cartilage derived from the hyomandibular arch

Hypural bones A series of bony elements, usually ventral to the notochord tip, that serve to support principal caudal fin rays (see explanatory figures)

Illicium First dorsal fin spine that has migrated to an anterior position on the upper lip and transformed into a complex tentacle which serves as a lure to attract prey; found in certain pediculate fishes (e.g. Lophiiformes)

Insertion Mode or place of attachment (usually posterior); opposite of "Origin"

Interneurals As used herein, synonymous with pterygiophores; slender, median, deep bones lying vertically above the vertebrae, usually positioned between the neural spines.

Interopercle Lower, anterior (usually small) bone of the operculum lying under the preopercle

Interorbital Situated or extended between the orbits of the eyes

Isthmus Area on venter of head, between the lower edges of opercular bones; the "throat" region

Jan January

Jul July

Jun June

Juvenile stage A young fish, fundamentally resembling the adult in meristic characters (excluding squamation) but smaller and reproductively inactive. Coloration and habitat use can be quite different from that of adults

Larva Any organism which at birth or hatching is fundamentally unlike its parent and must pass through a transformation before assuming adult characters

Lateral ridge A ridge on the anterior (flat) portion of pre-

opercle bone, sometimes bearing spines in larval stage; lateral ridge series of spines (if present) are separate from a series along edge of preopercle bone (if present)

Leptocephalus The pelagic larvae of fishes in the orders Anguilliformes, Elopiformes and Notacanthiformes characterized by small heads, prominent teeth, and transparent, ribbonlike bodies

Lunate Crescent-shaped

m Meter

MAB Middle Atlantic Bight; continental shelf waters between Cape Cod and Cape Hatteras

Mar March

Maxillae Longest paired bones of the upper jaw; usually associated with paired premaxillae

May May

MCZ Museum of Comparative Zoology, Harvard University; acronym for museum holding several larvae illustrated or referred to in this atlas

Melanophore A pigment cell containing melanin; a black or brown pigment cell

Meristic Pertains to those countable characters that occur in series (e.g. teeth, vertebrae, scales, fin rays, gill rakers, etc.)

Mesohaline Refers to estuaries or zones in estuaries, where the salinity ranges from 5.0 to 18.0 parts per thousand (ppt)

Mesopelagic Occurring in the open ocean at middle depths in the water column, usually between 100 and 1,000 m

Metamorphosis Physical development of the individual after birth or hatching involving significant change in form as well as growth and differentiation. It usually accompanies a change of habitat or of habits but may occur without such change. See "Transformation"

Midbrain Middle of three primary divisions of the vertebrate brain (see explanatory figures)

Midline The median line or median plane of the body or a body part

Migration (eye) In pleuronectiform fishes, the movement of one eye from one side of the head to the other, also involves crossing of optic nerves in the optic chiasma

mm Millimeter

mmNL Notochord length of a fish larva in millimeters, measured from tip of snout to posterior tip of notochord; used before completion of caudal fin supporting structures (see explanatory figure)

mmSL Standard length of a fish larva in millimeters, measured from tip of snout to posterior edge of caudal fin supporting bones (see explanatory figure)

mmTL Total length of a fish larva in millimeters, measured from the most anterior part of body (usually tip of snout) to most posterior part of longest caudal fin ray (see explanatory

figure)

Monophyletic A group of related taxa is monophyletic if it consists of a common ancestor and all its descendants. (see "Paraphyletic" and "Polyphyletic")

Myomeres Muscle segments occurring in a series along the plane of the body, the number of which is usually about the same as the number of vertebrae in adults (see explanatory figures)

Myosepta Dividing tissue between adjacent myomeres (see explanatory figures)

N North; northern

Nape The dorsum of "neck" area immediately posterior to head

Nares Nostrils

Nasal organ A rosette shaped structure found on the snout of larvae before formation of paired nares or nostrils

Neoteny The retention of juvenile characteristics in the adults of a species, or the attainment of sexual maturity by an organism still in its larval stage

Neritic Refers to ocean waters from the low tide mark to a depth of about 100 fathoms; in study area corresponds approximately to waters over continental shelves

Neustonic Occurring close to the surface in the open ocean.

NL Notochord length; a straight-line measurement from tip of snout to tip of notochord (see explanatory figures)

NMFS National Marine Fisheries Service (National Oceanic and Atmospheric Agency); also NOAA Fisheries

Notochord Longitudinal, flexible rod of cells, forming the supporting axis of the body

Notochord length A straight-line measurement from tip of snout to tip of notochord (see explanatory figures); NL (abbrev.)

Nov November

Nuchal bar Refers to a pigmented bar extending obliquely and posteriorly from the eye, usually reaching the origin of the first dorsal fin

Occipital crest A median, bony ridge, usually serrated, on top of head (see explanatory figures)

Occiput Dorsal outline of the head from nape to snout tip

Oceanic As used herein, refers to high-salinity waters beyond continental shelf depths and seaward of prominent banks (e.g. Georges Bank, Grand Bank); in the present study area this includes the Slope Sea (*sensu* Csanady and Hamilton, 1988), Gulf Stream, and northern Sargasso Sea as well as the deeper portions of Davis Strait. See "Neritic"

Oct October

O.G. Oil globule

Oil globules Discrete spheres of fatty material with buoyant

properties within the yolk of certain fishes' eggs

Oligohaline Refers to estuaries, or zones in estuaries, where the salinities range from 0.1 to 5.0 parts per thousand (ppt)

Opercle Upper, posterior, and usually the largest bone of the operculum of a fish's "cheek" region (see explanatory figures)

Operculum Pertaining to the gill cover; a complex of flat bones in cheek region comprised of opercle, interopercle, subopercle and preopercle bones

Opisthonephros The larval kidney, resembling, but not identical to, the embryonic mesonephros; usually obviously visible lying along the dorsum of intestine in leptocephalus larvae

Orbital Referring to the orbit or eye

Origin The more fixed, central, or anterior point of attachment of a structure (e.g. a fin)

Ossification Process of bone formation; skeletal structures are generally considered to be ossified when they take up bone-specific stains

Otic Pertaining to the ear or ear-area of the head

Ovoviviparous Producing eggs that develop within the maternal body and hatch within or immediately after extrusion from the female parent

P₁ Pectoral fin

P₂ Pelvic fin

Paedomorphic The quality of larval characteristics being present in adult stages. (Also see "neoteny".)

PAL Preanus length; straight line measurement from snout tip to anus

Palatine teeth Teeth that originate on the palatine bones in the roof of the mouth

Papilla Fleshy projection or protuberance

Papilliform hyoid barbel A short, fleshy protuberance in the hyoid region

Paraphyletic A group of related organisms is said to be paraphyletic if the group contains the most recent common ancestor of its members, but the group does not include all the descendants of this common ancestor (see "Monophyletic" and "Polyphyletic")

PCL Preclavus length. Used as a unit of measure in larval and juvenile fishes of the family Molidae where a true caudal fin structure is lacking. PCL is the distance along a straight line from tip of snout to base of "pseudocaudal" rays. See "clavus" and "pseudocaudal"

Pectoral fin One of a pair of rayed fins located behind the head on the side of the body, or closer to the ventral edge (see explanatory figures)

Pedicel A small, short stalk or stem

Peduncle A narrow part (or stalk) by which some larger part of the whole body is attached or joined to a distal structure

Pelvic fin One of a pair of rayed fins, usually located on the ventral edge of the body in the abdominal or "chest" region; sometimes located anteriorly, under the head; in some taxa, this fin is reduced to one or a few filamentous rays or is totally absent

Pelagic Of, relating to, or living in the open sea

Pelagic-juvenile A specialized stage between larvae and settled juveniles; generally occupy same habitats as larvae, have complete meristic characters, but also may have specialized characters such as elongate fin rays, spines or unique pigment patterns; many of these have been described as new genera (e.g. "Svetovidovia" (Moridae); "Krohnus" (Macrouridae); "Querrimana" (Mugilidae); etc.

Periproct Tissue (often black) surrounding the anus (e.g. in the Macrouridae)

Peritoneal pigment Internal pigment on the peritoneum or dorsum of the abdominal cavity (see explanatory figure)

Peritoneum Smooth, transparent membrane that lines the cavity of the abdomen

Perivitelline space Fluid-filled space between the fertilization membrane and the chorion of a fish egg

Photophores Luminous organs on various marine (mostly deep-sea) fish larvae

Pigmentation Deposition of pigment in various body tissues

Planktonic Passively floating, drifting, or weakly swimming with prevailing currents

Polyhaline Refers to estuarine areas where the salinity ranges from 18.0 to 30.0 parts per thousand

Polyphyletic a group of organisms is polyphyletic if the trait its members have in common evolved separately in different places in their ancestry. Equivalently, a polyphyletic taxon does not contain the most recent common ancestor of all its members (see "Monophyletic" and "Paraphyletic")

Post Posterior

Posterior Situated toward the rear portion of the body or a body structure; opposite to anterior (see explanatory figure)

Postflexion stage A stage in the development of larvae after the completion of flexion (which see) and after resorption of the urostyle tip

Postorbital Situated behind (posterior to) the orbit

Posttemporal spine A sharp, externally visible, process emerging from the posttemporal bone of the skull (see explanatory figure)

PrC Principal caudal fin rays (abbreviation); refers to those rays (branched and unbranched) that articulate with any of several ural bones (e.g. hypurals and parhypural). Also see

"Principal rays"

Preanal Situated in front of origin of anal fin or anal finfold (see explanatory figure); "Preanal length" is measured from tip of snout to origin of anal fin

Preanus Situated in front of the anus; "Preanus length" is measured from tip of snout to anus

Predorsal bones Synonymous with "supraneural"; for discussion of homologies among and between predorsal bones, supraneurals, pterygiophores and neural spines, see Mabee (1988)

Preflexion stage A stage in the development of larvae before the beginning of the process of flexion

Premaxillae Paired bones of upper jaw, usually bearing teeth and associated with paired maxillae

Preopercle Upper anterior bone of the operculum (see explanatory figure)

Preopercular spines Spines along the lateral ridge or posterior edge of the preopercle bone; when numbered, they are counted from the lowermost (or most ventral) to the uppermost (usually situated at the level of, and behind, the eye)

Principal rays In the caudal fin, a group of fin rays articulating with hypural bones and supporting most of the surface of the caudal fin; these typically reach the posterior margin of the fin; an often present, typical number in perciform fishes is 17 (9+8), with the central 15 branched, plus 1 unbranched ray dorsally and 1 unbranched ray ventrally (see "Procurrent ray" and explanatory figures)

Procurrent ray Fin rays in the caudal fin not articulating with hypural bones, usually shorter than principal rays and generally not reaching the posterior margin of caudal fin. Occur in 2 series, 1 dorsal, 1 ventral, both extending anteriorly from principal rays. Also referred to as secondary caudal fin rays (see explanatory figures)

Procurrent spur A pointed structure on the base of the posteriormost ventral procurrent ray found in some fishes in certain acanthopterygian orders. May or may not be accompanied by a fore-shortened preceding ray (which see). Johnson (1975) presents presence or absence of these 2 characters in a survey of fishes in 4 major orders (Beryciformes, Stephanoberyciformes, Perciformes and Scorpaeniformes) (see explanatory figures)

Proximal Near point of attachment or origin; opposite of "Distal"

Pseudocaudal A caudal end structure in fishes of the family Molidae where a true caudal fin and supporting structures are lacking. The notochord tip atrophies during larval development in molids, and a series of fin rays and pterygiophores extend from the dorsal and anal fins which then meet each other in the gap created by lack of caudal fin rays. Also termed "clavus". See detailed description of this structure in

Tyler (1980); Leis (1977); Johnson and Britz (2005)

Pterotic spines Pertaining to spines in the area between the prootic and epiotic bones in the dorsal and outer part of the temporal region of a fish's skull (see explanatory figure)

Pterygiophores Elongate bones that support the fin spines and rays, located between the neural spines, and usually occurring in characteristic, meristic patterns

Ramus The length (usually horizontal) of the lower jaw; plural "rami"

Ray See "Fin ray"

Ref References; sources of information

Retia mirabilia (singular rete mirabile) A clump of parallel arterial and venous capillaries which supplies the gas gland with blood and is found on the outside of the gas bladder. (See Gadiformes – Macrouridae)

Reticulated In the form of a network or web

Retrorse Bent backward or downward

Rugosity (Rugose): wrinkled or striated; when used to describe gut features, refers to obvious mucosal folds that appear as lines crossing the intestine (e.g. larvae of Scaridae)

S South; southern

Sculpted Property of an egg's chorion bearing distinctive shapes, convolutions, ridges or other ornamentation; also "sculptured"

Segmented Property of the yolk of an egg; separated into divisions or segments; opposite of homogeneous

Sep September

Serrate (Also "serrated"); an edge consisting of a series of sharp points

Sequence of fin ray formation A short-hand method of describing the order in which fin rays begin to form (not complete ossification) in each fin. Fins that form in sequence separated by a dash (–), those forming simultaneously separated by comma (.). The formula $C - D_2, A - D_1 - P_2 - P_1$ indicates that fin rays first appear in the caudal fin, followed by second dorsal and anal fins (together), followed by spines in the first dorsal fin, followed by pelvic fin rays, and finally by pectoral fin rays. Although the rayless pectoral fin is often the first to appear in ontogeny (as a "flap"), it is often the last fin to complete fin ray ossification.

S.F. (or s.f.) Subfamily

Shell Chorion (syn.)

SL Standard Length; length of fish measured from tip of snout to posterior edge of hypural bones, or to tip of urostyle (last element in vertebral column) in early stages

Slope Sea That portion of the study area between the continental shelf of North America and the Gulf Stream; often separated into western and eastern components. See Csanady and Hamilton (1988) for detailed description

Smooth (chorion) Uniform, not rough or sculpted

Snout Forward part of head, anterior to eye (see explanatory figures)

sp. Species

Spatulate Spoon-shaped

Sphenotic Pertaining to a bone of the skull, situated above the prootic and often forming a part of the posterior boundary of the orbit

Spine See "Fin spine"; also a sharp, pointed shaft-like structure occurring on any of various head bones

Spinous scale Larval scale bearing spines or other sharp processes; not the ctenoid scale in adults of certain species

Stalked eye Eye situated on a stalk or peduncle

Standard Length Length of fish measured from tip of snout to posterior edge of hypural bones, or to tip of urostyle (last element in vertebral column) in early stages; SL (abbrev.)

Stellate melanophore Star-like pigment spot

Striations Narrow, structural bands or lines

Subcutaneous Situated or occurring beneath the skin

Subopercle Posterior bone of the operculum, usually at least partially lying under the opercle bone

Subterminal mouth Set back from anteriormost point of snout (as in sharks, *Albula*, etc.)

Supernumerary "Extra" elements that occur in larvae but are lost at transformation to older stages. An example is the pectoral fin in certain myctophids where there are more fin rays in larvae than in adults.

Supracleithral spine A spine occurring above the cleithrum, with its origin on the supracleithral or temporal bone of the skull

Supraneural Elongate, splinter bones that precede the dorsal-fin pterygiophores. Methodology of describing the arrangement of these bones follows Ahlstrom *et al.* (1976) as in the following hypothetical example: **0/0+0/P+2/1/** where a forward slash represents a neural spine, a **0** represents a supraneural, a **2** represents a pterygiophore supporting 2 dorsal spines, a **1** represents a pterygiophore supporting 1 dorsal spine, and a **P** represents a pterygiophore not supporting a spine or ray; therefore, the example formula indicates that the 1st supraneural precedes the 1st neural spine, the 2nd and 3rd supraneurals lie between the 1st and 2nd neural spines, pterygiophores carrying no dorsal spines, then 2 dorsal spines lie between the 2nd and 3rd neural spine, and a pterygiophore supporting 1 dorsal spine lies between the 3rd and 4th neural spine. See also "Predorsal bones".

Supraneural element A thick, columnar bone occurring under the second pterygiophore supporting the third dorsal spine in fishes of the Balistidae. Not to be confused with "supraneurals", as defined above, which are not present in tetraodontiform fishes.

Supraoccipital spine Spine or crest on midline of the occiput (see explanatory figure)

Supraocular Spine or ridge of spines deriving from the frontal bone, situated over the eye; synonymous with "supra-orbital"

Supraorbital Spine or ridge of spines deriving from the frontal bone, situated over the eye; synonymous with "supra-ocular", the term most used throughout this atlas

Tail That portion of a fish larva's body posterior to anus; not to be confused with caudal fin

Telescopic eye An eye, not on a stalk, protruding within an envelope of skin or thin membrane

Terminal mouth Located at termination of head or anterior tip of larva

Thermocline A temperature discontinuity in the water column of lakes or oceans; over continental shelves warmer waters generally overly colder, bottom waters, and the thermocline defines the transition zone between the two. The reverse situation is possible, where warmer waters may be subducted from offshore and come to lie below colder shelf water.

TL Total Length; length of fish measured from tip of snout to most posterior part of longest caudal fin rays; the maximum length that can be measured on a fish

Total Length Length of fish measured from tip of snout to most posterior part of longest caudal fin rays; the maximum length that can be measured on a fish; TL (abbrev.)

Transformation In most fishes, pertains to physical development of the individual after the larval stage involving gradual change in form as well as growth, differentiation, and acquisition of adult characteristics. It often accompanies a change of habitat or of habits but may occur without such change

Tubercle A small, knobby prominence

Unpubl. Unpublished information; based on "grey literature" or personal observations

Urohyal Median posterior bony element of the hyoid arch attached between the hypohyals

Urostyle The last vertebral element in fishes, formed by fusion or loss of several posterior centra

U.S. United States

USNM United States National Museum; acronym for museum holding several larvae illustrated or referred to in this atlas

V Ventral

Vent Ventral opening of the alimentary canal; the anus (syn); (see explanatory figures)

Venter Refers to ventral, or lower, portion of body or body part

Ventral Underside of body or body-part; opposite of dorsal

(see explanatory figures)

Ventral fins Pelvic fins (syn.)

Vert Vertebrae

Vertical blood vessel Blood vessel perpendicular to the midline, which connects the dorsal aorta with the gut region or kidney (nephros) in larval eels (leptocephali)

W West; western

WNA Western North Atlantic Ocean

X–Y Bones Accessory bones in the caudal fin of some gadi-form fishes (e.g. Phycidae); located anterior to the neural and haemal spines of the 1st preural centrum, and enter into the support of secondary caudal fin rays

Yolk Material stored in the ovum that provides nutrition for the developing embryo

Yolk-sac larva Early preflexion larva containing yolk material in a sac in the gut region

Identification of Eggs and Larvae

"Minor errors in identification of larval fishes can lead to major misinterpretations of ecological and taxonomic phenomena." (Powles and Markle, 1984.)

A wealth of literature now exists concerning the study of eggs and larvae of fishes. Most contributions with a focus on a specific geographic region have stressed identification at the species level with summaries of characters arranged by family, suborder or higher levels. A smaller number of studies have concentrated on larval characters at the family level (e.g. Leis and Carson-Ewart, 2004) and the characterizations contained therein have application to larvae collected anywhere in the world. Another publication (Moser *et al.*, 1984) stressed characters at the generic level and higher, demonstrating the utility of using those characters in studies of phylogenetic relationships. Below is a brief review of methods available to positively identify early life history stages of fishes.

Eggs:

The eggs of most marine fish species in the western North Atlantic are undescribed. Those of many other species resemble each other closely. Nevertheless, a number of characters, taken in combination, can often serve to positively identify fish eggs, especially those in late stages of development collected in continental shelf waters.

Important characters include:

Diameter and shape: the outside measurement of the entire egg. Most are spherical, but some are elliptical or slightly flattened at one of the poles. Note that diameter (size) can vary geographically and that there is typically a range of values that can result from maternal influences, temperatures of the environment, or other factors. Marine fish eggs range

from about 0.5 mm to about 5.5 mm, with the average about 1.0 mm.

Chorion: the "shell" or outer covering of an egg is either smooth and transparent, or variously etched or sculpted with a variety of patterns. Some are characteristically colored. In some groups, filaments (single or multiple) serving to attach the egg to various substrates arise from various important loci on the chorion. In rare cases, a secondary membrane occurs within the outer chorion.

Yolk: the sphere within the chorion is either homogeneous in its surface pattern, or variously segmented or etched with a pattern. Segmentation is generally more common in primitive taxa. Pigmentation patterns may be present or absent on the yolk surface.

Oil globules: useful characters pertaining to these structures include: presence or absence, number, position, size (diameter) and pigmentation. The most common condition in marine fishes with pelagic eggs is to have a single oil globule with a wide variety of sizes. Some have multiple oil globules that may or may not coalesce into a single one.

Perivitelline space: The space between the inner chorion and outer yolk is usually narrow (in most fish eggs), but the eggs of several groups have a very wide distance between these two surfaces. Wide spaces characterize many primitive groups of fishes, but are found in some more advanced taxa as well.

Embryo: in middle to late stage eggs, the characters of developing embryos are often useful in their identification. Pigment patterns are often diagnostic, and may differ from patterns in yolk-sac larvae after hatching. Also useful is the relative amount of development that occurs before hatching. For example, precocious fin ray development often occurs in embryos of exocoetids and some cyclopterids have a suction disk fully formed before hatching.

Important reviews of pelagic fish eggs have been provided by Robertson (1975), Ahlstrom and Moser (1980), and Matarese and Sandknop (1984). These should be consulted for more detailed information and example illustrations. Markle and Frost (1985) present morphological and seasonality data for pelagic fish eggs likely to be collected over the Scotian Shelf. Distribution patterns of the eggs of 33 taxa on the continental shelf of the United States are presented by Berrien and Sibunka (1999).

Larvae:

Soon after hatching, yolk-sac larvae of all teleosts greatly resemble each other. In later developmental stages, however, larval fishes vary greatly and display two kinds of characters: permanent and transitory. Permanent characters are those that

begin in larvae and are carried over to adult stages. Examples include the number of vertebrae and patterns of photophores. Transitory characters are those that are unique to larvae and are not found in juveniles or adults. Obvious examples of these include elongate fin rays or specialized pigment patterns. In order of their importance, the following characters are most critical in identifying the larvae of fishes:

1. Meristic characters
2. Body proportions and fin positions
3. Sequence of development
4. Miscellaneous structures
5. Pigmentation

Meristic characters pertain to any series of elements that can be counted (e.g. teeth, vertebrae, scales, fin rays, gill rakers). These are permanent characters, in that the numbers of certain elements in larvae are usually the same as the number in adults. Sometimes, however, there are differences, such as when a larva has supernumerary fin rays in a fin, which will be lost when the larva transforms into the juvenile stage. In this case, the fin rays that will be lost are considered to be transitory characters. Rarely do meristic characters coincide between species, especially when several series are considered together. The most important meristic character to consider is probably the count of myomeres, or muscle segments running the length of the body. This count relates very closely to (or totally coincides with) the number of vertebrae in adults. Although often difficult to count accurately, even an approximate count will eliminate most taxa from consideration. The distribution of myomeres (e.g. those anterior to, and posterior to the level of the anus) is also an important consideration. In anguilliform leptocephali, for example, critical measurements include the enumeration of myomeres anterior and posterior to important landmarks such as internal organs arranged along the intestine. The location of important structures (e.g. fin origins) relative to myomere number is also important, and in some cases this number may change as structures "migrate". These cases provide another example of the dynamic nature of ontogeny.

Body proportions include relative measurements of various body parts as well as the positions of fins, relative to each other and to the whole body. Standard proportional measurements include head length, preanus length, predorsal length, body depth and several others (see explanatory figures). Most of these are expressed as percentages of the standard length, but eye diameter, snout length or gape (of the mouth) may be expressed as a percentage of the head length. Relative lengths or positions of fins are often very helpful in identification, and early expressions of these characters can often be ascertained early in development, before fin rays are fully formed. An obvious example of this character concerns relative lengths of second dorsal and anal fin bases. These are about equally long in some (e.g. Carangidae) but the second dorsal fin base is nearly twice as long as the anal fin base in

others (e.g. Sciaenidae). Note also the ontogenetic migration that occurs in the fins of some Clupeidae.

Sequence of development is a relative measure of ontogenetic development. It is another reminder of the dynamic nature of this process, and the order in which events occur often varies between taxa. Many landmark events occur within the framework of notochord flexion and the simultaneous development of caudal fin rays (see definitions of preflexion, flexion and postflexion stages). The sequence of fin ray formation is an easily observable character if an entire developmental series is at hand. The pectoral fin is usually the first visible fin (but as a membranous flap lacking fin rays). In most fishes, the caudal fin rays form first, followed by the dorsal and anal fin rays. Rays of the paired fins (pectoral and pelvic) usually form late (especially the pectoral), but in rare cases the pelvic fins are precocious and prematurely large. Note the difference in fin sequence in the Nomeidae, for example. In *Cubiceps* the pelvic fin rays are last to form. In *Psenes*, they are the first. Also valuable are observations of the loci within a fin where ossification occurs. In *Merluccius*, for example, fin rays in the second dorsal fin form from two centers of ossification, possibly the suggestion of a past relationship to ancestors where this fin was two separate fins, or as a precursor to a condition where this fin will be separated into two.

Miscellaneous structures in larvae include transitory spines on the head or other loci; elongate, often filamentous fin rays; trailing or protruding terminal sections of the gut;

or other unusual structures associated with internal organs. Head spines can be absent, but when they are present may be simple or ornamented with spurs or secondary barbs, or may be in the form of serrated ridges. Spinous scales, either precursors of adult scales or separate larval structures that have no relationship to adult scales, cover the body in some taxa. Trailing, elongate fin rays are sometimes equipped with enlarged structures that resemble unrelated organisms. A complete array of known, specialized larval structures are described in this volume. Also see Moser (1981) and Kendall *et al.* (1984) for many more examples and their distributions in the larvae of teleosts.

Pigmentation, including the number and location of melanophores relative to a larva's body or fins is sometimes crucial for identification, but pigmentation is most important at the species level. Only rarely do unrelated taxa share a pattern of melanophores or other pigment cells. It is important to note that pigment changes during ontogeny and important series of melanophores may add or lose members during development. Pigment spots also vary in intensity due to expansion or contraction of cells and care must be taken to locate important melanophores that are unusually faint or small. Juveniles often display a pigment pattern that is unlike larvae or adults, often in response to living in cryptic habitats, or in response to a temporary epipelagic stage. Conversely, vague larval pigment patterns are sometimes retained in transformed individuals, and these can be very helpful in establishing an identification.

TABLE 4. Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Acipenseriformes	Elopiformes- Albuliformes	Notacanthiformes	Anguilliformes
Eggs (type)	Demersal, adhesive	Undescribed	Undescribed	Pelagic, few described
Egg shape	Spherical to oval	–	–	Spherical
Chorion	Thick	–	–	Smooth
Yolk	–	–	–	Segmented
Oil globules	–	–	–	0 to 1 or more
Larvae – Shape	Stubby, thick gut	Leptocephalus-like	Leptocephalus	Leptocephalus
Vertebrae	60–61	53–86	225–486	68–400+ (most 100–250)
Preanus length	60–70% SL	75–98% SL	>90% SL	50–90% SL
Gut character	Bulky, massive	Straight	Straight, simple	Straight to looped, some trailing
Eyes	Small, round	Round	Round or elliptical	Round to barely oval; some with choroid tissue
Head spines	None	None	None	None
Transformation	Gradual	Marked, shrinkage	Marked; some adults unknown	Marked, shrinkage
Special pelagic- juvenile stage	None	None	None	None
Fin elements	Soft rays	Soft rays	Soft rays or spines	Soft rays
Early forming fins	None	Caudal	Pectoral	None
Pelvic fins form	Late, abdominal	Late, abdominal	Late, abdominal	Absent
Pectoral fins form	Late	Late	Early	Late
Dorsal fin	Single, plates + rays	Single, short	Single, short	Single, short to very long
Anal fin	Single	Single, very short	Long, spines and rays	Single, short to long
Adipose fin	None	None	None	None
Caudal fin (PrC)	60 (total)	10+9, Forked	Filament	None to 11
Miscellaneous				Fang-like teeth

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Saccopharyngiformes	Clupeiformes	Siluriformes	Salmoniformes
Eggs (type)	Undescribed	Pelagic, few demersal	Mouth brooders	Pelagic
Egg shape	–	Spherical (most); oval (engraulids)	Round	Round
Chorion	–	Smooth	–	Smooth or with inner pustules
Yolk	–	Segmented	Large	Segmented
Oil globules	–	0, 1 or many	0	1 to many
Larvae - Shape	Leptocephalus, deep	Elongate, slender	Stocky, precocious	Elongate, slender
Vertebrae	72–240	38–62	50–54	31–70
Preanus length	46–73% SL	65–95% SL	About 50% SL	70–90% SL
Gut character	1 to few prominent loops	Straight, simple	Straight	Straight, folds or sacs, often trailing
Eyes	Round	Round	Round	Round to oval, some stalked
Head spines/barbels	None	None	Barbels on snout, lower jaw	None
Transformation	Marked, shrinkage	Marked; fins migrate	Gradual	Marked
Special pelagic-juvenile stage	None	None	None	None
Fin elements	Soft rays	Soft rays	Spines and rays	Soft rays
Early forming fins	None	None	All, in embryo	None
Pelvic fins form	Absent	Late, abdominal	Early	Late, abdominal
Pectoral fins form	Late	Late	Early	Late, some long
Dorsal fin	Single, short to long	Single, short	Single, short	Single, short
Anal fin	Single, short to long	Single, longer than Dorsal*	Single, short	Single, short
Adipose fin	None	None	Present	Present in most
Caudal fin (PrC)	Absent to 4	10+9	7+8	10+9
Miscellaneous	Large mouth, huge gape	* Dorsal longer in <i>Etrumeus</i>	Yolk retained into juvenile stage	Pigment important

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Stomiiformes	Aulopiformes	Myctophiformes	Gadiformes (Macrouridae)
Eggs (type)	Pelagic	Pelagic	Pelagic	Pelagic
Egg shape	Spherical	Spherical	Spherical	Spherical
Chorion	Smooth (most)	Smooth (most)	Smooth (most)	Usually sculpted*
Yolk	Segmented	Homogeneous or segmented	Segmented	Undescribed (homogeneous in 1)
Oil globules	0 or 1	0 or 1	0 or 1	1
Larvae - Shape	Elongate, slender	Most elongate, some stout	Varies; often elongate	Attenuate; tapers to finless tip
Vertebrae	29–98	(29) 38–121	30–41	80–116+
Preanus length	30–95% SL (most long)	20–80% SL	30–65% SL	<50% SL (in most)
Gut character	Straight, trailing in a few	Straight in most	Straight; various shapes	Coiled; often dark peritoneum
Eyes	Round to oval, some stalked	Round to very narrow; some with choroid tissue	Round to narrow; some stalked or with choroid tissue	Round
Head spines/barbels	None	None in most*	None*	Barbels lower jaw
Transformation	Marked, photophores delayed	Marked, prolonged or delayed	Marked	Marked, especially changes in fin rays
Special pelagic-juvenile stage	None	Present in some	None	Yes, although may occur deep
Fin elements	Soft rays	Soft rays	Soft rays	Soft rays
Early forming fins	P ₁ in <i>Ichthyococcus</i>	D and P ₁ in some	P ₁ in <i>Neoscopelus</i>	P ₂ , D and A
Pelvic fins form	Late, abdominal	Early in some, abdominal	Early in some, abdominal	Early often elongate
Pectoral fins form	Late	Early in some	Early in some	Late, pedunculate
Dorsal fin	Single, short	Single, short	Single, short	Usually 2
Anal fin	Single, short	Single, >D in most	Single, short	Single
Adipose fin	Present in some	Usually present	Present	None
Caudal fin (PrC)	10+9	10+9	10+9	Absent
Miscellaneous	Photophores form in groups; wide finfolds in some	* Present in <i>Sudis</i> and <i>Alepisaurus</i>	* Preopercle spines in <i>Nannobranchium</i>	* Some smooth. Some larvae luminescent

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables

Character	Gadiformes (Gadidae)	Gadiformes (Lotidae)	Gadiformes (Phycidae)	Gadiformes (Merlucciidae)
Eggs (type)	Pelagic	Pelagic	Pelagic	Pelagic
Egg shape	Spherical	Spherical	Spherical	Spherical
Chorion	Smooth	Smooth, large pits	Smooth	Smooth
Yolk	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Oil globules	None	1	1 to multiple	1
Larvae - Shape	Moderate	Elongate	Stocky	Elongate
Vertebrae	49–61	62–78	44–55	51–57
Preanus length	39–50% SL	40–50% SL	40–55% SL	45–50% SL
Gut character	Coiled	Coiled	Coiled	Coiled
Eyes	Round	Round	Round	Round
Head spines/barbels	Barbel on lower jaw	Barbel on lower jaw	Barbels lower jaw or snout	None
Transformation	Gradual	Gradual	Gradual	Gradual
Special pelagic- juvenile stage	None	None	Yes, neustonic pigment	None
Fin elements	Soft rays	Soft rays	Soft rays	Soft rays
Early forming fins	Caudal	Pelvic	Pelvic	None
Pelvic fins form	Last to form	Early	Early	2 nd to form
Pectoral fins form	Late	Last	Last	Late
Dorsal fin	3, almost equal in length	1–2	2, short + long	2, 2 nd with low midsection
Anal fin	2	1, long	1	1 with low midsection
Adipose fin	None	None	None	None
Caudal fin (PrC)	5–7 on hypurals	6–8 on hypurals	6–9 on hypurals	8–9 on hypurals
Miscellaneous	X–Y bones absent	X–Y bones absent; P ₂ ray count increases at transformation	X–Y bones present P ₂ ray count increases or decreases at transformation	X–Y bones present

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Ophidiiformes	Batrachoidiformes	Lophiiformes	Atheriniformes
Eggs (type)	Pelagic (or viviparous); some in veils	Demersal; attachment devices	Pelagic; often in mucous veils	Demersal; attachment devices
Egg shape	Spherical or slightly oval	Spherical	Spherical to slightly oval	Spherical
Chorion	Smooth	Smooth	Smooth	Smooth or with filaments
Yolk	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Oil globules	0 or 1	0 to several	0 or 1	0 or 1
Larvae - Shape	Elongate	Stocky	Globular, plump	Moderately elongate
Vertebrae	48–129	34–49	16–31	36–47
Preanus length	33–55% SL	About 50% SL	>75% SL (most)	20% SL to 50% SL
Gut character	Straight, then coiled	Coiled	Coiled	Coiled
Eyes	Round	Round	Round	Round
Head spines/barbels	Opercle spines in a few	Cirri on lower jaw	Rarely	None
Transformation	Gradual (most; marked (few)	Gradual	Marked	Gradual
Special pelagic-juvenile stage	Present in some	None	None	None
Fin elements	Soft rays	Soft "spines" and rays	Spines and rays (elongate in some)	Spines and rays
Early forming fins	P ₁ in some ¹	None	Often (D, P ₁ , P ₂)	None
Pelvic fins form	Late, thoracic or jugular	Late, thoracic	Early or late, thoracic	Late, abdominal to thoracic
Pectoral fins form	Early in some	Early	Late (most)	Late
Dorsal fin	Single, long	1 very short, 2 nd long	2, anterior an illicium	2
Anal fin	Single, long	Single	Single	1
Adipose fin	None	None	None	None
Caudal fin (PrC)	0–14	7+7	4+4 (8–9 total)	9+8
Miscellaneous			Body enclosed in "envelope" in many	

¹ Vexillum forms early in Carapidae

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Cyprinodontiformes	Beloniformes	Lampridiformes	Beryciformes
Eggs (type)	Demersal (also viviparous)	Pelagic or demersal	Pelagic	Pelagic
Egg shape	Spherical	Spherical to oval	Spherical	Spherical
Chorion	Filaments on most	Smooth or with filaments, spines	Smooth; spinules in some	Smooth
Yolk	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Oil globules	Many	0 (usually) to many	0 to many	1
Larvae - Shape	Moderately stocky	Elongate (most) compressed	Elongate and	Slender to stocky
Vertebrae	25–36	36–97	46–200	15–32
Preanus length	About 47–55% SL	65–80% SL	45–90% SL	30–60% SL
Gut character	Coiled	Straight	Coiled	Coiled
Eyes	Round	Round to oval	Round	Round
Head spines	None	Chin barbels in a few	None	Extensive
Transformation	Gradual	Gradual	Gradual	Gradual (usually)
Special pelagic-juvenile stage	None	None	Present (some)	Present (some)*
Fin elements	Soft rays	Soft rays	Soft rays	Spines and rays
Early forming fins	Caudal (in embryo)	Caudal (often in embryo)	Anterior D or P ₂	P ₂ often; D in some
Pelvic fins form	Late, abdominal	Late, abdominal	Early (usually), abdominal to thoracic*	Early in many; various locations
Pectoral fins form	Varies; some early	Late	Late	Mid-sequence
Dorsal fin	Single	Single (rarely with finlets)	Single*	Single or 2
Anal fin	Single	Single	0 or single	Single, 0–4 spines
Adipose fin	None	None	None	None
Caudal fin	12–22	7+8 (PrC)	3–32	10+9 (PrC)
Miscellaneous			*Elongate or ornamented fin rays in many	*"Rhynchichthys" in Holocentridae

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Stephanoberyciformes	Zeiformes	Gasterosteiformes	Syngnathiformes
Eggs (type)	Pelagic	Undescribed	Demersal	Demersal; often in brood pouch
Egg shape	Spherical	–	Spherical	Spherical to pear-shaped
Chorion	Smooth	–	Adhesive	Smooth
Yolk	Homogeneous	–	Homogeneous	Homogeneous
Oil globules	1	–	Multiple	0 to many
Larvae - Shape	Slender to stocky	Stocky, compressed	Elongate	Elongate, stocky or prehensile tail
Vertebrae	23–59	22–46	27–34	23–87
Preanus length	30–80% SL	About 50% SL	40–60% SL	45–90% SL
Gut character	Coiled, few straight	Coiled	Straight, thick	Straight (usually)
Eyes	Round	Round	Round	Round
Head spines	Present in few	Many	None	On bony plates in some
Transformation	Gradual to marked	Gradual	Gradual	Gradual
Special pelagic-juvenile stage	Present in some*	Present in some	Present in some*	Pelagic coloration in some*
Fin elements	Spines and rays	Spines and rays	Spines and rays	Spines and rays
Early forming fins	P ₂ in several	P ₂ in some	None	None
Pelvic fins form	Early; various locations	Early, abdominal to thoracic	Late; 1 spine, 0–2 rays	Late, abdominal or absent
Pectoral fins form	Mid-sequence	Late	Late	Late
Dorsal fin	Single or 2	2, 1 st short, 2 nd long	2, 1 st short, 2 nd short	Single or 2
Anal fin	Single, 4 spines	Single, 1–3 spines	Single, short	Single
Adipose fin	None	None	None	None
Caudal fin (PrC)	10+9	13–15	12–13	0–14
Miscellaneous	*"Kasidoron" in Gibberichthyidae		* Oceanic juvenile in <i>G. aculeatus</i>	*Centriscidae

TABLE 4. (Cont'd). Egg and larval characteristics of orders (and certain gadiform families); an expansion of similar tables found in Ahlstrom and Moser, 1976; Fahay, 1983; Fahay and Markle, 1984; Leis and Trnski, 1989; Matarese *et al.*, 1989; Leis and Carson-Ewart, 2004; Richards, 2006. Values are based on taxa in present study area. Also see Perciformes suborders for similar tables.

Character	Scorpaeniformes	Perciformes	Pleuronectiformes	Tetraodontiformes
Eggs (type)	Pelagic or demersal	Pelagic or demersal	Pelagic, rarely demersal	Pelagic or demersal
Egg shape	Spherical to slightly elliptical	Varies; spherical in most	Spherical	Spherical
Chorion	Smooth	Smooth (usually)	Smooth (usually)	Smooth or sculpted
Yolk	Homogeneous	Homogeneous (most)	Homogeneous (usually)	Homogeneous
Oil globules	0 to many	0, 1 or more	0, 1 to many	Many
Larvae – Shape	Elongate to stocky	Elongate to stocky	Compressed	Stocky to globular
Vertebrae	22–69	24–26 (most); 18–168 total range	24–60	16–23
Preanus length	20–60% SL	20–80% SL	<40% SL (usually)	40–90% SL
Gut character	Coiled	Coiled in most	Coiled, bulging	Coiled, large
Eyes	Round	Round; some narrow or with choroid tissue	Round	Round
Head spines	Present, often extensive	None to extensive	Extensive in some	Rarely
Transformation	Gradual	Gradual (usually)	Eye migrates	Gradual
Special pelagic-juvenile stage	Often	Present in some	Prolonged pelagic stage in some	None
Fin elements	Spines and rays	Spines and rays	Soft rays	Spines and rays*
Early forming fins	None	1 or more (some)	Ant. D or P ₂	None (in most)
Pelvic fins form	Mid-sequence	Early in some; usually thoracic	Early in some; thoracic to jugular	Late or absent
Pectoral fins form	Mid-sequence; often large	Early in some	Late	Early in some
Dorsal fin	Single or 2	Single or 2 in most	Single	Single or 2
Anal fin	Single, 0–3 spines	Single, 1–3 spines	Single	Single
Adipose fin	No	No	None	None
Caudal fin (PrC)	Varies; 5+5; 8+7; 7+6, etc.	9+8 (usually)	9+8 (usually)	4+5, 5+5, 5+6, or 6+6 (or "clavus")
Miscellaneous	All have suborbital stay	Extreme variation in most characters; see suborders	Elongate fin rays in many	* or soft rays only

