Figure 198. Atlantic spiny lump sucker *Eumicrotremus spinosus*. Massachusetts Bay. Drawn by H. L. Todd.

Biology. A benthic species occurring in cool northern seas, living on mud, gravelly, or rocky bottoms at depths of 5–82 m (Dunbar and Hildebrand 1952; Backus 1957b). Temperature range is −1.4° to 5°C (Scott and Scott 1988). Spiny lump sucker from European waters eat amphipods (Scott and Scott 1988) and are eaten by Atlantic cod (Jensen 1944c) and thick-billed murre (Gaston et al. 1985). One specimen was infected with a blood parasite (Khan et al. 1980). Little is known about reproduction, but eggs measuring 2.3–2.5 mm in diameter of a golden yellow color were found in a Greenland specimen (Scott and Scott 1988). Andriashev (1954) reported eggs 1.2–4.5 mm in diameter deposited on a rocky bottom in August or September.

Acknowledgment. A draft of the cyclopteroid section was reviewed by Kenneth W. Able.

General Range. Spiny lump sucker inhabit the Canadian Arctic and Greenland east to Nova Zemlya in the Barents Sea and northern parts of the Atlantic Ocean, from Hudson Bay south to the Gulf of Maine as strays (Scott and Scott 1988).

Occurrence in the Gulf of Maine. Stray specimens of this northern fish have been reported from Eastport, Maine; from off Cape Ann; from Salem, and on the north side of Massachusetts Bay; three small specimens were collected about 15 miles southeast of Cape Ann by the U.S. Fish Commission in 1878.

Sea snails. Family Liparididae

Kenneth W. Able

Sea snails are tadpole-shaped, soft-bodied, naked, generally small fishes; like lumpfish, most of them have a sucking disk on the ventral surface. But, unlike lumpfishes, snailfishes have a single dorsal fin (vs. two) with numerous dorsal rays (28–82), more anal rays (24–76), and more vertebrae (38–86). The more than 150 species of snailfishes (Liparididae or Cyclopteridae of some authors, see Able et al. 1984) are known in all oceans from the Arctic to the Antarctic and from the intertidal zone down to greater than 7 km (Andriashev 1954, 1986). The Gulf of Maine harbors four species.

There has been considerable confusion regarding the taxonomy of these forms. In addition, realization that there are more species (three Liparis and one Careproctus) in the Gulf of Maine than were recognized by Bigelow and Schroeder necessitates a complete reexamination of their distribution, biology, and life history. Most notably, it is clear that *Liparis liparis* does not occur in the western North Atlantic (Able 1990a). Prior accounts of this form are probably due to confusion with two previously undescribed species, *L. inquisitus* and *L. coheni* (Able 1973, 1976b). Two other deepwater snailfishes that lack disks (*Paraliparis calidus*, *P. copet*) are reported from north and south of the Gulf of Maine (Able et al. 1986) and might occur here.
**FLATDISK SNAILFISH / Careproctus ranula (Goode and Bean 1879)**

![Image of Flatdisk snailfish](image)

Figure 199. Flatdisk snailfish *Careproctus ranula*. Off the mouth of Halifax Harbor, female, 52 mm SL, USNM 22310. Insert is ventral view of sucking disk. Drawn by H. L. Todd. (From Goode and Bean 1896: Fig. 251.)

**Description.** Anterior part of body deepest and broadest, tapering gradually to small caudal fin (Fig. 199). Pectoral fin bilobed, with upper, larger lobe reaching back to about anal fin origin. Pectoral fin notch shallow. Sucking disk flattened; disk diameter generally greater than eye diameter but not exclusively so, contrary to previous reports (Burke 1930). Skin naked, soft, flaccid, and unpigmented.


**Color.** Unpigmented except for the black eye.

**Size.** All specimens examined, including adults, are less than 75 mm TL.

**Distinctions.** Distinguished from closely related species (i.e., those with a sucking disk) by the presence of a single pair of nostrils (as opposed to two pairs in *Liparis* and *Cyclopterus*), more median fin rays, and the lack of a notch in the dorsal fin as found in *L. atlanticus* and *L.inguinalis*.

**Reproduction.** The smallest female with ripe ovaries was 54 mm TL (Able and Irion 1985). Eggs that appeared mature were 3.0 mm in diameter, and females with eggs of this size typically had ten to twenty eggs in the ovary. A 44-mm specimen from the Gulf of Maine (MCZ 9948) taken in April had seven eggs about 2.0 mm in one ovary and ten eggs in the other. Mature eggs have been observed in several seasons, suggesting a protracted spawning period.

**General Range.** This species has been collected from 100 to 253 m from the Gulf of St. Lawrence, off Nova Scotia, and in the Gulf of Maine (Able and Irion 1985). Data from unpublished collections indicate that it occurs further south, at similar depths, from the edge of Georges Bank to off New Jersey and off Chesapeake Bay (K. W. Able, pers. obs.), but these individuals have somewhat different meristic features and should be investigated further.

**Occurrence in the Gulf of Maine.** Most collections are from deep water in the mouth of the Bay of Fundy, but individual specimens have been collected in deep water off the central coast of Maine, in the central basin, and the Northeast Channel (K. W. Able, pers. obs.). *Albatross IV* collected one (MCZ 99446) at 42°53′ N, 70°03′ W at 101–106 m depth.

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**ATLANTIC SEA SNAIL / Liparis atlanticus (Jordan and Evermann 1898)**

![Image of Atlantic sea snail](image)

**Description.** Body broad anteriorly, laterally compressed behind anal fin origin (Fig. 200). Head profile relatively flat with gradual slope to snout. Anterior and posterior nostrils in tubes, anterior nostril much longer. Eyes and mouth small. Posterior jaw teeth strongly triglobed, with lobes of similar size. Dorsal fin originates behind suprabranchial pores. Notch in dorsal fin especially prominent in males during breeding season when anterior rays become elongate and separate at tips. Posterior dorsal and anal fin rays barely reach caudal fin base. Pectoral fin bilobed, longest ray in upper lobe not quite reaching anal fin origin; rays in lower lobe fleshy at tips. Disk relatively large.

Color. In preserved specimens, dorsal surface uniformly brown, somewhat lighter ventrally, lightest on disk. Caudal fin often with one to three vertical bars. Live specimens were black, gray, or dark brown on the body with fins barred with white, blue, or pink (Detwyler 1963).

Size. Reach 144 mm TL (128 mm SL) and 28.4 g. The largest specimen from extensive collections in the Gulf of Maine was 97 mm TL (Detwyler 1963).

Distinctions. Differ from other snailfishes, except L. inquisitus, in the presence of a notched dorsal fin, and from other species in that the dorsal and anal fins only reach the base of the caudal fin (vs. overlapping) and in having fewer pyloric caeca (23–45 for L. atlanticus vs. 14–21 for L. inquisitus).

Habits. This benthic species is intertidal to subtidal along the coast, although some are apparently found on Georges Bank as well (Able et al. 1986). Juveniles and adults are often found under stones or attached to and other seaweeds (Bigelow and Schroeder; Detwyler 1963), as well as on hard, sandy-mud bottom (Gordon and Backus 1957). Liparis atlanticus have been found stranded in the extensive intertidal zone of Minas Basin, N.S. (Rleckney and McAllister 1973). Prior records from sea scallops appear to be misidentifications (Able 1973; Able and Musick 1976); Liparis atlanticus have been reported from tide pools (6–75 cm deep) in Newfoundland at 6.0–12.5°C and 29.5–30.0 ppt (Van Vliet 1970). At one extensively collected location in the Gulf of Maine they were rare at temperatures above 12°C (Detwyler 1963).

Food. Stomachs of fish (65–88 mm TL) from the New Hampshire coast contained primarily crustaceans with fewer polychaetes. Feeding may occur in early morning and evening (Detwyler 1963).

Predators. Found in the stomachs of one winter skate and three sea raven (Rountree 1999).

Parasites. A tapeworm, Spathebothrium simplex, was common in fish from New Hampshire (Munson 1970) but other parasites including trematodes, acanthocephalans, nematodes, and protozoans were found (Detwyler 1963). A protozoan, Haemagogcerina sp., was recorded from Quebec specimens (Margolis and Arthur 1979) and haematozoa from specimens collected in New Brunswick (Laird and Bullock 1969).

Reproduction and Early Life History. In New Hampshire, this species probably reaches sexual maturity at 60–70 mm in its second year (Detwyler 1963). Mature adults begin migrating into the intertidal zone in October prior to spawning in March. Although these had as many as 1,400–3,000 eggs, only 475–700 reached maturity at any one time. In aquaria, females typically induced the male to select and prepare a spawning site.
Prior to spawning the male drove conspecifics away from the spawning area. The male cleaned the area, a stone with attached Irish moss, Chondrus crispus, by rubbing it with his snout. Eventually he took a position near the site, expanded his fins, and began to quiver. The female, now with a prominent bulge in the area of the vent, swam over the site prepared by the male and deposited a small mass of eggs. The male fertilized the eggs and then nuzzled them against the algae, butting them into place with his snout. The female deposited four more egg masses and these were added to the initial mass. The female eventually left the site and became inactive while the male took a position next to the egg mass and fanned it with his fins. He guarded the eggs for several days and attacked any intruders. In another instance, Detwyler (1963) observed that a single egg mass could result from a single pair of adults or one female and several males. Adults left the intertidal spawning area in June (see Detwyler 1963 for additional details).

Fertilized eggs are 0.8–1.4 mm in diameter. Embryonic development up to yolk-sac absorption has been described (Detwyler 1963). The larvae are distinct from all other western North Atlantic Liparis, except L. inquillus, in the small size at comparable stages of development, presence of a notched dorsal fin, and fin ray counts (see Able et al. 1986). Liparis atlanticus larvae differ from L. inquillus in having lateral melanophores on the tail in preflexion larvae (<8 mm) and a smaller eye diameter–disk length ratio.

The average length-weight relationship can be expressed as log W = –13.1546 + 3.4181 log L for females; log W = –11.5067 + 3.0004 log L, τ = 0.92 for males (Detwyler 1963).

**General Range.** Along the coast from Ungava Bay to as far south as Rhode Island, Connecticut, and the south shore of Long Island (Able and McAllister 1980), including Georges Bank (Able et al. 1986).

**Occurrence in the Gulf of Maine.** Extensively collected from the coast of New Hampshire and Massachusetts Bay (Detwyler 1963; Collette 1986; Collette and Hartel 1988). Larvae have been collected frequently from southern Nova Scotia, near the mouth of the Bay of Fundy (Able et al. 1986), and the coast of Maine (Hauser 1973), suggesting that adults also occur in these areas.

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**Figure 201.** Gulf snailfish Liparis coheni. 44°37.5′ N, 66°30.5′ W, 70.7 mm TL, USNM 212261. Drawn by R. Bradley. (From Able 1976: Fig. 1.)

**Description.** Anterior part of body broad, then compressed behind anal fin origin (Fig. 201). Head broader than high, sloping gradually to snout. Anterior nostril in tube; posterior a raised slit. Mouth extending to below front of small eyes. Teeth trilobed; anterior teeth with weakly defined lobes. Dorsal fin origin behind vertical through suprabranchial pores. Anterior dorsal rays somewhat shorter, longer posteriorly. Notch in dorsal fin absent. Dorsal fin overlaps one-quarter to one-half of caudal fin. Pectoral fin bilobed, rays in upper lobe extending to near origin of anal fin, rays in lower lobe separate and fleshy at tips. Disk slightly longer than wide.


**Size.** Maximum recorded size is 89.0 mm TL.

**Distinctions.** Distinguished from Coreproctus munda by the larger disk, which is several times greater than eye diameter. Liparis coheni differs from other Liparis in the Gulf of Maine in lacking a notch in the anterior dorsal fin. This species was probably referred to as L. liparis by Bigelow and Schroeder.
Habits. Juveniles and adults are benthiic at depths from 4 to 210 m in estuaries and near shore (Able 1976b; Able and Irion 1985). Little else is known because it is seldom collected and in the past has been confused with other snailfishes.

Reproduction and Early Life History. Spawning occurs over a prolonged period during the winter and early spring, based on collection of mature males and females, as well as larvae (Able 1976b). Larvae can be distinguished from other Liparis in the Gulf of Maine by larger sizes at comparable stages of development, lack of a dorsal fin notch, and higher fin ray counts (Able et al. 1986). Most larvae have been collected in estuaries or nearshore waters of the central Gulf of Maine and off southern Nova Scotia.

General Range. Liparis coveni have been collected from the Gulf of Maine, northern Georges Bank, on Roseway Bank off Nova Scotia, and in the Gulf of St. Lawrence, especially in the St. Lawrence estuary and Chaleur Bay (Able 1976b; Able and Irion 1985).

Occurrence in the Gulf of Maine. Known to occur in Massachusetts Bay (Collette and Hartel 1988), Boothbay Harbor, the mouth of the Damariscotta River, the mouth of the Bay of Fundy, Passamaquoddy Bay, and northern Georges Bank (Able 1976b; Able and Irion 1985).

INQUILINE SNAILFISH / Liparis inquinulus Able 1973

Description. Tadpole-shaped, body compressed behind anal fin origin (Fig. 202). Head broader than high, sloping to snout, then rounded. Anterior nostrils in tubers; posterior nostrils appear as raised pores. Mouth extends to front of small eye. Lips with scalloped appearance. Teeth trilobed, anteriorly with weakly defined lobes. Dorsal fin origin behind suprabranchial pores, notched at fifth to seventh ray; rays in notch about one-half of longest ray before notch. Dorsal fin overlaps one-tenth to one-quarter and anal fin overlaps one-quarter to one-half of caudal. Pectoral fin bilobed; rays in upper lobe extend to anal fin origin; rays in lower lobe separate and fleshy at tips. Disk slightly longer than wide.


Color. Extremely variable; spotted, striped, mottled, or plain (Able 1973). These patterns do not seem to be correlated with sex, season, or geographical location. The eye in live specimens can be black, brown, or silvery. The caudal fin is barred.

Size. The maximum size of adults is 71 mm TL.

Distinctions. Liparis inquinulus have a larger disk than C. ranaula (greater than eye diameter vs. less than eye diameter).

They differ from L. coveni in the notched dorsal fin and from L. atlanticus in having more dorsal (33–38 vs. 31–34), anal (28–31 vs. 24–27), and pectoral fin rays (30–35 vs. 26–30).

Habits. Liparis inquinulus have been collected from 3 to 97 m, where they are often commensal with sea scallop, Placopecten magellanicus (Able 1973, Able and Musick 1976). This association appears to be distinctly seasonal (Able and Musick 1976; Luczkovich et al. 1991), with many individuals (12–55 mm) in scallops through the summer but fewer in fall and winter, apparently because they move inshore to spawn. When L. inquinulus were introduced into aquariums with scallops they swam over and around the scallops but concentrated most of their activity along the scallop's mantle. Eventually they placed their heads against the mantle and forced their way into the mantle cavity with exaggerated swimming motions. Inside the scallop, fish attached to the mantle by their disks, usually in an inverted position. As many as 32 juveniles have been found inside a single scallop (Able and Musick 1976).

Use of sea scallops may follow a diet pattern (Able and Musick 1976). In a single 24-h period 3,593 fish, averaging 21.0 mm TL, were collected from 616 of 841 scallops examined in a single area in the New York Bight. Most occurred during the day. No noticeable damage to scallop tissues has been observed as a result of their presence. Liparis inquinulus and red

Figure 202. Inquiline snailfish, Liparis inquinulus. 39°30' N, 73°30' W, 42.5 mm TL, USNM 208466. Drawn by J. Davis. (From Able 1973: Fig. 1.)
Lake, *Urophycis chuss*, may co-occur in sea scallops (Bigelow and Schroeder; Musick 1969; Able and Musick 1976). In aquariums, without scallops, *L. inquelinus* preferred an inverted resting position with the disc attached to any smooth substrate such as bivalve shells, rocks, or the side of the aquarium. Once attached, a fish usually flexed the tail alongside the head.

**Food.** *Liparis inquelinus* is apparently a nocturnal feeder (Able and Musick 1976). In aquariums, fish appeared to depend on the reception of tactile and/or gustatory stimuli received by the head or pectoral fins and not visual cues. When swimming, the fleshy fin rays in the lower lobe of the pectoral fin were extended toward the bottom. If these fin rays or the head touched live amphipods, the amphipods were eaten. Histological examination demonstrated the presence of taste buds on the surface of the lower pectoral fin rays. Observations over a 24-h period indicated that fish probably left the scallops at night to feed: the fullest stomachs, with the least-digested prey items, occurred after the fish returned to the scallops. Food was primarily bentho-crustaceans, as indicated by presence of sand grains in the stomach along with the prey, which were usually amphipods (Able and Musick 1976).

**Predators.** Sea scallops may offer *L. inquelinus* a refuge from most predation. The only known predators of large sea scallops is the large enough to be occupied by *L. inquelinus* (Able and Musick 1976; Lutzkovich et al. 1991), are Atlantic wolffish and Atlantic cod (Bourne 1964), and these eat scallops only occasionally. *Liparis inquelinus* may maximize protection by living in scallops most of their demersal life, entering as soon as they leave the plankton and remaining in association until they begin to move inshore to spawn. There is no evidence of predation by the co-occupant, *U. chuss* (Lutzkovich et al. 1991). *Liparis inquelinus* have been found in stomachs of cod and sea raven (Rountree 1999).

**Reproduction and Early Life History.** In the laboratory, individuals deposited eggs in unguarded small clumps of 20–80 on the bottom of the aquarium. Once, eggs were collected in the field attached to hydroids (Able and Musick 1976). Females may spawn more than once, based on laboratory observations and field-collected fish with multiple modes of egg diameters in the ovary. The number of maturing eggs varied from 105 to 1,135 for fish in the laboratory and from 231 to 563 for fish collected off New Jersey. Ripe eggs are 1.0–1.3 mm in diameter with oil globules.

In the Mid-Atlantic Bight spawning probably occurs at lengths of 41–72 mm TL from February through April (Able and Musick 1976) and over a similar period in the southern Gulf of St. Lawrence (Able and Irion 1985). Larvae are planktonic from April through June and have been collected during May in the Gulf of Maine. The larvae can be distinguished from other members of the genus in the western North Atlantic by the small sizes at comparable stages of hatching, disk formation, notochord flexion, presence of a notch in the anterior dorsal fin during late flexion and beyond, and generally lower fin ray counts (Able et al. 1986). Larvae larger than 13 mm TL were not usually found in the plankton.

**General Range.** Known from Newfoundland to Cape Hatteras including the Gulf of St. Lawrence and Georges Bank (Able 1973; Able et al. 1986).

**Occurrence in the Gulf of Maine.** Collections of larvae and juveniles from sea scallops have been reported from Georges Bank and shallow inner portions of the Gulf of Maine, the Bay of Fundy, and Browns Bank off Nova Scotia (Able and Musick 1976; Able et al. 1986).

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**PERCIFORM FISHES. ORDER PERCIFORMES**

The Perciformes are the most diversified of all fish orders (Nelson 1994). Perciforms are the dominant vertebrate group in the oceans and the dominant fish group in many tropical and subtropical freshwaters. Although Johnson and Patterson (1993) presented evidence that the order as presently constituted is not monophyletic, the classical arrangement utilized by Nelson (1994) will be followed here with a few exceptions. According to Nelson (1994), the Perciformes contain 18 suborders, 148 families, about 1,496 genera, and about 9,293 species. There are representatives of 6 of the 18 suborders in the Gulf of Maine: Percoidae, Labroidei, Zoarcoidei, Trachinoidei, Scombroidei, and Stromateoidei.

**Perchlike Fishes. Suborder Percoidae**

Percoidae is the largest suborder of the Perciformes containing 71 families, 528 genera, and about 2,860 species (Nelson 1994). The Percoidae may be the basal group from which the two most advanced orders, Pleuronectiformes and Tetraodonti-
fins are thoracic in position; and the premaxilla is included in the gape of the upper jaw. Representatives of 13 percoid families are known from the Gulf of Maine: temperate basses (Moronidae), wreckfishes (Polyprionidae), sea basses (Serranidae), bigeyes (Priacanthidae), tilefishes (Malacanthidae), bluefish (Pomatomidae), remoras (Echeneidae), dolphins (Coryphaenidae), jacks (Carangidae), pomfrets (Bramidae), porgies (Sparidae), croakers (Sciaenidae), and butterflyfishes (Chaetodontidae). Many of these are southern species that just visit the Gulf of Maine in the summer.

KEY TO FAMILIES OF PERCOIDEI IN THE GULF OF MAINE

1a. Oval adhesive disc with transverse ridges (lamellae) on top of head
2b. Dorsal fins separate, or nearly so, divided by notch that extends to or almost to fin base, or at least half of dorsal fin spine short and isolated in adults
3b. Dorsal fin spines rigid and sharp, clearly differentiated from soft rays
4a. Maxilla scaly in adults; scale large, keeled in adults; lateral line absent or obsolete; dorsal fin elevated anteriorly, originates posterior to head, usually falcate in adults
5b. Maxilla naked; scales small to moderate; lateral line well developed
6a. Dorsal fin origin on top of head, in advance of upper end of gill opening
7a. Dorsal and anal fins naked, except a small basal sheath may be present; jaws with posterior molliform teeth
8b. Dorsal and anal fins covered with scales; jaws without posterior molliform teeth
9a. Bands of bristle-like teeth in each jaw; body highly compressed, dish-shaped
10a. Lateral line extending to end of caudal fin
11a. Anal fin preceded by 2 small anal fin spines; lateral line may have 2 or 3 notches along posterior portion
12a. First and second dorsal fins about equal in length; first dorsal with 8–10 long spines, teeth of moderate size
13a. First dorsal fin much lower than second dorsal; first dorsal with 7 or 8 short spines, teeth large and very sharp

TEMPERATE BASSES, FAMILY MORONIDAE

Temperate basses have two well-developed dorsal fins, the first with eight to ten spines and the second with one spine and 10–13 soft rays. The anal fin has three spines and 9–12 soft rays. The opercle has two spines. The lateral line extends almost to the tip of the tail and has auxiliary rows above and below the main row. Temperate basses were included with the sea basses in the Serranidae by Bigelow and Schroeder, transferred to the Percichthyidae, which is now considered to include only South American and Australian freshwater species, and then placed in their own family (Johnson 1984; Nelson 1994). Sea basses have three opercular spines and the lateral line does not extend out onto the caudal fin. There are two genera of temperate basses, Morone with four species in North America (two confined to freshwater) and Dicentrarchus with two species from off Europe and North Africa (Nelson 1994).

KEY TO GULF OF MAINE TEMPERATE BASSES

1a. Dorsal fin separated by a distinct space; sides distinctly striped
1b. Dorsal fin joined at their bases; sides not distinctly striped

WHITE PERCH / Morone americana (Gmelin 1789) / Bigelow and Schroeder: 1953:405–407

Description. Body short and deep, three and a half times in total length, compressed, with a thick caudal peduncle (Fig. 203). Head pointed; mouth terminal and short. Lower jaw projects slightly. Small unequal teeth on jaws and sides of tongue. Eyes large, contained about five times in HL. Edges of gill covers slightly serrate. First dorsal fin rounded, third and fourth spines

Striped bass
White perch