PROWFISH

TAXONOMY

Scientific name: *Zaprora silenus* Jordan 1896
Common name: prowfish
Family: Zaproridae
Taxonomic comments:
Current taxonomy distinguishes *Zaprora silenus* as the only species and the only genus in the family Zaproridae (Jordan and Evermann 1898, Mecklenburg 2003, Smith et al. 2004). The relationship of this family to other fishes has been problematic; McAllister and Krejsa (1961) classified the prowfishes in the superfamily Stichaeoidae (northern blennioids) and suggested they are most closely related to the Stichaeidae (pricklebacks). Following McAllister and Kresja (1961), Nelson (1984) classified the Zaproridae in the suborder Zoarcoidei, an expanded group of northern blennylike fishes; however, no further work has been done to elucidate the relationships of *Zaprora* within the suborder Zoarcoidei (Mecklenburg 2003).

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DESCRIPTION

Basic description: A large marine fish.

General description:
A large marine fish; adults may reach over 1 m in total length. Body elongate and laterally compressed; snout short and blunt; mouth large, with small, sharp teeth in a single row. Anal fin and dorsal fin long and evenly contoured, caudal fin large and slightly rounded, pectoral fin longer than head; pelvic fins absent. Olive-gray or brown to gray-blue or green, lighter ventrally, with distinctive large head pores with white, yellow or blue margins and often with many dark or yellow spots on sides and back; fins often dark-edged. Young fish orange-brown with inconspicuous head pores (Eschmeyer et al. 1983, Mecklenburg et al. 2002, Mecklenburg 2003, Smith et al. 2004).
Length (cm): ≤100

Reproduction:
Little studied. Females are sexually mature between 4.4 and 5 years old (Cailliet and Anderson 1975, Smith et al. 2004). Larvae transform at 30 mm (Smith et al. 2004). Juveniles are pelagic.

Ecology:
Pelagic as larvae; become demersal as adults (Smith et al. 2004). Juveniles utilize living cover (e.g., jellyfish aggregations) for rearing (i.e. jellyfish provide juveniles refuge from surface feeders;

Brodeur 1998). May be an obligate commensal with large medusae until adulthood (Brodeur 1998). Little known regarding predators; has been found in diets of diving seabirds and comprised 25% of food biomass delivered to Tufted Puffin (*Fratercula cirrhata*) chicks. Larger skates (*Bathyraja maculata*) and halibut (*Hippoglossus stenolepis*) are known predators (Smith et al. 2004). Although occasionally taken incidentally and processed in commercial fishing operations on the outer continental shelf (Berger 2002 in Smith et al. 2004), no current commercial or subsistence harvest for this species exists.

Food:
Diet consists principally of scyphozoans (jellyfishes) and salps; may also take hyperiid amphipods, euphausiids and other fishes (Mito et al. 1999, Tokranov 1999, Smith et al. 2004, NMFS 2005); sharp teeth and blunt mouth capable of 180° gape allow prowfish to bite off pieces of jellyfish bells and tentacles. Juveniles feed exclusively on jellyfish.

Habitat:
Generally found near the bottom at depths between 100 and 250 m, although they have been found occurring as deep as 801 m (Smith et al. 2004). Most often encountered near the edge of continental shelf and upper slope; commonly caught in the juvenile fish assemblage nearshore (Rogers et al. 1986, Allen and Smith 1988, Smith et al. 2004, NMFS 2005). Thought to prefer rocky substrates in areas of high relief (Tokranov 1999); habitat typical of areas near the continental shelf break. Juveniles and young adults often taken near the surface over deep waters (Mecklenburg 2003).

STATUS

Global rank: GNR – suggested change to G4G5 (13Dec2005)
Global rank reasons:
Population abundance and trends unknown; low occurrence in trawl data may simply indicate species' habitat is poorly sampled by bottom trawls. Widespread coastal distribution; known centers of greatest abundance in the eastern North Pacific are in the Aleutian Islands and Gulf of Alaska. Degree of bycatch in commercial fisheries is unknown but of potential concern.

State rank: S3S5 (17Aug2005)
State rank reasons:
Population abundance and trends unknown; low occurrence in trawl data may simply indicate species' habitat is poorly sampled by bottom trawls. Widespread coastal distribution with centers of greatest abundance in the Aleutian Islands and Gulf of Alaska. Degree of bycatch in commercial fisheries is unknown but of potential concern.

DISTRIBUTION AND ABUNDANCE

Range:
Global range:
North Pacific: Bering Sea south to San Miguel Island, California and Hokkaido, Japan including the Okhotsk Sea (Allen and Smith 1988, Mecklenburg et al. 2002).

State range:
From Navarin Canyon on the northwestern slope of the Bering Sea southeast to Unimak Island and Port Moller, west in the Aleutian Islands to Stalemate Bank near Attu Island and southeast along the outer continental shelf and upper slope (Allen and Smith 1988, Smith et al. 2004). Also in nearshore waters of the Gulf of Alaska from Kodiak, Cook Inlet, Prince William Sound and Southeast Alaska (Rogers et al. 1986).

Abundance:
Global abundance:
This species has been observed infrequently despite numerous and extensive trawl surveys that included thousands of net deployments off Alaska and the west coast of North America. It is unclear whether these results indicate low abundance or a preference for habitat that is poorly sampled by bottom trawls (i.e. rough, rocky substrate or steep bottom gradients; Smith et al. 2004). Most abundant in research bottom trawl catches close to the break between the continental shelf and upper continental slope near 200 m depth (Smith et al. 2004). In Alaska, highest densities recorded near the Aleutian Islands (average CPUE = 65.1 prowfish/km^2), lower in the Gulf of Alaska (average CPUE = 6.7 prowfish/km^2; Smith et al. 2004), Bering Sea (average = 0.01 prowfish/1,000 m^3; Brodeur 1998), and Kachemak Bay (CPUE of 0.01 prowfish/km^2; Abookire et al. 2001).

State abundance:
Population estimate for Alaska is unknown. Most abundant in research bottom trawl catches close to the break between the continental shelf and upper continental slope near 200 m depth; prowfish were collected in the Gulf of Alaska and Aleutian Islands at depths between 34 and 258 m (Smith et al. 2004). Highest densities recorded near the Aleutian Islands (average CPUE = 65.1 prowfish/km^2), lower in the Gulf of Alaska (average CPUE = 6.7 prowfish/km^2; Smith et al. 2004), Bering Sea (average = 0.01 prowfish/1,000 m^3; Brodeur 1998), and Kachemak Bay (CPUE of 0.01 prowfish/km^2; Abookire et al. 2001). Rarely captured in nearshore surveys conducted in Lower Cook Inlet, 1995-1996 (Robards et al. 1999), although prowfish habitat was likely under-sampled.

Trends:
Global trend:
Unknown.

State trend:
Unknown.

PROTECTION

Global protection:
See State protection comments.

State protection:
Protected where species occurs in nearshore waters of Glacier Bay National Park and the Alaska Maritime National Wildlife Refuge.

In the United States, the Magnuson-Stevens Fisheries Conservation and Management Act (Public Law 94-265), amended by the Sustainable Fisheries Act (1996), requires the National Marine Fisheries Service (NMFS) minimize adverse impacts to essential fish habitat (EFH) by the fisheries it manages (EFH defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity"; NMFS 2003). An amendment adopted to the North Pacific Fishery Management Council's Ground Fish Management Plan for the Gulf of Alaska and Bering Sea identified one habitat area of particular concern as living bottom substrates such as corals (NMFS 2003, 2004); protection of bottom substrates also protects bottom-dwelling fish species like *Z. silenus*.

Bottom contact trawl gear is prohibited (no-trawl zones) by the North Pacific Fishery Management Council in specific areas in the Bering Sea including sectors around the Pribilof and Aleutian Islands (this includes the Aleutian Islands Habitat Conservation Area, Aleutian Islands Coral Garden Marine Reserves, and the Bowers Ridge Habitat Conservation Zone); also protected from bottom trawling are 10 sites along the central Gulf of Alaska; 16 seamounts in the Gulf of Alaska are protected from all bottom contact gear as are five sites (for red tree coral) in Southeast Alaska off Cape Ommaney and the Fairweather grounds (AMCC 2005).

CHALLENGES

Global challenges:
See State challenges.

State challenges:
Mortality associated with incidental bycatch in commercial fisheries along the outer continental shelf is of potential concern (see sources in Smith et al. 2004). Studies show higher growth rates for prowfish in the Gulf of Alaska compared to Kamchatka and the northern Kuril Islands. Size-dependent mortality from incidental capture could affect these two populations differently, potentially posing a larger threat to Gulf of Alaska stocks because a higher proportion of larger fish are caught in trawls in this area (Smith et al. 2004).

Increasing ocean temperatures in the 1970s caused changes in the Gulf of Alaska marine ecosystem (Anderson and Piatt 1999); effects of climate and/or ecosystem change on prowfish and their principle prey, jellyfish, are of potential concern. Anderson and Piatt (1999) documented an overall increase in jellyfish biomass in the Gulf of Alaska between 1972 and 1997; a decadal switch to a cold-water regime (as predicted by Ware 1995 in Anderson and Piatt 1999) could potentially reverse this trend, thereby resulting in decreases of this primary food source.

Water pollution from commercial vessel dumping or oil spills throughout this species' range are of potential concern, particularly to pelagic larvae and juveniles which occur close to the surface.

RESEARCH AND INVENTORY NEEDS

Global research needs:
See State research needs.

State research needs:
Research needed on the associations between prowfish and large gelatinous zooplankton (jellyfish), including a comparison of distribution and abundance throughout species' range. Adult and juvenile habitat requirements unknown; need study, including spatial and depth distributions. Investigate potential threats, e.g., predators, habitat loss and the effects of climate change on distribution and/or abundance of primary prey, jellyfish. Information needed on size frequency, growth, reproduction, and diet in waters off Alaska (Smith et al. 2004).

Global inventory needs:
Bycatch in commercial fisheries should be monitored. Range-wide population unknown; directed surveys needed at index locations and elsewhere to estimate abundance and monitor trends.

State inventory needs:
Estimate Alaska population size using trawl surveys and bycatch reports. Monitor the occurrence of prowfish as bycatch in commercial fisheries. Determine geographic range of pelagic juveniles. Directed surveys needed at index locations and elsewhere to estimate abundance and monitor trends. Data needed on jellyfish assemblage abundance and trends; few data currently exist, but those suggest medusae are concentrated around the Pribilof Islands and along surface convergences caused by Langmuir cells in the Bering Sea (see sources in Brodeur 1998). Determine if prowfish abundance is correlated with jellyfish densities.

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
See State conservation and management needs.

State conservation and management needs:
The current lack of knowledge about prowfish population status and habitat requirements limits the ability of fisheries managers to recognize population fluctuations or habitat loss. Management should focus on obtaining a reliable and repeatable estimate of population size and trend and determine factors that could adversely affect prowfish populations (e.g., prey availability, spawning or other habitat availability, predation and bycatch mortality). Threat of incidental bycatch should be studied and bycatch mortality minimized.

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Acknowledgements

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