Fringed flounder
Etropus crossotus

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(Text and information largely based on Reichert 2002)

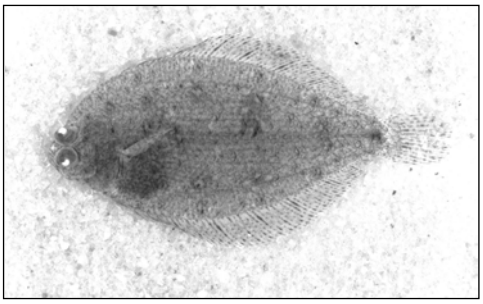

Figure 1: Juvenile Fringe Flounder.
Photo: Marcel Reichert

DESCRIPTION

Taxonomy and Basic Description

The fringed flounder (*Etropus crossotus*) is a species of the genus *Etropus* in the family Bothidae or lefteye flounders (order Pleuronectiformis). The 8 species in the genus *Etropus* are among the smallest Bothidae and are further characterized by the form of the pelvic fin, a straight lateral line, and a relatively small mouth (Leslie and Stewart 1986). The fringed flounder can be distinguished from the other *Etropus* species by the shape of the scales and an evenly brownish gray coloration on the eyed side, while the blind side is whitish and rarely colored. Fins may be speckled with small dark spots while juveniles can have faint spots on the eyed side, especially along the dorsal and anal fin and at the base of the caudal fin.

The fringed flounder is among the most abundant flatfishes in the *Spartina*-dominated saltmarshes of South Carolina (Reichert 2002). This small species has a life history that is characterized by a short life span of just over one year, a long spawning period from March to October, and a diet that does not change considerably during its life and consists predominantly calanoid copepods but also includes considerable numbers of small epibenthic crustaceans and polychaetes (Stickney et al. 1974; Reichert 1998, 2002). The overall sex-ratio is 1:1, and males and females do not exhibit significant differences in growth. Fringed flounders can reach a maximum total length of about 17 cm (6.7 in.), but are rarely longer than 15 cm (6 in.), with a wet weight of seldom more than 40 g or 1.4 oz. (Topp and Hoff 1972; Reichert and Van der Veer 1991; Reichert 2002).

Reversal or eye migration to the right side resulting in a dextral individual is extremely rare. After examining more than 5,000 individuals over 10 years of study, only one dextral individual was observed (female, standard length 8.4 cm, SEAMAP-SA collection, Reichert 2002).

POPULATION SIZE AND DISTRIBUTION

Four *Etropus* species occur in the coastal waters off South Carolina: *Etropus cyclosquamus* (shelf flounder), *Etropus rimosus* (gray flounder), *Etropus microstomus* (smallmouth flounder), and *Etropus crossotus* (fringed flounder) (Leslie and Stewart 1986), but the fringed flounder is the most abundant species in South Carolina (SEAMAP-SA data, Reichert 2002). The fringed flounder has a tropical and subtropical distribution ranging from Chesapeake Bay, VA to the coasts of Brazil and is abundant off the southeast coast of the US and the Gulf of Mexico (Topp and Hoff 1972; Martin and Drewry 1978; Leslie and Stewart 1986; Ogburn et al. 1988; Reichert and Van der Veer 1991; Allen and Baltz 1997; Reichert 2002). In spite of the fact that South Carolina is close to the northern limit of the species' distribution,

density estimates indicate that it is quite successful in maintaining thriving populations in the area (Reichert 2002). Juveniles can be abundant in estuaries in South Carolina, especially during the summer (Reichert and Van der Veer 1991). Catches of fringed flounder in the SEAMAP-SA trawl survey indicate a decline in the early part of the time series through the mid-1990s, with a temporary increase in the mid-2000s, followed by a sharp increase in the most recent years (Figure 2). Although this may not be indicative of the overall population size, it may point to an increase in the fringe flounder population in recent years. It is unclear if the effect of rainfall, temperature, and other environmental factors, especially those affecting the estuarine nursery grounds, changes in species composition, or other factors may explain this relative abundance pattern.

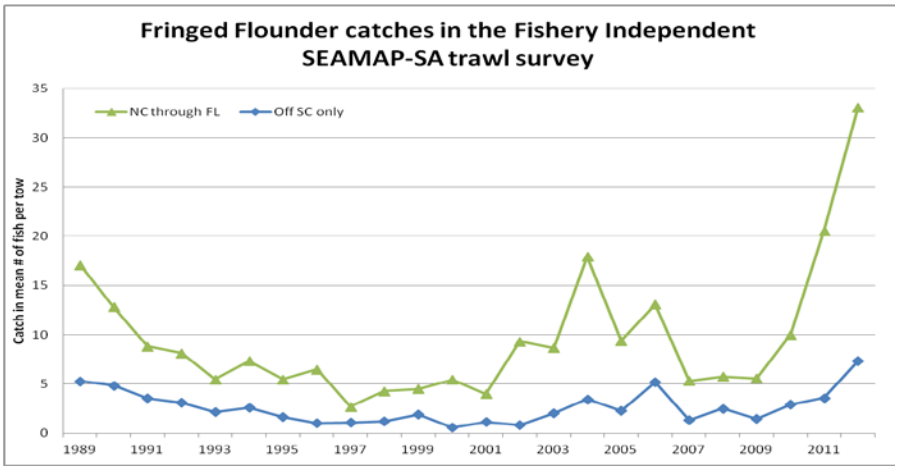

Figure 2: Catches of Fringed Flounders in the SEAMAP-SA Trawl Survey in number of fish per tow.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Adult fringe flounders are commonly found in shallow coastal waters to a depth of about 30 m (98 ft.). Although there is no directed fishery for this small flounder, it is caught in trawls as by-catch and has been caught in sufficient numbers to enter the industrial bottom trawl fishery in the past (Beaumariage 1968; Topp and Hoff 1972; SEAMAP-SA data). The fringed flounder can be found year-round over mud and muddy sand in shallow coastal waters (<30 m depth) and estuaries at temperatures ranging from 11°C to 31°C (52-88°F) and salinities from less than 5 ppt to more than 35 ppt, but it seems to prefer warmer temperatures and higher salinities (e.g. Topp and Hoff 1972; Ogburn et al. 1988; Reichert and Van der Veer 1991). Prey size is limited by the relatively small mouth and consists predominantly of calanoid copepods, small benthic and epibenthic crustaceans and polychaetes throughout most of their lives (Topp and Hoff 1972; Stickney et al. 1974; Reichert and Van der Veer 1991). Fringed flounder is preyed upon by larger flounders, sharks, and other bottom dwelling piscivores. Based on its small size, life history characteristics, its prey and predators, and relative abundance, the fringe flounder may play an important (trophic) role in both estuaries and the shallow coastal ocean.

Fringed Flounders spawn from March through October, peaking in late spring and summer (Hettler and Chester 1990; Reichert 2002). Spawning most likely takes place in shallow coastal waters since sexually mature fringed flounder are rarely collected inside the estuaries, but are also rarely found in waters deeper than 30 m (Reichert

2002). Multiple batches of pelagic eggs, about 0.5 mm (0.02 in.) in diameter, are spawned in these coastal waters from April through September and hatch in a few days. The batch fecundity is estimated to be between 9,000 to 47,000 eggs with a total annual fecundity between 112,500 and 587,500 eggs, depending on the size of the fish (Reichert 2002). Females can reach sexually maturity at 7-7.5 cm (2.8-3 in.) standard length, but 50% of the females reach maturity at 8-8.5 cm (3.1-3.3 in.) standard length.

Eggs hatch within a few days and the larval stage duration is between 27 and 46 days, depending on temperature (Reichert 2002). Larvae and metamorphosing juveniles are transported actively or passively into the estuarine nursery areas. The newly settled juveniles start their demersal life in the marsh creeks when they are about 9 mm (0.35 in.) long. In the following months, they find favorable temperatures (24-29ºC or 75-84 °F) and an abundance of food in the form of copepods, small epibentic crustaceans, and polychaetes which provide for maximum growth (Reichert 2002).

Depending on the time of settlement, they reach a length of about 7 cm (3 in.) in 14 to 20 weeks. At this size, most individuals migrate out of the estuary and into coastal waters where they grow to an adult length of 8 to 13 cm (3-5 in.) and complete reproductive development. Spawning does not commence until late winter/early spring of the year following birth. By that time, almost all the adults that spawned in the previous year have disappeared from the population because the maximum age of the fringed flounder is about 14½ months, which means that it is effectively an annual species (Reichert 1998). The life span is unusually short for this flatfish species as literature information indicates species that live 3-5 years are considered extremely short-lived, and the known life span of most flatfishes generally exceed 6 years (Reichert 2002).

CHALLENGES

Maintaining availability of suitable habitat and water quality are essential for the management of the species. By-catch in the trawl fishery is another challenge as fringed flounders are vulnerable to handling and net entanglement, contributing to by-catch mortality.

CONSERVATION ACCOMPLISHMENTS

In 1986 SCDNR closed estuaries to trawling, thereby protecting important nursery habitat for fringed flounder. This closure and equipment restrictions have reduced by-catch in trawl fisheries which undoubtedly contributes to conservation of these species. A combination of management, although not necessarily directed at fringe flounder conservation, and environmental condition may have contributed to a recent increase in relative abundance.

CONSERVATION RECOMMENDATIONS

- Further explore the ecological role fringed flounders have as trophic links between the benthos and pelagic marine ecosystems.
- Monitor trends in fringed flounder populations by continuing to collect data from ongoing monitoring programs like the SEAMAP-SA trawl survey and by-catch in

the commercial fishery. In addition, the role of environmental conditions, in particular rainfall (salinity) and temperature, in explaining long term relative abundance patterns should be investigated.

- Work with the shrimp fishery to develop ways to return by-catch more expeditiously so as to reduce mortality. Continue developing trawl gear improvements to further reduce the impact on bottom habitat and communities.
- Protect water quality in marine ecosystems by encouraging municipalities to use Best Management Practices (BMPs) to reduce runoff from highways, agricultural fields, and housing developments. Improve BMPs in areas already affected by non-point source pollution.
- Plan development based on sound terrestrial and estuarine ecology that takes into consideration all factors that will affect the long-term health of the estuary ecosystem. For example, rather than use commercially important species as indicators, look at groups of species across all trophic levels.

MEASURES OF SUCCESS

By developing and implementing ways to monitor population trends for fringed flounders and other benthic organisms, SCDNR will be able to document the continued stable abundance of important species. The measurement of success will be the trend in catches of fringed flounders in the SEAMAP-SA trawl survey and other surveys.

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