

Dogfish Prey Information from Dogfish FMP (1999)

2.1.3.5 Food and feeding

Bowman *et al.* (1984) provided an extensive examination of the diet of spiny dogfish collected from shelf waters of the Northwest Atlantic Ocean during the period 1969-1983. The area studied included continental shelf waters extending from Cape Hatteras, North Carolina to Browns bank, Nova Scotia. The stomach contents of 10,167 spiny dogfish were examined during this period (about 50% of the stomachs were empty). Fish comprised the single most important prey item in the diet of spiny dogfish. Herrings (several species), Atlantic mackerel, American sand lance, and codfishes, including species such as Atlantic cod, haddock, silver hake, red hake, white hake and spotted hake were some of most important prey items identified. Other important contributors to the diet of spiny dogfish included *Loligo* and *Illex* squid, ctenophores, crustaceans (principally decapod shrimp and crabs) and bivalves (principally scallop viscera).

Bowman *et al.* (1984) observed a high degree of variability in the diet of spiny dogfish across seasons, areas and years. They considered this a reflection of their omnivorous nature and the high degree of temporal and spatial variability of both dogfish and their prey. Their diet appears broadly related to abundance trends in some of their major prey items. For example, when herring abundance was declining and mackerel abundance appeared to be at a peak during the period 1969-1972, Bowman *et al.* (1984) found mackerel to predominate in the diet of spiny dogfish. Conversely, during 1973-1976 when mackerel abundance was declining the incidence of mackerel in the diet of spiny dogfish was substantially reduced.

The incidence of *Loligo* and *Illex* squid in the diet of spiny dogfish was also shown to be related to their abundance. Another example of the opportunistic nature of spiny dogfish feeding was the appearance of scallop viscera in their diet after the increase in sea scalloping in the Northwest Atlantic Ocean beginning in 1978. Bowman *et al.* (1984) reported that trends in the incidence of scallop viscera in the diet of spiny dogfish closely followed trends in the level of sea scallop fishing effort in the study area.

2.1.3.6. Predators and competitors

As noted in the previous section, Atlantic herring, Atlantic mackerel, and *Loligo* and *Illex* squid are important components of the diet of spiny dogfish when they are abundant and available. As a result, spiny dogfish are potential competitors with virtually every marine predator within the Northwest Atlantic Ocean ecosystem. These include a wide variety of predatory fish, marine mammals and seabirds.

For example, bluefish, sea ravens, and the Atlantic angel shark are known to be major *Loligo* predators. The fourspot flounder, witch flounder, rougtail stingray, and white hake are also known to prey on *Loligo*. In many cases, squid remains in the stomach of fish are only identified as "squid" without reference to species. It is likely that some of these are *Loligo* and there are at least 42 other species of "squid"- eating fish in addition to those identified above (Langton and Bowman 1977). Cetacean and seabird predation upon squid is substantial. Kenney *et al.* (1985) estimated that between 154,000 mt and 224,000 mt of squid were consumed off the northeast US annually by whales and dolphins.

Illex are a major source of food for marine carnivores. Adults are heavily preyed on by porpoises, whales, and numerous pelagic fishes (e.g., tuna and swordfish). Other known predators of *Illex* are the fourspot flounder, goosefish, and bluefish. *Illex* is probably eaten by a substantially greater number of fish, however, partially digested animals are often difficult to identify and are simply recorded as squid remains, with no reference to the species. There are at least 47 other species of fish that are known to eat "squid" (Langton and Bowman 1977). As noted above, squid comprise an important component of the diet of marine birds and mammals (Kenney *et al.* 1985).

Atlantic mackerel have been identified in the stomachs of numerous fish species. They are preyed upon heavily by whales, dolphins, silver hake, white hake, weakfish, goosefish, Atlantic cod, bluefish, and striped bass. They also comprise part of the diet of swordfish, red hake, Atlantic bonito, bluefin tuna, blue shark, porbeagle, sea lamprey, and shortfin, mako and thresher sharks (Langton and Bowman 1977).

2.2.1.3 Habitat Requirements by life history stage

The following information on juveniles and adult dogfish habitat requirements was taken directly from the document "FMP EFH Source Document, Spiny Dogfish, *Squalus acanthias* Linnaeus, 1758: life history, food habits, status of the stock, habitat characterization, and distribution and relative abundance" (McMillan and Morse 1998). It does not contain information on eggs and larvae because dogfish are oviparous (no placenta, live birth). The McMillan and Morse (1998) document is referred to hereafter as the dogfish EFH background document. Most of the tables and figures from McMillan and Morse (1998) are included in this FMP. The McMillan and Morse (1998) dogfish EFH background document is currently being modified for publication by NMFS and can be obtained in its entirety from NMFS, Sandy Hook Laboratory, 74 McGruder Road, Highlands, New Jersey 07732.

Habitat characteristics for juvenile and adult spiny dogfish are provided in Table 4. This table includes the particular study, investigator, geographic area, hydrographic preference, estuarine use, and prey/predator selection.

For this analysis, McMillan and Morse (1998) assumed 32.6 in (83 cm; females) and 23.6 in (60 cm; males) are the median lengths at which 50% of the individuals are mature. Individuals are classified as either adults or juveniles; i.e. males and females for the particular life stage were combined for distribution and abundance plots.

2.2.5.1 Habitat threats prioritized for dogfish EFH

Many anthropogenic (caused by man) actions threaten the integrity of dogfish EFH. These threats have been prioritized based on the following:

Dogfish are epibenthic predators found across the Continental Shelf and in estuaries (Figures 1 and 4-11). They are opportunistic feeders, however, some of their prey items, e.g., menhaden, are estuarine dependent. A total of 14 estuaries in the North Atlantic have been designated as dogfish EFH, and cumulative impacts from estuarine and land-based activities can have negative effects on dogfish EFH in nearshore and offshore waters.

2.2.6 Prey Species

According to section 600.815 (a)(8), actions that reduce the availability of a major prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat that are known to cause a reduction in the population of the prey species may be considered adverse effects on a managed species and its EFH. The bulk of this information can be found in section 2.1.3.5 Food and Feeding.

In summary, dogfish are non-selective predators, however some of their prey items are estuarine dependent. Conservation and enhancement recommendations (section 2.2.5) address degradation in estuarine areas for dogfish and their food sources.