

Atlantic Bluefin tuna, *Thunnus thynnus*

Life cycle

The Atlantic bluefin tuna (ABFT) is a highly migratory species inhabiting the North Atlantic Ocean and its adjacent seas (Mather et al. 1995; Block and Stevens, 2001; Rooker et al., 2007; Galuardi et al., 2010; Galuardi and Lutcavage, 2012). These fish can live between 20 to 32 years and the highest recorded ABFT body weight is 725 kg. Although these fish conduct trans-Atlantic migrations, the International Commission for the Conservation of Atlantic Tunas (ICCAT) manage ABFT as two stocks separated by the 45°W meridian. The major spawning ground for the larger eastern stock is the Mediterranean Sea, where fish spawn from May to August (Heinisch et al. 2008). The current theory for fish of the western stock assumes that these fish spawn solely in the northern Gulf of Mexico and the Florida Straits from April to June (Baglin 1980).

Differential sexual maturation schedules are assumed for the stocks. ABFT of the eastern stock achieve sexual maturity between the ages of three to five years old (Corriero et al., 2005), while western fish are considered mature only at nine years (Restrepo et al., 2010). However, the differential reproductive behavior of the ABFT stocks is a matter of debate. Scientists have questioned the postponed maturation theory for western fish (Lutcavage et al., 1999; Goldstein et al., 2007). In addition, studies provide evidences that the age at maturation of western fish is similar to eastern spawners (Heinisch et al. 2014), and that ABFT utilize additional spawning grounds in the western central Atlantic (Richardson et al., 2016). ABFT are iteroparous annual spawners, i.e. have multiple spawning cycles after achieving maturity. A single female may spawn a total of 50 – 100 million eggs in daily batches over a period of one month (Medina et al., 2002; Aranda et al., 2013; Knapp et al., 2014).

Fisheries

Records of ABFT fisheries date back to ancient times. Fish were caught in the Mediterranean Sea during their pre/post spawning migrations. Historic yield records from the 16th to the 19th centuries give evidence to the existence of a large-scale fishery (Di-Natale,

2010). The traditional Mediterranean ABFT fishery was based on labyrinth traps (Almadra, Tonnara) placed near the shore on the fish migration routes. In the 1990's a more advanced and active fishing method was introduced to the Mediterranean ABFT fishery, purse seining. This method involves a ship that circles a school with a large fishing net (purse seine), creating a net cage with the fish trapped inside alive. The fish are then transferred to a towing cage and are towed to a tuna farm for fattening. This fishing method makes management more difficult, and along with lack of enforcement on fishing quotas, was considered harmful to ABFT populations.

During the previous two decades, both stocks were considered to be under constant fishing pressure and in depletion (Fromentin & Powers 2005.). In 2007 ICCAT initiated a fifteen-year recovery plan for the stocks (updated in 2009). The plan addressed the overfishing problem by means of quota reductions and new enforcement measures. ICCAT expects to achieve full population recovery by 2022, and some indications suggest that the goals have been already achieved (ICCAT, 2015).

Aquaculture

ABFT aquaculture is captured-based. Fish are caught by purse-seiners and transferred to Marine fish pens, where, in most cases, they are fattened for approximately six months, harvested and sold, mainly to the sushi-sashimi markets. Major producing countries are Spain, Italy, Malta, Morocco, Croatia, Greece and Turkey. These tuna farms depend entirely on fishing operations and quotas, and crave for proper supply of (currently unavailable) hatchery produced fingerlings.

Research

Research on culturing Pacific Bluefin tuna started in Japan in the 1960's. The Bluefin tuna research center of Kinki University operates since 1979 and closing the life cycle of the species in captivity was achieved in 2002 (Sawada et al. 2005). In the Mediterranean Sea research on ABFT commenced in 2003 with the first of the three DOTT (Domestication of

Thunnus thynnus) projects, the Reprodott. Successful spawning trials were obtained two years later (Mylonas et al. 2007). These projects (Reprodott, Selfdott, Transdott) focused on reproduction and larval rearing of the species, as well as understanding basic physiological mechanisms. Independent research groups have conducted additional studies on the culture of ABFT across the Mediterranean. A first ABFT land-based breeding center was established in Pt. de Mazzaron, Spain, containing first-generation fish that hatched from eggs spawned following controlled reproduction in the DOTT projects.

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