Collapse of Bluefin Tuna in the Western Atlantic

Introduction

The Atlantic bluefin tuna (*Thunnus thynnus*) is one of the world's largest vertebrates, weighing up to 900 kg (Fromentin & Powers 2005). It is an extraordinary fish. It regularly makes transoceanic migrations and uses its elevated body temperatures to hunt actively in frigid high latitudes (Block et al. 2001). It also fetches astronomical prices in the sushi market (Associated Press 2001). This last fact makes the bluefin a tragic case because short-term economics and politics have conspired against the bluefin's survival. The Atlantic bluefin tuna's western breeding population is unprecedentedly low and declining. Commercial catches off the United States have fallen to 10% of the quota, which suggests a population collapse. Recent research findings are not being incorporated into management decisions. Although the bluefin is a special fish, its problems are just one instructive example of how management can go off track if the scientific part of the process is corrupted by short-term economics and political lobbying.

Two recognized populations inhabit the Atlantic and Mediterranean. Mediterranean-spawning bluefin mature by age 5 (Corriero et al. 2005), whereas bluefin that spawn in the Gulf of Mexico mature by about age 12 (Diaz & Turner 2006). Both populations migrate extensively, mixing throughout the North Atlantic, but they do not interbreed (Lutcavage et al. 1999; Nemerson et al. 2000; Block et al. 2005; Carlsson et al. 2007).

Paper submitted July 12, 2007; revised manuscript accepted October 1, 2007.

Everywhere they swim, bluefin tuna are fished heavily. The European Commission (EC) recently moved to reduce catch quotas for the eastern Atlantic and Mediterranean, but the quotas remain nearly double what EC scientists recommend. We considered the western-Atlantic breeding population, which The World Conservation Union lists as critically endangered.

Western Atlantic catches peaked in 1964 at 18,679 t, declining to 1,523 t in 2005 (Fig. 1). From 1962 to 1967, Japanese boats annually caught 5,000–12,000 t of mature bluefin off Brazil. South Atlantic bluefin now appear extirpated (Porch 2005). After Brazil's bluefin disappeared and North Sea bluefin populations crashed and did not recover (MacKenzie & Myers 2007), concern over the Atlantic bluefin tuna's future prompted several nations to form the International Commission for the Conservation of Atlantic Tunas in 1966. The commission now has 43 members, but has never met its charter mandate to maintain fish populations at levels allowing "maximum sustainable catches."

In 1981 the commission drew a "management line" down the Atlantic's center. Declines in the west were already of sufficient concern that the commission's scientific committee that year recommended western catches "be reduced to as near zero as feasible" (ICCAT 1982). Consequently, in 1982, commission managers recommended an initial catch limit of 1160 t. But bowing to pressure, the next year they raised it to 2660 t (Safina 1993; Porch 2005; Fig. 2). Continued decline followed. By 1991 commission scientists estimated spawning biomass at 22% of the 1975 reference level (ICCAT 2006*b*).

In 1991 the commission faced a proposed listing of the west Atlantic bluefin by the Convention on International Trade in Endangered Species of Wild Fauna and Flora that would have suspended international trade, so they agreed to phase in a 50% quota cut over several years (Safina 1993). In 1994 the commission reduced the quota by 17%. When a U.S. National Research Council review recommended more research, the commission abandoned quota cutting, increasing the quota slightly in 1995 and again in 1997. Population decline resumed.

Reinterpreting Data to Raise Fishing Quotas

In 1998 the commission's scientific committee determined the annual west-Atlantic catch of 2500 t could not be sustained, 2000 t was likely sustainable, and a quota near zero was necessary to restore the population to 1970s levels within 20 years (ICCAT 1999).

A consultant hired by U.S. tuna exporters and placed on the commission's scientific committee suggested the committee reassess the population with a new model that omitted 1970s spawner-reproduction data. The 1970s data showed that large

Conservation Biology, Volume 22, No. 2, 243–246

DOI: 10.1111/j.1523-1739.2008.00901.x

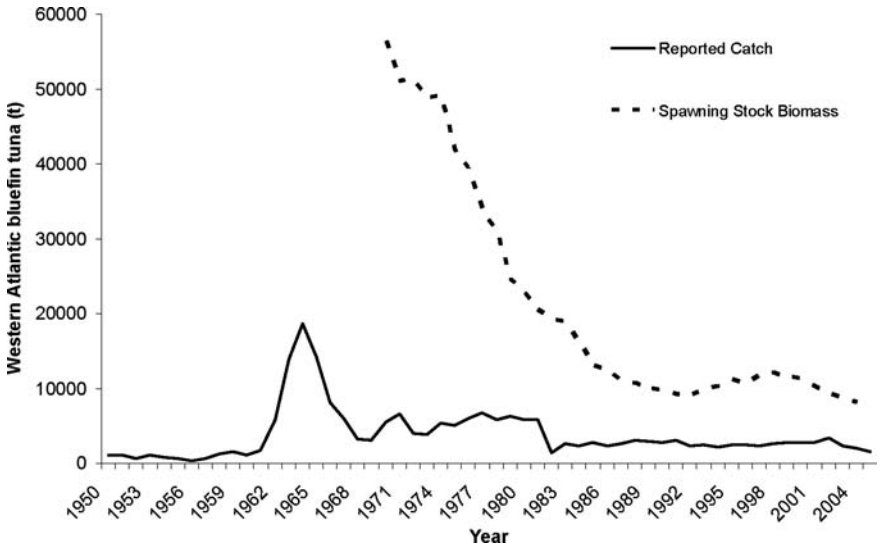

*Figure 1. Western Atlantic bluefin tuna reported catches and spawning-stock biomass. Spawning biomass lumps fish of eastern and western origin and assumes spawning begins at age 8 (ICCAT 2001*b*, 2006*b*, 2006*c*).*

breeding populations spawn occasional large cohorts of juveniles, a trend that has been widely observed in other fisheries (Myers & Barrowman 1996). The new model, which assumed the annual number of juvenile fish entering the fishery could not increase beyond the 1981–1994 average, implied that fewer adults were needed to produce a lower estimated potential yield, and this was used to establish a lower recovery goal. Supporters justified omitting 1970s spawner information by asserting that the reproductive potential of western bluefin tuna had changed since the 1970s due to less favorable environmental conditions; thus, the 1970s spawner–reproduction relationship was deemed no longer relevant (Porch 2005). The implication was that lower catches of recent years were equivalent to a new, lower potential yield, and it was concluded that no drastic management changes would be needed.

No data indicated that the ocean's bluefin carrying capacity had changed. Populations of key bluefin prey had recovered to high levels (NEFSC 2006; TRAC 2006), whereas bluefin populations had declined. Bluefin spawning success is better correlated to population abundance than any studied variable (ICCAT 2001*a*; Brown et al. 2002; Ravier & Fromentin 2004). Nonetheless, and despite unprecedented population lows, in 1998 the commission chose the new spawner–reproduction model and increased the catch quota to 2500 t (ICCAT 1999). Actual catches in the western Atlantic were higher: 3200 t in 2002, well over the quota (ICCAT 2004). In 2003 they raised it again, to 2700 t.

In sum, in the 1980s through 1990s the commissioners implemented much larger catch quotas than the scientific committee recommended. When the population continued declining, they blamed environmental change and implemented several quota increases.

Since 2002 actual catches have decreased annually. The allowed western-area quota is 2700 t, and catches from 2003 through 2005 were 2357 t, 2000 t, and 1523 t, respectively. The U.S. commercial catch

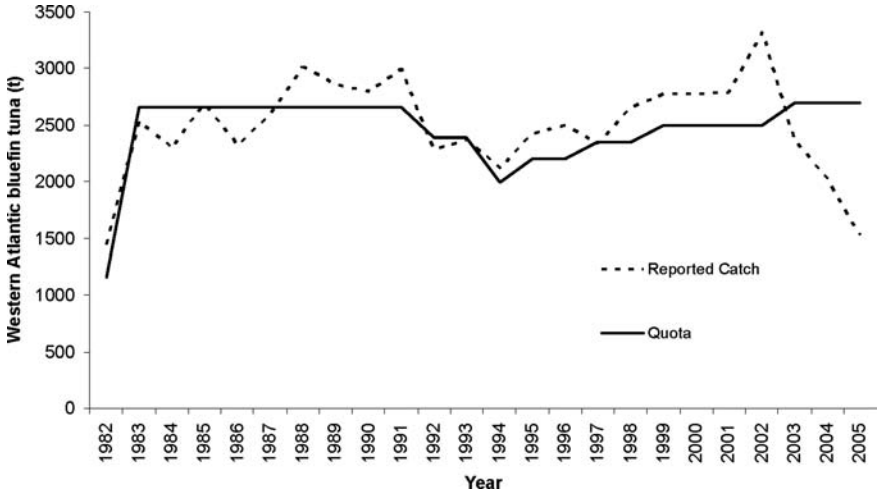

*Figure 2. Western Atlantic bluefin tuna reported catches and quota levels from 1982 to 2005 (ICCAT 2001*b*, 2006*b*, 2006*c*).*

was only 27% of its quota in 2005 and around 10% in 2006 (McHale 2006, 2007*b*). As of September 2007 (the time of this writing), commercial fishers caught only 63% of what they caught by the same date in 2006 (McHale 2007*a*). Effort remains strong; reduced catches result from unavailability of fish. These trends suggest U.S. bluefin may approach widespread commercial unavailability as early as 2008.

Continued Fishing Mortality of the West Atlantic Breeders

The commission first highlighted the desirability of ending fishing for bluefin tuna in the Gulf of Mexico during their spawning season (January–June) in 1981 (ICCAT 1982). Not until 1998 did the U.S. National Oceanic and Atmospheric Administration Fisheries Service seek to specifically limit the targeting of Gulf of Mexico bluefin spawning aggregations by limiting the take of bluefin to 1 fish/trip (50 C.F.R. § 285.31 [a][30]).

In addition, boats targeting yellowfin tuna (*T. albacares*) and swordfish (*Xiphias gladius*) are still allowed to fish in the spawning areas of Gulf bluefin. New data indicate that high water temperatures and low oxygen levels kill the majority of bluefin hooked on longlines whether carcasses are retained or discarded (Block et al. 2005).

Preventing Extinction of West Atlantic Bluefin Tuna

Recent satellite-tagging studies and genetic tests unequivocally show that discrete western and eastern bluefin populations mix during migrations (e.g. Lutcavage et al. 1999; Nemerson et al. 2000; Block et al. 2005; Carlsson et al. 2007). Migration patterns also vary depending on the age and size of tuna and fluctuations in oceanographic conditions (Sibert et al. 2006). Many fish counted against east or west catch quotas originate on the other side of the management line. Accounting for mixing is especially critical for the smaller western population (Magnuson et al. 2001; ICCAT 2006*c*). Because the population originating east of the management line is substantially larger, the quota is significantly higher on that side of the line (29,000 t for the eastern Atlantic and Mediterranean) than west of it. Furthermore, fishing in the east is ineffectively controlled, with rampant illegal fishing, overcapacity, and catches often significantly over the quota (Fromentin & Powers 2005; Fromentin & Ravier 2005; Fonteneau 2007). Eastern catches of bluefin that originate west of the management line could be significant.

Overfishing and poor management have caused collapse of the western Atlantic bluefin tuna. Failing catches indicate a fishery running out of time. Based on the numbers and trends, we believe the western Atlantic bluefin tuna is now in danger of extinction.

Continued decline appears inevitable unless catches are reduced to near zero. We call for a 5-year moratorium on possession of bluefin tuna throughout the western Atlantic and the closure of Gulf of Mexico spawning areas to all gear capable of catching bluefin tuna during bluefin spawning season. Eastern catches should be stopped until quotas and management-area boundaries adequately take into account the mixing of western fish with eastern fish and eastern regulations and enforcement are improved. Eliminating all fishing mortality may help western bluefin recover from collapse.

Lessons Learned

The impending extinction of a key population of a large, economically valuable vertebrate is a tragedy in itself, but the case of the western Atlantic bluefin is only one of many instructional case studies in management failure that highlights the need for reform. When the advice of scientists is not heeded, problems usually worsen, sometimes catastrophically. Fisheries managers are notorious for ignoring scientific advice, and this has caused problems for many fish species in, for instance, the North Sea (Rosenberg 2003). The reasons scientific advice is ignored include industry lobbying, inability of nations (or other political divisions) to agree on common goals for shared resources, and interference by politicians, such as congressional members who act on behalf of their constituents but in fact work against their constituent communities' long-term interests.

Because so many people have interfered with the scientific process in order to keep catches high, the irony is that the western Atlantic bluefin population is crashing and those who sought high catches are now witnessing catches that are under 10% of the quota, with the resulting loss of economic activity. Sustainable catches from a recovered population could be much higher than current landings (ICCAT 2006*a*). The wider problem is that recovery may not be possible; collapsed populations often do not recover if relief comes too late (Hutchings & Reynolds 2004). We do not know whether it is already too late for the western bluefin. It is likely not too late for the Mediterranean population. All of this points toward the wisdom of temporarily ceasing all fishing of Atlantic bluefin tuna, revamping fisheries management commissions such that scientific advice is independent and insulated from lobbying, and mandating managers to limit fisheries catches to levels recommended by those independent scientists.

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