

Seafood Watch Seafood Report:

Tunas Volume V



Illustration courtesy IATTC, from Joseph, Klawe & Murphy, 1988

Southern Bluefin Tuna (*Thunnus maccoyii*)

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About Seafood Watch® Seafood Reports:

As part of an ongoing effort to document the status of commercially important marine species, research biologists working for the Monterey Bay Aquarium Seafood Watch® program develop reports covering each type of seafood listed on the Seafood Watch pocket guide for consumers.

Seafood Watch seafood reports are “living” documents that synthesize the best available and most up-to-date scientific information on the current status of seafood items found in the United States. As the information on each species changes, so too will each report, in order to reflect those changes.

In developing these reports, Seafood Watch uses the best available scientific information. Research published in academic peer-reviewed journals is used whenever possible. Other sources include government data, fishery management council data, personal communications with fisheries scientists and aquaculture experts, industry data, and personal communications with fishers and fish farmers.

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INTRODUCTION TO SERIES ON TUNAS

This is Volume V in a series of eight seafood reports covering the tunas most frequently found in West Coast markets and restaurants.

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NATURAL HISTORY OF THE TUNAS:

Tunas are world-wandering fishes. Embodying the term "pelagic", they cruise the open oceans, swimming ceaselessly. They travel hundreds, often thousands, of kilometers per year. In their natural habitat, they never encounter a wall or shore.

As a group, tunas are large fishes. An adult Atlantic bluefin can be more than 2 meters long and weigh 500 kilograms [1]. And tunas possess some remarkable adaptations. Their super-efficient muscles and hydrodynamic bodies enable them to cruise through the water in bursts of up to 50 mph, allowing them to chase down such speedy pelagic prey as mackerel, squid and bonito. Unlike other fishes, many tunas can maintain a body temperature above that of surrounding water, making them functionally warm-blooded [26, 27].

Tunas feed near the top of the food web, eating both planktivorous fishes and mid-sized predatory fishes. As tunas grow, they become large enough to escape most predators--with the exception of sharks, the larger toothed whales, and humans.

All tunas are prolific spawners, broadcasting millions of gametes near the ocean's surface. Some species (albacore and the bluefins) gather in specific spawning grounds, often where ocean currents form gyres that favor the retention of spawn and larvae in the plankton. Others (yellowfin, skipjack and bigeye) spawn year-round throughout their ranges [29]. All commercially-important tunas need warm water to breed: they spawn only where the sea surface temperature is at least 24°C [29]. Spawning takes place at night [29]. Depending on her size, a single female tuna can release one million to ten million eggs per spawning [1]--and females typically spawn every two or three days throughout a protracted breeding season [29].

Tunas support the world's most lucrative fishery, but surprisingly little is known about the life history, stock structure and population biology of many of the species [27, 28, 29]. Tunas' pelagic habitat has long kept them out of the reach of scientists. In the last few years, techniques such as satellite tagging and DNA fingerprinting have opened wider windows on the tunas' world [27, 28]. But a lack of basic biological information still

complicates tuna management. Many management regimes are based on mathematical models of tuna populations, which, in turn, are based on scanty studies or educated extrapolations [3]. The amount of research available varies widely among tuna species and populations. Fisheries landing data show some tuna populations at high levels of relative abundance, some fully exploited, and a few in serious decline [5].

COMMERCIAL TUNA FISHING:

Tuna have been fished for thousands of years, taking an important place in culture and myth around the world [4]. The tuna trade has evolved into an enormous international industry, built on the mass production of inexpensive canned tuna. The size and scope of this fishery make it the world's most lucrative. In 1998, the latest year for which figures are available, world tuna fisheries took in approximately \$3 billion.

The global catch of tuna and tuna-like species increased from less than 0.6 million metric tons in 1950 to 5.5 million metric tons in 1998. The 1998 catch of tuna and tuna-like species represented about 8.5 percent of the total production of marine finfishes in that year [5].

Tuna fisheries include both low-value, high volume fisheries that supply the canneries, and high-value, low-volume fisheries that specialize in fresh tuna. In recent years, the wholesale price paid at landing for fresh sashimi-quality tuna has reached more than US \$500 per kilogram. However, only very small quantities sell at these high prices. The wholesale price paid at landing for cannery-grade tuna can be less than US \$1 per kilogram [5].

Fishing Methods:

Three methods supply most of the world's tuna: purse seine, pole and line, and longline [5; 6]. Other methods include troll lines, hand lines, and driftnets. In a few selected high-value fisheries, centuries-old techniques are still employed on a commercial scale: giant Atlantic bluefin are taken in traps in the Mediterranean and east Atlantic, and by harpoons off the coast of North America [10].

Recreational fisheries:

The recreational take of tunas is a very small fraction of the commercial take wherever data are available [3]. Recreational fisheries are generally left out of international management plans, although they do figure into U.S. management law. For purposes of this report, the recreational catch of tunas has been considered insignificant.

International Tuna Fishery Management:

As fish which roam the open seas, tunas do not stay within any one nation's territorial waters. Such highly mobile species always present a challenge to fisheries regulators. Through international cooperation, tunas are managed by three main regional alliances: in the eastern Pacific, the Inter-American Tropical Tuna Commission (IATTC), founded in 1950 by agreement between the U.S., Costa Rica, and other Pacific tuna fishing nations; in the Atlantic Ocean, the International Commission for the Conservation of Atlantic Tunas (ICCAT), founded in 1966 by agreement between the U.S. and other Atlantic fishing nations; and, in the Indian Ocean, the Indian Ocean Tuna Commission, established in 1991 under the framework of the U.N. Food and Agriculture Organization.

U.S. Tuna Fishery Management:

In the U.S., the states regulate fisheries near the shore (usually out to a distance of three miles). Federal waters, the U.S. Exclusive Economic Zone (EEZ), extend from three to 200 miles offshore. As large pelagic fishes, tunas spend most of their time in the federal zone, and are managed by a federal authority, the National Marine Fisheries Service (NMFS). NMFS is a division of the National Oceanic and Atmospheric Administration (NOAA), which in turn is a division of the federal Department of Commerce. Federal fisheries management under NMFS implements the Magnuson-Stevens Fishery Conservation and Management Act, and NMFS managers must also comply with major U.S. federal laws, including the Endangered Species Act, Migratory Bird Treaty Act, Marine Mammal Protection Act and the Atlantic Tunas Convention Act. As the national fisheries agency of the United States, NMFS is also responsible for reporting U.S. fisheries statistics to ICCAT, IATTC and other international bodies to which the U.S. belongs [7].

In general, NMFS operates through eight regional fishery councils. The councils' membership is a balance of commercial and recreational fisherman, marine scientists and state and federal fisheries managers, who combine their knowledge to prepare Fishery Management Plans (FMPs) for stocks of finfish, shellfish and crustaceans. In U.S. management law, tunas are often lumped together with swordfish, billfishes, and pelagic sharks, a group known collectively as the "highly migratory species" (HMS).

Executive Summary:

Southern bluefin tuna (*Thunnus maccoyii*), inhabiting the cold oceans of the southern hemisphere, are slow-growing and late to mature. This species is prized in the sashimi trade, with most of the worldwide catch being marketed in Japan. Australia, New Zealand, and Japan do most of the fishing for this species. These three nations manage the stocks cooperatively under a trilateral agreement known as the Convention for the Conservation of Southern Bluefin Tuna (CCSBT). Heavy fishing throughout the 1970s and 1980s sent southern bluefin populations into a severe decline. While the three CCSBT nations now adhere to strict fishing quotas, fishing by non-member nations is increasing, and the stock is not recovering.

A Note on Outside Review:

Seafood Watch is indebted to the experts who graciously reviewed this paper for scientific accuracy: Dr. Charles Farwell of the Tuna Research and Conservation Center, and Dr. Joshua Eagle of Stanford University. It is important to note that scientific review does not constitute an endorsement of Seafood Watch on the part of the reviewing scientists; the Seafood Watch staff is solely responsible for the conclusions reached in this report.

SOUTHERN BLUEFIN TUNA

Species Biology

Scientific name: *Thunnus maccoyii*



Illustration courtesy IATTC, from Joseph, Klawe & Murphy, 1988

Distribution and Habitat:

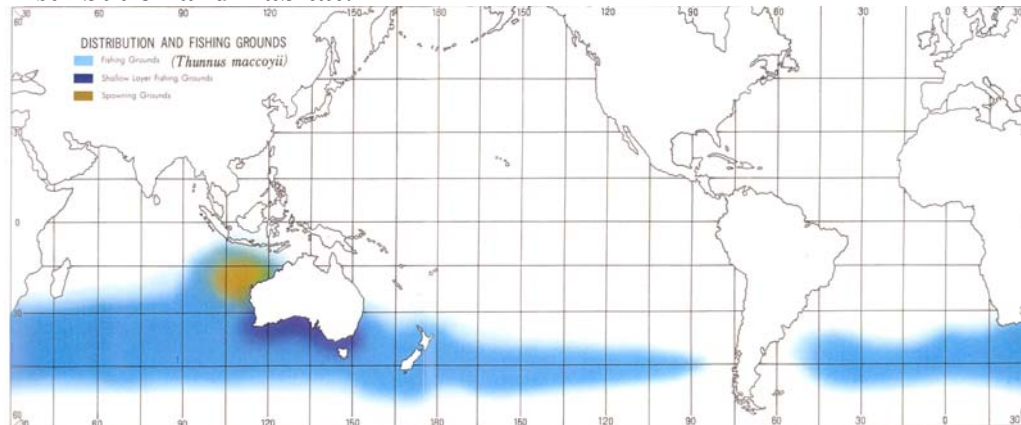


Figure 1: Range of the southern bluefin tuna. After Ueyanagi, 1975.

Biological Characteristics/ Life History:

The southern bluefin is a large, cold-water tuna of the southern hemisphere. Its only known spawning ground is located in the Indian Ocean, in an area south of Java and off northwest Australia [9]. Juveniles migrate southwards along Australia's west coast and congregate in the coastal waters off south Australia. As the fish mature, they extend their distribution to cover the circumpolar area throughout the Pacific, Indian and Atlantic Oceans [9].

The largest southern bluefin on record weighed 157 kgs, although the average weight of individuals caught today is approximately 7 kg [8]. They are believed to become sexually mature at about 8 years, at a length of about 155 cm, and to have a maximum lifespan of 42 years [9].

Statement on the Availability of Science:

In general, for all three species of bluefin, basic biological data such as growth rates, age at maturity, reproductive potential, and age structure of the population, are poorly known. Many of the data used by managers are derived from models, which in turn can fairly be said to be based on best guesses, supported by studies that often involve very few tuna ([11], pp. 14 - 22; [10], pp.98 and 100).

This being said, the southern bluefin fishery is better documented than many others. Just three, developed nations do most of the fishing for this species: Australia, Japan and New Zealand [12]. These three countries manage this species under a regional agreement known as the Convention for the Conservation of Southern Bluefin Tuna (CCSBT). Good logbook data are available from all three, and the Australian fishery took an early lead in tagging studies and other measures of fishery health [12]. Stock assessments are supposed to be carried out annually by the CCSBT (although the last one was completed in 1998) [9]. These stock assessments are based on actual fisheries indicators, such as total catch and average length and weight of catches, rather than relying heavily upon models [12].

We have a particularly complete historical picture of the Australian fishery because, as Caton notes, "in the early days of the fishery, catches were measured from cannery throughput, where almost 100% of catches were processed" [12]. However, the Australian fishery illustrates the challenge of record-keeping in any tuna fishery. Although Australia's managers have excellent catch records going back decades, the diversity of fishing methods used over the years makes it very difficult to calculate a standard catch per unit effort (CPUE) that can be used to compare fishing effort across decades.

"The Australian fishery prior to 1950 was a very small troll fishery; pole-and-line fishing expanded rapidly through the 1950s, with larger vessels progressively entering the fishery. In the 1960s, aircraft spotting support began to be provided, and by the mid-1970's purse seiners became prominent. In the 1980s, the fishery operated with aircraft spotting of schools, pole-and-line boats holding the fish with live bait while purse seiners circled them. It is therefore believed that CPUE from surface vessels is meaningless as an index of abundance" [12].

Additionally, there is always the problem of unreported catches. IATTC notes that non- or underreporting by some fleets, in particular gillnet fleets in the South Pacific and Indian Ocean, could well be giving rise to significant underestimates of total catches of southern bluefin [11].

Market Information:

Market Names:

Alternative names for the southern bluefin include bluefin, southern Pacific bluefin, and minamimaguro.

Seasonal Availability:

Southern bluefin is fished year-round.

Major Product Forms:

Southern bluefin is marketed primarily as fresh tuna for sashimi [8].

Import and Export Sources and Statistics:

Nations supplying major amounts of southern bluefin to the world market include Japan, Australia, and New Zealand. Lesser amounts are supplied by South Korea and Taiwan. Most of the catch is marketed in Japan [8]. The U.S. is a net exporter of bluefin tuna: in 1999, U.S. concerns exported about 1,086 metric tons of fresh bluefin, of which 1,083 mt went to Japan [15]. Small amounts of fresh bluefin also went to the British Virgin Islands, Netherlands Antilles and South Korea. Small amounts (less than 96 mt) of frozen bluefin were exported in 1999 to Australia, Japan, Spain, and

Brazil [15]. The U.S. also imports some fresh and frozen bluefin tuna--an average of 486 mt/year, 1999-2001 [15]. The largest sources of southern bluefin imported to the U.S. are Mexico, Canada, Italy and Spain. Some of this bluefin is subsequently re-exported to Japan--an average of 20.6 mt/year, 1999-2001. It should be noted that these NMFS statistics combine import and export figures for all three species of bluefin, making no distinction between Atlantic bluefin, Pacific northern bluefin, and Southern bluefin [15].

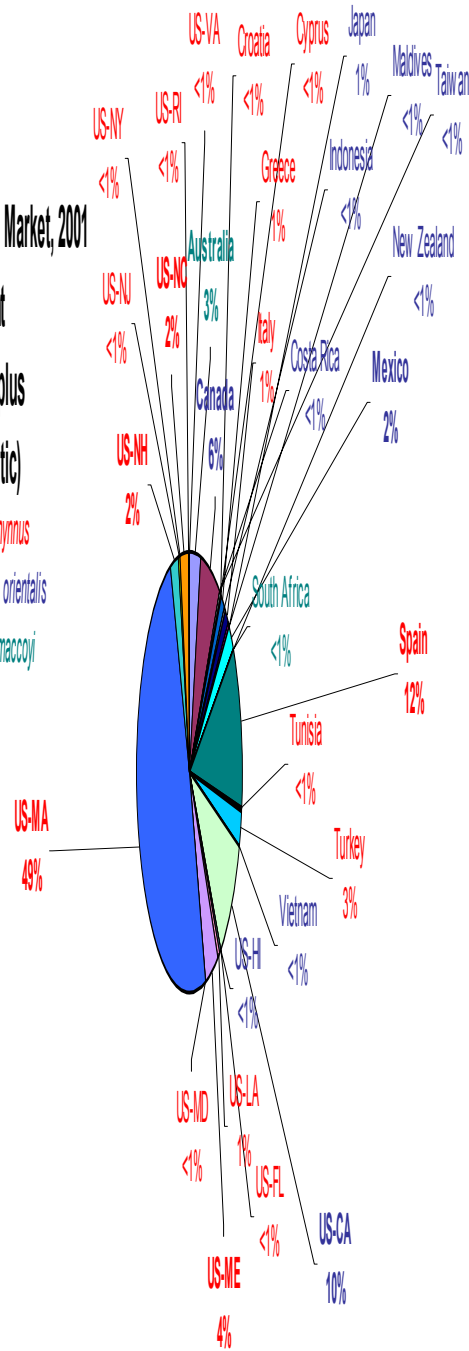
Consumption Information and Trends:

In 2000, southern bluefin accounted for 0.4 % of world tuna catch by weight [5,6] or about 13,000 metric tons/year [8].

Sources of Bluefin on U.S. Market, 2001

total 2,052.8 mt
 (626.7 mt import plus
 1426.1 mt domestic)

Atlantic bluefin *Thunnus thynnus*
 Pac Northern bluefin *Thunnus orientalis*
 Southern bluefin *Thunnus maccoyii*



Data Source: NMFS Stats

Fishery Information:

Fishery Range and Distribution: About 10% of the world's southern bluefin comes from the South Atlantic, 25% from the southern Pacific, and 65% from the Indian Ocean [8].

Fishing Methods: Major methods of catching southern bluefin include pole and line, surface trolling and long-line fishing [8]. In the Indian Ocean, current developments in fishing gear and techniques tend to lead to larger catches of smaller animals. The Indian Ocean Fishing Commission's Expert Consultation reports that purse seines take smaller animals than pole-and-line vessels; surface gears (purse seines, drift nets) take smaller bigeye, albacore, and bluefin tunas than longlines; and fishing on debris or FADs takes smaller yellowfin tunas than fishing on free schools [17].

Fishing Effort:

Extensive fishing for southern bluefin began in the 1950s. This species has been heavily exploited throughout its range, with a large fishery on its spawning grounds in the Indian Ocean [12].

Adults have been caught by Japanese longliners since 1952 and by the New Zealand handline-troll fishery since 1980. Australian commercial fishing on juveniles began in 1951 [12]. Taiwan and Indonesia also exploit southern bluefin, and Korea started a fishery in 1991 [9].

The Japanese longline fishery, which concentrates on mature adults, recorded its peak catch of 77,927 mt in 1961. Australian catches of young fish by the surface fishery peaked at 21,501 mt in 1982 [9]. Since then, total catches, breeding biomass, and recruitment, as well as standardized catch per unit effort, have all continued to decline [26]. Figures 2, 3, 4 and 5 present this information graphically.

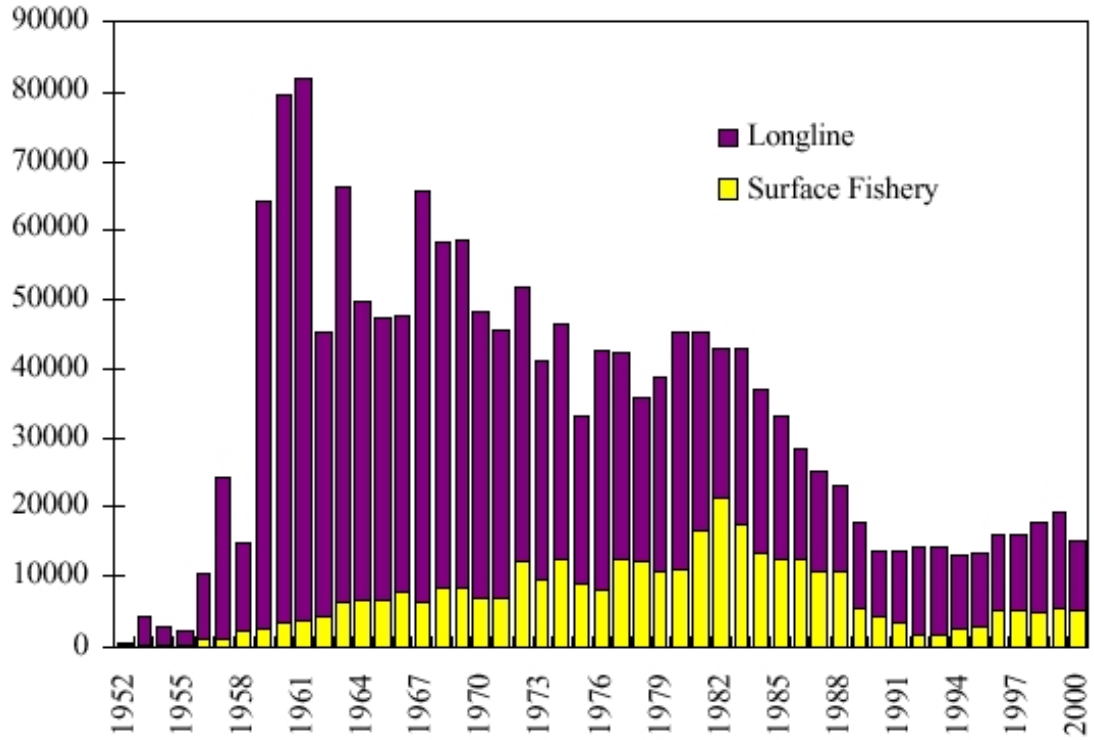


Figure 2: Southern bluefin world catch, 1952-2000. Source: ICCAT, 2002

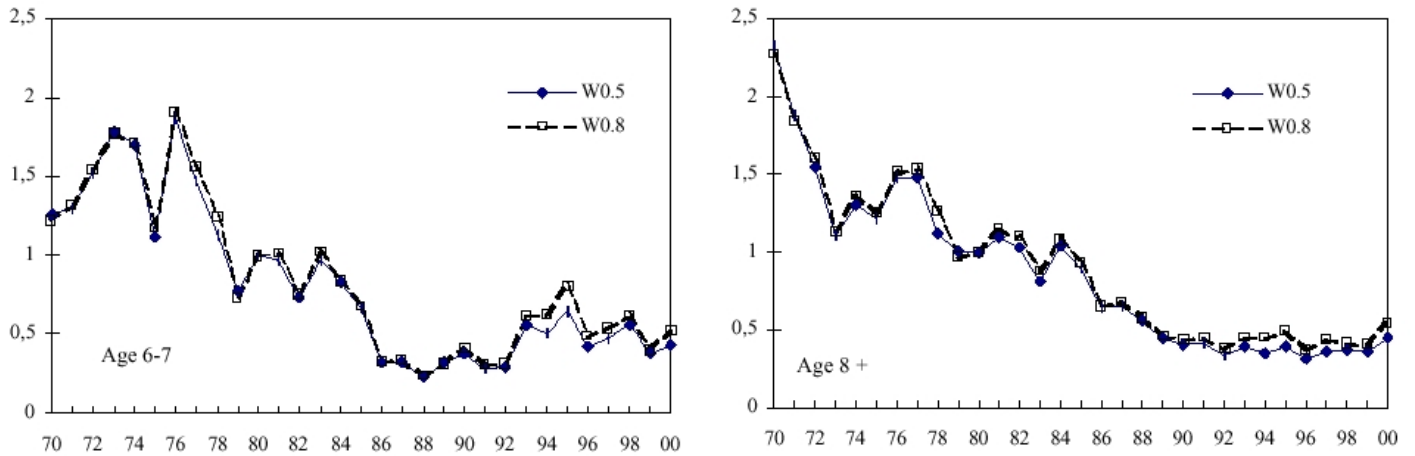


Figure 3: Decline in catch per unit effort (CPUE) of Japanese longliners on juvenile (left) and adult (right) southern bluefin, 1970-2000. Source: ICCAT, 2002

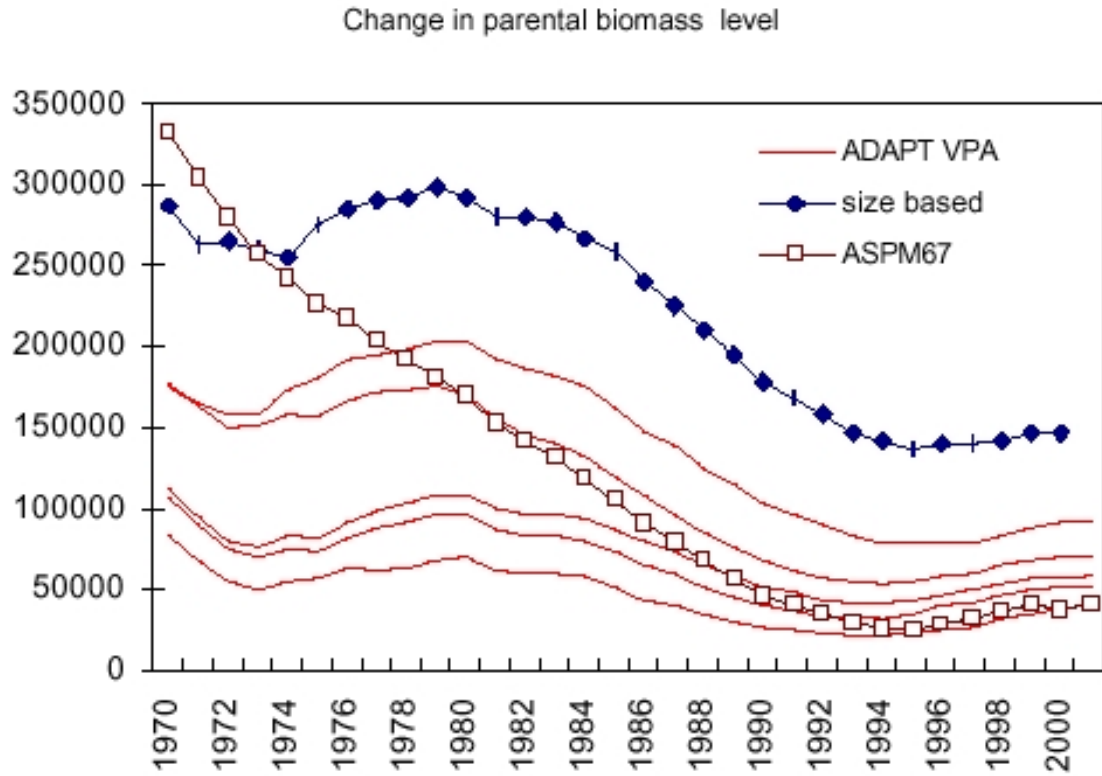


Figure 4: Decline in parental biomass (breeding adults), southern bluefin, 1970-2000. Source: ICCAT, 2002

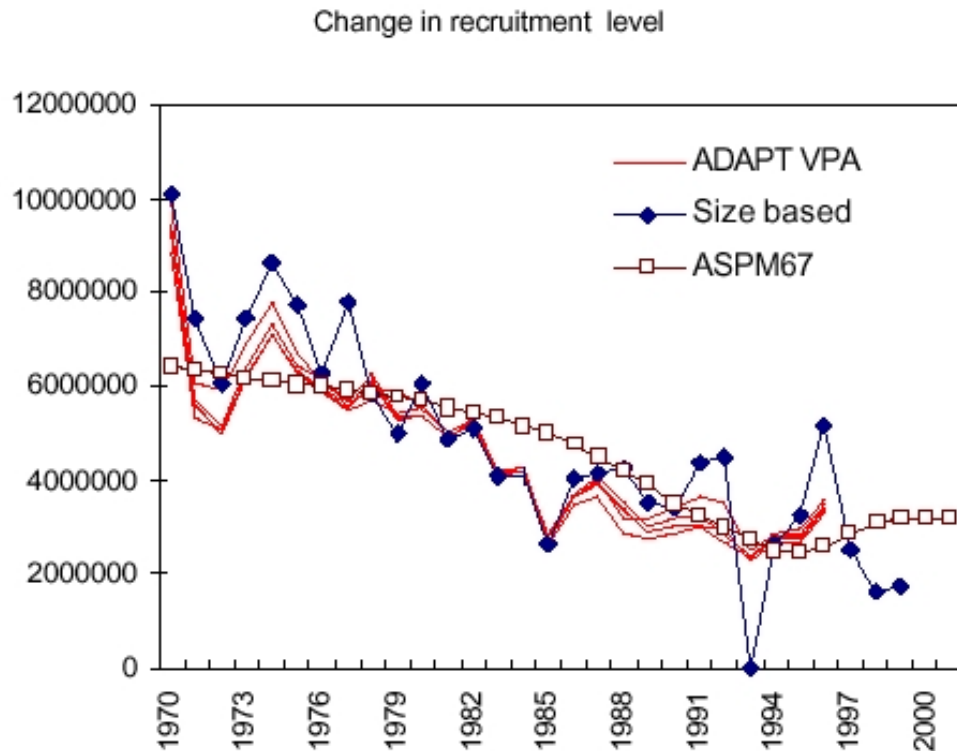


Figure 5: Decline in recruitment, southern bluefin, 1970-2000. Source: ICCAT, 2002

Catches by the three CCSBT nations (Australia, Japan and New Zealand) have been controlled by quota since 1986 [12]. In 2000, the quota limits were 5,225 mt for Australia, 6,065 mt for Japan, and 420 mt for New Zealand. These catch limits have remained the same since 1990 [9].

However, catches by non-CCSBT nations have increased steadily over the last decade, from about 2,200 mt in 1991 to 6,318 mt in 1998 [9]. These unregulated catches threaten to negate any conservation benefit of the CCSBT quotas. Current developments in fishing gear and techniques tend to lead to larger catches of smaller animals. As most of the non-CCSBT catch is marketed in Japan, some scientists see non-CCSBT fishing as a way for Japan to get around its CCSBT quotas [16].

Although the Indian Ocean supplies 65% of the world's southern bluefin [8], this catch represents a very small fraction of the Indian Ocean tuna fishery. Data from the Seychelles Fishing Authority [21] show that, on average, about 50 vessels per month purse-seine for tunas in the western Indian Ocean. In 1998, the latest year for which data is available, the species breakdown of their catch was 64% skipjack tuna, 25% yellowfin tuna, and 11% other tunas (mainly bigeye and albacore) [21]. The catch rate for all tuna species was 17.4 mt per vessel-day, up from 16.3 mt the previous year [21].

Management:

Australia, Japan and New Zealand are the major fishers for southern bluefin, and these three nations have a history of cooperation in the management of the fishery [12]. By 1994, regional management initiatives such as their Trilateral Tuna Agreement had evolved into an international forum known as the Committee for the Conservation of Southern Bluefin Tuna, or CCSBT [13]. This body is responsible for management of this species as a whole in the three oceans, conducting research and setting catch quotas [13]. Because the range of the southern bluefin extends to a small area of the south Atlantic (off the coast of South Africa), ICCAT bears an overlapping responsibility for management of southern bluefin in the Atlantic Ocean [9]. Generally, ICCAT applies CCSBT's management principles to the Atlantic stock. As of 2000, ICCAT had no additional management recommendations for Atlantic southern bluefin tuna [9].

Since 1991, tuna fisheries of the Indian Ocean have been managed by the Indian Ocean Tuna Commission, or IOTC, an international body established under the framework of the U.N. Food and Agriculture Organization [19]. Nations whose tuna fisheries are at least partly covered by the IOTC include Thailand, Seychelles, Mauritius and Madagascar, Maldives, Sri Lanka and Indonesia [18].

The IOTC has not yet produced a definitive survey of the southern bluefin fishery. There is no IOTC management plan in place for Indian Ocean southern bluefin [20].

Monitoring:

General monitoring provisions used by ICCAT and CCSBT nations include reporting of boat positions and catches; requirements for inspection when the ships are in port; requirements that fishing gear be stowed (stored away in unusable condition) when the boat is outside its authorized fishing grounds; requirements that the boats carry position-fixing equipment, and requirements that they accept onboard observers working for management agencies. Recent advances in technology are allowing quicker identification of vessels and more accurate, "hands-off" tracking of their movements. For example, in many areas, fishing vessels are required to carry transponders, which

relay their position via satellite to regulatory agencies. These technologies are known as Vessel Monitoring Systems (VMS).

Catch reports come from logbooks, in which the ship's crew records details of each day's catch, including total weight of the catch and sometimes the number of individual tunas per species. The major tuna fisheries bodies require logbooks to be kept by each licensed vessel. Logbooks are forwarded to national fisheries regulators at the end of each fishing trip [14].

It should be noted that a sizeable fraction of the southern bluefin fishery is unregulated [16]. Fishing by nations not party to CCSBT increased enormously during the 1990s, wiping out the expected benefits of CCSBT management and slowing recovery of the species [9].

In 1998, the IOTC began one of its first monitoring projects: a sampling study of longline catches at ports in Thailand, Malaysia, Singapore, Indonesia, Mauritius and South Africa. This survey is an attempt to measure catches landed by the many Indian Ocean longline vessels that report no logbook data [18]. This study is ongoing [20].

Enforcement:

Enforcing international tuna fishing law is a challenge, given that boats operate on the high seas, far from easy observation. Some nations do various amounts of at-sea inspection and enforcement using surface vessels. However, because of the expense, such coverage is spotty [6].

Trends/Status of Stocks:

The southern bluefin tuna is in recognized decline throughout its range. CCSBT's latest stock assessment (1998, as cited in [9]), shows spawning biomass in decline, and recruitment at approximately 1/3 of the 1970 level.

Under the CCSBT, Australia, Japan and New Zealand have adhered to strict catch quotas since 1986. However, fishing by nations not party to CCSBT has increased since then, wiping out the expected benefits of these quotas and slowing recovery of the species [9]. According to Australia's national fisheries management body, the Bureau of Rural Sciences, the southern bluefin is fished at 30% above the total allowable catch limits set by the CCSBT [13].

Outlook for Recovery:

The CCSBT will consider the stock recovered if spawning biomass regains its 1980 level. Under current conditions (the degree of fishing pressure, the state of management policy, the average rate of recruitment to the population), the chances of this happening by the year 2020 range from 6% to 87%, depending upon the modeling assumptions chosen [9].

Although there is some disagreement between Japanese and Australian scientists about the ability of the stocks to rebuild (the Japanese being far more optimistic), Australian scientists predict that the spawning stock will remain far below safe biological limits unless the total catch is reduced [13]. Continued unregulated fishing by non-CCSBT nations is likely to hamper recovery efforts.

Bluefin Ranching:

Because prime-quality bluefin can sell for up to \$200/kilogram on the Japanese sashimi market [5], entrepreneurs have attempted to raise wild-caught bluefin tuna in captivity. Commercial bluefin "ranches" exist in Croatia, Spain, Morocco, Australia and Japan [8]. In these operations, small wild-caught bluefin are released alive into ocean pens and fattened on baitfish (such as mackerel and sardines) before being sent to market. This industry will continue to grow, but, due to the slow

growth of the tuna and the high costs involved, it is not expected to greatly influence the bluefin supply [8]. Some scientists fear that the expansion of bluefin ranching may increase fishing pressure on the already-depleted populations of wild bluefin, as fishermen seek small juveniles to sell to ranchers [16].

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Tuna illustration from Joseph, J., Klawe, W. & Murphy, P. 1988. Tuna and billfish: fish without a country. La Jolla, California, USA, Inter-American Tropical Tuna Commission. 69 pp.

Figures 2 and 3 adapted from reference 9.