# AN OVERVIEW OF WORLD TUNA FISHERIE

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Tunas have been important to mankind for several thousand years. Archaeological evidence shows that early humans harvested tuna more than 6,000 years ago, and tuna products may have been among the earliest processed fisheries commodities traded among ancient civilizations. Currently, fishermen of nearly 80 coastal and island nations harvest tuna from the world's oceans. The harvest is consumed in many forms: raw, cooked, smoked, dried, and canned. They were commonly known as "Chicken of the sea" and form the third largest product in international seafood trade with about 10% of the total trade in value terms.

Tuna occurs in temperate to tropical waters and broadly classified into coastal/neritic and oceanic species. The principal market species of tuna were skipjack (Katsuwonus pelamis), yellowfin (Thunnus albacares), bigeye (Thunnus obesus), albacore (Thunnus alalunga), northern bluefin (Thunnus thynnus), and southern bluefin (Thunnus maccoyi). Temperature (thermocline) and food availability (areas of convergence and divergence) are reported to influence their distribution and abundance. Tunas show distinct migratory routes, spawning and feeding locations.

In the scientific and popular literature, tunas are most often described as highly migratory fishes-"wanderers" of the world's ocean. Their 'highly charged life styles as apex predators in the oceanic pelagic environment are facilitated by a number of anatomical, biological, and physiological specializations.

Tunas have demonstrated their speed and stamina in long-distance migrations and International organizations and scientists of many nations have gathered data on these migrations through tagging studies. From these studies we know that albacore tuna migrate from the coast of California to the coast of Japan, a trip of over 8,500 km moving on average of not less than 26 km per day. Northern blue fin tuna have traveled at least 7,700 km across the Atlantic Ocean (ATL) in 119 days, a sustained journey of over 65 km per day. A tagged skipjack tuna released 200 km south west of the tip of Baja California was recaptured west of Enewetak in the Marshall Islands, a distance of nearly 9,500 km. Tagged yellowfin tuna have been recovered within 620 km of the site of their release.

## 1. World tuna fishery - a time line

Since the nineteenth century, and indeed since ancient times, tuna fishing has been carried out in many places in the world. These fisheries were local, and generally near the coasts. As most species of tunas are highly migratory, these fisheries caught tunas only at certain points in their life cycle, and thus had to be seasonal. They included, in the Atlantic, purse seining for bluefin off Norway, trolling for albacore in the Bay of Biscay, trap fishing in the Straits of Gibraltar and along the North African coast, Pole and line fishing for bigeye and skipjack near oceanic islands and artisanal fishing along the coasts of Africa. In the Pacific, there were various artisanal fisheries near islands in tropical waters, troll fisheries for albacore and baitboat fisheries for yellowfin and skipjack off the west coast of the United States of America, baitboat fisheries for skipjack near Japan, and many other fisheries for various tunas along the coasts of Japan. Coastal fisheries using baitboats and small seine nets existed off South America. In the Indian Ocean, fisheries for skipjack existed off Sri Lanka, India and the Maldives, and southern bluefin tuna were the target of longline fishing off Australia.

As a result of increasing demand for tuna for canning, industrial fisheries started during the 1940s and 1950s. In 1960s, Spanish and French baitboats and purse seiners started fishing for tunas off tropical West Africa, and were joined by Japanese baitboats. Also, Japanese longliners expanded their fishing area all over the world, still targeting mostly albacore and yellowfin for canning. In 1965, the Republic of Korea and

Taiwan Province of China started large-scale longline fisheries, learning the techniques from Japan, for exporting tuna to the canning industry. At the end of the decade, the Japanese longline industry developed extremely cold storage systems, which established new frozen products for the sashimi market, and consequently started to change their target species from yellowfin and albacore to bluefin and bigeye tunas. At this time in the Pacific, the US baitboat fishery off Central and South America was almost completely replaced by purse seiners, which developed a new fishing method, called dolphin fishing. Schools of yellowfin tuna associated with dolphins, a phenomenon observed only in the eastern Pacific, were their major target, and speedboats were used to chase the tuna into the net, together with the dolphins. The purse-seine fishery by European nations in the tropical eastern Atlantic developed quickly, targeting yellowfin and skipjack in 1970.

The tremendous increases in production during 1970-1978 periods were the result of expansion of the fisheries in the eastern Atlantic and the development of new offshore fishing areas in the eastern Pacific. Subsequently, after six years of little increase in world production, many vessels transferred to the western Pacific and western Indian Ocean, where they located/developed new fishing grounds. The catches during this period showed the greatest rate of growth seen in the fishery in many decades. During 1980, many new countries entered the large-scale industrial fisheries, mostly with purse seiners (e.g. Brazil, Mexico and Venezuela). Small-scale longline fishing operations also started in coastal countries in various areas (e.g. Mediterranean countries, Indonesia and the Philippines).

Starting in the 1980s, and increasingly in the 1990s, many coastal states, in all oceans, started new tuna fisheries by chartering flag of convenience (FOC) boats. Some of these vessels changed flag to the coastal state that chartered them, and possibly this tendency will be intensified in the near future.

From 1991 through 1996 catches stayed relatively steady, between about 3.1 and 3.2 million metric tonnes. From 1996 through 1999 the catch increased by about 19%, mostly due to the improvement and increased use of fish aggregating-devices (FADs). During this decade, many other coastal countries entered the large-scale industrial fisheries, mostly with purse seiners and long liners.

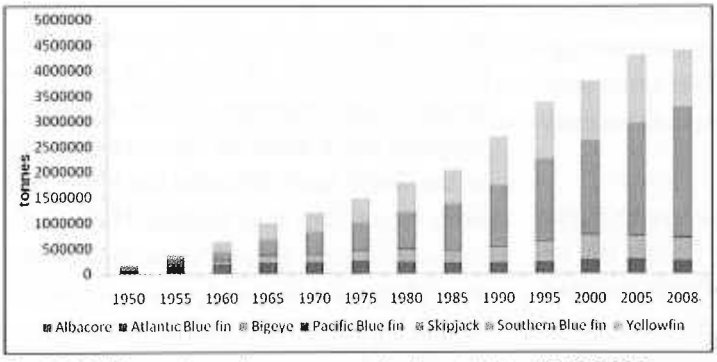


Fig. 1. World species wise tuna production during 1950-2008

In 1997 the catch reached 3.5 million tonnes, and it has continued to increase to 4.45 million tonnes during 2006 and since then there was a decline. Production of tuna in the world oceans is stabilized at around 4.2 million tonnes during 2009 (Fig. 1). In the last decade, tuna farming (keeping tuna in captivity for a short time for fattening purposes) started as a new industry. This business resulted in increasing price and demand for specific sizes and species of tunas, and hence affected fisheries to a great extent. The relatively small tunas of high valued species taken by purse seiners that used to be sold only to the canning industry can be now fattened in cages and converted to products for the sashimi market.

The ocean wise contributions of the tuna during 2004 are shown in Fig.2 and world species wise contribution during 2008 is given in Fig. 3. In global fish trade, tuna export value grew by 44%, reaching US$ 6.54 billion (($ 6540 million in 2003), while tuna imports grew by 47%, totaling US$ 7.5 billion in 2008.

Main tuna catching nations are concentrated in Asia, with Japan and Taiwan (Province of China) as the leading producers. Other important tuna catching nations in Asia are Indonesia and Republic of Korea.

## 2. Major Tuna species

### i. Skipjack (Katsuwonus pelamis (Linnaeus, 1758)

Among tunas, skipjack is the most widely distributed species, being found in commercial

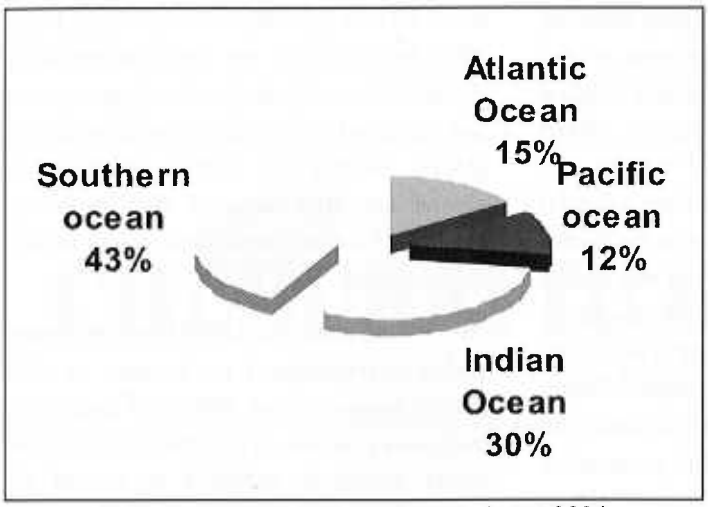


Fig.2. Ocean-wise tuna production during 2004

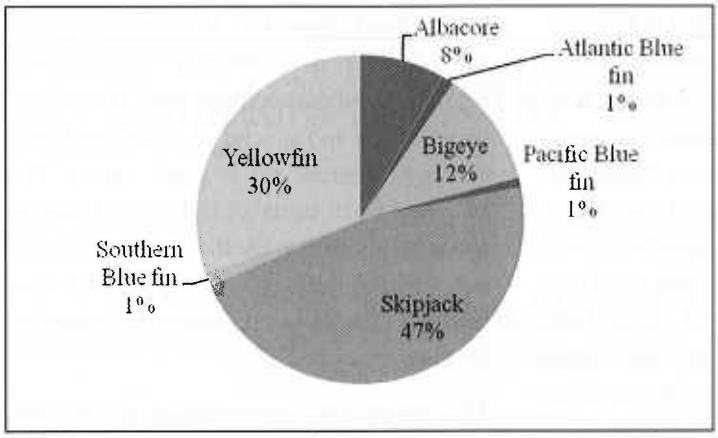


Fig.3. Species composition of world tuna production during 2008

quantities between 45°N and 40°S; inhabits the upper mixed layer of the ocean, and is caught mostly with purse seines and pole-and-line gear.

In terms of weight of fish caught, skipjack is the most dominant species in the catch of the Pacific, Atlantic and in the Indian Ocean. During the last several years, skipjack tuna dominated for about 47% of the total world catch of the principal market species. Most of the catch is used for canning. Skipjack is a short-lived species, with high rates of natural mortality and population turnover. They spawn year-round over vast oceanic areas in equatorial waters, and seasonally where the 24-26°C isotherm extends.

Genetic studies of the Pacific population of skipjack suggest that there is some mixing of fish across the Pacific Ocean, but for management purposes the stocks in the western Pacific are often considered separate from those in the eastern Pacific, as supported by tagging data, which shows limited movement of skipjack between the two areas. Studies based on tagging experiments conducted by the Secretariat of the Pacific Community (formerly South Pacific Commission (SPC)) suggest the stock of skipjack in the western Pacific is under exploited and that it may be possible to increase catches significantly. Such increases would, of course, depend on demand for raw material, price, the ability of the fishermen to locate additional fishing areas, and the vulnerability to capture of the fish in these new areas.

In the Atlantic Ocean, there is no conclusive evidence concerning the stock structure of this species, and skipjack in the eastern and western Atlantic are treated as separate stocks. International Commission for the Conservation of Atlantic Tunas (ICCAT) concluded that the resource was under exploited in both the western and eastern Atlantic.

Skipjack in the Indian Ocean are considered to comprise a single stock, so that any management and conservation measures enacted would have to apply over the entire ocean. Although studies of the stock do not show clear evidence that it is fully exploited, scientists have expressed some concern about the possibility of increased fishing levels adversely affecting stock abundance.

## ii. Yellowfin (Thunnus albacares (Bonnaterre, 1788))

This species, like skipjack, is widely distributed, but is confined to slightly more tropical latitudes. In terms of weight of catch, the second most important species of tuna is yellowfin, which accounts for more than 30% of the world catch. Yellowfin live longer and reach larger sizes than skipjack. Most of the commercial catch is used for canning, and fish over 10 kg are considered prime raw material for this purpose. Two stocks of yellowfin tuna are widely distributed throughout the tropical Pacific Ocean, and are caught by longline

vessels throughout their area of distribution. They are eastern Pacific and west-central Pacific, of which west-central Pacific region supports the largest tuna fishery in the world, producing about 35% of the world's yellowfin.

The population of yellowfin in the Atlantic is considered to consist of a single intermingling stock.The fish spawn in equatorial regions of the central Atlantic. Most of the young migrate east to the nursery grounds, where they stay until they are about 65 to 85 cm in length, and then most migrate to the western Atlantic, many returning to the eastern Atlantic fishing grounds at about 110 cm. It is not clearly known whether yellowfin from the eastern and western Indian Ocean belong to the same stock, but if the two are independent of each other it may be possible to increase yellowfin catches somewhat in the eastern area.

## iii. Bigeye (Thunnus obesus (Lowe, 1839))

Bigeye tunas are distributed throughout most of the world's oceans, but they occur mostly in waters below the thermocline. Bigeye make extensive vertical movements and often feed at deeper areas than other tuna species. Among their unique adaptations to life at greater depths is a layer of subcutaneous fat, which insulates them from the cold. This fat makes them very valuable in the sashimi market, and has made them the target of subsurface longline fisheries. Bigeye matures at the beginning of their third year, at a fork length of about 100 cm. They spawn largely in tropical waters, and growth is relatively rapid.The bigeye tuna is a generally understudied tuna species despite its high value and intensifying importance in tuna fisheries. In the Atlantic, the Gulf of Guinea is a major nursery area. Young fish often mix in shallow schools with yellowfin and skipjack tunas, often in association with drifting objects or seamounts. At larger sizes, bigeyes move into more temperate waters.

A recent genetic analysis of Pacific bigeye population by the Pelagic Fisheries Research Programme (PFRP) was unable to detect any major subdivisions. Some bigeye move considerable distances, they also demonstrate considerable site fidelity – a considerable number of bigeye was recaptured at the release site after more than 5 years at liberty.

## iv. Albacore (Thunnus alalunga (Bonnaterre, 1788))

The albacore is widely distributed, mostly subtropical to temperate tuna and are considered to constitute separate north and south stocks in both the Pacific and the Atlantic undertake extensive migrations, seeking optimum conditions for feeding and reproduction. Albacore matures at about 5 years of age and tend to spawn in subtropical waters. Surface fishing with hooks and lines in temperate and subtropical regions accounts for most of the catch of younger fish, while longline fisheries in more tropical waters capture the older fish. Purse-seining accounts for only a very small portion of the total albacore catch. Because of the wide distribution and highly migratory characteristics of this species, levels of catch vary a great deal from year to year. Because of the high demand for its white flesh along with limited supply never exceeding 260,000 tonnes, canned albacore has always fetches a premium price.

## v. Bluefin tuna

Southern bluefin (Thunnus maccoyii (Castelnau, 1872)

Northern bluefin(Thunnus thynnus (Linnaeus, 1758)

There are two species of bluefin tuna, southern bluefin (Thunnus maccoyii), found throughout the temperate waters of the southern hemisphere, and northern bluefin (Thunnus thynnus), found in the north Pacific and the north Atlantic (Some taxonomists consider that the northern bluefin of the Atlantic and the Pacific are separate species). Southern bluefin spawn in the eastern Indian Ocean, and as they grow they migrate through Australian coastal waters to the high seas, where they are found in the southern parts of all three oceans. In the Pacific Ocean northern bluefin spawn in restricted areas off Formosa and southern Japan, and in the Sea of Japan some of them migrate across the Pacific to off North America, and then return to the spawning grounds in the west as they approach sexual maturity. A few individuals

make southerly migrations to areas below the equator in the western Pacific. Bluefin tuna are distributed widely throughout the Atlantic Ocean, northern bluefin occur in most waters north of the equator and in the Caribbean and Mediterranean Seas. Historically they were taken in the western Atlantic as far north as Nova Scotia and as far south as southern Brazil. In the eastern Atlantic they were taken off Norway in the north and as far south as North Africa and throughout the Mediterranean Sea. For management purposes, the population has been divided into an eastern and western stock, with the stock boundary approximately equidistant from the two continents. There is some mixing between the two stocks, however, and some scientists think that the bluefin of the Atlantic Ocean and Mediterranean Sea should be considered as a single stock for management purposes. Spawning occurs in the Mediterranean Sea and the Gulf of Mexico. They are slow-growing and long-lived species, with some individuals reaching more than 25 years of age. In terms of quantity landed, bluefin is the least important of the principal market species of tuna; however, these low tonnages believe the commercial importance of the species. Because of their large size, and the colour, texture, and high fat content of their flesh, they are the most sought-after species for sashimi, and command a higher price than any other species of tuna.

## 3. Tuna Farming

Tuna farming also known as tuna penning, tuna aquaculture, tuna ranching, and tuna mariculture is a proactive means to increase the tuna industry efficiency while reducing tuna species exploitation. For this tuna are captured at sea by purse seine netting and transferred to a specialised towing floating sea-cage. The cages are then slowly towed, sometimes large distances, to grow out sites. Small fish under 10 kg sizes are transferred in cages of 50-60 m diameter and 19-30 m in depth, with the mesh size of 55-85 mm. Once the fish are transferred into the grow out cages, they continue to be fed a diet of fresh baitfish, squid, pellets, or a combination of these feeds. When fish are fat and is favorable in market, harvesting is generally carried out by net-crowding some fish and removing by gaff or diver. The fish are then graded on the basis of condition (weight, defects, fat score) and flesh colour at the processing factory before being airfreighted and chilled. (Although many are now frozen at temperatures below -60C and shipped in containers).

According to a World Wide Fund for Nature (WWF) report released on 11th April 2003 there is threat on tuna farming in the Mediterranean, as dwindling of wild tuna populations. In view of this threat, the conservation organization is calling for a moratorium on the development of new tuna farms in the Mediterranean, until its environmental impacts, particularly on tuna stocks, are addressed at the international and national levels. WWF calls on General Fisheries Commission for the Mediterranean (GFCM) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) as well as the European Union (EU) to set up effective regulations for tuna farming, aimed at rebuilding the over fished tuna stock.

## 4. Tuna Breeding

The organizations actively involved in tuna breeding research are listed below:

- **Japan** - Kinki University
- **Mediterranean** - EU DOTT Project (Domestication of Thunnus thynnus)
- **Panama** - Achotines Laboratory (IATTC-JOFCF - Panama Government)
- **Australia** - Stehr Group's Clean Seas Aquaculture (Arno Bay)

The **Achotines Laboratory** of the Inter-American Tropical Tuna Commission (IATTC) in Panama is successfully spawning the yellowfin tuna in land-based tanks. IATTC believes that this is the only successful example of yellowfin tuna breeding in the world. According to Dan Margulies, Senior Scientist tuna has been spawning in captivity almost daily since 1996. Juveniles have been cultured for up to 100 days, and are routinely reared up to six weeks after hatching. IATTC's Tuna Billfish programme has two main responsibilities, one is to study the biology of the tunas of the Eastern Pacific Ocean to estimate the effects that fishing and natural factors have on their abundance and the other is to recommend appropriate conservation measures so that stocks of fish can be maintained at levels that will afford maximum sustainable catches.

**Kinki University** has succeeded in rearing bluefin in captivity for 23 years from the

juvenile stage - longer than any other research center in the world. Researchers are now grappling with the challenge of self-sustainable farming: obtaining viable eggs from farmed adults, and raising the fry to become the next generation in a continuous cyclical process. In another world first, university researchers have already tagged and released some farmed fry. Their success in advancing bluefin tuna farming technology will no doubt bring changes to the whole fishing industry. The results obtained by the practical research at Kinki University fisheries laboratories are without par, and can proudly claim to be meeting the challenge to sustain the future supply of fish.

## 5. The tuna fishing practices of the world

Since the advent of the human race, every type of device imaginable has been used to capture tuna, from spears or harpoons, to dynamite. Probably the first commercial harvests of tuna were made using hand hauled nets and fish traps. The first commercial capture of tuna probably took place in the Mediterranean Sea. The Phoenicians used fish traps more than three millennia ago to capture bluefin tuna, which they traded throughout their empire. Though such traps are still used to harvest tuna in the Mediterranean Sea, and Japan too, nearly all of the present-day harvest of tuna is made from fishing vessels with a variety of gear types and sizes. Currently many kinds of fishing methods are used and many types of fishing vessels, from small coastal sail boats of the Maldive Islands to the giant purse seiners of Japan and United States. World gear wise tuna production is given in Figs. 4 and 5.

## Gear Types

**Purse Seines** : Purse seiners target mostly yellowfin tuna and skipjack, and on a world scale account for roughly 48% of all the tuna landed. In recent years the purse-seine catch of bigeye tuna has been increasing rapidly, mostly due to the increased use of FADs. Scientists have urged caution against the expansion of fishing effort in the surface fisheries of the western Indian Ocean, and have expressed concern over the fact that the increased use of FADs has increased the catch of small yellowfin, which could be reducing the yield per recruit, and hence the total potential yield.

**Longlines**: The gear is passive and non- selective to the extent that it can capture several species of tunas along with other types of fish, particularly swordfish and marlins. The gear mainly target fishes mostly at depths between 100 and 150 meters, where temperature is cool and the largest tunas such as bigeye and bluefin aggregate which fetch very high prices in the sashimi markets of Japan. The majority of large longline vessels target bigeye tuna. The smaller vessels use shorter mainlines and fewer hooks than do the larger vessels and operate mostly in near shore waters. The larger vessels are often supplied by tender vessels, and can stay at high sea for extended periods. The largest long line fleets are those of Japan, followed by those of Taiwan, Province of China and Republic of Korea. In terms of tonnage of tuna captured, long lining captures about 21% of the world catch of tunas.

**Pole and Line**: Pole-and-line fishing is a two-mode type of fishing. Live baits for chumming to be caught first followed by tuna - skipjack and yellowfin. The live bait was used to attract the tuna shoal to the vessel where they were caught by pole-and-line gear. If the tunas were feeding well, and the "chummer" could keep the fish alongside the vessel, several tonnes could be captured in a short time. Though pole-and-line fishing which was at one time the major type of tuna fishing in terms of catch, because of improvements in purse-seine gear and fishing methods it has diminished its importance.

**Trolling**: Trolling consists of towing from a vessel, generally less than 20 meters in length, and several lines with bait or lures attached. Most troll fisheries target albacore tuna (Thunnus alalunga), but several other species are also caught. Trolling accounts for only a very small percentage of the world catch of tunas.

**Gillnets:** Drift gillnets, which are generally used to capture tunas in the open ocean, consists of a series of individual webbings joined together, often-exceeding 100 km in length. Because of the high incidental capture of other non target species, the use of drift gillnets longer than 2.5 km, was banned on the high seas by the United Nations. Only a small percentage of the world catch of tunas is now taken with gillnets.

**Fish Aggregating Devices (FADs):** Fish Aggregating Devices are structures located at

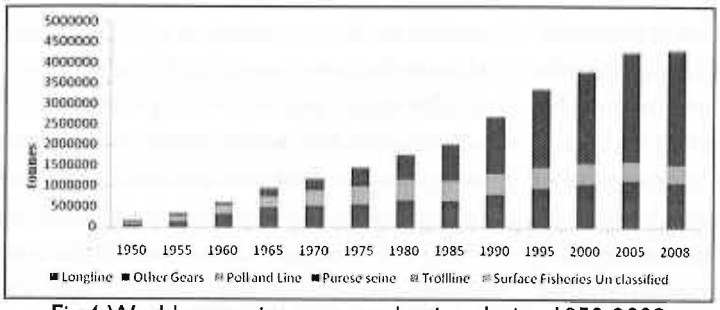


Fig.4. World gear wise tuna production during 1950-2008

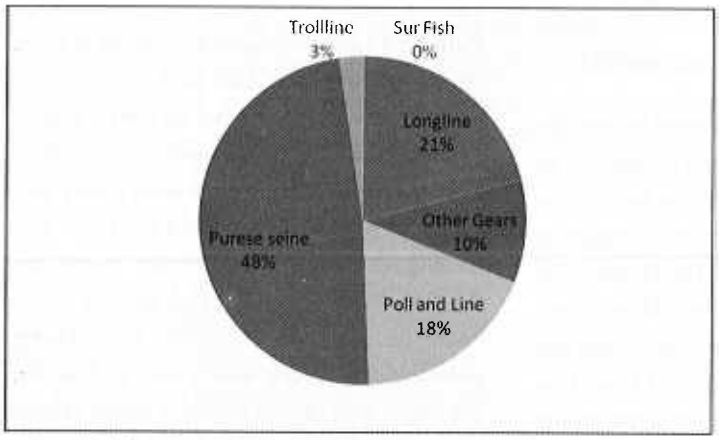


Fig.5. World Gear wise tuna production during 2008

surface or at midwater depths to take advantage of attraction of pelagic fish to floating objects. A FAD comprises a large anchor (up to 1m), a heavy-duty mooring chain (usually about 30m in length) and mooring rope, with about 50 purse-seine floats strung at the surface. The ropes and chain are joined using various shackles, rope connectors, splices and thimbles. A flag-pole is attached to facilitate locating the FAD. FADs may be placed in shallow (50-100m) or deep (500-1,500m) waters. Deep-water FADs attract or aggregate

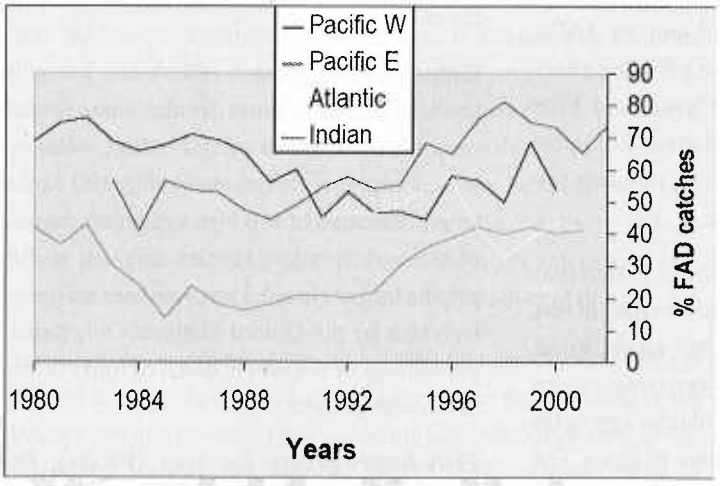


Fig 6. Percentage of total catch of tropical tunas taken under floating objects (FAD

Skipjack (Katsuwonus pelamis), Yellowfin (Thunnus albacares), and Bigeye (T. obesus). FADs anchored a few kilometers off the coast, and in depths of over 500m are generally more successful in attracting schools of tunas than shallow-water FADs. FADs aggregate the smaller tunas (Skipjack and immature Yellowfin, for example) at the surface and larger tunas (such as mature Yellowfin and Bigeye) at depths of 300-400m. FADs locally called payaos have been utilized for centuries in Philippines to attract migrating tuna shoals. During May 1977 to July 1979, in Hawaiin waters two types 'buoy type' and 'raft type' devices were used as aggregating devices of which buoy type attracted numerous pelagic fishes including large schools of skipjack and small yellowfin. FADs can reduce fishing effort and conserve fuel. Tropical tunas and other tuna related species are frequently found in association with floating objects. More than 50% of the world catch of tropical tunas come from fishing associated with FADs (Fig.6). Appropriate observations and understanding of the association phenomenon will enable us to derive fishery-independent indices of local abundance and indicators of the pelagic ecosystems.

## 6. Processing

The internationally traded tunas are raw material for canning (fresh, frozen and frozen pre-cooked loins), tuna for direct consumption (fresh/chilled and frozen) and canned (solid pack, chunks, flakes, grated). Japan is the main world market of tuna for direct consumption (sashimi). Sashimi originates from fresh raw tuna meat, or from tuna frozen at -40° immediately after harvest. The sashimi market requires the use of larger species, such as bluefin tunas (ensuring the premium sashimi) bigeye and yellowfin. Tuna for the sashimi market is graded on aesthetic characteristics, such as bright/clear appearance of the skin, clear and moist eyes,

elastic skin and undamaged abdominal walls, and on the high fat contents of the fish.

For processing tuna for canning soon after unloading from the vessel they are thawed in running water or sprays of water. They are then quickly gilled, gutted, headed and chilled or frozen. After cutting, the tunas are loaded into trays and taken to the pre-cooker. After pre-cooking and cooling, the cleaners remove the skin from the fish and separate the loins from the skeleton. The last step, canning, is a totally automated process. Canned tuna products are packed in oil, brine, spring water or sauce. After sealing the cans "retort cooking" is done for two to four hours.

It is a relatively common practice in the tuna industry to undertake all the processing stages up to tuna loining as close as possible to the landing areas in developing countries and to export the semi processed product (tuna loins) to canneries in developed countries. Other tuna commodities include dried and smoked tuna, tuna steaks, tuna burgers, tuna jerky, tuna sausage and tuna role. Animal feed and pet food are produced from processing waste of tuna canneries.

## 7. Conclusion

Tunas are highly sought after fish, and fisheries for tuna have developed over the last half century to such an extent that most of them are in need of restrictive management and several fisheries are overfished. The tuna fishery is one of the biggest yet most threatened fisheries in the world, mainly due to overfishing which has lead to 5 of the 23 identified commercially exploited tuna stocks being overexploited and further 11 being fully exploited . The development of tuna fishery has meant that the world's tuna fishing fleets are larger than those required to provide maximum sustainable yields and larger again than those required to produce the maximum economic benefit from the fisheries. The major market species discussed in this paper are all subject to international fisheries requiring multilateral cooperation for management and in all ocean basins regional fisheries management organizations have been established as the vehicle for cooperation. It has been understood for many years that tuna fisheries need international cooperation for their conservation and management.

The sea is not so large, nor the human population so small, to exempt even extremely fecund and very widely distributed organisms such as skipjack and yellowfin tuna from concern about sustainability. Bluefin tunas in their distributional ranges are depleted. Fishing pressure for Atlantic skipjack and yellowfin has been reported to be at or above maxi¬mum sustainable levels. Albacore are over fished and fully exploited in the North and South Atlantic, respectively, while the Atlantic bigeye has rapidly declined. In the Pacific, skipjack are under moderate levels of exploitation, while yellowfin stocks are under moderate to optimum exploitation pressure, though increasing ef¬fort directed at juvenile yellow fins and bigeye appears problematic. As in the Atlantic, Pacific bigeye populations have de¬clined rapidly. Indian Ocean tuna fisheries, management and monitoring are all at an early stage of development, but fishing pressure is drastically increasing which in turn negatively affected the tuna production since 2006.

Future recovery of depleted populations and sustainable management of all these species will require much better commitment and better scientific understanding than have been applied to tuna conservation and management until now. Our action must be swift if we are to ensure that tuna populations are maintained at levels of abundance that can support maximum yields on a sustained basis, to guarantee to future generations to enjoy the benefits of these resources.

Implementation of the 1995 UN agreement on high seas and straddling stock fisheries would further help harmo¬nize and improve performance standards for management, conservation and re¬covery of tuna populations. The adoption of rights-based management systems is the most promising way forward to overcome those problems. These systems would relieve governments from day-to-day allocation decisions and allow them to focus on their more important role of being responsible for the conservation of the fisheries (FAO, 2010).