Trends in World Tuna Fishery

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Tuna's have been important to mankind for several thousands of 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 civilisations. Currently, fishermen of nearly 80 nations harvest tuna from the oceans of the world. The harvest is consumed in many forms: raw, cooked, smoked, dried, and canned. Known commonly as "Chicken of the sea", tuna forms the second largest product in international seafood trade with about 9% of the total trade in value terms.

Tuna occurs both in temperate and tropical waters, broadly classified into coastal/neritic and oceanic species. The principal marketed species of tuna are 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 oceans. Their 'highly charged" life styles as apex predators in the oceanic pelagic environment are facilitated by a number of anatomical, biological, and physiological specialisations.

Tuna have demonstrated their speed and stamina in long distance migrations and International organisations 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 over a distance of not less than 26 km per day on an average. Northern blue fin tuna are known to have travelled 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.

WORLD TUNA FISHERY IN A HISTORIC PERSPECTIVE

Since the nineteenth century, 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, fishers caught them only at certain points in their life cycle. In other words, the fishing had to be seasonal. The fishing methods included, in the Atlantic, purse seining for Bluefin off Norway, trolling for Albacore in the Bay of Biscay, trap fishing for it in the Straits of Gibraltar and along the North African coast, Pole and line fishing for Bigeye and Skipjack near 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. These 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 and established deep freezing cold storage systems. These facilitated the introduction of new frozen products for the *sashimi* market. Consequently, they started to change their target species from Yellowfin and Albacore to Bluefin and Bigeye tunas. By 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. 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 by 1970 targeting Yellowfin and Skipjack.

The tremendous increases in tuna production during 1970-1978 period 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 marginal increase in world production, many of the vessels were shifted to the western Pacific and western Indian Ocean, where they located and developed new fishing grounds. The catches during this period showed the greatest rate of growth seen in the fishery of the area 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 to the flag of 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 nations entered the large-scale industrial tuna fisheries, mostly with purse seiners and long liners.

In 1997 the global tuna catch reached 3.5 million tonnes, and it continued to increase to 4.3 million tonnes by 2004 (Fig.1). In this 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. This trend influenced utilisation of tuna fish stocks upwards to a great extent. The relatively small tunas taken by purse seiners that used to be sold only to the canning industry can be now converted to products for the *sashimi* market.

The ocean-wise contributions of tuna during 2004 are shown in fig.2 and species wise contribution in fig. 3. In global fish trade, tuna export value grew by 41%, reaching US$ 5.3 billion ($1900million in 1987), while tuna imports grew by 44%, totalling US$ 6.54 billion in 2003. Main tuna catching nations are concentrated in Asia, with Japan and Taiwan as the main producers. Other important tuna catching nations in Asia are Indonesia and Republic of Korea.

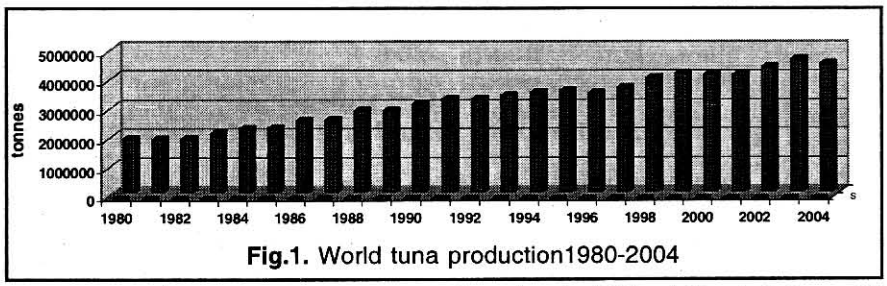

Fig.1. World tuna production1980-2004

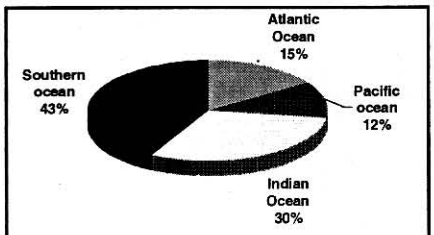

Fig.2. Ocean-wise tuna production during 2004

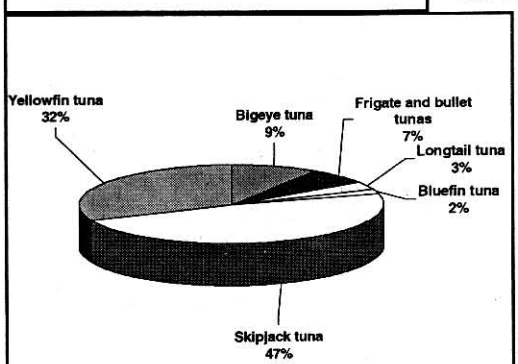

Fig.3. Species composition of world tuna production during 2004

MAJOR TUNA SPECIES

Skipjack (*Katsuwonus pelamis* (Linnaeus, 1758)): Skipjack is among the most widely distributed of all tuna species, being found in commercial quantities between 45°N and 40°S; it inhabits the upper mixed layer of the ocean, and is caught mostly using purse seines and pole-and-line gear. In terms of weight of fish caught, Skipjack is the dominant species in the catch of the Pacific, Atlantic and in the Indian Ocean. During the last several years, Skipjack dominated by 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 in the vast oceanic areas of 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. However, 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 show 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 that 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 capture vulnerability of the fish in these new areas.

So far as the Atlantic Ocean is concerned, there is no conclusive evidence concerning the stock structure of this species, while 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 much 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 optimally exploited, scientists have expressed some concern about the possibility of increased fishing levels adversely affecting stock abundance.

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 weighing 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 these 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 reach the nursery grounds, where they stay until they are about 65 to 85 cm in length. At this stage, most migrate to the western Atlantic Many return to the eastern Atlantic fishing grounds at the size of about 110 cm.

It is not known whether Yellowfin from the eastern and western Indian Ocean belong to the same stock. However, if the two are independent of each other, it may be possible to increase yellowfin catches somewhat in the eastern area.

Bigeye (*Thunnus obesus* (Lowe, 1839)): Bigeye is distributed throughout most of the world's oceans, but it occurs mostly in waters below the thermocline. Big eye make extensive vertical movements and often feed deeper than other tunas. Among their unique adaptations to life at greater depth 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. Big eye mature at the beginning of their third year of life, at a fork length of about 100 cm. They spawn largely in tropical waters. Further, the growth is relatively rapid. The Big eye tuna is a generally understudied tuna despite its decreasing 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. At larger sizes, Big eye move into more temperate waters.

A recent genetic analysis of Pacific Big eye population by the Pelagic Fisheries Research Programme (PFRP) was unable to detect major subdivisions. Some bigeye move over considerable distances. They also demonstrate considerable site fidelity. A considerable number of Big eye were captured at the release site after more than 5 years of life of liberty.

Albacore (*Thunnus alalunga* (Bonnaterre, 1788)): The Albacore is widely distributed. It is mostly a subtropical to temperate tuna. Considered to constitute separate north and south stocks in both the Pacific and the Atlantic, these tuna 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 fishing in more tropical waters captures 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 always fetches a premium price.

Bluefin Tuna: There are two species of Bluefin tuna, southern bluefin [*Thunnus maccoyii*] (Castelnau, 1872), found throughout the temperate waters of the southern hemisphere, and northern Bluefin (*Thunnus thynnus*) [(Linnaeus, 1758)], 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 the 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 waters 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 a 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 theAtlantic 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.

Bluefin are a slow-growing and long-lived species, with some individuals reaching more than 25 years of age. In terms of tonnage landed, Bluefin is the least important of the principal market species of tuna; however, these low tonnages add to 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.

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's efficiency, while reducing exploitation of tuna species. For this, tuna are captured at sea by purse seine netting and transferred to a specialised towing sea-cage. The cages are then slowly towed, sometimes over long distances, to grow out sites. 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 in a favourable condition for marketing, harvesting is generally carried out. The fish are then graded on the basis of condition (weight, defects, fat score) and flesh colour at the processing factory before being chilled and airfreighted. (Although many are now frozen at temperatures below -60°C and shipped in containers).

According to a WWF report released on 11th April 2003 there Is threat on tuna farming in the Mediterranean, because of dwindling of wild tuna populations. In view of this threat, the General Fisheries Commission for teh Mediterranean (GFCM) 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 GFCM and the ICCAT as well as the European Union (EU) to set up effective regulations for tuna farming, aimed at rebuilding the overfished tuna stock.

TUNA BREEDING

The organisations involved in tuna breeding research are listed below:

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

The ***Achotines Laboratory*** of the 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 almost daily since 1996. Juveniles have been farmed 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 young ones. 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 they can proudly claim to be meeting the challenge to sustain the future supply of fish.

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. These first commercial captures 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 in the seas of Japan too, nearly all of the present-day harvest of tuna is made from fishing vessels with a variety of gear types and sizes.

GEAR TYPES

Purse Seines : Purse seiners target mostly Yellowfin tuna and Skipjack, and on a world scale account for roughly 60% 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 regarding 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, plus other types of fish, particularly swordfish and marlins. The gear fishes mostly at depths between 100 and 150 meters, where temperatures are cool and the largest tunas such as Bigeye and Bluefin which fetch very high prices in the sashimi markets of Japan, are caught. The majority of large longline vessels target bigeye tuna.

The smaller vessels use shorter mainlines and fewer hooks compared to the larger vessels and operate mostly in near shore waters. The larger vessels are often supplied by tender vessels, and can stay at sea for extended periods. The largest long line fleets are those of Japan, followed by those of Taiwan, and Republic of Korea. In terms of tonnage of tuna captured, long lining captures about 14% of the world catch of tunas.

Pole and Line: Pole-and-line fishing is a two-mode type of fishing. Live bait must first be caught before the tuna, which are most often Skipjack and yellowfin, can be captured. The live bait was used to attract the tuna to the vessel where they were caught by pole-and-line gear. If the tuna were feeding well, and the "chummer" could keep the fish along side the vessel, several tonnes could be captured in a short time. Though pole-and-line fishing was at one time the major type of tuna fishing in terms of catch, because of improvements in purse-seine gear and methods, it has diminished in importance.

Trolling: Trolling consists of towing from a vessel, generally less than 20 meters in length, several lines with bait or lures attached. Most troll fisheries target albacore tuna (*Thunnus alalunga*), but several other species are also taken. 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, consist of a series of individual nets connected together, often exceeding 100 km in length. Because of the high incidental capture of other 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 taken with gillnets.

Fish Aggregating Devices (FADs): Fish Aggregating Devices are structures located at 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 30 m 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 finding the FAD. FADs may be placed in shallow (50-100m) or deep (500-1,500m) waters. Deep-water FADs attract or aggregate Skipjack (*Katsuwonus pelamis*), Yellowfin (*Thunnus albacares*), and Bigeye (*T. obesus*) tunas. FADs anchored a few kilometres off the coast, and in depths of over 500m are generally more successful in attracting schools of tunas compared to 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 (called *payaos*) have been utilised for centuries in the Philippines to attract migrating tuna. During May, 1977 to July 1979, in Hawaiin waters two types of FADs, 'buoy type' and 'raft type' were used of which buoy type attracted numerous pelagic fishes including large schools of Skipjack and small Yellowfin tunas. FADs can reduce fishing effort and conserve fuel. Tropical tunas and other species are frequently found in association with floating objects. More than 50% of the world catch of tropical tunas come from fishing under FADs (Fig.4). 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.

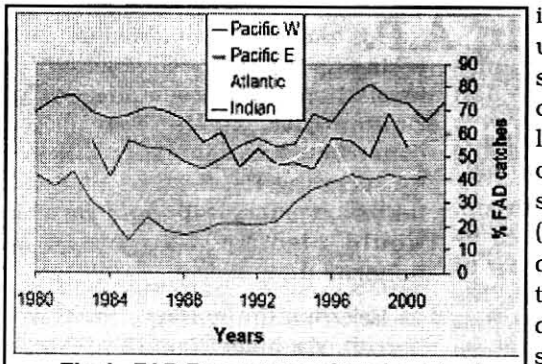

Fig 4. FAD Percentage of total catch of tropical tunas taken under floating objects

PROCESSING

The main internationally traded tuna forms 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°C 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 precooking 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 roe. Animal feed and pet food

are produced from processing waste of tuna canneries.

DATABASE FOR MANAGEMENT OF TUNA FISHERY

FAO's Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks calls on nations to work together within regional organisations to maintain lists of vessels operating in their areas of competence which should include all types and sizes of vessels used to catch tunas, rather than just large purse seine and distant water long line vessels. Accordingly, several of the regional tuna bodies have taken initiatives to create and maintain databases.

These regional bodies are the International Commission for the Conservation of Atlantic Tunas (ICCAT), Indian Ocean Tuna Commission (IOTC) for the Indian Ocean, and the Secretariat of the Pacific Community (formerly South Pacific Commission {SPC} for Pacific ocean). The Inter-American Tropical Tuna Commission (IATTC) covering primarily the eastern tropical Pacific and Forum Fisheries Agency (FFA) maintain databases for vessels that are currently and have previously operated in their respective regions. There are, however, areas that fall outside the jurisdiction of these various bodies, for which data is lacking. Most notably, these areas represent parts of the west-central Pacific.

Also the information that is collected by the various organisations is not uniform as some organisations include detailed data and specifications for individual vessels, while others compile only statistics on the numbers of vessels fishing for tunas. Because the problems of tuna management are quite similar throughout all fisheries and areas, and because the vessels move from region to region, there is a strong need to collect detailed information by individual vessels that is comparable among regional organisations. The type of data that should be collected has been clearly identified in the FAO's Agreement to Promote Compliance and by some of the regional tuna bodies, and such lists can serve as useful guidelines for collecting and maintaining a vessel database. The kind of information which would be useful to include in any international registry of tuna fishing vessels to be compiled by the regional tuna bodies includes: a). Name of vessel, former names, and registration number; b). Flag of registry and previous flag(s) if applicable; c). International radio call sign; d). Date and location of construction; e). Length, beam, and moulded depth; f). Gross tonnage; g). Fish hold capacity in cubic meters; h). Fish-carrying capacity in metric tonnes; i). Power of main engine(s); j). Fishing method(s); k). Type of aircraft used in fishing, if applicable; l). Name and address of registered owner(s); and m). Names and addresses of manager(s)

CONCLUSION

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 are everywhere depleted. Fishing pressure for Atlantic Skipjack and Yellowfin has been reported to be at or above maximum sustainable levels. Albacore are over fished and fully exploited in the North and South Atlantic respectively, while the Atlantic Big eye has rapidly declined. In the Pacific, Skipjack are under low to moderate levels of exploitation while Yellowfin stocks are under generally moderate exploitation pressure, though increasing effort directed at juvenile yellowfin and Big eye appears problematic. As in the Atlantic, Pacific Big eye populations have declined rapidly. Indian Ocean tuna fisheries management and monitoring are all at an early stage of development, but fishing is increasing.

Future recovery of depleted populations and sustainable management of all the above mentioned tuna species will require much higher 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, enjoyment of the benefits of these resources. Implementation of the 1995 UN agreement on high seas and straddling stock fisheries would further help harmonise and improve performance standards for management, conservation and recovery of tuna populations.

Fisheries Institute at Machilipatnam in A.P.

Minister for Animal Husbandry and Fisheries, A.P., Mr. Mandali Buddha Prasad said that plans were afoot to set up a fisheries training institute with a testing laboratory for aquaculture at Machilipatnam. Addressing a meeting organised by owners of mechanised boats at Machilipatnam harbour during his visit, Mr. Buddha Prasad said that Chief Minister Y.S. Rajasekhara Reddy had announced a special package worth Rs. 75 crores for taking up various welfare activities for fishermen across the State. Community halls would be constructed in all fisher villages by spending Rs. 5 lakhs to Rs.15 lakhs on each hall. Life jackets would also be distributed to fishermen.

Referring to the construction of a port at Machilipatnam, Mr. Prasad said that the long-pending Bandar port project would be a reality soon.

AP. Scene: Marginal Increase in Share of Fisheries in the Economy

Bad news to Andhra Pradesh's economy is that the share of agriculture to Gross State Domestic Product (GSDP) has marginally declined. But, the good news is that fisheries, besides trade, hotels, construction, real estate and livestock have registered promising growth rates. This is largely due to fall in production of food grains from 169.50 lakh tonnes to 160 lakh tonnes during the period, it is stated