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Short Communication

Oceanic Tuna, a Species of Unique Trait and an Important Commodity in International Market

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Introduction

At the Howble's courts order, the author as Director Fisheries had to inspect one Taiwanese long liner of over 40 m OAL moored at Abardeen jetty, Port Blair, India in May 1982. The long liner was apprehended by the coast guard's patrol vessel fishing in the territorial waters of Andaman Sea.

The long liner was equipped with gears for tuna fishing and its refrigerated fish holds were nearly half filled with gibbed Yellowfin tuna, caught within a week from the Exclusive Economic Zone (EEZ) around Andaman and Nicobar Islands.

The Indian Exclusive Economic Zone is a much coveted fish poaching avenue not only for Taiwanese fishing vessels, but also of other countries. Thai fishing vessels are frequently poaching tuna from Indian EEZ and their presence have been noticed in the Bay of Bengal and Andaman Sea.

Sri Lankan fishermen was also included in the poachers list recently. The tuna long lining vessels of this country have been seen fishing for tuna in Indian waters as north as Visakhapatnam.

In violation of the Maritime zones of India (Regulation of fishing by foreign vessels) Act, 1981, fishing vessels of foreign countries were catching tuna from the Exclusive Economic Zone of India.

The species of tuna (13 species), recognized by its fusiform, streamlined body and a lunate caudal fin, are large sized fishes with deepest body near the middle of the first dorsal fin base. They are epipelagic, oceanic and inhabit above and below the thermocline. Vertical distribution of tuna seems to be regulated by the thermal stratification of water columns, which is roughly between 18° and 31°C

Tuna ecology

Tuna have a high metabolism and an internal temperature higher than that of the surrounding waters, a characteristic of these species. Tuna are constantly engaged in the search of suitable areas to ensure their survival. Consequently, they spend their whole lives swimming and their resulting high energy consumption require them to feed daily large quantities of food, which can attain as much as, 15% of their total weight. As a result, the areas of tuna concentration are by no means casual and migration takes place according to "hydrological routes" in which each species finds the optimum environment for survival in every stage of its existence.

Traits

Oceanic tuna are mostly large in size and inhabit in the oceanic habitats, chiefly comprising of skip jack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), Bigeye tuna (*Thunnus obesus*), albacore (*Thunnus alalunga*) and southern bluefin tuna (*Thunnus maccoyii*).

Skipjack tuna, smallest among tuna community (less than 6 kg) are found throughout all inter tropical waters. Bigeye inhabits in greater depth and their occurrence is influenced by the thermocline of the water column. Young southern bluefin is widely distributed in the three oceans of southern hemisphere in relatively cold waters (5° - 10°C).

Physiological tolerances differ from one tuna species to another. Temperature and dissolved oxygen of the water governs their habitats and migratory paths. According to their morphological and physiological requirements during their life stages the interdependences on water temperature and dissolved oxygen will vary.

The first problem confronting the tuna is to remain in the water column. According to the presence of a swim bladder (genus Thunnus) or absence of swim bladder (skipjack), tuna has to face difficulties to remain afloat in different layers of water column. Swim bladder reduces density of the body. To maintain constant depths skipjack have to swim more faster as they grow. For that reason they require increasing intake of oxygen. Swim bladder of Yellowfin tuna grow with age. This helps them to reduce the speed as well as oxygen intake. Bigeye and bluefin tunas retain their swim bladder throughout their life span.

The second problem is the water temperature. Due to underdeveloped thermo - regulatory system, young tuna have to swim within narrow thermal territories. On the other hand adult individuals can move much deeper. Young skipjack's movement is restricted within warm and oxygenated mixed layer of the thermocline, whereas older individuals can tolerate and move in low oxygenated waters.

In three oceans of southern hemisphere, in relatively cold waters of 5° - 10°C, southern bluefin tuna reside between 30° to 50° S. The species is also reported to be available as far as 10°S in the Indian Ocean, south of Indonesia for spawning.

Adult bluefin can grow over 2m in length weighing 200 kg and can survive for 20 years. It can swim very fast, at times up to 88 km per hour. With their streamlined body with immense power they soar and glide within wave like a jet fighter in the air. Seventy five percent of its muscle is hydro - dynamically efficient. This along with a very strong heart and enough oxygen intake from large volume of water through its mouth, passing over the largest gill areas of any fish, made the species specially remarkable.

The red muscle of tuna along the vertebral column, together with heart exchange mechanism of its efficient circulatory system made them, fish with warmest body temperature, permitting them to resort for instantaneous horizontal and vertical movement, independent of environmental temperature acclimatization.

Bluefin tuna resort to ram feeding with mouth wide open to swallow its prey during day and night and can feed 5 to 10% of its body weight daily. The speed with which it approaches its prey and the suction force it create by its muscular jaws, the prey inspite of its strongest resistance, has got no other option but to enter into its mouth along with water.

The author experienced the force with which small yellow tuna (8 - 10 kg each) attacked the baited hook of troll lines and the impact on the lines, when he was fishing with troll line in Andaman Sea in 1983. A big sized yellowfin can easily straighten the bent hook and set free. For this reason, in the branch lines of a long line, meant for tuna fishing revolving hooks on swivel are used to prevent twisting of lines and escape of hooked tuna.

Capture

The commercial nature of tuna makes them to move in schools, easily noticeable from the water surface. The behavior seems to be a protective measure and can vary according to area and the hour of the day.

Tuna schools mainly in surface and deep sea. The former school can be easily spotted by sighting on a crow's nest by experienced personnel, while the later by the acoustic devices, such as echosounder sonar.

Surface school can swim freely or gather around floating objects. Birds may accompany free swimming surface or subsurface schools.

To identify a fish school according to the behavior of individuals it comprises, they are known as:

1. When large fish school swimming sub - surface in the same direction, ripples appear on the surface, known as breezer.
2. But when only dorsal fins can be visible from the surface from time to time, they are called finner.
3. Jumper signifies when single fish jumps out of the water and dive with head first creating a choppy sea, indicating momentarily loosing contact with other members of the school.
4. Mixed schools made up of small tunas at a time jump out of water forming a choppy sea is known as smoker.
5. Large fish is seemed to jump in a disorderly manner while preying on anchovies, or euphausids, causing the water to foam, is called boiler.

Tuna can also gather around floating and anchored objects and mammals like whales and dolphins can be comprised of one or more species. Birds may or may not accompany them.

Acoustically, three different patterns deep sea tuna schools have been identified. The first type was detected below floating object in a compact form. The schools were composed of adult skipjacks mixed with small yellowfin and bigeye. In the second type, both free swimming and aggregated schools form two parts, the upper one, compact with smaller individuals, while the lower one was longer with larger individuals, thicker than upper layer. At times, the two parts were separated and the schools belong to mixed size and species. Typical free swimming formation, made up of large fish, belong to third type in a thicker layer of water making an oblong diamond shape on the echosounder screen.

Knowledge of tuna schooling pattern facilitate in finding out the suitable fishing gear and method to be used for capture of tuna.

In successful tuna fishing, one of the main requisites is adequate knowledge of the conditions prevailing on the fishing grounds. Apart from the oceanographic data such as, direction and rate of current and water temperature, it is necessary to study the kind of tuna, their schooling habits, migration direction and size and density of schools. To obtain high catches, one must know the daily changes in these factors to be able to forecast the daily movement of fish. Positioning the long line (direction of shooting) is important, since the long lines should be set not only at right angles to the current direction, but also in approximately the middle of tuna schools. The type of bait used and its condition is of the highest importance in tuna long line fishing.

In pole and line fishing of tuna highest attention is required to be paid for chumming fish by spreading live bait fishes over the water surface and spraying water jets over the unbaited hooks to mask the hooks from live baits.

Seining to surround tuna school with large and deep seine net with the help of powerful speedy seiner is now resorted for small and medium sized tuna.

More recent are the harpooning flotillas, assembling at the migratory path of bluefin tuna during their return journey from feeding ground. Bluefin adds 50 to 100 kg during feeding migration. These fatty fishes have demands for sashimi in Japanese market. Each flotilla hires a small plane to track the moving bluefin around the flotilla. Over the loud speaker of the plane cracked "Two boats". The spotted tuna was two boat lengths from the flotilla. The captain of flotilla stood over the bow with harpoon in his hand, muscle tensed, like a javelin thrower in Olympic. "Half boat", the voice from the loud speaker roared, and the harpoon was shot by the harpooner. Nothing was visible except foam of air on the sea surface. After a few seconds, the harpooner shouted, "Hitted". Immediately one of the crew member pushed the red bottom. 1200 volt of electric current flowed through the wire to the brass tip of the harpoon. A giant bluefin of 225 kg float on the surface, brought to the flotilla and packed in a styrofoam box to be flown in a chartered plane to Sujuki market for auction.

Commodity

Tuna has the largest protein contents, especially the protein content in tuna red meat are by far the highest among fresh foods served in meals. 100 gram of tuna red meat contain 20g protein as against 11g in beef and 19 gram in pork. Tuna flesh is rich in vitamin D, which can prevent high blood pressure and occurrence of osteoporosis.

Tuna are bled as soon as they are hauled aboard and chilled as per standards laid down for export. Immediately after the harvest and taking fish on board, a stinger was pushed inside them behind the head in a way that it would get into the vertebral column and paralyze the central nervous system. Thereafter before transfer to the fish hold, the gills and viscera are removed. After that fish should be hung fourteen minutes for draining the blood. Each tuna is cleaned with water and cleaned fish are put in ice box or chilled refrigerated sea water tanks.

With regard to the aspects of production of quality sashimi and loins of tuna and their processing for export, the icing of tuna onboard is emphasized, the need to replace ice used once for every four hours.

The checking of quality is done by using a gadget known as "Sashi bou". This is needed to be inserted into each of the fishes and later pulled out. Some meat would also come out sticking all around "Sashi bou". This is then tested by a process that would also include testing by tasting. The "Sashi bou" test would indicate how long the fish can be kept under preservation.

Quality of sashimi produced out of bluefin tuna is highest in price followed by sashimi out of bigeye tuna and yellowfin tuna.

In the market sashimi out of tuna is graded on the basis of species, the time and the area of capture, the method of preservation (fresh refrigerated or frozen) and the method of capture. It is further evaluated, on the presence of fat, appearance of skin, protuberant, clear and moist eyes, intact stomach and fish smell.

A+ grade sashimi is made from large tuna individually during the season prior to reproductive period.

"Masmin" is the most popular product made out of tuna in Lakshadweep and the 90% of the tuna caught in the islands are processed into this traditional products. This product resembles the Katswobhushi of Japan. It has a shelf life of about a year and has excellent taste [1-5].

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