



## The Surveying of Biological Characteristics of Long tail Tuna (*Thunnus tonggol*) in the Southern Coasts of Iran

**Masoud Hedayatifard**

Assistant Professor of Agricultural College, Islamic Azad University Po Box: 163,  
Ghaemshahr, Iran, e- mail: Persiafish@gmail.com

### Abstract:

Tuna fishes (Scomberidea) are of the most valuable industrial aquatics of the world's water. The fame of different types of can made with them is so great that even effects on the canned products of the other nutrition. In Oman Sea and to some extent Persian Gulf, 5 important species of this valuable family are living and immigrating. Among them, long tail tuna *Thunnus tonggol*, or Havoar (Persian name) has most amount of fish catching in Iran. Biological properties and aspect characteristics of this fish have been under survey of many of fisheries science and industries experts. So that cause of differences with the other species of Scomberidea family in different regions of the world, in morphology, chromatology, systematic properties, biological and ecological characteristics have been considered. In this research, after fishing some kinds of longtail tuna from Oman Sea and Hormoz strain, its biological parameters have been tested, so that its diet is carnivorous and usually eats the fishes, crustacean and mollusca. Total length of this fish is on the average, 75 to 80 cm tall that at the age of 5 to 6 years, reaches the maximum amount. The longtail tuna is mature at the age of 2 and its sexual ratio is 1:1. The spawning is done in August to October annually. Its local fishing's method in the Iranian water is Drift Gill Net and other local fishing equipments like purse-seine and long-line, and also there are industrial methods too. Fishing region of longtail tuna is almost in all fishing areas of southern coasts of Iran especially in Oman Sea, from Hormoz strain to Chabahar and Pozm gulfs. Longtail tuna's fishing is done during all the year but in warm months of the year has more increase. According to these specialties and in comparison with the researches in other world fishing areas of longtail tuna strengthens this theory that this fish in southern waters of Iran is the individual among its species.

**Key words:** *Biology, longtail tuna (Thunnus tonggol), Persian Gulf, Oman Sea, Tuna fish*



## 1. Introduction

In Oman Sea and to some extent Persian Gulf 5 important species of this valuable family are living and immigrating. Tuna fish (Scomberidea) are of the most valuable industrial aquatics of the world's water. The fame of different types of can made with them is so great that even effects on the canned products of the other nutrition.

Long tail tuna *Thunnus tonggol* or **Havoor** (Persian name), has most amount of fish catching in Iran. *Thunnus tonggol* is included in the subgenus *Neothunnus* with two other tropical species of this genus, *T. albacares* and *T. atlanticus*. This pepper presents some biological characteristics of the longtail tuna (*Thunnus tonggol*).

### 1.1 Short properties of family Scombridae:

Distribution in tropical and subtropical seas. Body elongate and fusiform, moderately compressed in some genera. Snout pointed, premaxilla beaklike, free from nasal bones which are separated by the ethmoid bone; mouth large; teeth in jaws strong, moderate, or weak; no true canines; palate and tongue may bear teeth. The 2 dorsal fins separate and depressible into grooves with 5-12 finlets behind second dorsal and anal fins; first dorsal fin with 9-27 rays, origin well behind the head. Pectoral fins high on body. Pelvic fins moderate or small with 6 fin rays, placed below the pectoral fins. Caudal fin deeply forked with supporting caudal rays completely covering hypural plate. At least 2 small keels on each side of caudal fin base, a larger keel in between on caudal peduncle in more advanced species. Lateral line is simple. Vertebrae 31-66. Body covered with small to moderate scales or a scaly corselet developed and rest of body naked or covered with tiny scales. Gill membranes not united to isthmus. *Thunnus* and close relatives with a specialized vascular system for heat exchange. Females of many species attain larger sizes than males. Batch spawning of most species takes place in tropical and subtropical waters, frequently inshore. Eggs are pelagic and hatch into planktonic larvae. It is among the most important of commercial and sport fishes.

### 1.2 *Thunnus tonggol* (Bleeker, 1851)

Classification of this fish is following:

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Superclass	Gnathostomata
Class	Osteichthyes
Division	Teleostei
Cohort	Acanthopterygii
Order	Perciformes
Suborder	Scomberoidei
Family	Scombridae
Subfamily	Scombrinae
Tribe	Thunnini
Genus	Thunnus

**Synonym names:**

- *Kishinoella rara* (Kishinouye, 1915)
- *Kishinoella tonggol* (Bleeker, 1851)
- *Neothunnus rarus* (Kishinouye, 1915)
- *Neothunnus tonggol* (Bleeker, 1851)
- *Thunnus nicolsoni* (Whitley, 1936)



**Figure 1, *Thunnus tonggol* Bleeker, 1851 (Longtail tuna or Havoor)**

Some of the most important characteristics of Longtail Tuna are following:

English:	<b>Longtail tuna</b>
Latin:	<b><i>Thunnus Tonggol</i></b>
Size + Weight:	Average today about 90 cm about 15-20 kg
Biggest Angled Fish:	35,7 kgs in Australia,
Catching Areas:	65% Western Pacific 35% Indian Ocean
Catching methods:	Mostly pole and line, Long Lines, Purse seine
Share of all tuna caught:	about 20% or 20.000 m/t
Main Production Areas:	Thailand, Indonesia, Indian Ocean
Major markets:	United Sates
Popular Product Forms:	Canned (White Tuna)

**1.3 Morphology of Longtail Tuna:**

Its vertebrae are 39; it is a small species, deepest near the middle of the first dorsal fin base. The second dorsal fin is higher than the first dorsal fin; the pectoral fins are short to moderately long. The dorsal, pectoral and pelvic fins are blackish; the tip of the second

dorsal and anal fins are washed with yellow; the anal fin is silvery; the dorsal and anal finlets are yellow with grayish margins; the caudal fin is blackish, with streaks of yellow green. Lower sides and belly silvery white with colorless elongate oval spots arranged in horizontally oriented rows (Figure 1 and 2). Swimbladder is absent or rudimentary. Juveniles of longtail tuna, bluefin tuna (*Thunnus maccoyii*), yellowfin tuna (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*) are very similar.

**1.4 Product characteristics:** The meat is quite tender and has an almost white color. It has not too much taste. It is by some more appreciated as a canned product than the somewhat drier albacore meat (Figure 4).

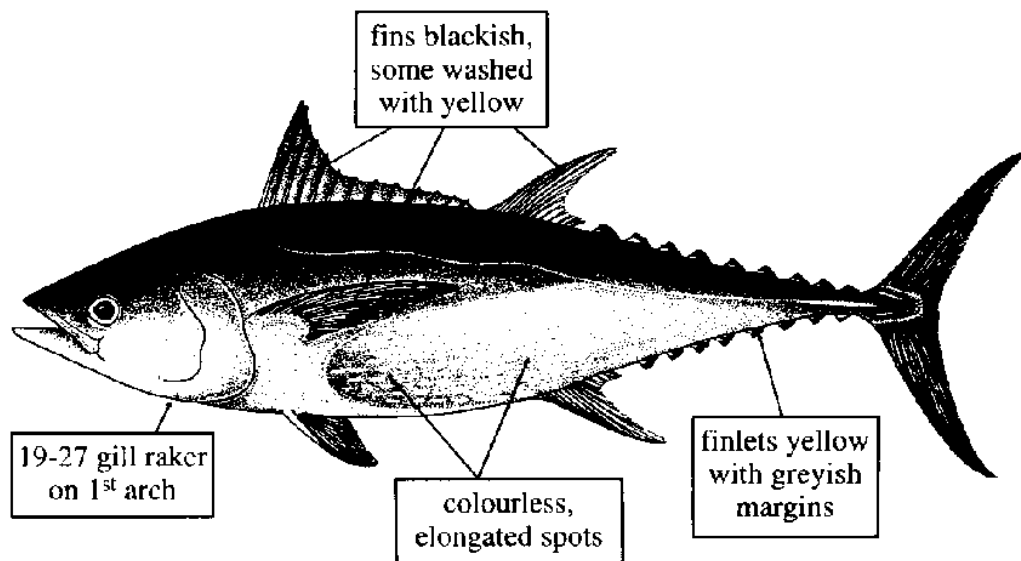


Figure 2, Features of longtail tuna *Thunnus tonggol*.

## 2. Distributions

The longtail tuna lives throughout the Indo-West Pacific; it is most abundant over areas of broad continental shelf. The general distribution of longtail tuna extends from the coast of Somalia, Gulf of Aden, Red Sea of Japan, Papua New Guinea, Australia, and New Zealand and also Oman Sea and southern coasts of Iran (Figure 3). Longtail tuna is basically confined to the neritic regime.



**Figure 3, Distribution of longtail tuna in Iranian Coasts.**

In the Indian Ocean, the southernmost distribution of longtail tuna off the east coast of Somalia is at about Ra'as Hafun.



**Figure 4, Fillet of longtail tuna.**

### 3. Behavior and food

Longtail tuna is essentially a neritic species with most phases of its life cycle confined to the continental shelf. Therefore, it is highly probable that there are numerous stocks throughout the distributional range of the species. Longtail tuna forms schools of varying sizes. This fish feeds on a variety of fish, cephalopods, and crustaceans, particularly stomatopod larvae and prawns (Figure 5). The adults and juveniles feed about 20% and 40% of their body weight, respectively. Longtail tuna are generally found in the neritic regime with kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*).

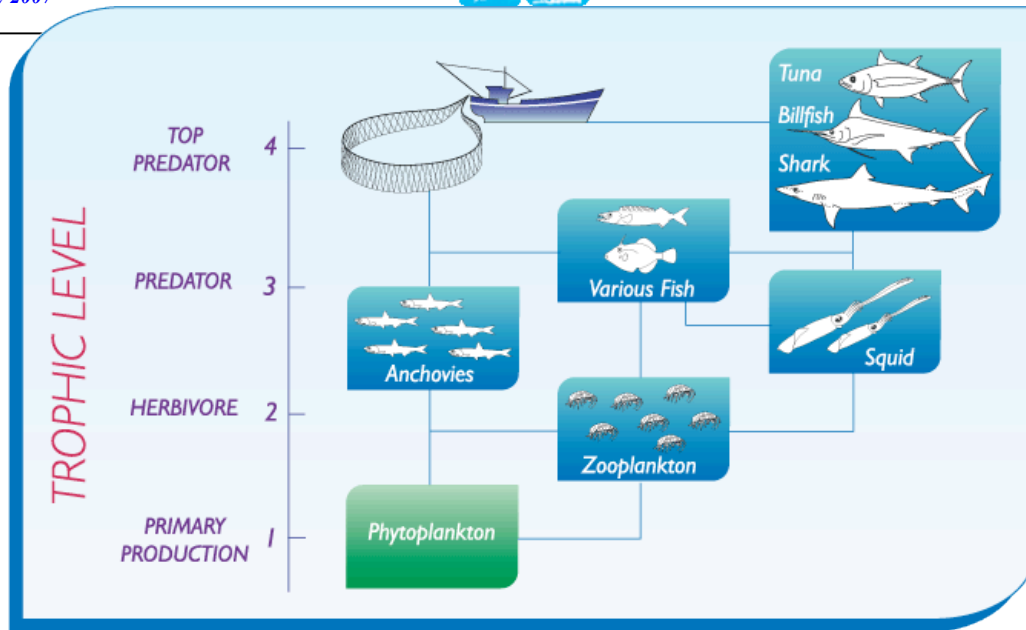


Figure 5, Nutrition and Trophic levels of longtail tuna.

## 4. Migration

Movements in the Sea of Oman might be deduced from seasonal changes in peak fishing months along the coast of Iran. These fish move offshore with increasing size and have essentially all departed from the inner-neritic by 40 cm. Longtail tuna in the 40- to 49-cm size range are distributed principally in the outer-neritic and is the dominant species in this regime. Larger fish (more than 50 cm) are rarely captured during the investigations and it is speculated that these fish emigrate out from the coast. Presumably the larger fish require cooler water temperature in the south to slow metabolism and allow the diversion of energy into gonad development.

## 5. Reproduction and Early stage

### 5.1 Spawning season

The spawning season varies according to location. Off the west coast of Thailand there are two distinct spawning seasons: January-April and August-September. *Thunnus* species require warm water to spawn, at the spawning season. It's spawning is done in August to October annually in the Iranian waters from the Oman Sea. Mature females were found in January-April and again in August-September. Spent females are observed in January and March. There appear to be two distinct spawning seasons for longtail tuna; a major spawning from January through April, with probable peak in March, and a minor spawning in August-September.



## 5.2 Size and age at first maturity

On the Iranian coasts in Persian Gulf and Oman Sea, sexual maturity is attained at 39.6 cm and spawning occurs mostly during end of summer. This size in the coasts of Australia and New Guinea is 51 and 60 cm respectively. Fish in the size group with mode at 38 cm were immature and in the group with mode at 51 cm were maturing, as these had enlarged, developing gonads.

Sexual maturity of longtail tuna determined by visual examination of ovaries and assigned maturity stages according to a 5-point scale. The characters used to define maturity stages were size of gonad, colour, degree of softness, and turgidity.

Mature (stage-IV) and spent (stage-V) female longtail tuna were captured in the outer-neritic and restricted inner-neritic regime during the northeast monsoon. Though larvae have a high temperature tolerance (at least between 21.4° and 29.5°C), the widest among tuna species studied, their optimum temperature is between 26.5° and 27.5°C, and the species is usually confined to oceanic salinities.

Stage of maturity indices collected during a 2-year period off the coasts of Oman sea were grouped by month to show development of maturity through the year and to define spawning seasons.

**Table 1, Coefficients of the general equation used:  $W = (a) FL^b$  for predicting fish round weight (kg) from standard length (cm) for longtail tuna and like species.**





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<i>Species</i>	<i>Type of Measurement</i>	<i>a</i>	<i>b</i>	
<i>S. Commerson</i>	TL	$9.61 \times 10^{-3}$	2.857	India
	TL	$1.54 \times 10^{-2}$	2.814	India
	FL	$1.72 \times 10^{-6}$	3.31	Oman
	TL	$5.6 \times 10^{-3}$	2.979	Saudi Arabian Gulf
	TL	$1.2 \times 10^{-3}$	2.812	Red Sea
	FL	$1.1 \times 10^{-2}$	2.85	Gulf of Aden, Yemen
	FL	$1.06 \times 10^{-5}$	2.94	South Africa
	FL	$7.3 \times 10^{-3}$	3.01	Western Australia
	FL	$1.32 \times 10^{-2}$	2.89	Queensland Australia
	FL	$5.7 \times 10^{-3}$	3.125	Indonesia
	FL	$1.72 \times 10^{-6}$	3.31	Oman
<i>S. guttatus</i>	TL	$1.01 \times 10^{-2}$	2.86	India
<i>A. solandri</i>	FL	$2.51 \times 10^{-4}$	3.19	South Africa
<i>T. tonggol</i>	FL	$1.5 \times 10^{-4}$	2.437	Hormuzgan waters
<i>S. guttatus</i>	FL	$9.6 \times 10^{-3}$	3.002	Indonesia Indian Ocean
<i>A. rochei</i>	FL	$1.7 \times 10^{-5}$	3	Indian Ocean
<i>A. thazard</i>	FL	$1.7 \times 10^{-5}$	3	Indian Ocean

## 6. Fecundity

Fecundity (Total number of ova spawned by a fish in a season) increased with age in the Iranian waters. Thus, Fecundity of longtail tuna ranging in size from 39.6 to 49.1 cm varied from 1.2 to 1.9 million eggs and averaged 1.4 million eggs.

Longtail tuna, like other species of tuna, probably spawn more than once a year.

## 7. Sex-ratio

The sex ratio is about 1:1, while males predominate in the adult stages. There are no significant differences in sex ratio for fish captured by pole and line (1:1 and troll line (0.97:1) off the west coast of Thailand. Numbers of males and females by 10-cm intervals and for total numbers were not significantly different for longtail tuna captured in Papua New Guinea.

## 8. Growth and Age





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In the Iranian coasts the long tail tuna is full grown at the age of 2 and on the average, 75 to 80 cm tall that at the age of 5 to 6 years, reaches the maximum amount. The maximum of length is usually 130 cm. Havoar's larvae has 6mm of length and its daily growth is about 1.5 cm. The growth of this species was determined by counting increments on otoliths of fish. Longtail grow rapidly to reach 40 to 46 cm in FL in one year. It can reach around 145 cm FL or 35.9 kg but the most common size ranges from 40 to 70 cm (Table 1). Table 2, presents the coefficients of the general equation for predicting fish round weight from standard length for seven species of neritic tunas.

**Table 2, Growth ( $L_{\infty}$ , K, to) parameters and the largest size of fish (length / weight) for *Thunnus tonggol***

Species	$L_{\infty}$ (cm)	k(yr)	$T_0$ (yr)	Larger size
<i>T. tonggol</i>	122.9	0.41	-0.032	
	131.8	0.395	-0.035	
	93	0.49	-0.24	
	58.2	1.44	-0.027	
	133.2	0.228		
	108	0.55		
	149.5	0.3	-0.06	
	55.0	1.70	-0.08934	

## 9. Fishing and capture

In Iran, 4700 boats, ships and vessels are fishing the 5 species of Tuna from the Persian Gulf and Oman Sea (Table 3 and 4, figure 6). Longtail tuna's local method of fishing in Iranian water is Drift Gill Net and other local fishing equipments like Sarookh and Ghashoghaki hooks, and also there are industrial equipments such as Purse Seine. Fishing region of longtail tuna is almost in all fishing areas of southern coasts of Iran especially in Oman Sea, from Hormoz strain to Chabahar gulf and Kooch-e-mobark to gulf of Pozm, from south of Qeshm island to Ra'as slaameh (in west-southern of Persia gulf), Jaask and Lengeh ports (in the Oman Sea coasts). Long tail tuna fishing is done during all the year but in warm months of the year has more increase. As, it was mentioned, Longtail tuna were captured with Drift Gill Net, purse-seine and long line throughout the year by Iranian fishermen. Sea-surface temperatures during fishing usually ranged from 25.0° to 31 °C. The most common size of Longtail tuna in Oman Sea ranges from 40 to 80 cm. There is a program to stock's conservation and fishing of Tunas especially Longtail Tuna to be better and we wish to have an ideal Tuna fishery in the Persian Gulf, Oman and Arabian Seas.

**Table 3, Landings in metric tons of longtail tuna in the  
region of southern Iran by country and year**

Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989
India	83	43	18	220	5540	185	444	55	55
Iran	2,229	2,924	5,924	6,421	11,848	11,710	12,069	16,907	19,399
Oman	0	0	0	0	0	0	17259	15669	6527
Pakistan	2770	3467	1171	1264	5268	3275	3402	3010	4856
U. A. E.	350	4000	3000	3000	2830	3973	3654	3930	3938
Yeman	144	126	328	681	927	397	497	552	563



**Figure 6, Tuna Fishing Boat**

**Table 4, Longtail tuna fishing of Iran during 1950 – 2005 (in metric tons)**

Country	Area	Year and Amounts									
		2000	2001	2002	2003	2004	2005				
		38,720	34,896	29853	30284	19528	22,400				
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		14,924	14,552	9,758	8,150	12,100	18,880	17,147	17,872	19,433	20,710
		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
<b>IRAN</b> (Islamic Rep. of) Graph	51 - Indian Ocean, Western	969	2,229	2,924	5,924	6,421	11,848	11,710	12,069	16,907	19,399
		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
		638	114	665	858	868	947	1,393	1,553	-	846
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
		-	-	-	-	-	-	-	-	-	-
		1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
		-	-	-	-	-	-	-	-	-	-

\* 2002 to 2004 isn't confirmed, 0: no data



## 10 Acknowledgments

To Professor Amin Keyvan (Department of Fisheries sciences, Islamic Azad University) and Dr. Alireza Nikooyan (Iranian Fisheries Research Institute) for their scientific helps; and my wife, Eng. Zohreh Jamali (Senior Expert of Marine Pollution and Environment) for her coordination's.

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