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SYNOPSIS OF BIOLOGICAL DATA ON BONITO  
Sarda orientalis Temminck and Schlegel 1842

Exposé synoptique sur la biologie de la pélamide  
Sarda orientalis Temminck et Schlegel 1842

Sinopsis sobre la biología del bonito  
Sarda orientalis Temminck y Schlegel 1842

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## 1 IDENTITY

1.1 Taxonomy

## 1.1.1 Definition (According to Matsubara, 1955)

Phylum VERTEBRATA  
 Superclass Gnathostomata  
 Class Osteichthyes  
 Subclass Teleostomi  
 Superorder Teleostei  
 Order Percida  
 Suborder Scombrina  
 Family Scombridae  
 Subfamily Thunninae  
 Genus *Sarda* Cuvier 1829  
 Species *Sarda orientalis*  
 Temminck and Schlegel 1842

## 1.1.2 Description

- Genus *Sarda* Cuvier 1829

"Body elongate, but rather short and compressed in young specimens. Scales minute, and a small corselet more or less distinct. The caudal keel is thick and naked. Teeth in both jaws are large, compressed, and strongly curved inward, but not trenchant. Near the anterior end of the lower jaw, the row of teeth is bent inwards and approaches the symphysis. Vomer is toothless, but a single row of rather strong and curved teeth on the palatine. Tongue also toothless. Many dark, longitudinal, more or less oblique stripes are found in the dorsal part of the body. Vertebrae of the caudal peduncle have lateral keels" (Kishinouye 1923).

- *Sarda orientalis* Temminck and Schlegel 1842

"D. 19, 15, 7-8. A. 15, 5-6. Gill rakers 4 + 9, vertebrae 25 + 20, body elongated fusiform in adult specimens, but rather short and compressed in young specimens. Mouth wide, maxillary reaching beyond the orbit, with large curved and compressed teeth. Teeth in jaws are more or less unequal in size. About 16 in the upper, and 10-13 in the lower jaw. Groove in the skin from the corner of the mouth is present, as in the tunnies. Posterior nostril is a mere slit. Scales minute. Lateral line undulating slightly, and has a peculiar, wave-like bend over the pectoral fin.

Stomach long, with more than 20 longitudinal folds. Intestine nearly straight, boundary of the rectum indistinct. Pylorus descending with a few longitudinal folds inside, and rather narrow.

Liver consists of three slender lobes, of which the two lateral lobes are very long and nearly equal in length, while the middle one is short.

Myotomes are strongly folded, so that in the cross-section of the lateral muscle we count nearly as many rings as in the same of tunnies. The median wedge-shaped portion of the lateral muscle is reddish, and the red portion becomes thicker towards the tail. On the surface of the last myotome we cannot find a tendon.

Skeleton porous and rather weak, and much resembling to the type of the Cybiidae. The vertebrae of the caudal peduncle are provided with lateral keels, each of which is divided into two, anterior and posterior portions. Two auxiliary intermuscular bones are found on the exoccipital, one on the dorsal wall of the foramen magnum, the other a little forward. At the dorsal part of the clavicle the anterior pointed process is widely separated from the posterior lamellar part.

Grows to a length of about 80 cm and to a weight of 1.5-3.0 kg.

Flesh is rather soft, and inferior in quality. Generally this species is not specially sought after, except in Kyushyu, but is caught as an adjunct in fisheries of the mackerel, bonitos, scuds, etc. It is said that in Kyushyu a few pound-nets are specially built for the capture of this species." (Kishinouye 1923) (Fig. 1).

1.2 Nomenclature

## 1.2.1 Valid scientific name

*Sarda orientalis* Temminck and Schlegel 1842.

## 1.2.2 Synonyms

*Pelamis orientalis* Temminck and Schlegel 1842

*Pelamis oriliensis* (not of Cuvier and Valenciennes) Day 1889

Sarda chiliensis (not of Cuvier and Valenciennes) Barnard 1925  
Sarda chiliensis var. orientalis Steindachner and Döderlein 1883

Sarda velox (?) Meek and Hildebrand 1923 (after Rosa 1950)

1.2.3 Standard common names,  
 vernacular names

TABLE I  
 Standard common and vernacular names

Country	Standard common name	Vernacular name
Australia	Oriental bonito	
Japan	Hagatsuo	Kitsunegatsuo, Hohzan, Sujigatsuo, Sabagatsuo, Shimagatsuo, Tozan
U. S. A.	Bonito	
Union of South Africa	Bonito	

1.3 General variability

1.3.1 Subspecific fragmentation (races, varieties, hybrids)

Four species of the genus Sarda, namely S. velox, S. orientalis, S. lineolatus and S. chiliensis, have been reported from the Indo-Pacific. S. velox is known to be closely related to S. orientalis. Godsil (1955), after a comparison of meristic counts, body proportions and distribution of these two species, reported as follows:

"On the basis of the above findings one must conclude that it would be possible, though entirely impractical, to distinguish, by a detailed dissection, S. orientalis (from Japan) from S. velox of the American coastline. Without an examination of the vertebral column and without an arterial injection, the separation of the two could not be made. Moreover, in the light of experience with other trans-Pacific species, one must anticipate continuous and overlapping variation within the entire

distributional range. If such should prove to be the case there would be no justification for a specific separation, and velox would become a synonym of orientalis. Although he fully believes that the names will prove synonymous, the writer proposes that the names of velox and orientalis be retained provisionally until such time as the mid-Pacific forms are similarly investigated. The retention of the presently accepted names will avoid the inevitable confusion that follows repeated and premature revisions."

- Meristic counts

TABLE II

Meristic counts of S. orientalis and S. velox

Features	<u>S. orientalis</u>			<u>S. velox</u>
	<u>1/</u>	<u>2/</u>	<u>3/</u>	<u>4/</u>
1st dorsal rays	19	17-19	18	17-19
2nd dorsal rays	15	12-14	15-16	15-16
dorsal finlets	7-8	7-8	8	7-8
anal rays	15	12-15	15	14-16
anal finlets	5-6	5-6	6-7	6
gill rakers:	13	10-12	11-13	8-11
upper limb	4	2-4	2-3	2-3
angle	-	-	1	1
lower limb	9	7-9	8-9	5-8

1/ Kishinouye (1923);

2/ Yabe et al (1953)

3/ & 4/ Godsil (1955)

## 2 DISTRIBUTION

2.1 Delimitation of the total area of distribution and ecological characterization of this area

Occurrence of this species has been reported from the following areas:

- (a) Indian Ocean  
Coastal seas of Muscat (Arabia),  
Seychelles Is., Natal (South Africa),  
India, Indonesia and West Australia.
- (b) Pacific Ocean  
Coastal waters of China, Formosa,  
Ryukyu Is. and Japan.

In the waters around Japan, this species is found in the southern seas south of the central part of Honshu, and along both the Pacific and Japan Sea coasts. Occurrence is most abundant in the coastal waters of Kyushyu. According to Kishinouye (1923), a juvenile was caught by a drag-seine in the coastal waters of Aomori Prefecture as far north as nearly 40°N. This is the most northern record of the occurrence of this species in the seas adjacent to Japan.

## 2.2 Differential distribution

- 2.2.1 Areas occupied by eggs, larvae and other junior stages: annual variations in these patterns, and seasonal variations for stages persisting over two or more seasons. Areas occupied by adult stages: seasonal and annual variation of these

- Areas occupied by larvae and other junior stages

According to Yabe et al (1953), juveniles of length between 75 and 100 mm are caught in the adjacent seas of Southern Kyushyu. Kishinouye (1923) reported that a young fish 170 mm in length was caught at Kushimoto (Wakayama Prefecture) in April.

- Areas occupied by adult stages

According to Yabe et al (1953), fishes around 400 mm in length are caught in considerable quantities by the set-nets along the coast of Southern Kyushyu.

2.3 Behavioristic and ecological determinants of the general limits of distribution and of the variations of these limits and of differential distribution

According to Kishinouye (1923), this species occurs in waters of temperature between 14° and 27°C.

### 3 BIONOMICS AND LIFE HISTORY

#### 3.1 Reproduction

##### 3.1.1 Sexuality (hermaphroditism, heterosexuality, intersexuality)

Heterosexual.

##### 3.1.6 Spawning

Nothing is known about the spawning, except indirectly through the occurrence of the juveniles (see section 2.2.1)

##### 3.1.7 Spawning grounds

- Coastal (surface, vegetation, shore, shoal, sand, shelter)

No definite information is available: however, spawning is supposed to take place in coastal waters of the tropical zone.

#### 3.2 Larval history

##### 3.2.1 Account of embryonic and juvenile life (prelarva, larva, postlarva, juvenile)

Kishinouye (1923) described a specimen of 170 mm in length as follows:

"The immature fish of Sarda has about 12 transverse bands. In each of these bands we find about six longitudinal bands, which ascend more or less backward. Pectoral, second dorsal and anal are very small". (Figs. 2 and 3).

#### 3.3 Adult history

##### 3.3.1 Longevity

According to Kishinouye (1923), this species attains a length of about 80 cm, and a weight of 1.5 to 3.0 kg.

#### 3.4 Nutrition and growth

##### 3.4.1 Feeding (time, place, manner, season)

No information is available but, as this species is found only in the coastal waters, it is assumed that it feeds on coastal fishes and

other animals.

##### 3.4.2 Food (type, volume)

After examining 18 specimens which were caught by trolling around Aburatsu (Southern Kyushyu), Yabe et al (1953) reported that 15 stomachs were empty, two contained anchovies (Engraulis japonicus) and one contained some unknown fish.

#### 3.5 Behavior

##### 3.5.1 Migration and local movement

Tominaga (1943) reported that distribution is restricted rather to the coastal waters. The northward migration in the adjacent waters of Japan follows that of the skipjack (Katsuwonus pelamis), comes into coastal regions and the fish are frequently caught by set net.

Yabe et al (1953) reported that, in the seas around Aburatsu, the juveniles do not form such large and dense schools as those of skipjack, yellowfin, bluefin, black skipjack and frigate mackerel. The young of a length between 75 and 100 mm are occasionally caught in small numbers by various fishing methods in the coastal waters of Aburatsu in March. After November, a considerable number of fish of a length of about 400 mm are caught by the set nets.

##### 3.5.2 Schooling

Tominaga (1943) described the habits of this species:

"(i) This species does not aggregate densely and rarely comes up to the surface of the sea.

"(ii) They always swim around the reef or the seas near the cape where the current is strong, and never go out to the high sea.

"(iii) This species has a habit to feed on the dead bait and is caught by the longline occasionally."

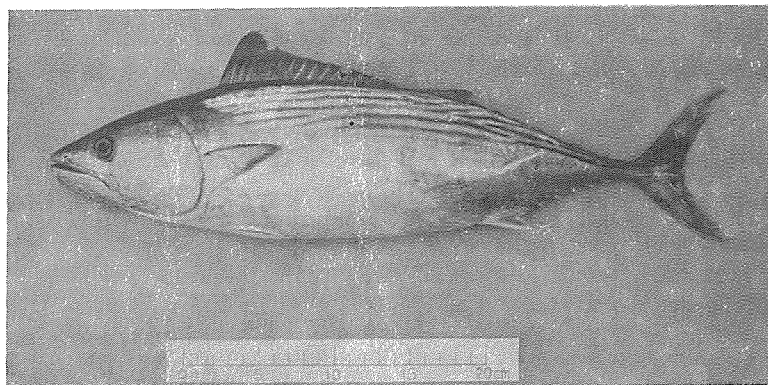


Fig. 1 Sarda orientalis Temminck and Schlegel

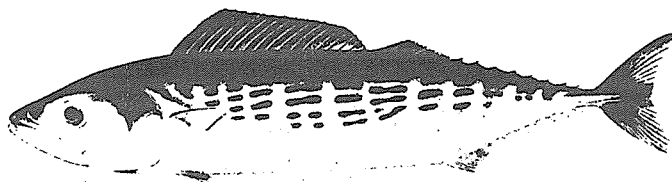


Fig. 2 Immature fish (Kishinouye 1923)

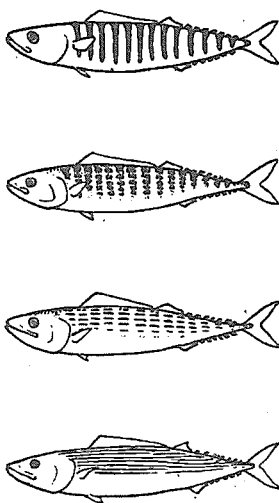


Fig. 3 Formation of bands (Uchida 1930)

## 4 POPULATION (STOCK)

4.1 Structure

## 4.1.3 Size composition

See section 4.2.1.

4.2 Size and density

## 4.2.1 Average size

TABLE III

Average size of *S. orientalis* landed at  
Aburatsu in 1950 (Yabe, 1953)

Date	No. fish measured	Body length (mm)	
		range	mean
Aug. 26	17	205-221	214
Sep. 1	2	241-249	245
" 2	3	233-243	239
" 8	5	161-270	234
" 9	10	254-277	263
Oct. 17	5	333-348	339

5 EXPLOITATION

5.1 Fishing equipment

5.1.1 Fishing gear

This fish is caught by various fishing gears, viz. trolling, live bait fishing for skipjack and other tunas, purse seine, set net, etc. There is no special fishery or fishing boats for this species in Japan.

5.1.2 Fishing boat

See section 5.1.1.

5.2 Fishing areas

5.2.1 General geographic distribution

See section 2.1(b).

5.2.2 Geographical ranges (latitudes, distances from coast, etc.)

See section 2.1(b).

5.3 Fishing seasons

5.3.1 General pattern of fishing season

In the adjacent waters of Southern Kyushyu where the catch is most abundant, the fish is caught throughout the year by various fishing methods. There seems to be a trend in the catch to increase in spring and early summer on the west coast, and in summer and autumn on the east coast.

5.3.2 Duration of fishing season

See section 5.3.1.

5.3.3 Date of beginning, peak and end of season

See section 5.3.1.

5.3.4 Variation in time duration of fishing season

See section 5.3.1

5.4 Fishing operations and results

5.4.3 Catches

See Table IV,

5.5 Fisheries management and regulation

Nil.

5.6 Fish farming, transplantation and other intervention

Nil.



TABLE IV

Amount of catch in southern Kyushyu in 1959  
(in kilograms)

Month	Species	set-net	trolling	purse seine	pole and line for mackerel	Total
January	Katsuwo <sup>1/</sup>	730	-	-	-	730
February	"	505	-	-	-	505
March	"	73	172	-	-	245
April	"	285	1,453	-	-	1,738
May	"	631	640	-	-	1,271
June	"	2,368	778	-	-	3,146
July	"	10,111	961	-	-	11,072
August	"	3,834	1,228	-	-	5,062
September	"	349	1,388	-	3,526	5,263
October	"	310	1,288	-	-	1,598
November	"	157	151	-	45	353
December	"	1,004	784	-	-	1,788
TOTAL	Katsuwo <sup>1/</sup>	20,357	8,843	-	3,571	32,771
October	<u>S. orientalis</u>	-	-	342	-	342
TOTAL	<u>S. orientalis</u>	-	-	342	-	342

1/ The catch is reportedly composed of S. orientalis and Euthynnus yaito and excludes skipjack and frigate mackerel.

TABLE V  
 Amount of catch in southern Kyushyu in 1960  
 (in kilograms)

Month	Species	set-net	trolling	purse seine	pole and line for mackerel	Total
January	Katsuwo <sup>1/</sup>	791	-	-	31	822
February	"	3,973	-	-	-	3,973
March	"	617	-	-	-	617
April	"	7,349	-	-	-	7,349
May	"	7,276	-	-	-	7,276
June	"	168	-	-	-	168
July	"	1,166	901	-	1,438	3,505
August	"	496	145	-	-	641
September	"	298	-	-	-	298
November	"	-	120	-	-	120
December	"	4,110	-	-	27	4,137
TOTAL	Katsuwo <sup>1/</sup>	26,244	1,166	-	1,496	28,906
July	<u>S. orientalis</u>	-	-	3,805	1,680	5,485
August	"	-	-	145	-	145
September	"	-	-	1,004	1,063	2,067
October	"	-	-	-	1,806	1,806
November	"	-	-	4,155	-	4,155
December	"	-	-	3,519	-	3,519
TOTAL	<u>S. orientalis</u>	-	-	12,628	4,549	17,177

<sup>1/</sup> The catch is reportedly composed of S. orientalis and Euthynnus yaito and excludes skipjack and frigate mackerel.