UNITED STATES DEPARTMENT OF THE INTERIOR, OSCAR L. CHAPMAN, *Secretary*
FISH AND WILDLIFE SERVICE, ALBERT M. DAY, *Director*

JUVENILE OCEANIC SKIPJACK FROM THE PHOENIX ISLANDS

By BELL M. SHIMADA

FISHERY BULLETIN 64
From Fishery Bulletin of the Fish and Wildlife Service
VOLUME 52

UNITED STATES GOVERNMENT PRINTING OFFICE • WASHINGTON : 1951

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 10 cents

JUVENILE OCEANIC SKIPJACK FROM THE PHOENIX ISLANDS

By BELL M. SHIMADA, *Fishery Research Biologist*

Studies by various investigators have added substantially to our hitherto limited knowledge of the spawning of oceanic skipjack (*Katsuwonus pelamis* Linnaeus 1758) in the Pacific Ocean. From evidence based on the examination of gonads or the capture of juveniles (see table), spawning grounds have been indicated in waters off Central America (Schaefer and Marr 1948), the Hawaiian Islands (Eckles 1949), the northern Marshall Islands (Marr 1948), the Truk Islands (Inanami 1942), the Philippine Islands (Wade 1950), and the northern Ryukyu Islands (Kishinouye 1923). The existence of additional spawning grounds near the Phoenix Islands in the south central Pacific is demonstrated by the capture of juveniles incidental to biological, oceanographical, and exploratory-fishing studies conducted in this locality during the summer of 1950 by the Pacific Oceanic Fishery Investigations of the U. S. Fish and Wildlife Service, Honolulu, Hawaii.

During a regular hydrographic cruise of the Pacific Oceanic Fishery Investigations research vessel *Hugh M. Smith*, between Hawaii and the Phoenix Islands, two juvenile scombroids were collected on July 18, 1950, at 3°50.5′ S. and 171°48.5′ W. by collaborating scientist V. E. Brock,[1] and subsequently identified as oceanic skipjack, *Katsuwonus pelamis*. These young fish, measuring 35 mm. and 48 mm. in total length,[2] were captured by dipnet under a night light while the vessel was adrift.

On August 5, 1950, a sister ship, *Henry O'Malley*, visited the Phoenix Islands for exploratory fishing. While night-light collecting from this vessel at a position approximately 400 yards off the west end of Hull Island (4°30′ S., 172°11′ W.), K. Yee,[3] caught three additional specimens of juvenile *K. pelamis*. Total lengths of these fish were 20 mm., 22 mm., and 36 mm.

All five specimens exhibit body contours typical of juvenile oceanic skipjack and possess a very slightly pigmented first dorsal fin and a colorless second dorsal fin, which are characteristic of young fish of this species (Schaefer and Marr 1948, Wade 1950). The 48-mm. juvenile of the *Smith* collection was stained with alizarin red S and found to have a "trellis" and a total of 41 vertebrae, urostyle included. The 20-mm. specimen of the *O'Malley* collection was stained and cleared after Hollister's (1934) method and was found to have a vertebral count of 20+21. These characteristics are definitive of *Katsuwonus pelamis* as shown by Kishinouye (1923), Frade and de Buen (1932), and Godsil and Byers (1944).

The 35-mm. specimen is colored with light-brown pigmentation except for the belly, which is colorless, and the head. Pigmentation is more concentrated dorsally and along the sides of the body where it outlines a narrow band along the midline. Scattered melanophores on the peritoneum are visible through the thin body wall and extend caudally to the anus. The top of the head forward of the nape is brown in color with subcutaneous melanophores on the underlying brain covering. The upper portion of the operculum, the posterior and inferior orbit, as well as the sides of the upper and lower jaw, are lightly pigmented with brown. The membrane between the first and second dorsal spine is irregularly marked with black spots from the base to the distal ends of the spines; the membrane connecting the remaining dorsal spines is similarly marked but only near the tips of the spines, the basal half being colorless. The second dorsal is without color. Black pigment spots are present along the upper pectoral rays and along the upper base of the fin. Similar spots are present along the insertion of the median fins and finlets.

The first dorsal fin is composed of 16 spines of which the second is the longest. Fourteen rays are present in the second dorsal fin. There are 8 dorsal finlets and 7 anal finlets. An interradial

[1] Director, Division of Fish and Game, Territory of Hawaii.

[2] Defined as the distance from the tip of the snout to the tip of the shortest median caudal ray.

[3] Fishery Methods and Equipment Specialist, Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service.

953184—51

membrane is present in both series of finlets and joins individual finlets at a point midway between the insertion and the tip. The anal fin has 15 soft rays, the pectoral 27 rays, and the pelvic 6 rays. The tip of one large spine and outlines of two additional spines are visible at the angle of the preopercle.

The two smallest specimens, of 20 mm. and 22 mm., agree in general with the description previously given for oceanic skipjack of this size by Schaefer and Marr (1948), but differ in a few respects from the larger juveniles. Body coloration is lighter dorsally, and pigmentation is more intense on the peritoneum. The snout appears to be more sharply pointed, possibly because the upper jaw noticeably overlaps the lower jaw. Two conspicuous spines are present at the bend of the preopercle, and the tip of one additional spine is visible on the inferior margin. Pigmentation of the first dorsal fin is limited to distal ends of the fin membrane between the first and seventh or eighth spine. This is also true of larger specimens, but in the latter coloration extends to the base of the first few anterior spines as well. The basal portion of the pectoral fin is colorless, and the dorsal and anal finlets are joined at the tips by interradial membranes.

The capture of these small juveniles is definite evidence that oceanic skipjack spawn in the Phoenix Islands area.

Published records of juvenile oceanic skipjack (Katsuwonus pelamis *Linnaeus*) *from the Pacific Ocean*

Date of capture	Locality	Size of specimen (mm.)	Number of specimens	How collected	Reference
August 1916	Ryukyu Islands (Okinawa).	210	1	Pole and line (?)	Kishinouye (1923, p. 388).
July 1923	Ryukyu Islands	105	1	From skipjack or yellowfin tuna stomach.	Kishinouye (1924, pp. 88–89).
Do	do	125	1	do	Do.
August 1923	do	210	1	do	Do.
Apr. 14, 1924	Ryukyu Islands (29°47′ N–129°25′ E.)	26	1	From skipjack stomach	Kishinouye (1926, p. 128).
May 16, 1924	Ryukyu Islands (28°10′ N–129°15′ E.)	58	1	From skipjack or yellowfin tuna stomach.	Kishinouye (1924, pp. 88–89).
May 19, 1924	Ryukyu Islands (29°51′ N–129°52′ E.)	60	1	do	Do.
Do	do	80	1	do	Do.
May 21, 1924	Ryukyu Islands (29°47′ N–129°25′ E.)	63	1	do	Do.
Do	do	83	1	do	Do.
Do	do	85	1	do	Do.
May–June 1924	Ryukyu Islands (28°31′ N–129°, 131° E.)	3	2	Plankton net	Kishinouye (1926, p. 128).[1]
Do	do	4	3	do	Do.[1]
June 1924	Ryukyu Islands	120	1	From skipjack or yellowfin tuna stomach.	Kishinouye (1924, pp. 88–89).
Do	do	153	1	do	Do.
Do	do	100 to 140	3	Dipnet	Kishinouye (1926, p. 128).
Apr. 23, 1939	Truk Islands	198	1	Pole-and-line fishing	Inanami (1942, p. 524).
May 3, 1940	do	45	1	From skipjack stomach	Do.[1]
Jan. 28, 1947	Costa Rica (9°22.5′ N.–85°47.5′ W.)	21	1	Dipnet	Schaefer and Marr (1948, p. 193).
Mar. 29, 1947	Costa Rica (9°10′ N–85°20′ W.)	44	1	do	Do.
July 24, 1947	Marshall Islands (Bikini Atoll).	45	1	Regurgitated by skipjack.	Marr (1948, p. 202).
Do	do	50	1	do	Do.
May 7, 1948	Philippine Islands (6°37.2′ N–121°31′ E.)	13 to 27	6	Dipnet	Wade (1950, p. 399).
July 13, 1948	Hawaiian Islands (20°30′ N–158°45′ W.)	113 to 118	6	Regurgitated by skipjack.	Eckles (1949, p. 245).
Sept. 3, 1948	Hawaiian Islands (19°33′ N–156°00′ W.)	183	1	From skipjack stomach	Do.

[1] Identification reported as doubtful.

LITERATURE CITED

ECKLES, HOWARD H.
1949. Observations on juvenile oceanic skipjack (*Katsuwonus pelamis*) from Hawaiian waters and Sierra mackerel (*Scomberomorus sierra*) from the eastern Pacific. U. S. Fish and Wildlife Service, Fishery Bulletin No. 48, pp. 245–250, 3 figs.

FRADE, FERNANDO, and FERNANDO DE BUEN.
1932. Poissons scomberiformes (excepte la famille Scombridae). Clef de classification principalement d'apres la morphologie interne. Comm. Int. pour l'Expl. Sci. de la Méditerranée, Rapp. et Proc. Verb,. vol. 7, annexe A, pp. 69–70.

GODSIL, HARRY C., and ROBERT D. BYERS.
1944. A systematic study of the Pacific tunas. Calif. Div. Fish and Game, Fish Bulletin 60, 131 pp., 18 tables, 76 figs.

HOLLISTER, GLORIA.
1934. Clearing and dyeing fish for bone study. Zoologica, vol. 12, No. 10, pp. 89–101, figs. 18–21.

INANAMI, YOSHIYUKI.
1942. Small skipjack captured at Truk. South Sea Fish. News [Nanyo Suisan Joho], vol. 6, No. 1, p. 524.

KISHINOUYE, KAMAKICHI.
1923. Contributions to the comparative study of the so-called scombroid fishes. Jour. Coll. Agric. Imp. Univ., Tokyo, vol. 8, No. 3, pp. 293–475, 26 figs., 22 pls.

KISHINOUYE, KAMAKICHI.
1924. Observations on the skipjack fishing grounds. Proc. Sci. Fish. Assn. [Suisan Gakkai Ho], vol. 4, No. 2, pp. 87–92.
1926. An outline of studies of the Plecostei (tuna and skipjack) in 1925. Proc. Sci. Fish Assn. [Suisan Gakkai Ho], vol. 4, No. 3, pp. 125–137, 1 pl.

MARR, JOHN C.
1948. Observations on the spawning of oceanic skipjack (*Katsuwonus pelamis*) and yellowfin tuna (*Neothunnus macropterus*) in the northern Marshall Islands. U. S. Fish and Wildlife Service, Fishery Bulletin No. 44, pp. 201–206, 2 tables, 1 fig.

SCHAEFER, MILNER B., and JOHN C. MARR.
1948. Spawning of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*) in the Pacific Ocean off Central America, with descriptions of juveniles. U. S. Fish and Wildlife Service, Fishery Bulletin No. 44, pp. 187–196, 5 figs.

WADE, CHARLES B.
1950. Juvenile forms of *Neothunnus macropterus*, *Katsuwonus pelamis* and *Euthynnus yaito* from Philippine seas. U. S. Fish and Wildlife Service, Fishery Bulletin No. 53, pp. 395–404, 13 figs.