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A New Miocene Queenfish of the Genus *Scomberoides* (Pisces, Carangidae) from Tottori, Japan

By

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Abstract A fossil fish collected from the Miocene bed at Miyanoshita, Kokufu-cho, Tottori Prefecture, Japan was identified as a new carangid species, *Scomberoides maruoi*. It is characterized by uniquely having both lanceolate and needle-like scales in the area between anal-fin origin and lateral line. The body is relatively deep.

Introduction

Mr. Toshiteru MARUO collected a fossil fish from the Miocene Iwami Formation of the Tottori Group (UEMURA et al., 1979) bed at Miyanoshita, Kokufu-cho, Tottori Prefecture, Japan (Fig. 1). The characters of this specimen were examined and compared with those of four extant and two fossil species of the genus *Scomberoides*: *S. commersonianus* LACEPÈDE, 1802, *S. tala* (CUVIER, 1831), *S. lysan* (FORSSKÅL, 1775), *S. tol* (CUVIER, 1831), *S. spinosus* (SMIRNOV, 1936) and *S. inensis* (OHE et FURUHASHI, 1977). Of these, *S. lysan*, *S. tol* and *S. inensis* have been recorded from Japan.

Materials and methods

Following specimens were examined for comparison.

Scomberoides lysan

NSMT-P 31607. Off Miho Peninsula, Suruga Bay, central Japan. Oct. 20, 1973.

NSMT-P 34145. Port of Shimizu, Shizuoka Prefecture, Japan, collected from drifting seaweed, on Oct. 1, 1990. SL 41.6 mm.

NSMT-P 34146. Port of Shimizu, Shizuoka Prefecture, Japan, collected from drifting seaweed, on Oct. 1, 1990. SL 37.0 mm.

Uncatalogued. Port of Nakaminato, Ibaragi Prefecture, Japan. Oct. 12, 1990. SL 42.1 mm.

Squamation, meristics, body proportion and distribution as summarized in SMITH-VANIZ and STAIGER (1973) were used for further comparison.

Table 1. Key characters and distribution of the genus *Scomberoides*. SL: standard length, BD: body depth. Species listed from most primitive (top) to most advanced (bottom). *: fossil species (count or character indeterminable). **Between the anal fin origin and lateral line. Data for recent species in this table are mostly taken from SMITH-VANIZ and STAIGER (1973).

species	SL/BD	Squamation**	Mouth size (relative)	No. of gill rakers	Distribution
S. commersonianus	3.5	lanceolate only	largest	8–15 ($\bar{X}$=11.3)	Indian Ocean, Indo-Australian Archipelago
S. tala	3.7	lanceolate only	large	8–15 ($\bar{X}$=12.0)	Indian Ocean Indo-Australian Archipelago
S. inensis	est. 3.8	lanceolate only	medium	*	Kyoto, Japan (Middle Miocene)
S. lysan	3.2~3.6	lanceolate (needle-like scales found only between gill cover and pelvic insertion)	medium	21–27 ($\bar{X}$=23.9)	Indian Ocean Indo-Australian Archipelago Central/Western Pacific
S. maruoi n. sp.	est. 3.2	lanceolate above, needle-like below	*	*	Tottori, Japan (Middle Miocene)
S. spinosus	est. 4.5	needle-like	*	*	Northeastern Caucasus (Lower Miocene)
S. tol	4.4	needle-like	smallest	21–27 ($\bar{X}$=24.3)	Indian Ocean Indo-Australian Archipelago Western Pacific (including Japan)

Systematics

Class Osteichthyes

Order Perciformes

Family Carangidae

Genus ***Scomberoides*** LACEPÈDE, 1802

Scomberoides maruoi sp. nov.

(new Japanese name: Sedaka-ikekatsuo)

(Figs. 2, 3)

Holotype: National Science Museum catalogue number NSM PV-19631.

Diagnosis: A *Scomberoides* species with distinctive regions of both needle-like (ventrally) and lanceolate (just above it) scales between the anal fin origin and lateral line. Compared to other members of the genus, this species has a relatively deep body

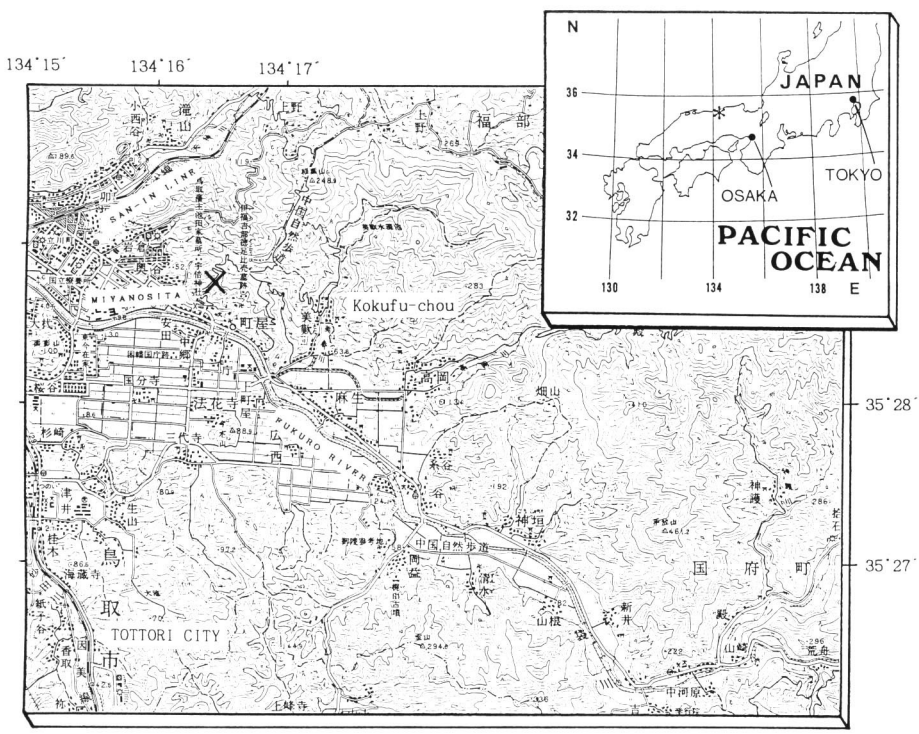

Fig. 1. A map of the locality yielded a new Miocene Queenfish, *Scomberoides maruoi* sp. nov. The topographic map is a part of 1/50,000 map sheet "Wakasa" of Geographical Survey Institute.

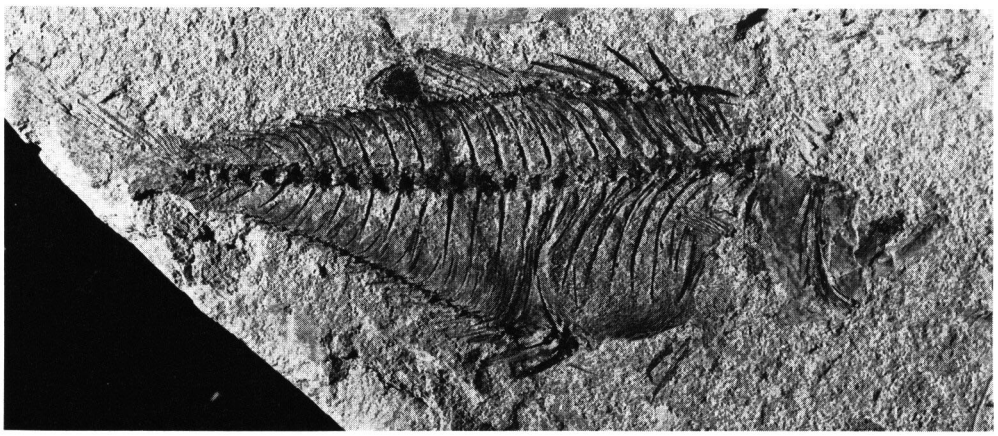

Fig. 2. Queenfish *Scomberoides maruoi* sp. nov., holotype NSM PV-19631 from the Middle Miocene bed in Miyanoshita, Kokufu-cho, Tottori Pref., Japan.

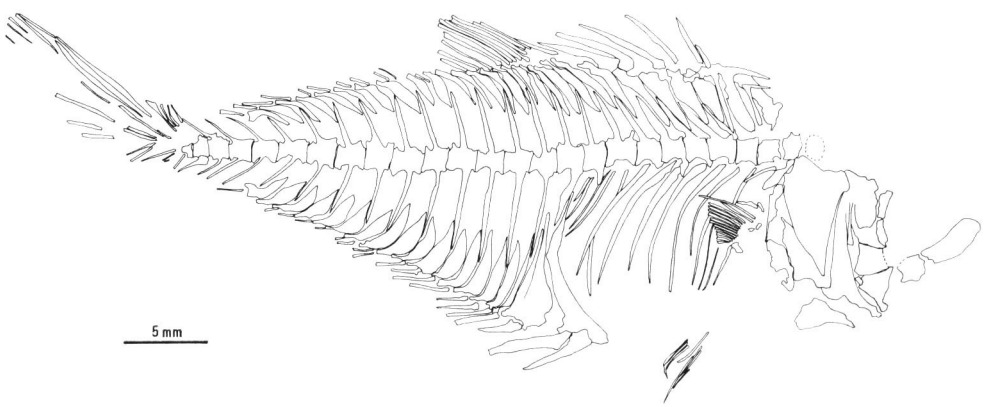

Fig. 3. A drawing of the skeletal parts of the above.

(Table 1).

Description: The anterodorsal part of the head is absent in this fossil specimen. From the anterior margin of the first vertebra to the posterior margin of the 25th vertebra, the distance is 37.2 mm, and the estimated standard length is about 53 mm.

Of the six infraorbital elements, the 1st, 2nd (incomplete), 4th, 5th and 6th elements are observable (Fig. 4A) with the posterior ends of the 2nd and 4th elements not expanded posteriorly (distinct from *Oligoplites* in which these elements are expanded posteriorly, Fig. 4B).

The lowermost radial and 17 pectoral fin rays of the pectoral girdle fragments are observable.

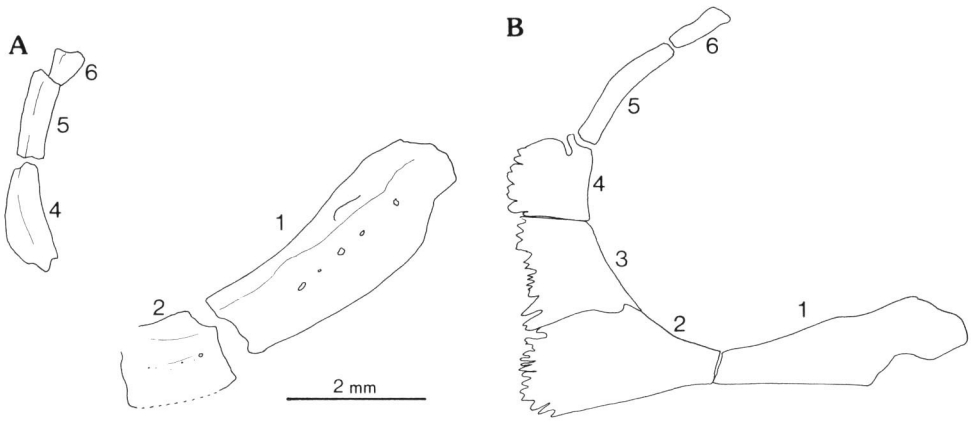

Fig. 4. Drawings of the infraorbital bones. A, *Scomberoides maruoi* sp. nov.; B, *Oligoplites s. saurus* (redrawn from Smith-Vaniz and Staiger, 1973).

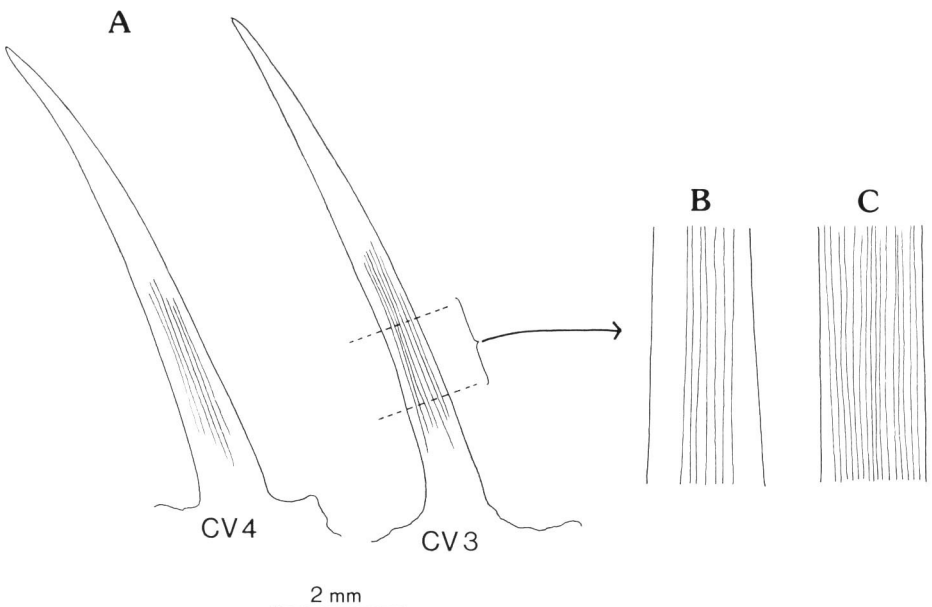

Fig. 5. Drawings of fine ridges of neural spines. A & B, *Scomberoides maruoi* sp. nov.: C, *S. lysan*. CV, caudal vertebra.

An almost complete dorsal fin skeleton is preserved of which seven spines on the first dorsal fin and one spine and 21 soft rays on the second dorsal fin are countable. There are 28 proximal pterygiophores. The anteriormost pterygiophore has a strong procumbent spine anterodorsally.

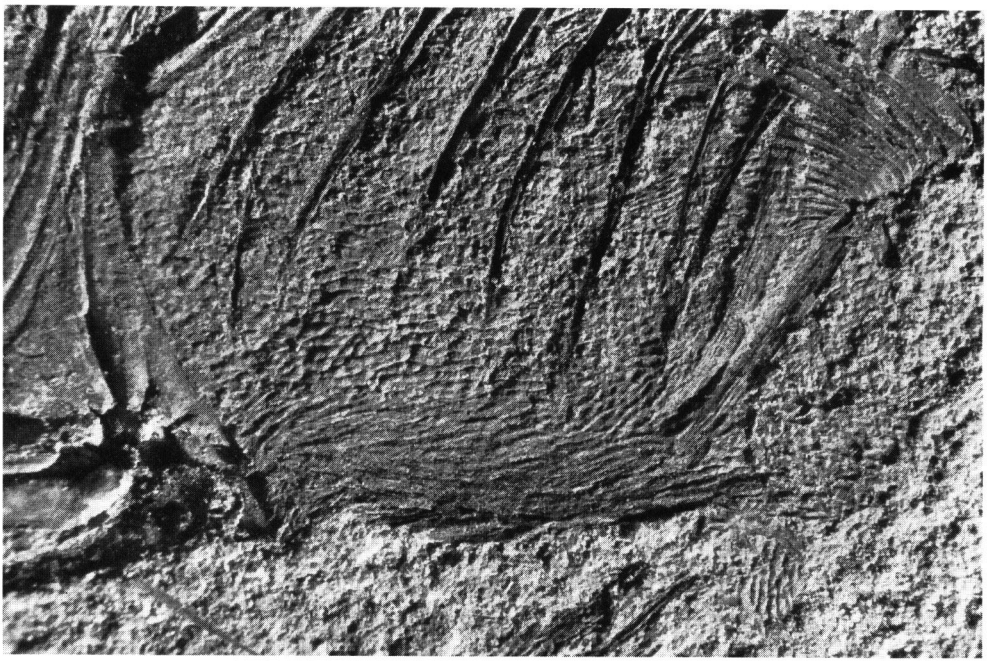

Fig. 6. A photograph of the area between the anal fin origin and the lateral line, showing lanceolate and needle-like scales of the type specimen of *Scomberoides maruoi* sp. nov.

One supraneural, which is probably the posteriormost one has an anteriorly projecting strong spine at the dorsal tip.

Of the almost complete anal fin skeleton, three spines are present of which two are detached from the third and 17 soft rays are countable (17th is lost). The 1st element of the 19 proximal pterygiophores supports two spines.

The vertebral column consists of 10 abdominal (anteriormost one not observable) and 16 caudal vertebrae (posteriormost one is the urostylar vertebra). Fine ridges run along both neural and hemal spines longitudinally (Fig. 5A, B). The number of fine ridges are: neural spines- 3rd (8), 4th (7), 6th (6), 7th (6), 8th (7); hemal spines- 2nd (6), 3rd (9), 5th (7).

The caudal fin skeleton is incomplete as only fragments of the urostylar vertebra, the parhypural and the caudal fin rays are observable.

The lateral squamation of this species is unique as scales in the area between the origin of the anal fin and the lateral line are needle-like ventrally and lanceolate just above it (Fig.6).

Body depth (at the 1st anal spine) is 3.2 times in the estimated standard length.

Discussion

The present specimen is diagnosed to be a carangid by the presence of two free anal spines, and a species of *Scomberoides* by having following combination of characters: 10+16 vertebrae, seven dorsal spines, 18 anal soft rays, and unexpanded 2nd and 4th infraorbitals (Fig. 4).

SMITH-VANIZ and STAIGER (1973) recognized five species of *Scomberoides*, four extant and one fossil species. OHE and FURUHASHI (1977) reported a new fossil species. This paper adds the seventh species. From their papers and GUSHIKEN (1983), distribution as well as key characters have been compiled in Table 1.

SMITH-VANIZ and STAIGER (1973) also recognized that "the transition from oval-shaped to needle-like scales is obvious in *Scomberoides*," and on the basis of outgroup comparison, the present authors recognize that within the region from the anal fin origin to the lateral line, needle-like scales is the advanced state and lanceolate, the more primitive. As shown in Table 1, this evolutionaly polarity seems also be supported by two other characters within the genus, the relative size of the mouth and the number of gill rakers. It appears that a large mouth and low number of gill rakers is the more primitive state, whereas a small mouth and high number of gill rakers is the more specialized. The seemingly more primitive species in this genus have a distribution limited to the Indian Ocean, and from this, we assume that *Scomberoides* originated in the Indian Ocean. As it evolved, the genus moved eastward into the western and then central Pacific Ocean. We assume that from the ancestral form, *S. commersonianus* branched off first with *S. tala* evolving from this line. We feel *S. inensis*, *S. lysan*, *S. maruoi* n. sp., *S. spinosus* and *S. tol* appeared in that order.

The present specimen is distinguished from its congeners by its unique body squamation (table 1). *S. commersonianus*, and *S. tala* have lanceolate scales only, and *S. tol* and *S. spinosus*, needle-like (SMITH-VANIZ and STAIGER, 1973; DANIL'-CHENKO, 1960). In *S. lysan* body scales near the ventral margin are longer than those on the lateral side, and presence of the needle-like scales is restricted within the part between the ventral part of the cleithrum and the posterior end of the urohyal The presence of both needle-like and lanceolate or oval scales indicate that the present specimen is similar to *S. lysan*. *S. lysan* however, differs from the present species in having more densely arranged ridges of neural and hemal spines than in the present species (Fig. 5C).

The present specimen is characterized by a higher body depth (at the first anal spine), 3.2 times standard length, compared to *S. lysan* (3.6) and *S. inensis* [3.8 calculated from OHE and FURUHASHI (1977)'s figure, p. 77].

Because the present specimen has a unique body squamation and a relatively high body depth, we conclude that it represents a new species which evolved intermediately between *S. lysan* and *S. tol*.

Etymology: The species is named for Mr. Toshiteru MARUO of Himeji Municipal Institute of Education, who collected and donated the type specimen to the National

Science Museum, Tokyo.

Acknowledgments

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Literature cited

DANIL'CHENKO, P. G. 1960. Bony fishes of the Maikop deposits of the Caucasus. *Transactions of the Paleontological Institute*, **78**: vii+247 pp., 37 figs., 28 pls. (Transaction IPST no. 1885, Israel Program for Scientific Translations.)

GUSHIKEN, S. 1983. Revision of the carangid fishes of Japan. *Galaxea*, **2**: 135–264, figs. 1–68, tabs. 1–20.

OHE, F. and Y. FURUHASHI. 1977. A new fossil carangid fish from the Miocene Toyooka Formation, Okutango Peninsula, Kyoto Prefecture, central Japan. *Bull. Mizunami Fossil Mus.*, (4): 73–85, figs. 1–3, tabs. 1–4, pls. 19–20.

SMITH-VANIZ, W. F. 1984. Carangidae: Relationships. pp. 522–530. *In* MOSER, H. G. et al. eds. Ontogeny and systematics of fishes. *Spec. Publ.* (1), *Amer. Soc. Ichthyol. Herpetol.*, ix+760 pp.

SMITH-VANIZ, W. F. and J. C. STAIGER. 1973. Comparative revision of *Scomberoides*, *Oligoplites*, *Parona*, and *Hypacanthus* with comments on the phylogenetic position of *Campogramma* (Pisces: Carangidae). *Proc. Calif. Acad. Sci.*, *4th Ser.*, **39**(13): 185–256, figs. 1–26, tabs. 1–7.

UEMURA, F., T. SAKAMOTO and N. YAMADA. 1979. Geology of the Wakasa District. Quadrangle series, Okayama (12) no. 22. Geological Survey of Japan. 91 pp., 8 pls., 1 map.