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New Records of Two Species of *Scomberomorus* from Japan

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Only three species of *Scomberomorus* have been known from Japanese waters (Matsubara, 1955; Anonymous, 1981): Chinese seerfish, *Scomberomorus sinensis* (Lacepède), Japanese Spanish mackerel, *Scomberomorus niphonius* (Cuvier) and narrow-barred king mackerel, *Scomberomorus commerson* (Lacepède).

During September to November, 1978, some unfamiliar Spanish mackerels, among thousands of *S. nipbonius*, were landed at Nishi-Maizuru Fish Market by the set-net fishermen, from several places in Wakasa Bay, the Sea of Japan. Fishermen and market dealers did not pay any special attention to these unfamiliar fishes, because they were seen quite seldom among several thousand individuals of *S. niphonius*. Though these unfamiliar fishes first seemed to be a single species, careful examination revealed that they represent two species, Korean seerfish, *Scomberomorus koreanus* (Kishinouye) and Indo-Pacific king mackerel, *Scomberomorus guttatus* (Bloch et Schneider). As both *S. koreanus* and *S. guttatus* are new records for Japan and are similar to each other externally, comparison and description of both species with a key to Japanese species of *Scomberomorus* are given here.

Materials and methods

Specimens used in this study, were purchased (6 specimens registered) from Nishi-Maizuru Fish Market and deposited at the Fisheries Research Station, Kyoto University (FRSKU) or examined (1 unregistered specimen) immediately after landing at the market. Methods of measurements and counts generally follow Collette and Chao (1975).

Key to Japanese species of *Scomberomorus*

1a. An abrupt dip below posterior first dorsal fin or no dip in lateral line. Margin of tooth without fine serrations. Total gill rakers of first gill arch 9~16 2

1b. A slight dip in lateral line below end of second dorsal fin. Margin of tooth with fine serrations. Total gill rakers on first gill arch 3~6 ..... Yokoshimasawara, *Scomberomorus commerson*

2a. Lateral line abruptly curved downward below posterior first dorsal fin. Lateral line without fine branches ..... Ushisawara, *Scomberomorus sinensis*

2b. Lateral line not abruptly curved downward. Lateral line with fine branches anteriorly 3

3a. Dorsal fin spines 19~22. Lateral line remarkably undulated. No folds in intestine ..... Sawara, *Scomberomorus niphonius*

3b. Dorsal fin spines 15~17. Lateral line slightly undulated. At least two folds in intestine 4

4a. Dorsal spines 16~17. Total gill rakers on first gill arch 9~11. Head length and length of pectoral fin about 19~20% and 9~12% of SL respectively. Two folds in intestine. Vertebrae 49~50 ..... Taiwansawara, *Scomberomorus guttatus*

4b. Dorsal spines 15. Total gill rakers on first gill arch 14~15. Head length and length of pectoral fin about 21~25% and 12~14% of SL respectively. Four folds in intestine. Vertebrae 46~47 ..... Hirasawara, *Scomberomorus koreanus*

Description of *Scomberomorus koreanus*

Material examined. FRSKU W622, 1 specimen (285 mm SL), Wakasa Bay, Sea of Japan, Nov. 3, 1978; FRSKU W650, 1 (307), Wakasa Bay, Nov. 26, 1978; FRSKU W625. 1 (342), Yooroo, Wakasa Bay, Nov. 7, 1978.

Description. Dorsal fin rays XV, 21~22+8~9; anal fin rays 21~23+7~8; pectoral fin rays 20~23; gill rakers 3+1+(10~11)=14~15; vertebrae (19~20)+(26~27)=46~47.

Body deep, maximum body depth slightly shorter than head length and fairly compressed (Fig. 1A). Small scales on corselet, cheek, lateral line and base of each fin. Scales on corselet and cheek slightly enlarged and slightly

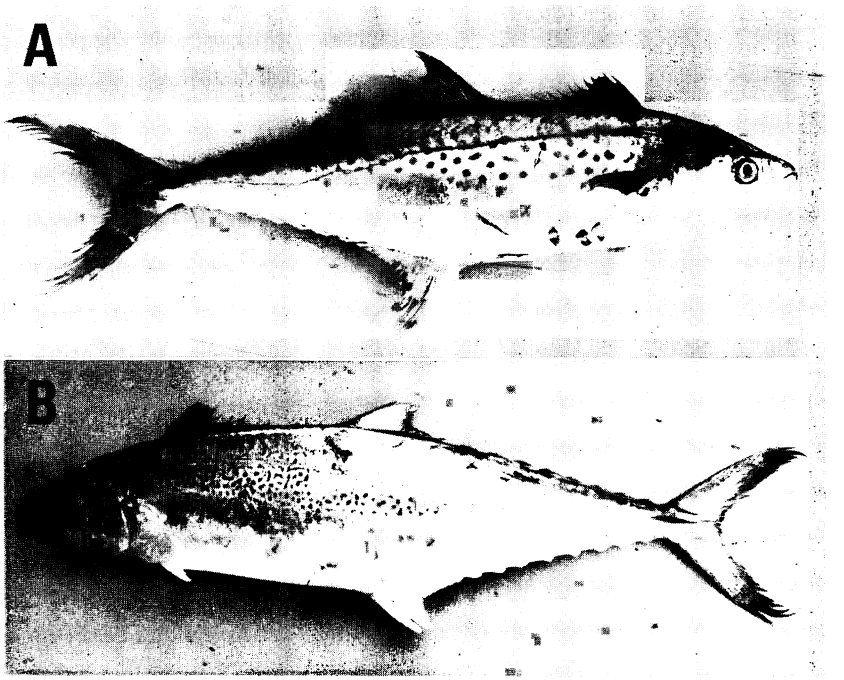

Fig. 1. *Scomberomorus koreanus* FRSKU W625, 342 mm SL (A) with pelvic fins folded in groove and *S. guttatus* FRSKU W490, 430 mm SL (B).

overlapped. Lateral line scales modified into incomplete tube-shaped structures. Head rather small, head length about 4.5 times in SL, with short snout. Mouth nonprotractile and oblique in lateral view, end of upper jaw exceeds slightly posterior margin of eye ball, lower jaw slightly projected more forward than upper jaw. Small caniniform teeth on both upper and lower jaws; lower jaw teeth slightly larger than upper jaw teeth (15～20 teeth in upper and 12～15 teeth in lower). Fine villiform tooth bands on vomer, palatines and tongue. Gill rakers short and blunt. Pseudobranchial filaments well developed. Nostrils rather small, close to each other, anterior one round and posterior one slit-shaped. Eye rather large, situated nearer to tip of snout than to posterior margin of opercle. Interorbital wide and convex. Lateral line runs nearly parallel to dorsal contour of body from shoulder region to caudal region, with slight undulations; numerous side branches on its anterior half. First dorsal fin rather low. Falcate second dorsal fin with finlets well developed. Anal fin with finlets similar to second dorsal fin. Caudal fin falcate and well developed, with a median keel and upper and lower keels on caudal peduncle. Pectoral fin rather short. Pelvic fin very small, with small bifurcated interpelvic process, inserted below hind insertion of pectoral fin. Caudal peduncle rather deep and compressed.

Color when fresh: Body greyish blue dorsally, silvery white laterally and ventrally. Several longitudinal rows of small brownish spots rather sparsely scattered along lateral median line. First dorsal fin membrane black. Pectoral, second dorsal and caudal fins dark brown. Pelvic and anal fins silvery white.

Liver with three lobes; right lobe most elongate, left lobe slightly shorter than right lobe and middle lobe inconspicuous (Fig. 2A). Caecal mass with numerous small sac-shaped tubules, forming a fairly large mass. Spleen visible in ventral view, situated between anterior part of intestine and caecal mass. Intestine elongate with four bends. Stomach long and large. Gallbladder an elongate green tubular sac, situated between tip of right lobe of liver and third bend of intestine in ventral view and parallel to intestine.

Description of *Scomberomorus guttatus*

Material examined. FRSKU W611, 1 specimen (420 mm SL), Niizaki, Wakasa Bay, Oct. 4, 1978; unregistered, 1 (420), Sep. 6, 1978; FRSKU W490, 1 (430), Amino, Tango Peninsula, Kyoto Pref., Sep. 8, 1978; FRSKU W612, 1 (489), Yooroo, Wakasa Bay, Oct. 24, 1978.

Description. Dorsal fin rays XVI~XVII, 18~21+8~9; anal fin rays 20~21+7~8; pectoral fin rays 23; gill rakers (1+2)+1+(7~8)=9~11; vertebrae 21+(28~29)=49~50.

Body rather deep, maximum body depth fairly shorter than head length and rather compressed (Fig. 2B). Small scales on corselet, cheek, lateral line and base of each fin. Scales on corselet and cheek slightly enlarged and slightly overlapped. Lateral line scales modified into incomplete tube-shaped structures. Head small, head length about 4.7 times in SL with short snout. Mouth nonprotractile and oblique in lateral view, end of upper jaw extends to posterior margin of eye ball, lower jaw slightly projected forward than upper jaw. Small caniniform teeth on both upper and lower jaws; lower jaw teeth slightly larger than upper jaw teeth (about 15~18 teeth in upper and about 12~15 teeth in lower). Fine villiform tooth bands on vomer, palatines and tongue. Gill rakers short and blunt. Pseudobranchial filaments well developed. Nostrils rather small, close to each other, anterior nostril round and posterior one slit-shaped. Eye rather large, situated nearer to tip of snout than to posterior margin of opercle. Interorbital wide and convex. Lateral line runs nearly parallel to dorsal contour of body from shoulder region to caudal region, with slight undulations posteriorly; numerous side branches in its anterior portion. First dorsal fin low, its base short, half of second dorsal base (including finlets). Falcate second dorsal fin with finlets well developed. Anal fin with finlets similar to second dorsal fin. Caudal fin falcate and well developed, with a median keel and upper and lower keels on caudal peduncle. Pectoral fin short. Pelvic fin very small, with small bifurcated interpelvic process, inserted slightly behind hind insertion of pectoral fin. Caudal peduncle rather deep and compressed.

Color when fresh: Body greyish blue dorsally, silvery white laterally and ventrally. Several longitudinal rows of small brownish spots scattered rather densely along lateral median line. First dorsal fin membrane black. Pectoral, second dorsal and caudal fins dark brown. Pelvic and anal fins silvery white.

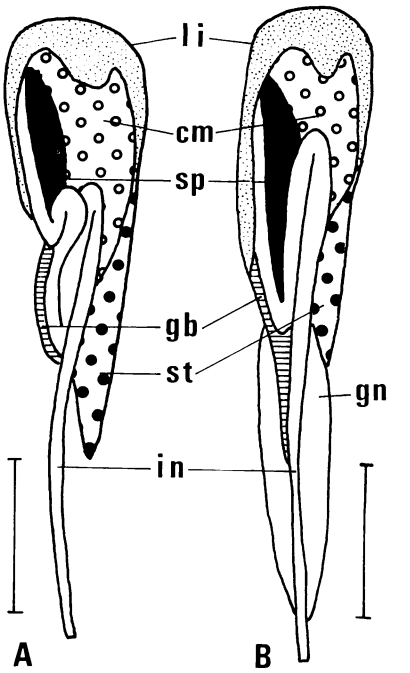

Fig. 2. Schematic illustration of viscera of (A) *A. Scomberomorus koreanus* (FRSKU W650) and (B) *S. guttatus* (FRSKU W490) in ventral view. cm, caecal mass; in, intestine; gb, gallbladder; gn, gonad; li, liver; sp, spleen; st, stomach. Scales indicate 30 mm.

Liver with three lobes; right lobe very long, most elongate, left lobe also long but shorter than right lobe and middle lobe shortest (Fig. 2B). Caecal mass with many small sac-shaped tubules, forming a fairly large mass. Spleen fairly large, visible in ventral view, situated between anterior part of intestine and caecal mass. Intestine elongate with two bends. Stomach large and long, extending further posteriorly when filled with food. Gallbladder, an elongate green tubular sac, situated between tip of right lobe of liver and about midpoint of posterior straight part of intestine in ventral view. Ovary sometimes large enough to cover posterior part of abdominal cavity.

Table 1. Distinguishing external characters of *Scomberomorus koreanus* (n=3) and *S. guttatus* (n=4).

Characters	Species	
	S. koreanus	*S. guttatus*
Dorsal spines	15	16～17
Anal fin rays	21～23	20～21
Upper gill rakers	3	1～2
Lower gill rakers	10～11	7～8
Total gill rakers	14～15	9～11
Vertebrae	46～47	49～50
Intestinal folds	4	2
% of SL:		
Head length	20.5～25.4	18.8～20.2
Pectoral length	11.5～13.3	11.3～11.7
D_2 height	11.9～13.2	10.1～11.1
A height	12.6～12.9	9.5～10.4
Upper jaw length	11.1～11.8	9.9～10.4
Eye diameter	3.1～ 3.3	2.9～ 3.0
Orbit diameter	3.5～ 5.8	3.2～ 3.6
Snout to D_1 origin	25.5～26.3	22.7～24.6
Snout to D_2 origin	48.0～49.7	50.0～51.0
Snout to P_2 origin	25.7～26.6	21.2～25.0
P_2 origin to A origin	27.5～29.8	29.6～31.6
D_1 base	23.9～25.4	26.9～28.0
D_2 base	15.3～18.1	14.5～15.9
Body depth	24.1～25.9	23.9～24.4
Body width	10.6～11.3	12.0～12.4
Head length / Body depth	0.85～1.0	0.77～0.84
Head length / Body width	1.8～2.4	1.6～1.7

Discussion

Distinguishing characters of *Scomberomorus koreanus* and *S. guttatus* are summarised in Table 1, based on the present comparative study. Because of our small sample size, little overlapping of the values in both species was found. These characters are considered to be enough to distinguish one species from the other. Confirming characters for distinguishing the species are the total number of vertebrae and the number of intestinal folds: *S. koreanus* with 46 or 47 vertebrae and 4 intestinal folds; *S. guttatus* with 49 or 50 vertebrae and 2 intestinal folds. Devaraj (1976, 1977) gave distinguishing characters of *S. guttatus* and *S. koreanus* based on material from Palk Bay and the Gulf of Mannar in the northen Indian Ocean. There are a few slight differences between his observations and ours, but most of the observations of both studies coincide well with each other. These slight differences may depend on the differences of locality and sample size between the two studies.

Since *S. koreanus* was originally described as *Cybium koreanus* by Kishinouye (1915) from Korea, no substantiated records of *S. koreanus* have been reported from Japan. This is the first confirmed record for the Japanese ichthyofauna, although Collette and Russo (1979) already reported that *S. koreanus* is distributed in the continental Indo-West Pacific from Japan and China south to Singapore and Sumatra and west to Bombay, India. Kishinouye (1923) stated that the distribution of *S. koreanus* is limited to the west and south coasts of Korea. It seems reasonable that stray individuals come to Japan from Korea where their local population exists. Reasons why *S. koreanus* has remained unrecorded until now are its rare occurrence and/or its confusion with *S. niphonius*.

Scomberomorus guttatus is known from the continental Indo-West Pacific from Hong Kong south to the Gulf of Thailand and west to the Persian Gulf (Collette and Russo, 1979). This new record from Japan extends its range.

Scomberomorus niphonius is usually landed at Nishi-Maizuru Fish Market almost throughout a year with the peak between August and November. Two specimens of *S. guttatus* were landed in September and two of *S. guttatus* were landed in October. Three specimens of *S. koreanus* were landed in November. Differences of migration patterns in these three species could be seen, but further study on this problem is needed.

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日本に初記録のサワラ属魚類2種

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日本近海からの実証的記録があるサワラ属魚類は，従来，サワラ *Scomberomorus niphonius*，ウシサワラ *S. sinensis* およびヨコシマサワラ *S. commerson* の3種のみであった．1978年9月から11月にかけて若狭湾沿岸の京都府漁連西舞鶴魚市場に水揚されたサワラの調査をした際，時々見慣れないサワラ類が多くのサワラに混って水揚されているのに気がついた．最初それらは同一種と思われたが，精査の結果ヒラサワラ *S. koreanus* およびタイワンサワラ *S. guttatus* の2種 (Fig. 1) であることが判明した．外部形質では両者はよく類似するが，脊椎骨数と腸の曲点数で両者を明確に区別することができる (Table 1; Fig. 2)．ヒラサワラおよびタイワンサワラはいずれも日本近海への実証的初記録に該当するので，日本産サワラ類5種の検索とともにここに報告する．

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