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EUTHYNNUS SP. NOV.? OR AN INTER-GENERIC HYBRID OF TUNA : AN ENIGMA†

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ABSTRACT

An unique specimen of tuna, showing characteristics intermediate between *Euthynnus* Lutken and *Katsuwonus* Kishinouye has been collected off Mangalore in 1980. The present paper embodies a detailed description of its morphological and meristic characters with a discussion on the status of the specimen. Evidences are not conclusive as to whether it is an inter-generic hybrid or a new species. Attention is drawn to the need for a global revision of the genus *Euthynnus*.

INTRODUCTION

AMONG the tuna-like fishes of the world, there is an urgent need for a detailed study of the genus *Euthynnus* Lutken despite the revisional studies carried out by Kishinouye (1923), Fraser-Brunner (1949), Godsil (1954) and Collette (1978). Only one species, *E. affinis* (Cantor) is known from the Indian Ocean and its distribution extends further eastwards to western Pacific. Fraser-Brunner (1949) considered both *E. yaito* Kishinouye (1923) and *E. lineatus* Kishinouye (1923) as sub-species of *E. affinis*. Jones and Silas (1964) while discussing the status of the genus *Euthynnus* and *E. affinis affinis* from the Indian Ocean, drew attention to the paucity of our knowledge on this group and called for a revisional study of this genus based on graded material from different geographical areas. Some of the specific points which needed clarification on the taxonomic status of the group were indicated by them as follows :

- (i) Significance of the gill raker counts in species discrimination in view of the overlapping counts evinced by different species ;
- (ii) importance of the characters such as the presence or absence of vomerine teeth ;
- (iii) the usefulness of the vertebral counts for species identification, and
- (iv) the validity of the specific name *Thynnus affinis* Cantor (1849) which is preoccupied by *Thynnus affinis* Guerin-Meneville (1938) for a species of an insect.

† Although the paper was communicated recently, it is included in this issue of the Journal in view of its topical interest—Editor.

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The authors have been continuously monitoring the tuna landings at various centres along the west coast of India during the last few years for biological investigations and for assessment of tuna landings in the coastal waters. On 19th May 1980, one of us (C.M.) came across a specimen of tuna which in external characters, especially in the colour pattern, markedly differed from any known species of tuna. This specimen was obtained in the purse seine catch along with a shoal of *E. affinis* and *Auxis thazard* from the inshore waters of Mangalore. A detailed study of this specimen was undertaken by us in comparison with the fresh material of *E. affinis* and *Katsuwonus pelamis* (Linnaeus). This paper embodies our observation on this specimen, which to us could either represent an inter-generic hybrid between *E. affinis* and *K. pelamis* or a new species of *Euthynnus*. The specimen is unique in several characters and to our knowledge no inter-generic hybrid among tunas has been reported. However, this possibility cannot be ruled out. Our material is insufficient to name a new species of *Euthynnus* for the very reason that years of examination of tuna material from the Indian seas and Indian Ocean has not indicated the occurrence of such specimens.

DESCRIPTION

Material : 1 specimen (male), 562 mm Fork length, caught in Purse seine in depth between 5 to 11 m on 19-5-1980, off Mangalore, Karnataka.

Body fusiform and elongate ; lateral line single with a downward curve below second dorsal fin and a steep rise above pectoral fin ; corselet well developed and with a blunt bulge adjacent to the tip of the pectoral fin (Fig. 1); dorsal fins more or less contiguous, a short gap separating the two; first dorsal fin high, being about twice the height of the second dorsal fin and more than half the head length ; first two spines of the first dorsal fin nearly equal in length and the succeeding spines progressively shorter, thereby giving the dorsal outline of the fin a concave shape; second dorsal and anal lobes shorter, followed by 8 dorsal and 7 anal finlets ; anal fin inserted on a vertical plane through the middle of the first dorsal finlet ; pectorals short, more than half of the head length ; shape of pectoral fin is very peculiar in that it tapers to the posterior tip abruptly and the rays present a triangular structure; tip of pectoral reaches to the base of 11th spine of the first dorsal in the vertical plane (Fig. 1).

Inter-pelvic process long, divided and assymetrical (Pl. III C) ; caudal peduncle not well developed, but with a dorso-ventral flattening ; posterior margin of the operculum relatively straight ; pre-operculum smoothly rounded in the posterior outline ; maxillary extends to the vertical plane through centre of eye.

Teeth minute, uni-serial on jaws ; vomerine teeth absent.

Pattern of the dorsal markings and those on the belly distinctive from any described species of tunas ; on the dorsal side four horizontal black stripes present on either side, starting from the corselet and extending towards caudal region ; lowest of these stripes start anteriorly below the lateral line and crosses the latter on its extent to the caudal region ; background colouration on the dorsal side bluish black with grey and silvery shades ; belly silvery, marked with seven dark, thick, interrupted stripes extending from below the pectoral fin to the caudal region ; some of these stripes unite posteriorly above the posterior tip of anal base.

Gill rakers well developed on the first arch with 13 numbers in the upper limb, 1 in the angle and 29 in the lower limb thus totalling to 43 (Fig. 2) ; gill teeth present

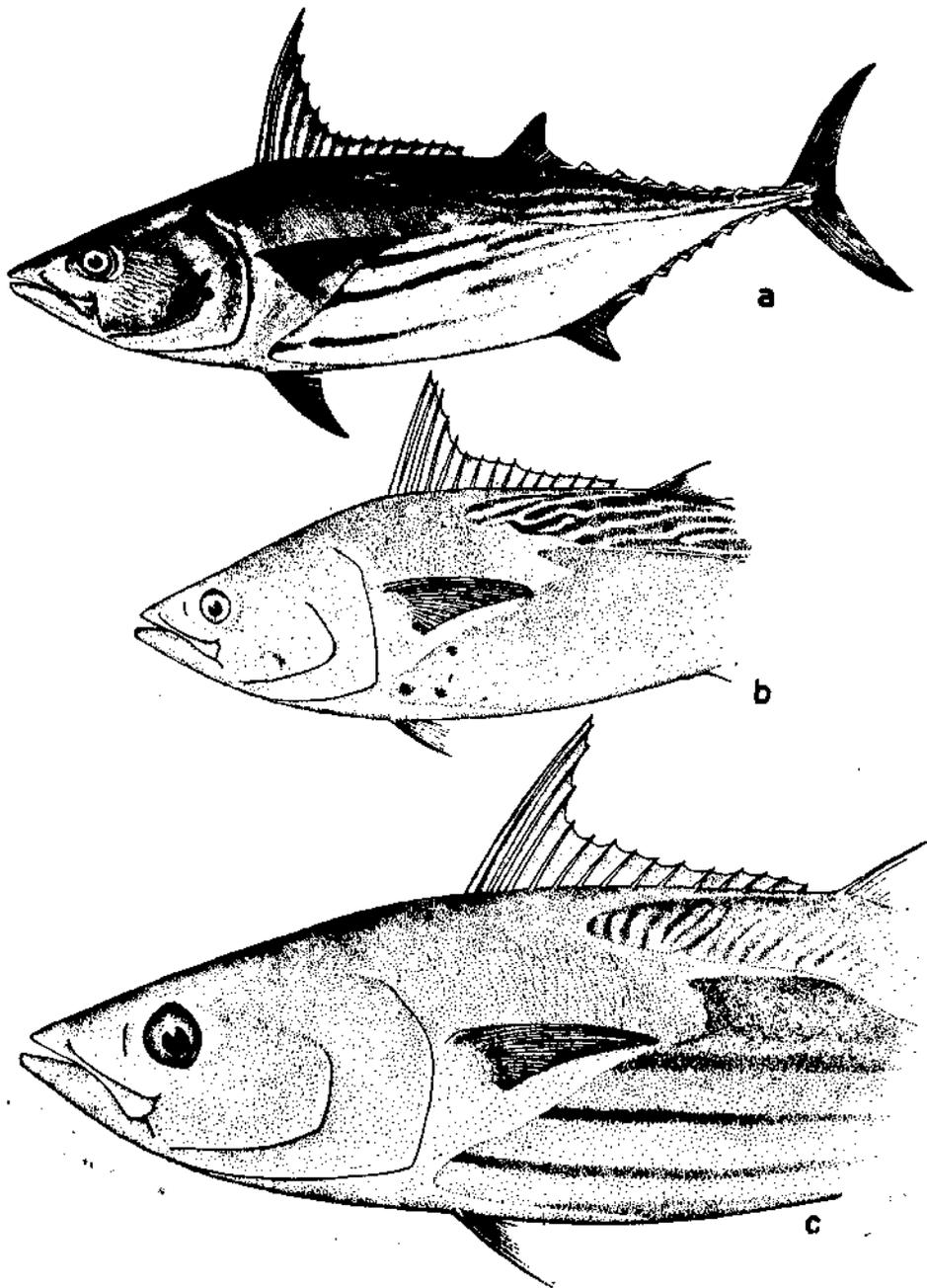


Fig. 1. Difference in the details of scaly area and extension of pectoral fin in : a. the tuna specimen, b. *E. affinis* and c. *K. pelamis*.

on all the arches and well developed in the first arch ; their number in the first gill arch is 11 in the upper limb, of which the first three are rudimentary ; one in the angle of the arch and 24 in the lower limb, of which the last one is rudimentary.

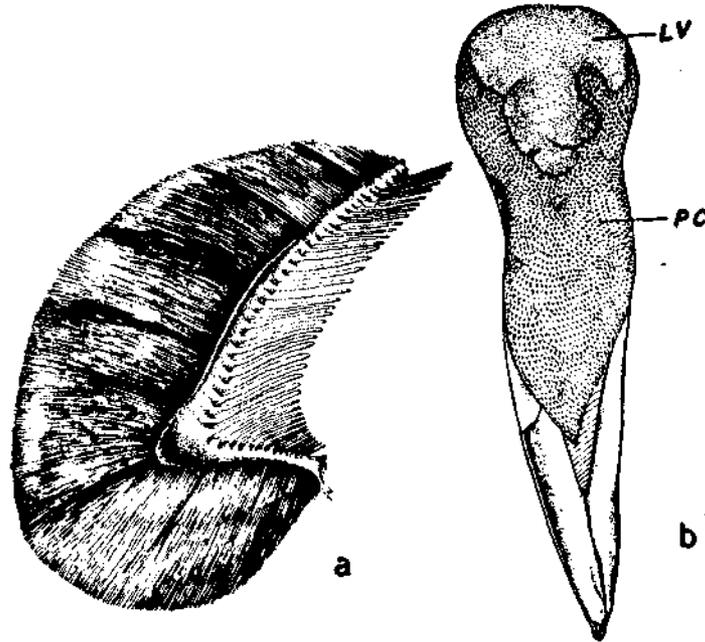


Fig. 2. a. First gill arch and b. ventral view of the viscera, *in situ* (LV=Liver, PC=Pyloric caeca).

Morphometric measurements and other meristic counts of the specimen are presented in Table 1.

Ventral view of the viscera, *in situ*, follows the pattern of the genus *Euthynnus* (Pl. III B, Fig. 2); caecal mass has been found to occupy nearly 30% of the anterior part of the body cavity; liver with its middle and left lobes of more or less equal length while the right lobe is elongated. Examination of the gonad indicates that the specimen is a maturing male (Stage II) with elongated testes, which is triangular in cross section.

Examination of the X-ray photograph of the specimen shows that it has 40 (20 pre-caudal and 20 caudal) vertebrae; no protuberances are present on any of the vertebrae examined; further, another feature observed in the specimen is that the seventh vertebra from the last caudal vertebra (inclusive) is squarish or box-like, as seen in *K. pelamis*. (Pl. IV A-C).

DISCUSSION

A perusal of the literature reveals that the genera *Euthynnus* and *Katsuwonus* have been discussed by some of the earlier workers drawing attention to the phylogenetic lineages or other morphological or meristic details. However, a global

TABLE 1. Comparison of the morphometric (mm) and meristic (No.) characters

	<i>E. affinis</i>	Present specimen	<i>K. pelamis</i>
Total length	662	604	485
Fork length	621	562	450
Head length	167	169	142
Snout length	49	51	57
Snout to first dorsal insertion	194	185	157
Snout to second dorsal insertion	355	344	278
Snout to anal insertion	395	393	298
Snout to ventral insertion	194	185	160
Snout to posterior margin of eye	70	74	70
First dorsal to ventral distance	165	138	114
Second dorsal to anal distance	134	109	107
Pectoral to first dorsal insertion	82	81	75
Extension of the tip of pectoral in relation to the base of the first dorsal spine	10th spine	11th spine	10th spine
Ventral insertion to vent	197	191	147
Distance between last dorsal spine and beginning of second dorsal	35	30	15
Length of first dorsal base	145	130	110
Length of second dorsal base	41	36	33
Length of anal base	38	41	36
Length of pectoral	101	99	76
Height of first dorsal	88	95	76
Height of second dorsal	44	54	45
Height of anal	44	55	46
Greatest body depth	163	145	118
Width between upper margin of eyes	60	53	48
Greatest body width	105	111	82
Maxillary length	62	64	59
Diameter of iris	22	23	33
Caudal spread	165	161	131
Greatest width of caudal peduncle at keel	16	13	11
Dorsal spread of caudal peduncle at keel	27	27	28
Number of first dorsal spines	15	15	16
Number of second dorsal rays	13	11	13
Number of anal rays	12	11	14
Dorsal finlets	8	8	8
Anal finlets	7	7	7
Length of longest dorsal finlet	21	20	16
Pectoral rays	27	27	28
Gill raker (first arch)			
Upper arch	8	13	17
Angle	1	1	1
Lower arch	23	29	37
Gill teeth	26	36	33

revision of the genus *Euthynnus* is wanting (Kishinouye, 1923; Fraser-Brunner, 1949, 1950; Godsil, 1954; Collette and Gibbs, 1963; Williams, 1963; Jones and Silas, 1964; Collette, 1978). Kishinouye (1923), Jordan and Hubbs (1925) and Godsil (1954) have placed the three genera viz., *Katsuwonus*, *Euthynnus* and *Auxis* in the

family Katsuwonidae, and other major tunas under the family Thunnidae in view of the fact that all the three genera possess the following characters :

- (i) Second dorsal fin lower than the first ;
- (ii) spleen dorso-lateral to the stomach so that it is entirely concealed in the ventral view ;
- (iii) air bladder is absent ;
- (iv) body scaleless except in the head and pectoral regions ;
- (v) characteristic skull structure, and
- (vi) ventral process of the vertebrae developed into a characteristic trelliswork.

At present, these three genera are considered under the Family Scombridae.

Collette and Gibbs (1963) stated that it is suggestive to unite the genera *Katsuwonus* and *Euthynnus* under a single genus as done earlier by Deraniyagala (1933), Fraser-Brunner (1950), de Beaufort (1951) and Fourmanoir (1960). However, Kishinouye (1923), Godsil and Byers (1944), Rivas (1951), Godsil (1954) and Jones and Silas (1964) considered *Euthynnus* as a distinct genus from *Katsuwonus*. Collette (1978) considered the above two genera under the Tribe Thunnini in the Sub-family Scombridae.

The major differences in the diagnostic characters of the genera *Euthynnus* and *Katsuwonus* discussed by earlier authors, chiefly Kishinouye (1923), Godsil (1954), Calkins and Klawe (1963) and Collette (1978) are presented in Table 2.

Details presented in the description of the specimen and in Table 2 indicate that the specimen at hand cannot be assigned under the genus *Katsuwonus*. Even though it shares some characters of the genus *Euthynnus*, it is different from all the described species under the genus as shown in Table 3.

Some of the above facts and the examination of the material does not permit us to think in terms of the possibility of an undescribed species of *Euthynnus* occurring in our waters. Only more material of this type would help us to determine whether we are dealing with a species new to science. In the following characters, the specimen appears to be intermediate between what is observed in the genera *Euthynnus* and *Katsuwonus* for the following reasons :

- (i) Presence of continuous horizontal stripes on the dorsal side, and black stripes on the belly is a unique character of this specimen. Black spots, characteristic of the species of the genus *Euthynnus* are absent below the pectorals. In *K. pelamis*, four dark conspicuous longitudinal bands are present along the side of the body below the lateral line, and none above the lateral line. In *E. affinis* the back is bluish black with many dark oblique bands, and the belly is silvery with three or more greyish dark spots below the pectorals.
- (ii) The shape of the pectoral fin of the present specimen which abruptly tapers to the posterior tip presents an intermediate condition between *E. affinis* and *K. pelamis*. Further, the tip of the pectoral fin extends

TABLE 2. Comparison of certain diagnostic characters of the Genera *Euthynnus* and *Katsuwonus*

Characters	Genus <i>Euthynnus</i>	Genus <i>Katsuwonus</i>
Colouration	Dorsal markings above lateral line in the form of continuous or broken horizontal bars or broken oblique bars. Variable number of black blotches present on the sides between pectoral and pelvic fins.	Striking pattern of dark longitudinal stripes (generally 4) along the side of the body below the lateral line, none present above.
Gill rakers	29-40	53-56
Liver	Left lobe longer than the middle or right lobes, and there is a conspicuous branch of the hepatic vein on the ventral surface of each lobe.	Right lobe longest but does not extend the length of the body cavity. Hepatic vein absent on the ventral surface of the liver.
Teeth	Present in both jaws, palatine and sometimes on the vomer too.	Present in both jaws only.
Hypaxial and Epaxial blood vessels under the skin	Hypaxial blood vessels under the skin atrophied. Epaxial blood vessels run just above the lateral median line of the body.	Both equally well developed.
Vertebrae	39 or less	41
Trelliswork of vertebral column	Places the aorta ventrally a distance greater than the depth of the centrum.	Moves the aorta ventrally a distance slightly less than the depth of the centrum.
Epihaemal spines	Well developed	Not well developed
Haemal arch	Closes at 12th vertebra	Closes at 16th vertebra
Shape of the postero-ventral outline of the cranium	Abruptly angular in the outline of the ventral margin.	Rounded.
Pre-frontals	Project appreciably beyond the dorsal outline of the skull so that both are visible simultaneously.	Smaller and may reach but do not project into the dorsal outline.
Exoccipital condyl receiving the atlas	Project beyond the transverse margin of the skull, a distance approximately equal to the length of the first vertebra.	Projection is much shorter, and equals roughly half the length of the first vertebra.
Sphenotics	More expansive and project further beyond the lateral margin of the skull.	Not more expansive, falling short beyond the lateral margin of the skull.

TABLE 3. Comparison of certain characters of the species under *Euthynnus*

Characters	<i>E. lineatus</i>	<i>E. alletteratus</i>	<i>E. affinis</i>	Present specimen
Gill rakers	32-39	37-40	29-34	43
Gill teeth	29-31	31-32	29-33	36
Vertebrae	37 (37-39)	39	39	40
Pre-caudal vertebrae	20	20	20	20
Caudal vertebrae	17	19	19	20
Protuberances on vertebrae	Four large lobes, one each on the 31st and 32nd vertebrae	Incipient lobes on the 33rd and 34th vertebrae	No trace of any protuberance	No trace of any protuberance
Caudal keel on	31st and 32nd vertebrae	33rd and 34th vertebrae	33rd and 34th vertebrae	35th and 36th vertebrae ?
Vomerine teeth	present	absent	present	absent
Maxillary extent	to vertical through centre of the eye	to vertical through centre of the eye	to or beyond through centre of the eye	to vertical through centre of the eye
Lateral line	dip below second dorsal	no dip below second dorsal	undulations above pectoral and below second dorsal	dip below second dorsal

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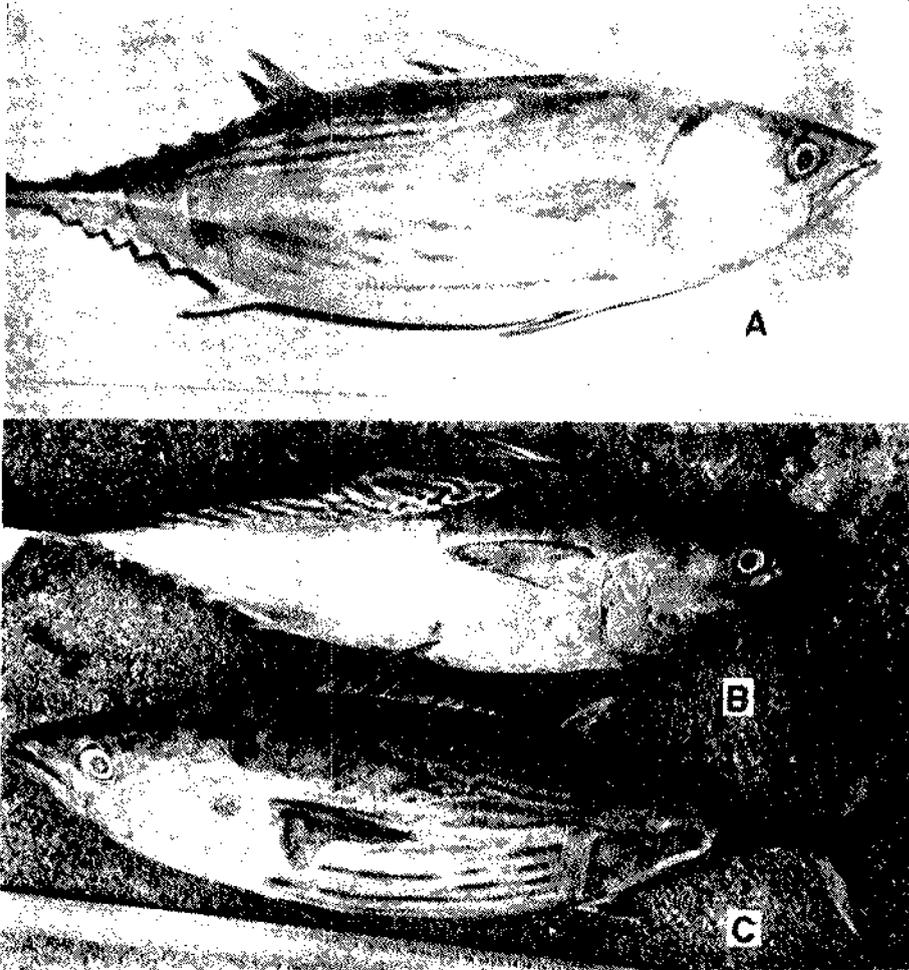


PLATE I. A and C. Lateral views of the tina specimen and B. right lateral view of *E. affinis* (Cantor)

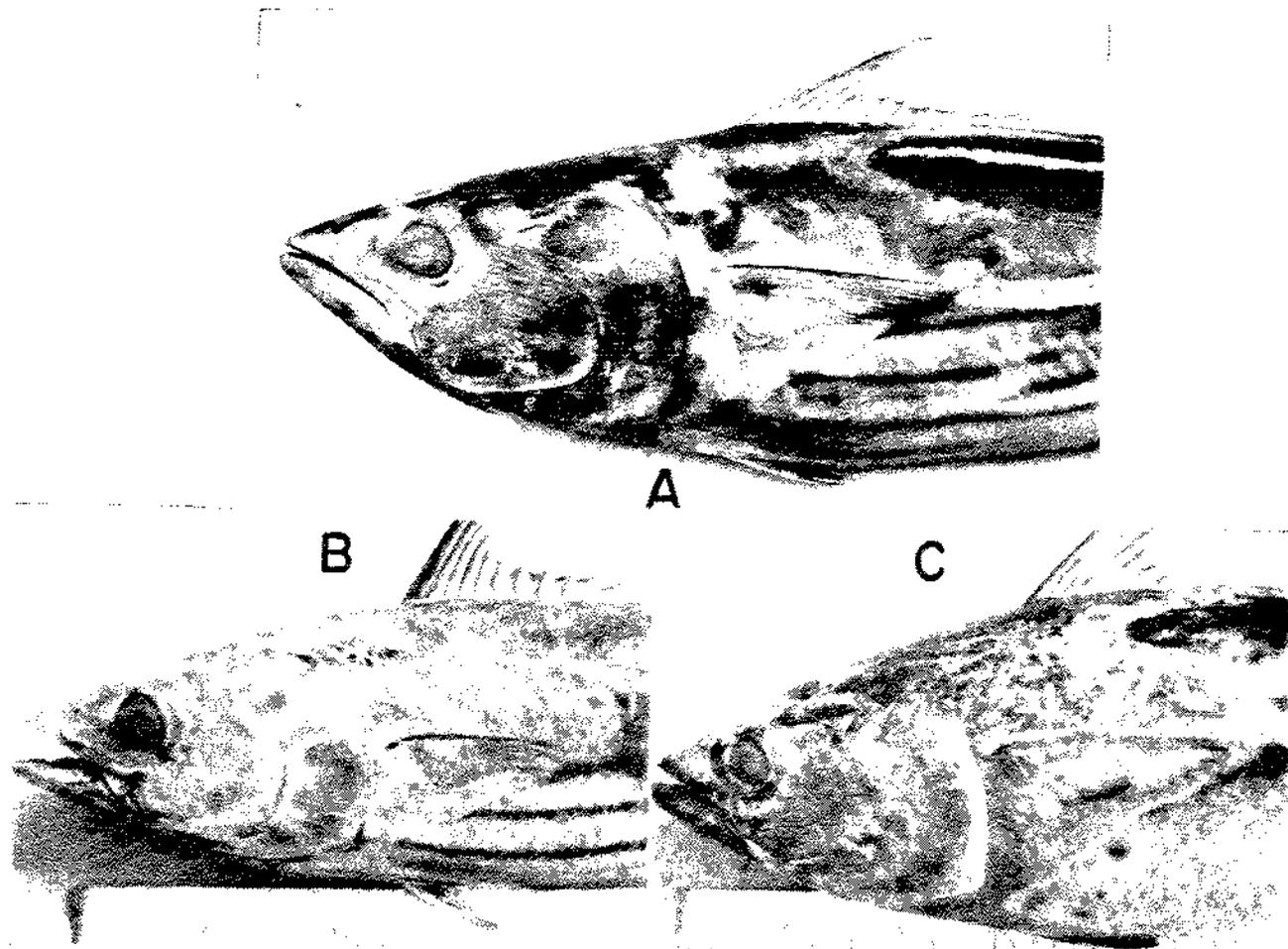


PLATE II. A. Configuration of the posterior margin of scaly area in the tuna specimen, B. *K. pelamis* and C. *E. affinis*.

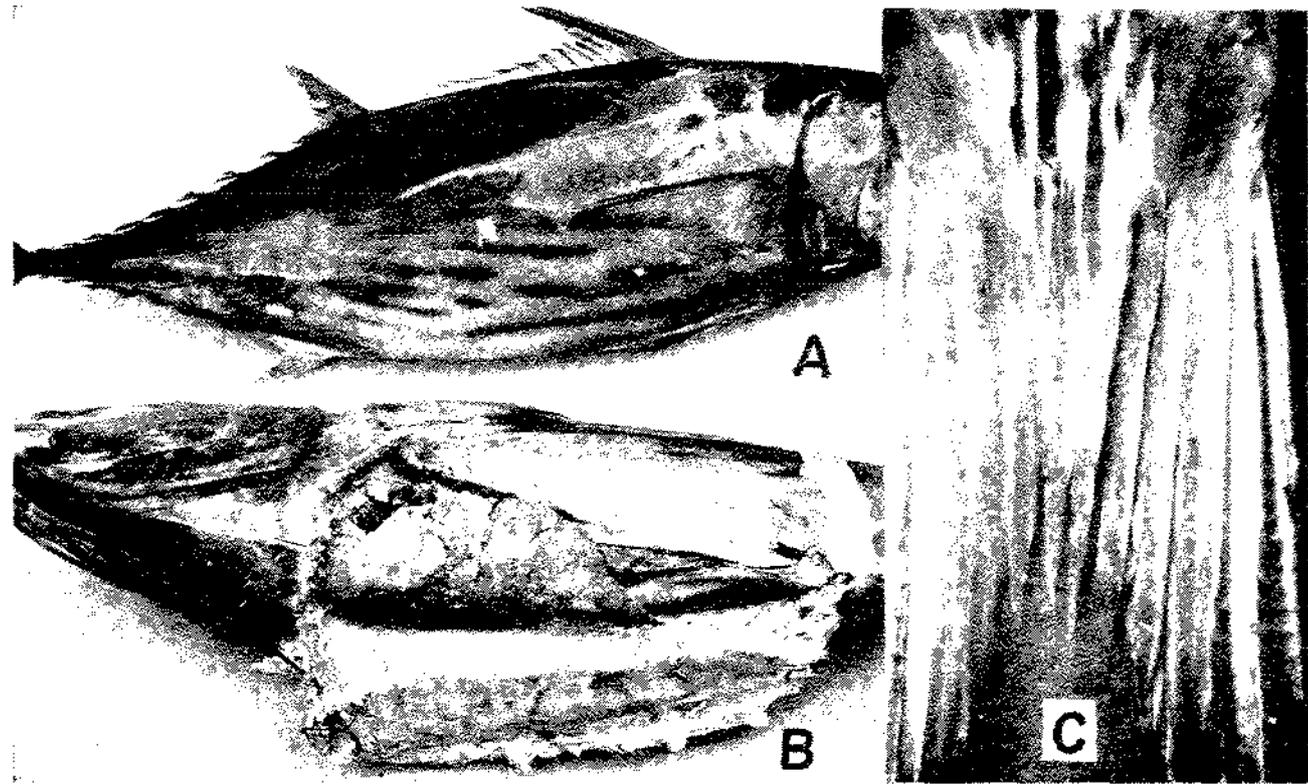


PLATE III. A. Lateral view of the tuna specimen showing the scaly area, B. ventral view of the viscera, *in situ* and C. inter-pelvic process.

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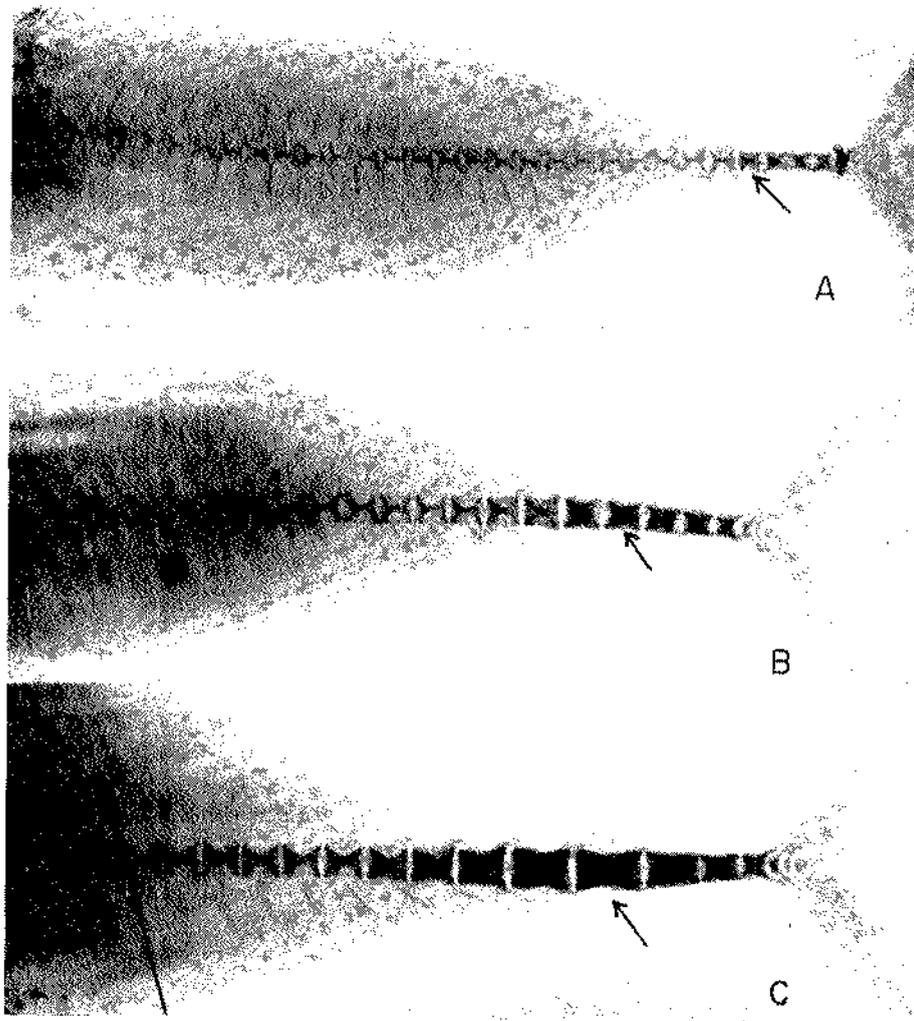


PLATE IV. Comparison of the caudal vertebrae: A. *A. pelamis*, B. tuna specimen and
C. *E. affinis*.

to below the base of the 11th spine of the first dorsal fin in the vertical plane whereas in *E. affinis* and *K. pelamis* it reaches to the base of the 10th spine (Plate II ; Fig. 1).

- (iii) The configuration of the posterior margin of the scaly area near the tip of the pectoral fin shows differences. The posterior lower loop in this area is relatively pointed in *E. affinis*, blunt in the present specimen and broad in *K. pelamis* (Fig. 1).
- (iv) Gill raker counts (43) indicate that the specimen is different from *E. affinis* which has 32 gill rakers (range : 29-34) and *K. pelamis* which has 55 (range : 53-63) gill rakers (Tables 1 and 2).
- (v) The fact that the specimen is a maturing male (stage II) is interesting from the point of view of it being a hybrid or an undescribed species.
- (vi) The most significant character observed in this specimen is the vertebral number and the condition of the vertebrae in the caudal region. *E. affinis* and *K. pelamis* have 39 and 41 vertebrae respectively whereas the present specimen has 40 vertebrae (20 caudal and 20 pre-caudal). Further, the 7th vertebra from the last caudal vertebra (inclusive) (Pl. IV B) is squarish or box-like, a character akin to that in *K. pelamis* (Pl. IV A). In *E. affinis* this vertebra is distinctly elongated and larger than the 6th and 8th vertebrae from the last caudal (Pl. IV C), as is also the case in *E. lineatus* shown by Godsil (1954).

To assume that inter-generic hybrid occurs in tunas itself appears preposterous, but such a possibility cannot be ruled out. We would like to refer to a note by Matsumoto *et al.* (1969) where they have postulated four cases of colour aberrations, two in the Pacific bonito, *Sarda chiliensis* (Cuvier) and two in the skipjack tuna, *Katsuwonus pelamis* (Linnaeus) as likely examples of hybrids as observed for the silver pike by Eddy and Surber (1947). We have here a strong case in which the present specimen shows characters intermediate between *E. affinis* and *K. pelamis*. Close monitoring during the last two decades has not brought to light any such material from our coastal waters to indicate the possibility of a new species of *Euthynnus* occurring in this area. The problem is enigmatic. This once again emphasises the need for examining more material from various geographical areas for a critical revision of the genus *Euthynnus*.

At the Central Marine Fisheries Research Institute we are trying to build up a serial collection of material and would be very happy to receive material of *Euthynnus* from different parts of the world for carrying out such a revisional study.

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