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A Carchariid Shark
new to
South African waters

by

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Introduction

In December, 1961 a mature male specimen of total length 814 mm. belonging to the genus *Carcharias* was obtained by the Division of Sea Fisheries, Cape Town, and was sent to this Institute for further identification.

The characteristics of this specimen differed from those of *Carcharias ferox*, *platensis*, *arenarius*, *tricuspidatus*, *owstoni*, *taurus*, *herbsti* and *noronhai* but agreed with those of *Carcharias kamoharai* Matsubara 1936 in almost every respect except in possessing spiracles, lacking a prominent white spot behind the eye and in that the longest tooth is only slightly greater than half the diameter of the eye.

Since there is close agreement in every other respect, these differences are considered to be insufficient to exclude the specimen from the species *Carcharias kamoharai*. It seems likely that there was some error concerning the recording of an absence of spiracles in the description by Matsubara.

The characteristics of the South African specimen also agreed with those of *Pseudocarcharias pelagicus* Cadenat 1963 in every respect except for a marked difference in first dorsal height and shape and in that *P. pelagicus* has basal denticles on some of the teeth. From the figure of *P. pelagicus*, however, it appears likely that the apical portion of the first dorsal had been lost due to an early injury and, as this specimen had only one tooth with a basal denticle, these differences are not considered sufficient to exclude the South African specimen from this species.

As the South African specimen cannot be excluded from either *C. kamoharai* or *P. pelagicus* these species are considered to be synonymous.

In his description of *C. yangi* Teng 1959, Chen mentions that it closely resembles *C. kamoharai* but differs from it in possessing the following:

1. Spiracles.
2. Basal cusps on the teeth.
3. No white spot behind the eye.
4. Weakly developed lateral keels.

On comparison with the specimens examined by Cadenat and that examined at this Institute, Nos. 1-3 become invalid as specific differences. As the longitudinal thickenings on the caudal peduncle may be interpreted as lateral keels, No. 4 is probably a difference in interpretation rather than a specific difference. *C. yangi* may therefore be considered synonymous with *C. kamoharai*.

The synonymy of *P. pelagicus*, *C. yangi* and *C. kamoharai* is confirmed by their dimensional proportions (Table I) and, according to nomenclatural law, the specific name *kamoharai* has priority.

TABLE 1

COMPARISON OF THE SOUTH AFRICAN SPECIMEN WITH THOSE OF THE TYPES OF
CARCHARIAS KAMOHARAI, PSEUDOCARCHARIAS PELAGICUS AND CARCHARIAS YANGI

	Type C.kamoharai	S.A. Specimen	Type P.pelagicus	Type C.yangii
According to description by	Matsubara	D'Aubrey	Cadenat	Chen
Sex	♂	♂	♂	
Total length in mm.	735	814	975	1000
Head† in total length	5.14	5.4	5.4	—
Head in precaudal length	3.84	4.3	4.1	—
Distance from snout to pelvic in total length	—	1.7	1.8	—
Distance from snout to pelvic in precaudal	1.38	1.3	1.3	—
Distance from snout to first dorsal in precaudal	2.0	2.0	1.9	± 2
Distance from snout to fifth gill slit in precaudal	—	3.1	3.4	3.2
Depth in precaudal	6.53	—	5.6	7
Horizontal diameter eye in interorbital	2	2.5	2	—
Horizontal diameter eye in preoral	>2	2.9	2.4	2
Horizontal diameter eye in head	6.50	6.6	6.2	—
Horizontal diameter eye in distance from snout to fifth gill slit	—	9.2	7.4	8
Interorbital distance in head	3.12	2.6	(3.1)*	—
Interorbital in distance from snout to fifth gill slit	—	3.7	(3.7)*	4.2
Preoral in head	2.75	2.3	2.5	—
Mouth height in head	4.0	4.6	3.2	—
Mouth width in head	3.18	3.0	3.4	—
First gill slit length in head	>3.3	3.0	3.5	—
First gill slit length in distance from snout to fifth gill slit	—	4.2	4.2	4.30
Second gill slit length in distance from snout to fifth gill slit	—	4.2	—	4.0
Third gill slit length in distance from snout to fifth gill slit	—	4.2	—	4.0
Fifth gill slit length in distance from snout to fifth gill slit	—	4.8	3.9	4.30
Pectoral length in head	±2.0	1.9	1.9	—
Pectoral length in distance from snout to fifth gill slit	—	2.7	2.2	2.5
Caudal peduncle length§ in head	3.06	2.3	(2.5)*	—
Caudal peduncle depth in head	6.10	6.9	7.5	—
Interdorsal distance in head	1.13	1.0	(1.1)*	—
First dorsal height in base	—	2.1	3.5‡	—
First dorsal height in free rear lobe	—	0.6	1.5‡	—
Second dorsal height in base	—	1.7	2.0	—
Second dorsal height in free rear lobe	—	1.3	2.2	—
Second dorsal base in interdorsal	>4.0	4.5	(4.8)*	4.0
Anal height in base	—	2.2	1.8	—
Anal height in free rear lobe	—	1.9	1.4	—
Dental formula	14-0-14 13-0-13	13-0-14 12-0-12	13-0-13 12-0-12	14-0-15 13-0-13
Relative lengths of 2 anterior upper teeth	—	Subequal	Subequal	—
Relative lengths of 2 anterior lower teeth	—	Subequal	Subequal	—
No. of teeth anterior to gap or small teeth	—	2	2	—
No. of small teeth in gap	—	0 or 1	1	3
No. of basal denticles on each side of tooth	0	0	0 or 1	0 or 1
Diameter eye in longest tooth	> $\frac{1}{2}$	> $\frac{1}{2}$	± $\frac{1}{2}$ (from fig.)	—
Eye in interorbital	—	0.9	>1	>1
Eye nearer snout than fifth gill slit	Yes	Yes	(Yes)*	Yes
Longer lip groove	Upper	Upper	—	Upper

TABLE 1 (Cont.)

	Type C.kamoharai	S.A. Specimen	Type P.pelagicus	Type C.yangtzi
Relative sizes of fins	DI>DII> Anal	DI>DII> Anal	DI>DII> Anal	DI>DII> Anal
Position of pelvic origin	Behind DI base	Behind DI base	Behind DI base	Behind DI base
Position of anal origin	Behind DII base	Behind DII base	Opp. post DII base	Behind DII base
Spiracles	Absent	Present	Present	Present
White spot behind eye	Present	Absent	Absent	Absent

* based on measurements estimated from those given in Cadenat's description.

† Head length=distance from snout to upper end first gill slit.**

§ Caudal peduncle length=distance from posterior end of second dorsal base to origin upper caudal.**

** These are the measurements given for the South African specimen and the type of P.pelagicus. It is probable that these are the measurements for the type of C.kamoharai but Matsubara does not specify how they were taken.

‡ The proportional discrepancies between the S.A. specimen and P.pelagicus have arisen due to the absence of the apical portion of the first dorsal of P.pelagicus.

Note: DI=first dorsal
DII=second dorsal

Cadenat has proposed a new subgenus for this species based on the following characteristics:

1. First dorsal low and different in shape to the second dorsal and anal.
2. Lengths of posterior lobes of second dorsal and anal greater than their respective heights.
3. Teeth with very few basal denticles.
4. Very low tooth count.
5. Only two anteriors (teeth anterior to the gap or small teeth on each side of the jaw).
6. No symphysials (small teeth on either side of the symphysis).

Of these, No. 1 has already been shown to be the result of damage and No. 3 does not exclude *owstoni*. It has not been possible to confirm that the dimensional proportions of the second dorsal and anal of *kamoharai* differ from those of all other *Carcharias* species as, other than in Cadenat's paper, no references to this characteristic have been found. The subgeneric status of *Pseudocarcharias* rests, therefore, only on the low tooth count, the number of teeth anterior to the gap (or small teeth) and the lack of small anterior teeth. The greater length of the upper lip groove in relation to the lower also appears to separate *kamoharai* from the other species of *Carcharias*.

However, in view of the variability of the teeth within a single species of *Carcharias*, as seen in *taurus*, these four characteristics are not considered sufficient to justify subgeneric status for *kamoharai*. This is confirmed by a comparison of the species of *Carcharias* (Table 2).

TABLE 2. COMPARISON OF C.KAMOHARAI WITH OTHER SPECIES OF GARCHARIAS

	taurus	tricuspidatus	noronhai	arenarius	herbsti	ferox	owstoni	kamoharai
According to description by	Bigelow & Schroeder	Day	Maul	Whitley	Whitley	Daugherty	Garman	4 authors*
Relative lengths of 2 anterior upper teeth	Subequal		First smaller	Subequal	Subequal	First smaller	Subequal	Subequal
Relative lengths of 2 anterior lower teeth		First smaller	First smaller	First smaller	First smaller	First smaller	First smaller	Subequal
No. of teeth anterior to gap or small teeth	3	3	3	3	3	3	3	2
No. of small teeth in gap	1	1	1	1	4	4	1	0 or 1
No. of basal denticles on each side of tooth	0 or 1 or 2	1	1	1	2 or 3	1 or 2 or 3	0	0 or 1
Diameter of eye in longest tooth	> $\frac{3}{4}$		< $\frac{1}{2}$			$\frac{1}{2}$	< $\frac{1}{2}$	> $\frac{1}{2}$
Longer lip groove	Lower	Lip grooves absent	Lower	Lower	Lip grooves equal in length	Lower	Lower	Upper
Dental formula	44 to 48 $\frac{41 \text{ to } 46}{40}$	32 to 34 $\frac{30 \text{ to } 34}{40}$	38 $\frac{40}{40}$	49 $\frac{40}{40}$	48 $\frac{40}{40}$	46 to 54 $\frac{35 \text{ to } 48}{40}$		26 to 29 $\frac{24 \text{ to } 26}{40}$
Preoral in head to first gill slit	4 or 5		3.8	4.4	2.7	2.6		2.3-2.75
Horizontal diameter eye in preoral	2.5-3.3		2.7	5	3.4	3.7	3	2
Horizontal diameter eye in inter-orbital			± 2.7		2.9	2.75		2
Relative sizes of fins	Subequal	Subequal	DI > DI > Anal	Subequal	Subequal	Subequal	Subequal	DI > DI > Anal
Interdorsal distance in 2nd dorsal base	0.6-0.7			0.5	0.4	0.3	0.75	0.25
Anterior margin pectoral in rear lobe	0.4	0.2	0.3					0.5
Position of pelvic origin	Behind DI base			Behind DI base	Behind DI base	Behind DI base	Behind DI base	Behind DI base
Position of anal origin	Opposite last DI base	Behind DI origin	Behind DI origin	Opposite Last DI base	Behind DI base	Behind DI base	Opposite last DI base	Behind DI base

It appears likely that Maul is correct in suggesting that these two species are synonymous.

*Matsubara, Chen, Cadenat and D'Aubrey.

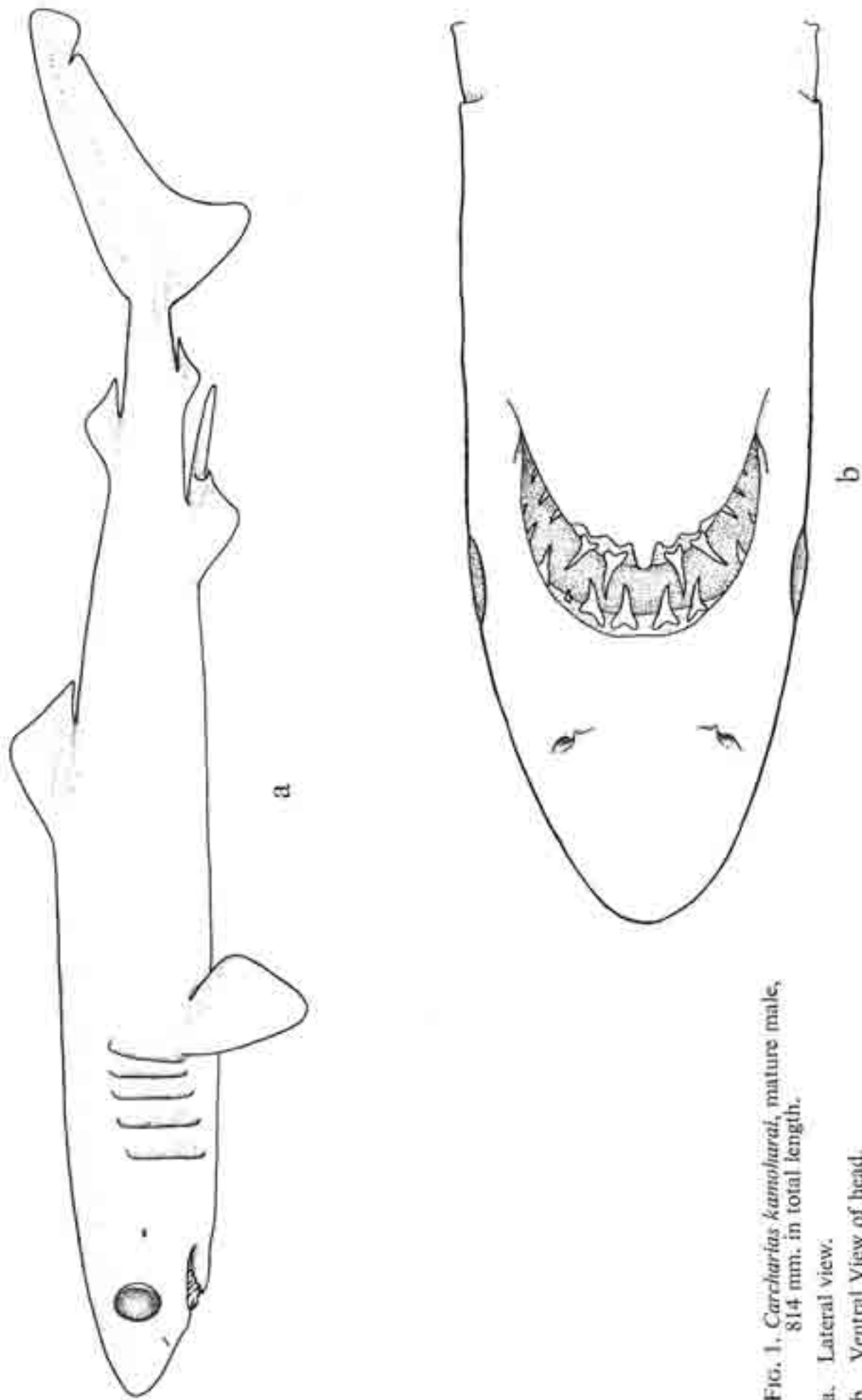


FIG. 1. *Carcharias kamoharui*, mature male, 814 mm. in total length.

a. Lateral view.

b. Ventral View of head.

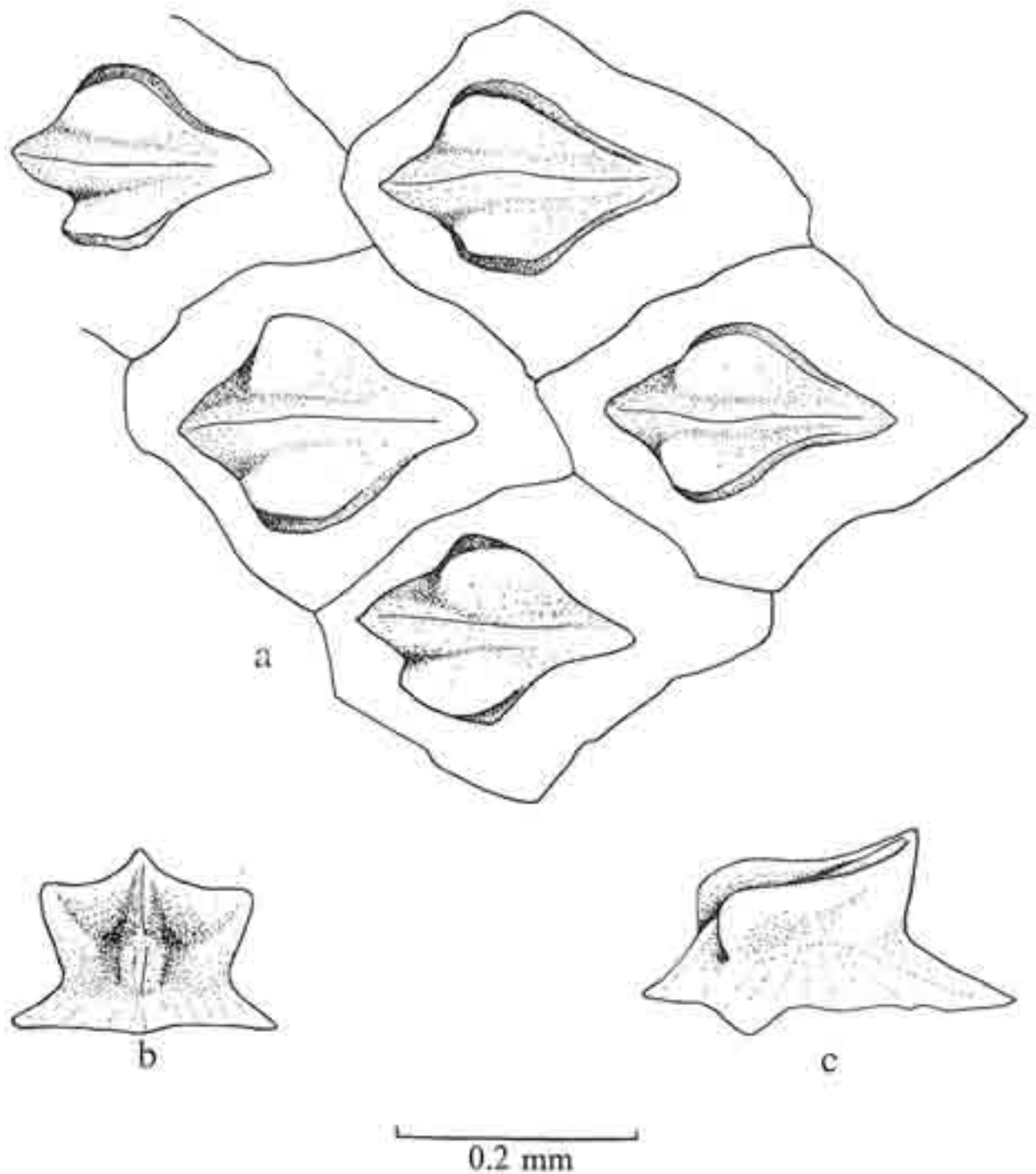


FIG. 2. *Carcharias kamoharai*, mature male, 814 mm. in total length.
 a. Dorsal view of dermal denticles. b. Anterior view of dermal denticle.
 c. Lateral view of dermal denticle.

Description

Carcharias kamoharai was first described from Japanese waters and descriptions have since been included in other works on the fishes of Japan. It has been described off Taiwan by Teng (1959) and off West Africa by Cadenat (1963). There is no previous record of it in South African waters and a description of the South African specimen is given as follows:

CARCHARIAS KAMOHARAI Matsubara 1936

Material

One mature male specimen of 814 mm. in total length. Preserved in formalin. Unfortunately the specimen had been gutted before it was examined and no data for the total weight or the greatest width and depth could be obtained.

MEASUREMENTS IN mm. OF CARCHARIAS KAMOHARAI MALE 814 mm. IN TOTAL LENGTH, AND AS PERCENTAGES OF THE TOTAL LENGTH

	<i>mm.</i>	<i>%</i>
From snout to origin of pelvic	484	59.5
" " pectoral	202	24.8
" " first dorsal	328	40.3
" upper end first gill slit	152	18.7
" anterior margin of eye	52	6.4
" inner end of nostril	45	5.5
" mandible (mouth closed)	66	8.1
Length nostril	12	1.5
Between inner ends nostrils	21	2.6
From inner end nostril to mandible (least)	22	2.7
" " orbit (least)	29	3.6
Horizontal diameter orbit	23	2.8
Vertical diameter orbit	28	3.4
Interorbital distance	58	7.1
From orbit to mandible (least)	20	2.5
Mouth width	51	6.3
Mouth height	33	4.1
Length upper lip groove	26	3.2
" lower lip groove	20	2.5
From orbit to spiracle	31	3.8
Length spiracle	4	0.5
" first gill slit	51	6.3
" second gill slit	50	6.1
" third gill slit	50	6.1
" fourth gill slit	47	5.8
" fifth gill slit	44	5.4
Between upper ends first to fifth gill slit	60	7.4
" " first to second gill slit	15	1.8
Interdorsal distance	150	18.4
Between fin fronts first to second dorsal	231	28.4
" " second dorsal to origin caudal	98	12.0
" " pectoral to pelvic	283	34.8
" " pelvic to anal	105	12.9
" " anal to origin lower caudal	62	7.6
Least depth before caudal grooves	22	2.7
" width before caudal grooves	22	2.7
First dorsal base	81	10.0

	mm.	%
First dorsal height	38	4.7
" " length anterior margin	71	8.7
" " rear lobe	21	2.6
Second dorsal base	33	4.1
" " height	19	2.3
" " length anterior margin	32	3.9
" " rear lobe	24	2.9
Anal base	24	2.9
" height	11	1.4
" length anterior margin	27	3.3
" rear lobe	21	2.6
Pectoral length from origin to outer tip	81	10.0
" base	32	3.9
" rear lobe	37	4.5
Pelvic origin to lateral corner	46	5.7
" " median tip	67	8.2
Length claspers (cloaca to tip)	95	11.7
Caudal upper lobe from origin to tip	202	24.8
" lower lobe from origin to tip	83	10.2
" terminal lobe from notch to tip	40	4.9
" upper origin to concavity	79	9.7
Standard length	652	80.1

Description

Trunk slender, caudal peduncle moderately slender and without keels but a slight longitudinal thickening evident on each side; upper caudal groove present, lower slight; dorsal midline not ridged.

Dermal denticles widely spaced and not overlapping. They are small, 0.21 - 0.25 mm. in length and 0.15 - 0.18 mm. in width. Three longitudinal ridges present, all of which are strongly keeled anteriorly. The lateral ridges lie close to the edges of each denticle and converge posteriorly to form one posterior marginal tooth.

Head (from the snout to the first gill slit) 4.3 in precaudal length. Snout long, slightly depressed and broadly tipped in profile. Preorbital distance 1.1 in interorbital and 2.9 in head. Eye large (horizontal diameter 6.6 in head); circular; anterior margin almost opposite anterior margin of mouth. Eye nearer tip of snout than first gill slit. No *nictitans* present. Spiracle well developed and situated level with and posterior to eye. Gill slits long (longest 3.0 in head) and anterior to origin of pectoral. Their ventral ends extend beneath level of pectoral origin. Nostrils much nearer mouth than tip of snout (prenarial distance nearly two-thirds preoral distance and a little more than twice internarial distance). Nostrils almost horizontal, small and slit-like; their anterior edge nearly straight but for a short, narrow nasal lobe. Preoral distance 2.3 in head or three times eye diameter. Mouth narrowly arched but wider than high (height 1.5 in width which is 3.0 in head); corners of mouth deeply sunken, upper lip groove longer than lower.

Teeth long, narrow, awl-shaped and similar in both jaws; longest tooth approximately equal to half eye diameter; no lateral basal denticles.

Dental formula $\frac{13-14}{12-12} \left(\frac{11 : : 2-2 : 1 : : 11}{10 : 2-2 : 10} \right)$

First two teeth on each side of centre are longest. Adjacent to these, on the upper jaw, there is a gap in which there may be one very small tooth. Teeth following the gap are smaller than first two teeth and decrease in size towards side of jaw. Situation of teeth on lower jaw same as on upper jaw, except no gap or small tooth between large central and smaller lateral teeth.

First dorsal origin midway between tip of snout and caudal origin, posterior to pectorals even when outer corner of pectoral is adpressed laterally. Rear tip of first dorsal well anterior to origin of pelvics. First dorsal low (height 2.1 in base) and triangular; posterior margin nearly straight; apical tip rounded and rear lobe stout.

Second dorsal of same shape as first (height 1.7 in base) but considerably smaller (base and height being 2.5 and 2.0 in those of first dorsal respectively). Base less than quarter of interdorsal distance; origin just posterior to rear end of pelvics; rear lobe terminates opposite posterior end of anal base.

Anal of same shape as first and second dorsals (height 2.2 in base) but considerably smaller than either (base and height 1.4 and 1.7 in those of second dorsal respectively); base 1.6 in distance from origin to rear tips of pelvics; anal opposite posterior end of second dorsal base; rear lobe terminates anterior to caudal origin by a distance nearly equal to length of base.

Pectorals short, quadrilateral in shape; slightly convex anterior margin; posterior margin almost straight; anterior (outer) and posterior (inner) corners rounded; inner margin slightly convex and almost equal in length to base or 2.2 in anterior margin. Anterior margin 1.9 in head.

Pelvics triangular and smaller than first dorsal but larger than second; anterior (outer) corner rounded but posterior corner pointed just outside of claspers. In this specimen claspers reach beyond anal origin.

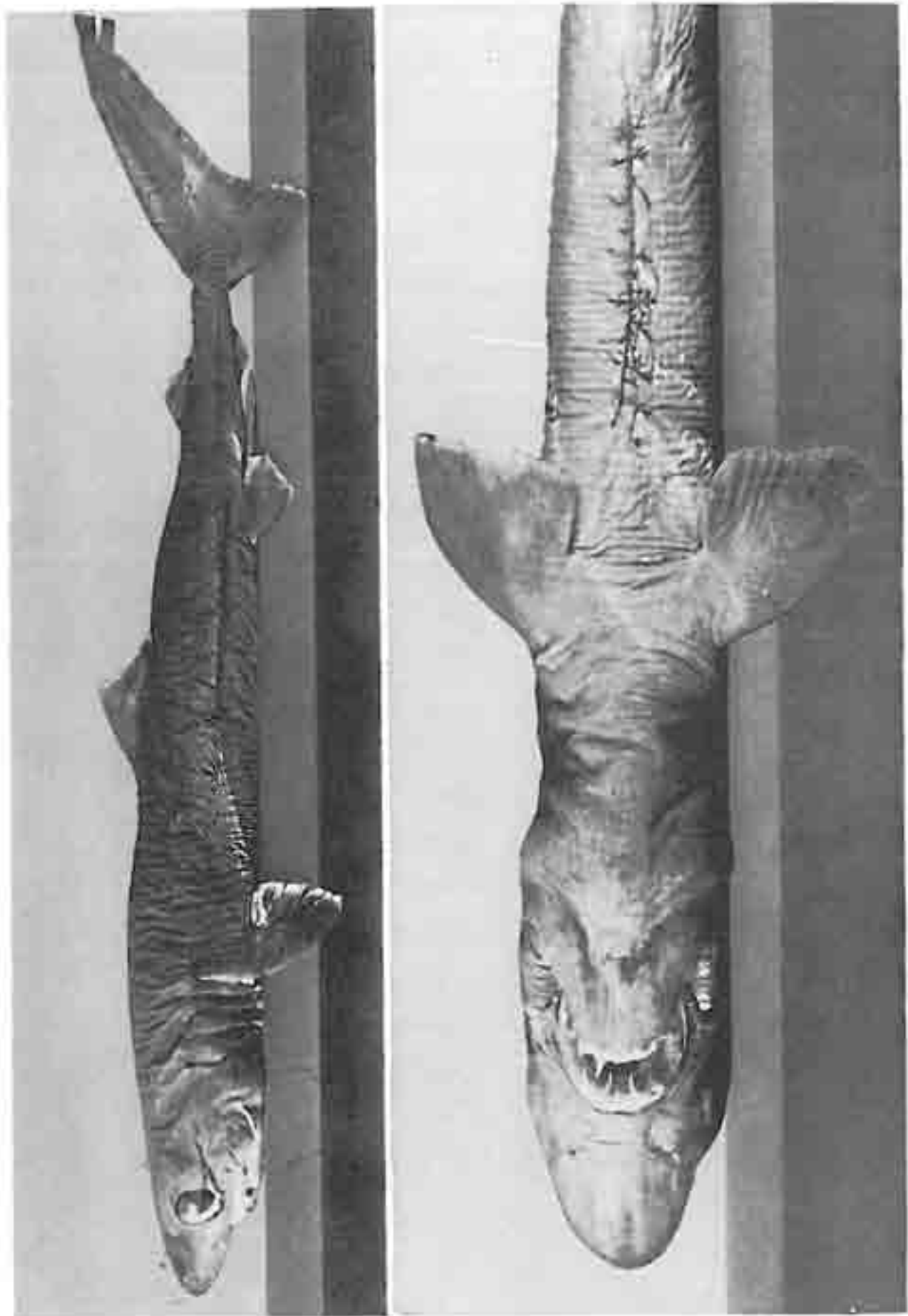
Upper caudal short, length less than one third of precaudal length or less than quarter of total length. Length of terminal lobe from notch to apex 5.1 in upper caudal length and length of lower caudal 2.4.

Colour

After preservation in formalin the colour is dark brown above and on the sides and light brownish grey on the ventral surface. Fins dark brown except for the undersides of the paired fins which become paler towards the base. With the exception of the upper caudal, the posterior margin of each fin is narrowly edged with white or appears transparent. There is no conspicuous white spot between the mouth and first gill slit as described by Matsubara. This area is, however, slightly paler than the lateral colour and appears to be a slightly darker extension of the ventral colour.

Vertebral counts

Total count	153
Precaudal count	84



a

b

FIG. 3. *Carcharias kamoharui*, mature male, 814 mm, in total length.

a. Lateral view. b. Ventral view.

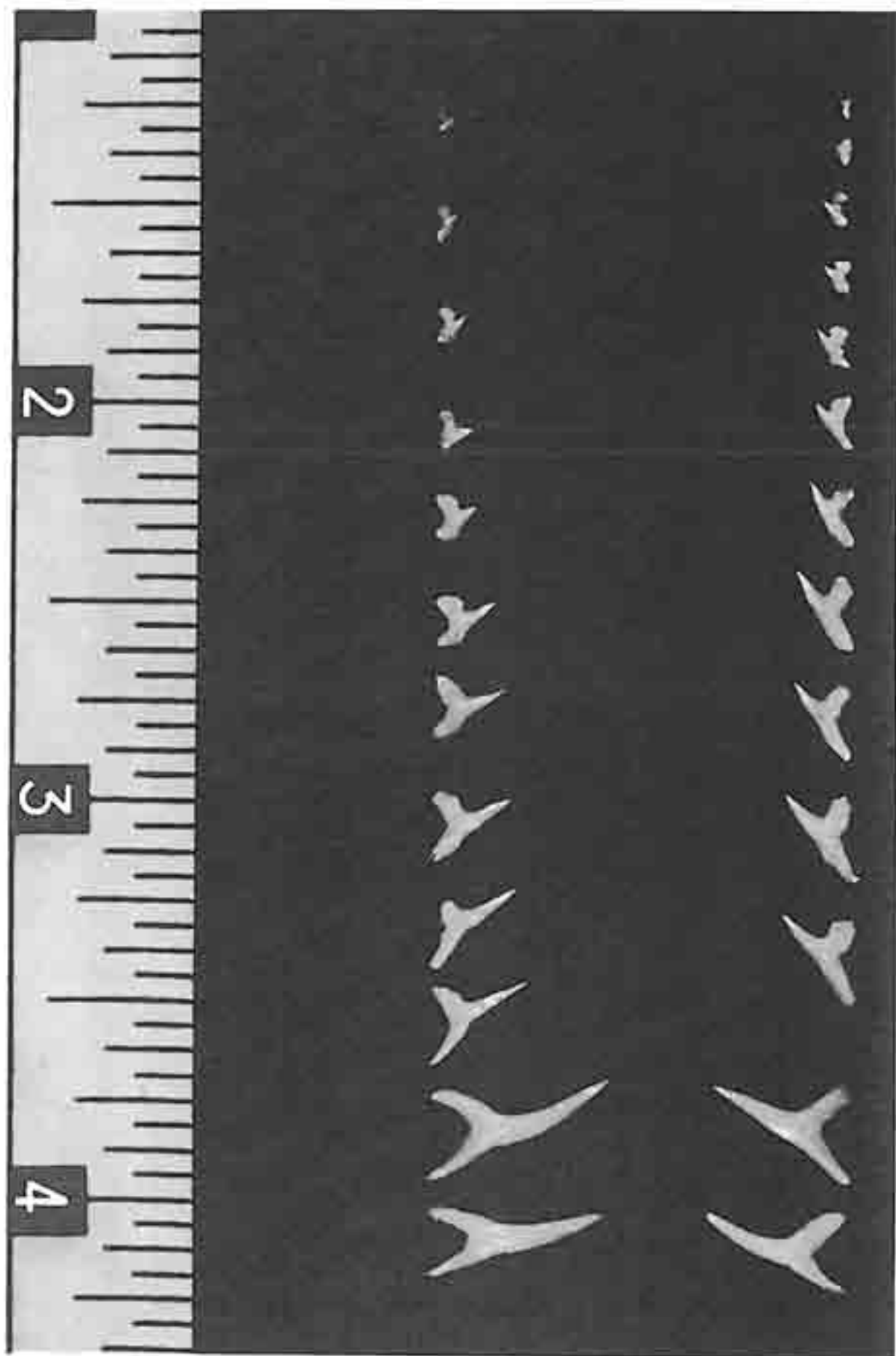


FIG. 4. *Carcharias kamoharai*, mature male, 814 mm. in total length.
Teeth of left side of upper and lower jaws.

General

In spite of the apparent rarity of this species (only 21 specimens are known to have been recorded), *C.kamoharai* is widely distributed and is found in the Atlantic, Pacific and Indian Oceans from approximately 33° N. to 35° S. The localities from which specimens have been recorded are as follows:

Specimen	Locality	Date	Remarks
<i>C.kamoharai</i> (holotype)	Kochi, S.W. Japan	—	—
<i>C.yangt</i> (holotype)	Taiwan	—	—
S.A. specimen	Capa Town, S. Africa	Dec 1961	Swimming feebly in shallow water
<i>P.pelagicus</i> (paratype)	Luanda, Angola	April 1962	Between 250-300 m. in depth
<i>P.pelagicus</i> (holotype)	Guinea Coast	Aug-Sept	—
16 specimens recorded by N. Merritt	S.W. of Madagascar 23-28°S 38-41°E	June 1964	Caught on long lines

The type of *C.kamoharai*, the S.A. specimen and the paratype of *P.pelagicus* (males of 735, 814 and 975 mm. in total length respectively) had well developed claspers, which reached beyond the origin of the anal, and it is assumed that *C.kamoharai* matures at a length of approximately 735 mm.

Summary

1. *Carcharias kamoharai* is recorded for the first time from South African waters.
2. *Pseudocarcharias pelagicus* and *Carcharias yangi* are synonymous with *Carcharias kamoharai*.
3. *Pseudocarcharias* is not considered to be of subgeneric status.

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