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THE LIZARD SHARK

**CHLAMYDOSELACHUS ANGUINEUS** Garman,

IN SOUTH AFRICA

by

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THE LIZARD SHARK  
**CHLAMYDOSELACHUS ANGUINEUS** Garman,  
in SOUTH AFRICA.  
(With Plates 19-23).

by

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From its primitive nature and unusual characters the Filled Shark or Lizard Shark **Chlamydoselachus anguineus** Garman, 1884 has attracted considerable attention.

First known only from deep water off Southeast Japan, in 1889 a small (610mm) specimen was found at Madeira in the northeastern Atlantic, a remarkable extension of distribution. This was further extended by the capture of a large (1900mm) female off northeastern Norway in 1896. Since that time, while southeastern Japan has remained by far the most prolific source of these rarities, during the past sixty years a further dozen specimens have been taken all along in a belt of the northeastern Atlantic from Madeira and off Morocco to northwest of Scotland, including the Atlantic coastal regions of Spain, Portugal and Gascony (see Fig 1).

In recent times the known distribution has been extended to the far eastern Pacific by the discovery of two specimens off northern California. All these records are in the northern hemisphere.

In 1951 I received a detailed description of an elongate eel-like smallish shark that had been seen on the eastern Cape coast, with later recognition of an illustration by the narrator concerned. This led me to report **Chlamydoselachus** as probably in South African seas. As I had not seen the actual specimen, which had been thrown away, there remained an element of doubt. This has now been dispelled by the discovery of the specimen described below.

This was taken off Walvis Bay, Southwest Africa at about 23°S, the precise locality and depth are not known. It is a male, with well developed myxopterygia, 930mm (mutilated) total length, estimated at about 980mm in life, and is hence one of the smallest adults yet found. The specimen was obtained and kindly sent by Mr. G. E. Venter of the South West African Marine Research Laboratory, Walvis Bay.

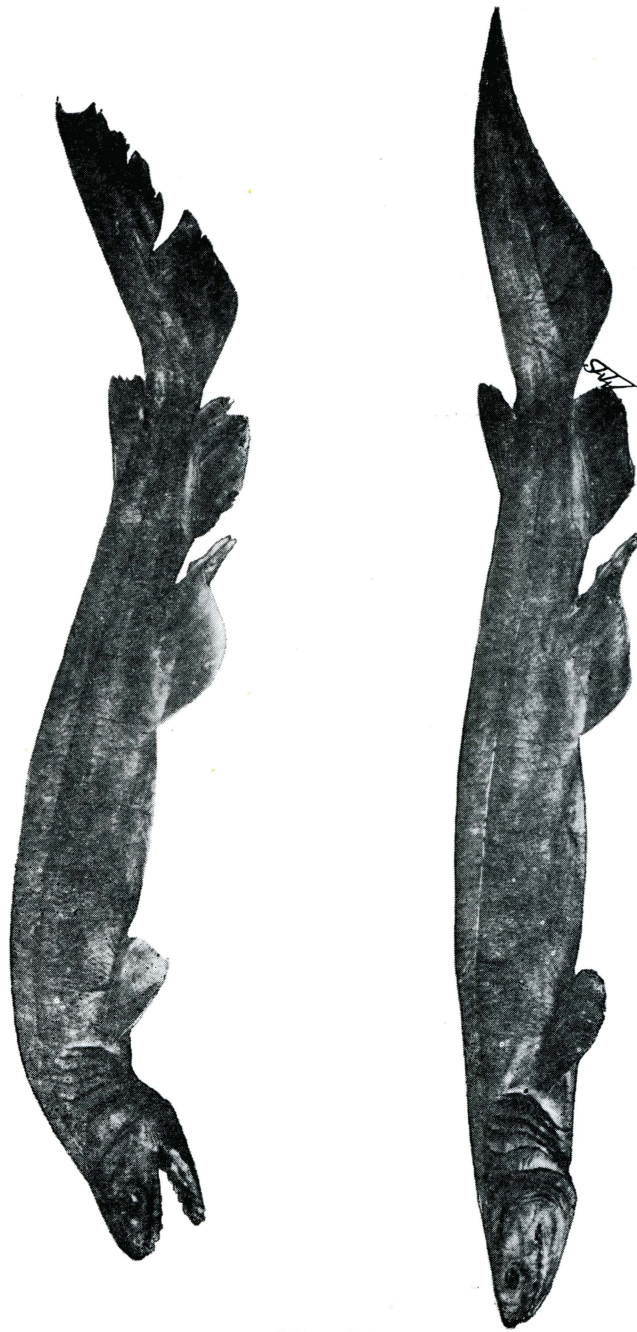
This fish while almost certainly congeneric with all specimens previously described, differs in some respects, notably in its relatively short trunk, as may be seen from the illustration (Plate 19) as well as from comparative data (Table I, below).

It should however be noted that analysis of available data of specimens of *C. anguineus* which have been universally accepted as conspecific, reveals that there is not only a degree of sexual dimorphism but that in each sex there is wide variation in form, e.g. in points of insertion of and actual dimensions of the fins. Thus in females the trunk averages longer than in the male, and the distance from the pelvic origin to the dorsal origin is 4.3-7 (mean 6.2) in the total length, whereas in males it is 6-12 (mean 8) in the total length (see note at foot of Table 1). Also the caudal in females appears to average slightly shorter than in males, being 4.1-4.3 in total length, whereas in males it is 3.4-4.

This 980mm male from South Africa has the following dimensions. In total length; depth of body 10.5, snout tip to hind edge of first gill flap 10; snout tip to edge of last gill flap (head length) 5.8, snout tip to the pelvic origin 2.2, to the anal origin 1.7, to the dorsal origin 1.6. Length of caudal about 3.4 in the total length. Maximum depth of caudal 3.3 in its length, 2 in head. Mouth 2.0, interorbital width 2.8 in head. Horizontal diameter of the eye 3.2 in the interorbital width, the vertical about 4. Pectoral fin 2.0, claspers 2.0 in head. Diameter of claspers about 6.5 in their length. Bases of pelvic and of anal subequal, about 1.7 in head. The anal origin is clearly in advance of the dorsal origin.

This South African specimen is in excellent condition, the body is flabby but evidently little distorted if at all. The dermal denticles are small, the skin slightly rough when stroked antorsely. The head is strongly depressed, the interorbital wide. The eyes are somewhat longer than deep, but give the impression that in life they may vary, possibly at will, from circular to ovoid. They are situated near the dorsal profile of the head, slightly nearer the front of the snout than the corner of the mouth. The maximum width of the mouth is almost equal to its length. The dermal denticles on the lips are increasingly enlarged inwards almost comprising a minor labial dentition. The lower jaw is slightly shorter and narrower than the upper. The teeth are unique, largely tricuspid, set in rows of five on subrectangular plates, more than twice as long as wide, that run transversely across the side of the jaw.

Most teeth have three main cusps with a smaller inner cusp each side between the median and the outer (PI 21). In the upper jaw there are on each side eleven main upper tooth plates, the hindmost two rather small. At the front of the mouth there is a gap between the series, and in this are two small plates with about half size teeth, not exactly median but slightly nearer the right side (PI 22). The cusps of the teeth all point inwards, the longest in the jaws are about 3mm in length. In the lower jaw there are twenty-one plates, the most anterior is median. There are about 650 main cusps of the teeth in all on the jaws. When the mouth is closed the upper teeth are exert and clearly visible from below (PI 20).



**Plate 19**

***Chlamydoselachus anguineus*** Garman. Male 930mm (South Africa).  
Below, fins reconstructed, about 980mm.



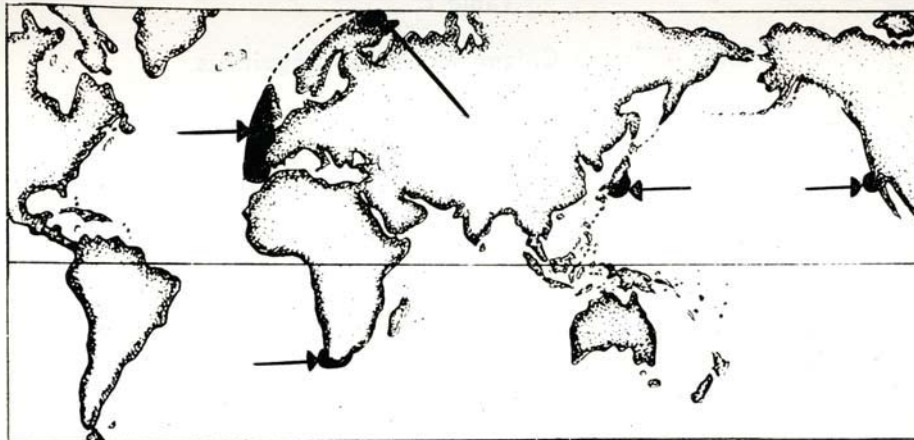


Fig 1. Present known distribution of **Chlamydoselachus**

Across the front of the upper jaw behind the tooth plates is a skinny fold stated to be a breathing valve. This is smoothly and broadly concave and distinct to the third or fourth plate on each side (PI 22). The tongue is distinct and tapering.

The spiracle is vestigial. It is situated about midway between the eye and the upper angle of the anterior gill flap.

The lateral line is distinct as a continuous shallow groove running from the upper angle of the anterior gill flap along the upper part of the side to the end of the caudal.

Tropeic folds are distinct along the midline of most of the belly, they are more marked anteriorly, where there is a distinct but shallow groove between them.

The circular vent lies at the anterior end of the relatively large cloaca (PI 23). Immediately posterior is a prominent large bluntly conical urogenital papilla with paired openings at the apex. Behind this on each side is a papilliform abdominal pore. When the specimen is handled from these latter there emerges a steady flow of liquid, chiefly oil. Whenever there is any pressure or flexure in the cloacal area, this immediately produces a flow of oil. When the fish is left in water or preservative, oil rapidly appears on the surface. This probably originates from the liver. Along the dorsal surface of each clasper is a deep groove. Near the apex of the organ this is covered by a sharp horny flap or keel, 25mm long and 7mm deep, a small fold of skin forms the apex of the clasper and continues the channel a short distance beyond the horny keel. Table I below gives available comparative data of **C. anguineus**.

**Table I.**

Data of adult *Chlamydoselachus anguineus*.

T:L. = total length.

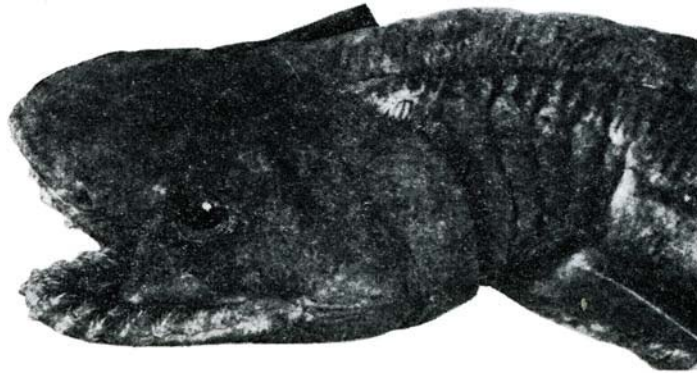
org = origin.

	FEMALES		MALES		
Origin .....	Various		Various		South Africa
Number of specimens	7		9		1
Total length mm .....	1220-1860		920-1500		980?
<b>All in T.L.</b>	Range	Mean +	Range	Mean	
Snout-1st gill slit .....	9-10.4	(6) 10.1	7-12.5	(7) 9*	10
Head length .....	6-9	(6) 6.6	5.5-7	(9) 6.3	5.8
Snout-dorsal org .....	1.4-1.6	(6) 1.5	1.5-1.9	(9) 1.7	1.6
Snout-pelvic org .....	1.8-2.2	(6) 2.0	2.0-2.3	(9) 2.15	2.2
Pect org-pelvic org **	2.7-3.4	(5) 2.9	3.0-3.7	(9) 3.3	3.7
Pelv org-dorsal org .....	4.3-7	(6) 6.2	6-12	(6) 7*	5.6
Body depth .....	8-12	(3) 11	9.7-12	(7) 10	10.5
Caudal, length .....	4.1-4.3	(3) 4.2	3.4-4	(8) 3.7	3.4?
<b>All in head</b>					
Mouth, length .....	1.6-2	(2) 1.8	1.9-2.1	(5) 2.0	2.0
Interorbital .....	2.4-3	(5) 2.8	2.7-3	(5) 2.9	2.8
Pectoral, length .....	1.6-2.4	(4) 2.0	2-2.2	(4) 2.1	2.0
<b>In interorbital</b>					
Horiz.dmr.eye .....	3.4-4.5	(5) 4.0	3-4	(5) 3.5	3.2

\* Excluding obviously abnormal or probably erroneous data but included under 'Range'.

+ Under 'Mean', (6) 1.5 indicates mean of data available from six specimens.

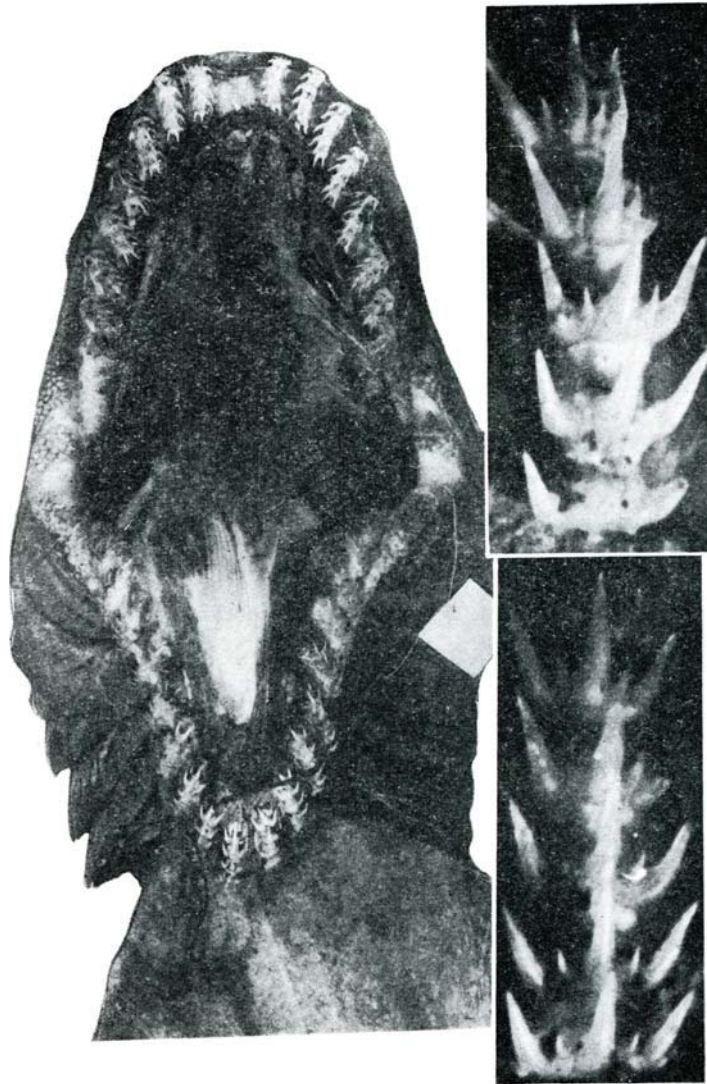
\*\* Trunk



**Plate 20**

**Chlamydoselachus anguineus** Garman. Male about 980mm (South Africa). Head.





**Plate 21**

***Chlamydoselachus anguineus*** Garman. Male about 980mm (South Africa). Cape. On right, 4th and 5th tooth plates of left side of jaw.

This South African specimen has a plainly shorter trunk than the majority of males, but it agrees otherwise so well with general data and diagnosis that it can scarcely be more than an extreme variant within the species. It may be noted that a 1500mm male specimen from Japan illustrated by Doflein (1906, fig), and reproduced by Smith (1933, Pl 1, fig 2) has much the same shape, short trunk and dimensions as the South African specimen described above. Some of the abnormality in the shape of the South African specimen arises from a slightly more anterior insertion of the pelvics.

There has been a good deal of speculation about the feeding habits of this shark. The relatively enormous gape of the mouth and the dentition indicate that it is a predator and that its food probably consists chiefly of fairly large prey. Once seized by those jaws with their numerous sharp retrorse pointed teeth, no ordinary prey would easily escape. In this respect the dentition and the further processing of prey are probably much like those of and deduced for the Coelacanth, in which also sharp teeth are set in groups in plates on the jaws.

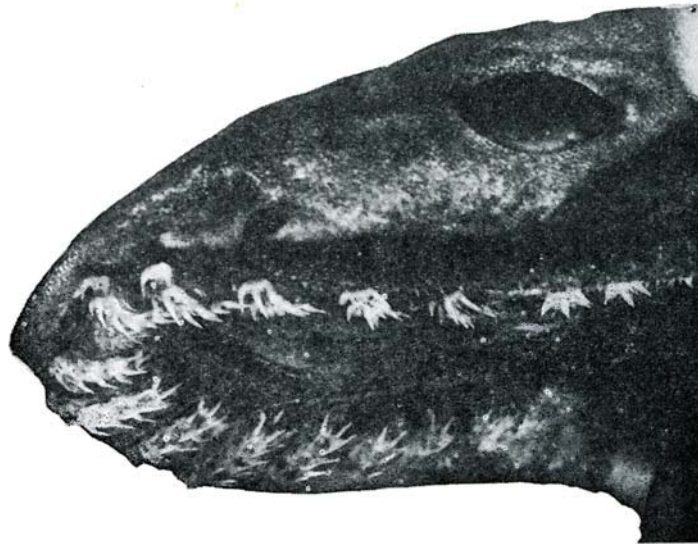
It is probable that **Chlamydoselachus** ingests its prey like a snake, that once the animal it holds is subdued, the Lizard Shark literally drags itself over it by convulsive movements of the wide gaping jaws. It is significant that nothing certain is known about the animals on which this shark preys because no specimens have been caught with undigested food in the stomach. The gorged fish probably lies torpid in the depths and until its meal has been mostly digested the fish probably remains indifferent to other food including baited hooks.

The present known distribution of this fish is interesting and merits further notice. Hitherto all records have come from the northern hemisphere, Japan, northeastern Atlantic and California. Especially in recent times a number of rare fishes have been found in South African seas, of which some are at present known chiefly from the northern hemisphere in the Atlantic and Pacific oceans. These and their known centres of occurrence are shown below (Table II). What is of especial interest is that few of the fishes below have been found at any locality intermediate between those shown in the table.

TABLE II.

Centres of occurrence of certain rather rare fishes.

	N.Eastern Atlantic	S.Africa	Mozambique Channel	Japan	California
<b>Chlamydoselachus anguineus</b> .....	X	X	—	X	X
<b>Pristigenys nipponia</b> .....	—	X	X	X	X
Genus <b>Velifer</b> .....	—	—	X	X	—
<b>Cubiceps gracilis</b> .....	X	X	—	X	—
<b>Centrolophus britannicus</b> .....	X	X	—	—	—
<b>Pentaceros richardsoni</b> .....	—	X	—	X	X
<b>Seriola songoro</b> .....	—	X	X	X	?
<b>Taractes asper</b> .....	X	X	X	—	—



**Plate 22**

**Chlamydoselachus anguineus** Garman. Male, about 980mm (South Africa). Front of mouth showing breathing valve and anterior smaller tooth plates.

**Below:** Left side of front of head showing nostrils and enlarged labial denticles.



It is clear that the two main centres of distribution of **C. anguineus** are: Japan, and in the Atlantic, the coastal slope fronting the Franco-Iberian peninsula. These are both areas of intensive fishing pressure in fairly deep water, as are also South Africa, California and Norway.

From the evidence adduced it seems likely that **Chlamydoselachus** may be expected to occur in at least the southern Mozambique channel, over an extensive area of the western coast of North America and about Australasia. In that respect it is of interest to note a report by Hanna (1883, 407-10, fig) of an unusual eel-like fish taken in a net on the coast of Maine, U.S.A. This led to several suggestions (e.g. Bigelow and Welsh 1924) that this may have been **Chlamydoselachus**. However from the available data the fish is considered more likely to have been **Regalecus**. All recent workers discount the validity of this record for **Chlamydoselachus**. Stead (1907,554) reported **Chlamydoselachus** from Australia. This record was based on remains of uncertain identity, chiefly the vertebral column and brain case of a supposedly elongate shark estimated at about 10ft in length. Later workers have unanimously rejected this supposition as invalid and the occurrence of this shark south of the equator in that part of the Pacific has not been certainly established. However Stead to the last (1963, Sharks and Rays of Australia, p 16) maintained that his record was valid, basing this chiefly on a description of the teeth by a fisherman who had seen the decomposed animal. In reality there is no reason why **Chlamydoselachus** should not occur there.

#### Vertebral Column

From its origin to the base of the caudal fin the vertebral column (of this specimen) appears to be entirely cartilaginous, a radiograph shows no trace of any significant calcification. The caudal portion however shows widely separated calcified centra, about twenty in all to the end of the column. They are progressively smaller and decreasingly calcified posteriorly, on a radiograph they have a 'diabolo' shape. On dissection these calcified areas stand out, they are more rigid and lighter in colour than the intervening cartilage. While the course of the vertebral column can be discerned as a shadow on the radiograph there is no sign of calcification anterior to the caudal base.

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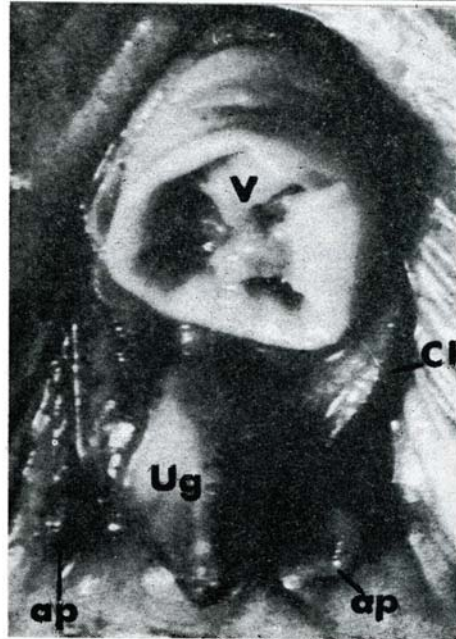
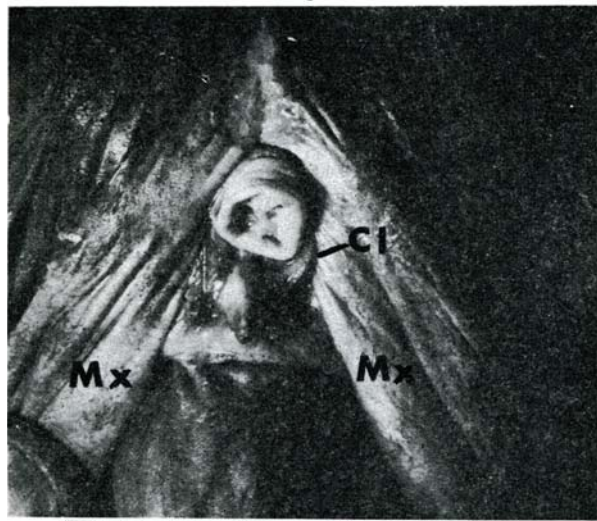


Plate 23

***Chlamydoselachus anguineus*** Garman. Male, about 980mm (S. Africa). ap., abdominal pores. Cl., cloaca. Mx., myxopterygia. Ug., urogenital openings in central conical papilla. V., vent, the gut prolapsed.

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