

## THE HISTORY OF MARINE HERPETOLOGY OF THE INDIAN AND PACIFIC OCEANS\*

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### ABSTRACT

The history of work on marine herpetology of the Indian and Pacific Oceans is recorded in a chronological order and taxa-wise.

REPTILES have evoked human interest from the earliest ages primarily as inducers of death secondarily as a source of food, ornament, leather and shelter. The placating of some species of lethal reptiles yet persists as various ceremonies in different parts of the world as at Ponape (Hambruch, 1936).

The ancient and medieval sailors had found turtles and land tortoises to be a valuable source of fresh meat, and brought back to their homes parts of reptiles or the entire animals preserved in rum and labelled with their local names. The bulk of these collections found their way into museums owned by the state or by royalty and nobility, where they were worked out and monographs published. In some instances the collectors themselves published such monographs.

In India the Moghul emperors employed painters of animals, but reptiles did not figure prominently in their work. The countries that published the most important herpetological monographs during the 17th, 18th and 19th centuries were Sweden, Holland, England, France, Germany and Italy and their work and collections provided the foundation for modern herpetology.

Arab and Persian traders had acquainted the ancients of Europe with the existence of various reptiles in the Indian Ocean, later the Greek Magasthanes commented upon the size and abundance of the turtles there and Strabo the Roman in 300 B.C. mentions the tortoise shell exported from Ceylon. They also commented upon the sea snakes.

When large tracts of Asia were conquered by various western races who left their comparatively poor native lands in quest of more profitable ones, several of the better educated officials whom they stationed in their colonies, made private collections and at times employed local artists to make paintings of the plants and animals. Some of these collectors also conducted experiments upon the potency of venom.

The Portuguese writers also made reference to the herpetology of India and Ceylon Joao Ribeiro (1640-1758) being one of them. A German Johann Jacob Sarr (1647-1657), and two Dutchmen Philippus Baldeus (1658-1671) and Jean Gideon Loten (1752-1757) were others. Marcel Bles (1773) who resided in Ceylon for 12 years sent to Buffon in Paris considerable material and Pierre Sonnerat who visited Ceylon, India, Malaya and China after leaving France in 1774, and Leschenault de la Tour who

collected in Ceylon and India in about 1817 presented their collections to the Museum National d'Histoire Naturelle in Paris. C. J. Temminck a Dutchman collected for the Leyden Museum about this time as did his countryman P. Bleeker who had concerned himself mainly with the Malayan region but had also visited and collected in Ceylon and India towards 1880.

Linnes pupils who were sent out in the vessels of the Swedish East India Company secured collections for Sweden and the Dutch, British and French. East India Companies also made extensive collections for their respective countries. Other collections were made by travellers such as Cook in the 'Endeavour' in 1770 and by ships such as the 'Bonito' 1837, the 'Novara' 1859, the 'Siboga' (1908), the 'Skeat Expedition' (1900), and the 'Dana' (1930), and the Albatross (1920) that were sent out solely for oceanographic research.

The establishment of Museums in various countries bordering the Indian and Pacific Oceans resulted in more intensive collecting but lack of literature and type specimens forced their officials to despatch their collections to Europe for identification. With the removal of these two impediments the officers of these museums commenced working out their collections themselves, which frequently resulted in one and the same animal being described under different and new names in various countries.

The most important of such early Museums were the Indian Museum Calcutta, the Madras Government Museum, the Colombo Museum, Raffles Museum at Singapore, the Imperial Museum at Tokyo, the Bishop Bernice Museum, Honolulu, and the Melbourne Museum, Australia. Other institutions such as the Bombay Natural History Society, the Asiatic Society of Bengal, various branches of the Royal Asiatic Society, the Philippine Institute of Science, and the Scientific Institute at Buitenzorg in Java rendered valuable service to herpetology.

Since the literature pertaining to the reptiles of the Indian and Pacific Oceans is so extensive that a detailed history of the herpetology of these areas will entail many years of work by a considerable body of workers. It is here proposed to deal with this subject in as concise a manner as possible. The author's name and date of publication are given in the text, the full title of his work is listed later in the Bibliography.

The early descriptions of reptiles were so inadequate that generally it was impossible to identify the animal dealt with and the first identifiable descriptions occur in Linne's tenth edition of his *Systema Naturae* published in 1758. In this and in later editions of it he refers to illustrations and quotes descriptions published by earlier authors and his example was followed by subsequent workers.

Prominent among these early works is the Dutchman Seba's *Thesaurus Animalium* (1734), which contains numerous illustrations. Other early works were by Fryer 1680, Pennant 1769, Peter Brown 1776, Forster 1781, Russell 1796, Schneider 1783-1799, Lacépède 1788 and 1845, Schoepff 1792, Latreille 1802, Shaw 1802, Daudin 1803, Cuvier 1829, Fitzinger 1835, Gray 1835, Kelaart 1852, Tennent 1854, Dumeril and Bibron 1854, Girard 1858, Wood 1864. Two workers who published important books on Indian herpetology were A. Gunther a German, 1864, and W. Theobald 1876, but it was the Belgian G. A. Boulenger the herpetologist at the British Museum who set the course for modern herpetology, when he published his first major work in 1890. This was entitled 'the Fauna of British India including

Burma and Ceylon (Reptilia and Batrachia)', and followed it up in 1912 with 'A Vertebrate Fauna of the Malay Peninsula from the Isthmus of Kra to Singapore, including the adjacent Islands'.

The safeguarding of sea turtles is a cogent problem and the International Union of Conservation of Nature and Natural Resources, at Morges, Switzerland is now publishing in the revised edition of its *Red Data Book* vol. III Amphibia and Reptilia its intention of acting upon the present writer's proposal published in 'Loris' vol. X, No. 4 of December 1965 entitled 'A Sanctuary for Turtles, Dugong, Whales and Dolphins in the Indian and Southern Oceans.'

The International appeal drafted by the present writer and signed by Professors Mertens and Wermuth of Germany and Meddem of Bogota to protect the *Crocodylia* has met with a fair response but further action is still necessary.

Other outstanding herpetologists of the twentieth century who worked on the Indian and Pacific Oceans reptiles are :—

F. Angel 1920-1933.	R. Mertens 1922-1934.
N. Annandale 1904-1921.	F. Mocquard 1897-1910.
T. Barbour 1908-1929.	F. Muller 1895-1923.
W. T. Blanford 1900.	C. Pope 1924-1935.
O. Boettger 1894-1901.	N. de Rooij 1915-1922.
G. A. Boulenger 1890-1920.	J. Roux 1904-1928.
R. Bourret 1927-1935.	K. P. Schmidt 1925-1948.
L. Brongersma 1928-1933.	M. A. Smith 1914-1945.
P. Chabanaud 1919-1923.	L. Stejneger 1898-1933.
N. G. Gee 1919-1930.	E. H. Taylor 1919-1954.
A. Gunther 1905.	J. van Denburgh 1909-1923.
Horikawa 1930.	T. Vogt 1911-1932.
J. Kinghorn 1928.	F. Wall 1897-1930.
F. Laidlaw 1901.	H. Wall 1911-1928.
R. Mell 1922-1931.	F. Werner 1896-1928.

The Reptilia of the Indian and Pacific Oceans exist as three orders which are classified as follows :—

#### CLASS REPTILIA

- (a) subclass Anapsida—order Testudinata turtles.
- (b) subclass Diapsida—crocodiles, lizards, snakes.
  1. superorder Archosauria
    - order *Crocodylia*—crocodiles
  2. superorder Lepidosauria
    - order *Squamata*—lizards and snakes
    - suborder *Serpentoidea*—snakes

## SUBCLASS ANAPSIDA

## Order Testudinata

*Fossil Species*

The fossil marine turtles of the Indian Ocean are barely known. Fragments of a Miocene turtle had been recorded from Ceylon but were left unnamed (Deraniyagala, 1936). Subsequently better preserved marginals of another turtle were assigned to a new genus and species and named *Miocaretta lankae*.

Each marginal comprises three osseous elements that are fused longitudinally, and there are two pits for the rib tips. The posterior marginals are fused to each other, end to end to form a peripheral ring and costoperipheral fontanelles were present. It is not improbable that the ribs lacked the broad bony plates of living species. 'The animal was as large as the living *Caretta caretta gigas*, but its marginals were thicker and heavier (Deraniyagala, 1961 a)'.

There are eight living species of sea turtles and of these seven occur in the Indian and Pacific Oceans. The following list gives the names generally applied to them.

1. A single Athecan termed the luth or leathery turtle *Dermochelys coriacea* (Linné).

The luth or leathery turtle possesses only a dorsal mosaic of numerous small bony platelets, each as large as the turtles eye, which are embedded in a shield of thick skin to form the carapace. In 1766 Linné had named this turtle *Testudo coriacea* in the 12th edition of his *Systema Naturae* (1766) and in 1816 de Blainville placed it in a special monotypic genus *Dermochelys*. Other generic names assigned to it were *Sphargis* by Merrem in 1820, *Coriudo* Fleming 1822, *Dermatochelys* Wagler 1830 and *Chelyra* Rafinesque 1832. Numerous specific names were also given to it, e.g., *Testudo arcuata* Catesby 1771, *Testudo lyra* Lacépède 1788, *T. tuberculata* Pennant 1801, *Sphargis mercurialis* Merrem 1820, *Dermatochelys porcata* Wagler 1830, *Sphargis coriacea* variety *schlegelii* Garman 1884 and *Sphargis angusta* Philippi 1899. Even today there are herpetologists who recognize two subspecies and restrict *D.c. schlegelii* Garman to the Indian and Pacific Oceans. Examination of newly hatched young and adults from the Indian, Pacific and Atlantic oceans however reveals that there is only a single monotypic genus.

2. There are seven recent marine Thecophoran turtles in the Indian area. In those the carapace consists mainly of large bony costal plates, each almost as large as a hind flipper. They are fused to the skeleton. Although the seven turtles are now listed under the names that are usually applied to them, drastic revisions of their taxonomy and nomenclature are necessary, as will be seen upon further perusal.

Names of sea turtles that are valid for scientific purposes date back to the 10th edition of Linné's *Systema Naturae* published in 1758, where in the luth is named *Testudo coriacea*, the green turtle is *T. mydas*, and a composite name *T. caretta* includes the hawksbill and the loggerheads. In 1766 Linné conferred the separate name of *Testudo imbricata* upon the hawksbill.

To judge from the collection in Linné's home at Uppsala which contains several sea turtles that have been wrongly identified, he too was by no means certain of his identifications. His *imbricata* is a young green turtle, and an adult carapace which he had assigned to the latter species is actually one of a brown loggerhead (Deraniyagala, 1961a).

Rafinesqué's generic name *Caretta* had been applied indiscriminately to each of the thecophoran turtles, by various herpetologists. For example the green turtle had been termed both *Caretta cepedii* and *Caretta esculenta* by Merrem in 1820, the hawksbill *Caretta bissa* by Rüppell in 1835 and in 1858 Girard termed it *Caretta squamosa* and *C. rostrata*. The green turtle has been termed 'green caret', the hawksbill the 'hawksbill caret' by various other medieval writers. (Kelaart 1861, Wood, 1864).

The following excerpts translated from de Lacépède, 1845 in *Hist. Nat. des Quadrupèdes Oviapares, des Serpents, des Poissons et des Cétacés*.

Vol. 1 indicate that five marine turtles were known in 1845.

He mentions :

(1) *La tortue Franche* the green turtle.

(2) *La caouane*

Some term it the *Caret*, but as this name has been applied for a long period by travellers, to the turtle that furnishes the beautiful scutes, we are reserving the name for the latter and here designate the other as the *caouane*.

(3) *La tortue nasicorne* also termed the *Tortue batarde* by American fishermen.

(4) *Le Caret* with beautiful scutes. On p. 22, pl. 1, he terms the hawksbill 'le Caret'.

(5) *Le Luth*, the Greeks believe that the God Mercury constructed his lyre from its carapace. It inhabits the Mediterranean, the shores of Peru, Mexico, France and Cornwall.

Thus according to Lacépède :

(1) The *Franche* is the Green turtle.

(2) The *Caret* is the hawksbill.

(3) The *Caouane* is the brown loggerhead.

(4) The *Nasicorne* or *Batarde* turtle.

(5) The *Luth* is the leathery turtle.

When Linné named the hawksbill in 1766, his old composite name which included the hawksbill, of *Testudo caretta*, was available for one of the three species of loggerheads, that were later discovered to inhabit the Atlantic.

It was in 1783 that Schneider named one of these Atlantic loggerheads *Testudo cephalo*, the type locality being South Carolina. This name is derived from the Greek 'cephale' = head and since the common brown logger-head possesses a conspicuously large head the name *Cephalo* was doubtless applied to this species.

In 1788 Lacépède in *Hist. Nat. Quad. Ovip. et Serp.* vol. I, described *T. nasicornis* from the equatorial seas off America and in his 1845 book he records that *T. nasicornis* is also known as *Tortue batarde* by the American fishermen. Garman and Baur also record this fact in their accounts of the grey loggerhead now generally known as Kemp's ridley.

In 1792 Schoepff gave Linné's name of *Testudo caretta* and clearly described and illustrated the grey logger of the Gulf of Mexico (Deraniyagala, 1961). In 1814 Rafinesque employed Linné's specific name *Caretta* for the new genus he created for his new species *nasuta* as genotype. The latter however is merely a synonym for *cephalo*. In 1820 Merrem placed Lacépède's *nasicornis* in Rafinesque's new genus and its valid name is *Caretta nasicornis* (Lacépède, 1788) while *Caretta caretta* (Schoepff, 1792) is its synonym.

In 1788 Lacépède had described as a new species another American loggerhead. He employed its Carib Indian name and termed it *Testudo caouana*. To judge from his 1845 book this is the brown loggerhead. As it resembles the hawksbill; both had been popularly termed 'caret' a name which restricted to the hawksbill. The correct name for the brown logger should then be the *Caretta cephalo* (Schneider, 1783), its synonyms being *T. caouana* Lacépède 1788 and *Caretta nasuta* Rafinesque 1814.

The loggerheads are the most variable and puzzling members of the sea turtles. At one time the generally accepted view was that there was only a single monotypic genus *Thalassochelys* Fitzinger, which possessed more than four pairs of costal scutes, and that the other generic names for such turtles were its synonyms. The normal number in all other testudinates is four pairs. Professor Hans Gadow of Cambridge based on his paper on Orthogonetic variation upon what he considered to be the monotypic genus *Thalassochelys* Fitzinger. His material comprized hatchlings collected at the New Hebrides (Trobriand Islands) by the Cambridge Balfour scholar Dr. Arthur Willey and specimens from various Museums. He maintained that the loggerhead hatchlings possessed permutations and combinations of 5 to 8 costal scutes upon the two sides of the carapace and that these were reduced to 5 pairs with age. In 1929 however the present writer revealed that Gadow's material comprized two distinct species namely the olive and brown loggerheads. (a) The former usually possess more than five pairs of costal scutes, the latter five pairs, and the number of scutes does not decrease with age in either turtle. Baur revived the genus *Lepidochelys* which Fitzinger created in 1843 for the olive back turtle from Manila bay which Eschscholtz had named *Chelonia olivacea* and he also placed it in the new subgenus (*Colpochelys*) which was created by Garman for the grey back loggerhead turtle from the Gulf of Mexico. Further discoveries have shown that the two are distinct sympatric species.

It is now suggested that to these, might be added, the grey back *Chelonia depressa* Garman 1880 from the seas off Queensland, Australia which although normally possessing only four pairs of costals resembles *L. olivacea* in colour, small scalation on the middle of the fore flipper pointed tip to the back and the depressed corselet with its subcircular outline. (b) The brown back which is termed *Caretta caretta* (Linné) was the other species utilized by Gadow. It was originally described from the Western Atlantic and has been subdivided into two subspecies. The forma typica inhabits only the Western Atlantic. Its subspecies occurring in the Indian and Pacific Oceans is *Caretta caretta gigas* Deraniyagala, which usually possesses more neural bony plates and a considerable percentage of individuals in which they are interrupted posteriorly by the costal plates of the two opposite sides meeting one

another mid-dorsally. When the neurals are numerous they are often short and resemble those of *Lepidochelys*. The forma typica *Caretta caretta caretta* (Linné) possesses fewer neural bones which are all elongate and contiguous and the series often ends anteriorly to the mid-dorsal junction of the last pairs of costal bony plates (Deraniyagala, 1963).

Almost as puzzling is the hawksbill for which the genus *Eretmochelys* was created by Fitzinger in 1843 with genotype *Testudo imbricata* described by Linné in 1766 from the Western Atlantic. A synonym for it is *Onychochelys* Gray 1873. The Atlantic animal was termed *Chelonia pseudo-mydas* by Lessen in 1834 and a Red Sea specimen was named *Caretta bisca* by Ruppell in 1835. In 1858 Girard named one specimen *Caretta rostrata* and another *Caretta squamosa* while the name of *Eretmochelys squamata* was given by Agassiz in 1857. It was eventually thought that there were two subspecies *Eretmochelys imbricata imbricata* (Linné) for the Mediterranean and Atlantic Oceans and *Eretmochelys imbricata bisca* (Ruppell) for the Indian and Pacific Oceans.

Turtles inhabiting comparatively sedentary water in bays and lagoons develop an encrustation of algal growth which collects a film of mud upon the carapace. This causes aetiolation and produces a relatively light coloured 'tortoise shell' which is not restricted to any one ocean. Apart from this the hawksbill also undergoes striking growth changes. As a hatchling its scutes are more or less juxtaposed, but become imbricated within six months and this condition reaches its maximum when the animal is 2½ years old. When the turtle commences ageing the scutes revert to the hatchling condition and again become juxtaposed. Such specimens have been erroneously regarded as distinct species but examination of hatchlings, young and living and mounted specimens of various ages by the writer in Asia, Europe and America showed that there is only one monotypic form.

The green turtle, also termed the 'green caret' or 'Carey' is *Chelonia mydas* (Linné). The type species for *Chelonia* Latreille 1801 is *Testudo mydas* Linné 1758, from Ascension Island. Some of the other names conferred upon the green turtle were *Testudo macropus* Walbaum 1782 *Chelonia cepidiana* Daudin 1802 and *Chelonia mydas* Schweigger 1812. This turtle also was thought to exist as two subspecies. The forma typica of the Atlantic has been given various names such as *Testudo viridis* Schneider 1783, *Chelonia virgata* Schweigger 1812, *Caretta esculenta* Merrem 1820, *Chelonia marmorata* Dumeril et Bibron 1835.

The Indian and Pacific Oceans were thought to harbour a distinct subspecies for which Thunberg's name of *Testudo japonica* 1787 and Girard's two names of *Chelonia formosa* and *Chelonia tenuis* 1858 and Becourts name of *Chelonia agassizii* for a specimen from the Pacific off Guatamala were employed, but examination of specimens shows that there is only a single monotypic form.

The generally accepted names for the scute turtles are :—

- (a) The green turtle *Chelonia mydas* (Linné).
- (b) The Flat back *Chelonia depressa* Garman.
- (c) The Hawksbill *Eretmochelys imbricata* Linné.
- (d) The Brown loggerhead *Caretta caretta gigas* Deraniyagala.
- (e) The Atlantic Brown loggerhead *Caretta caretta caretta* Linné.

- (f) The Olive loggerhead *Lepidochelys olivacea* (Eschscholtz).  
 (g) The Grey loggerhead *Lepidochelys kempi* (Garman) which is restricted to the Atlantic.

The first three thecophorans (a), (b) & (c) usually possess 4 pairs of horny costal scutes, the other four possess 5 or more pairs. The last six species possess bird-like upper beaks that are compressed bilaterally and slope forwards into a point. The median scales upon the fore flipper are smaller in (b) and (f), than in the others.

Turtle (a) possesses a blunt upper beak with a declivitous anterior margin and the skull has a median marginal premaxillary cleft instead of a point as in the other species. (b) and (f) possess small scales upon the middle of the dorsal aspect of the fore flippers.

In turtles (b), (f) and (g) the carapace is depressed and with a sub-circular margin; those of the others are deep. The marginal outline of (a) is elliptical that of (c), (d) and (e) is cordate. Six generally accepted generic characters after with age. They are as follows :—

- (1) The hatchlings of (c), (d), (e), (f) and (g) are dark ventrally but become light with age whereas those of (a) and (b) are white.
- (2) A certain number of individuals occur in (a), (b) and (c) with more than 4 pairs of costals consequently the number of costal scutes is unreliable as a distinguishing character.
- (3) Scute imbrication which occurs as a temporary phase in all the species is only rudimentary in some whereas in (c) it is very pronounced and of longer duration, but in every species the scutes ultimately become juxtaposed with age.
- (4) Grey dorsal adult colouration which occurs in (b) and (g) also occurs temporarily in (f) when it is adolescent, but this colour is replaced by olive green age.
- (5) The number of claws is apt to alter with age from 1 to 2 and then back with again to 1 on each limb in different individuals in each genus.
- (6) Inframarginal pores are apt to disappear with age.

The intergradation shown above of what are generally regarded as constant characters renders the recognition of four distinct genera untenable and the obvious solution is to assign all the marine thecophoran turtles to a single genus for which the earliest valid name is *Chelonia* Latreille 1802.

#### SUBCLASS DIAPSIDA

#### Order Crocodylia

#### The Marine or estuarine Crocodile

The next superorder of the Reptilia, is the Archosauria. Its order Crocodylia, possesses only a single species that can claim to any association with the sea. It is termed the marine, estuarine or marsh crocodile, but it also exists as one or two subspecies that ascend rivers beyond tidal influence. The range of this species is the most extensive of any reptile that spends a part of each day on land and it is also the heaviest of all living reptiles.



In the Indian Ocean the animal ranges from Ceylon, northwards upto Cochin, the entire east coast of India and eastwards over all Southern Asia, the East Indies, Philippines, Palau Islands, New Guinea, Northern Australia, the new Hebrides and the Bismark archipelago in the Pacific. Its failure to range further northwards along the west coast of India and westwards in the Indian Ocean is one of the mysteries of herpetology. Generally speaking this species is an avid man eater. The correct name for this crocodile has yet to be determined.

In 1734 Seba figured an embryo from Ceylon and named it *Crocodylus ceylonensis*. It is fig. I in his plate 103, and has no postoccipital scutes and the dorsal scutes are rectangular. The artist's insertion of the edentulous angle of gape has been mistaken for the left postoccipital scute. The neck of the figure resembles that of continental specimens of the marine crocodile which frequently lack the post occipital scutes but in which the dorsal scutes are subovate. The figures dorsal scutes resemble those of the swamp crocodile *Crocodylus palustris* Lesson 1831 which always possesses four well developed postoccipital scutes and rectangular dorsal scutes. Seba's figure possesses the neck of the marine crocodile and the scutes of the swamp crocodile which renders it useless for nomenclatorial purposes.

In 1763 Gronov described another Ceylon crocodile and referred it to Seba's *Crocodylus ceylonensis* but states that the dorsal scutes are ovate and that the lateral scales are very small and ovate. In view of this lack of postoccipitals in Seba's figure to which he has referred to and his written description that the scutes were subovate, the first valid name for the sea crocodile is *Crocodylus ceylonensis* Gronov 1763, type locality Ceylon. In 1795 Mayer name a Ceylon crocodile *Crocodylus natans* and based his description upon that by Gronov for *C. ceylonensis* adding however that the dorsal scutes are rectangular. This renders this description also useless.

In 1801 Schneider named as *Crocodylus porosus* a specimen of the sea crocodile and today the animal is generally known by this name. The holotype which is in the Berlin Museum possesses postoccipital scutes. Its type locality is given as 'India' and in those early days Ceylon was not infrequently included under 'India'. The holotype might be either the usual Ceylon form or the one that is unusual for India.

As shown above the correct name should be *Crocodylus ceylonensis* Gronov with Ceylon the type locality, but Dr. Heinz Wermuth of Berlin (1960) who has published a paper setting forth much of the above information considers that *C. natans* Mayer is the valid name and has suggested placing it in the official list of rejected names, utilizing Schneider's name *porosus* and restricting the type locality of *C. porosus* Schneider to the 'Mainland of Hither India'.

In 1844 Gray created the sub genus *Oopholis* with *Crocodylus porosus* Schneider 1801 as the genotype and in 1862 he elevated it to be a genus. Most of the characters that he utilized for this purpose are not distinctive. The fact that none of the ellipsoid dorsal osteoderms are contiguous, the small size of the lateral scales, the relatively large hind limbs as compared to the forelimbs and the more strongly webbed toes might however justify the recognition of this genus. The marine crocodile might be termed either *Oopholis ceylonensis* (Gronov) or *Oopholis porosus* (Schneider). If the former is accepted then the Indian subspecies should be termed *O. ceylonensis pondichianus* (Gray) 1862, but its type locality is Akyab (Theobald, 1876).

If Gronov's name is treated similarly to that of Mayer then the next valid name for this species is *Crocodylus oopholis* Schneider 1801 which had no type locality. This has now been arbitrarily fixed as 'Hither India' by Wermuth (1960).

## SUBORDER SERPENTOIDEA

The sea snakes form two categories. (a) Those that also occur in estuarine and fresh water and come ashore and (b) those that are more or less completely marine and never come ashore. All give birth to living young while in the water. They belong to two families each of which comprises two subfamilies. These are the :

- Family Colubridae (a) Subfamily Arcrochordinae.  
 (b) Subfamily Homalopsinae.  
 Family Hydrophiidae (a) Subfamily Laticaudinae ?  
 (b) Subfamily Hydrophiinae ?

## FAMILY COLUBRIDAE Cope, 1893

Members of the subfamilies (a) and (b) frequent coastal waters ; inhabit estuaries and ascend rivers up to their tidal limits.

The wart snakes subfamily Acrochordinae (Jan) were first described by Hornstedt in 1787 with *A. javanicus* Hornstedt as the type. In 1799 Schneider described *A. granulatus* from India and both were placed in a separate subfamily by Boulenger in 1890.

The first member of the subfamily Homalopsinae that was made known to science was when Russell figured the snake in 1796 that was described as *Hydrus enhydris* by Schneider in 1799 and assigned to the genus *Enhydris* Sonn. et Latreille in 1802. Other estuarine species of this genus were discovered and described as follows.

*E. sieboldi* (Schlegel) 1837, *E. bennetti* (Gray) 1842, *E. chinensis* (Gray) 1842, *E. dussumieri* (Dumeril et Bibron) 1854, *E. jagorii* (Peters) 1863, *E. bocourti* (Jan) 1865, *E. innominata* (Morice) 1875, *E. maculosa* (Blanford) 1879, *E. smithi* (Boulenger) 1914, *E. longicauda* (Bourret) 1934.

The other genera are (a) the monotypic one *Homalopsis* Kuhl and Hasselt 1822 with *H. buccata* figured by Russell in 1801 and described by Linné in 1754 and 1758, (b) The genus *Cerberus* Cuvier 1829 with type *C. rhynchops* (Schneider) 1799. This genus contains two other species *microlopis* of the Philippines and *australis* of Australia, (c) The Monotypic genus *Gerarda* Gray 1849 with the type *G. prevostiana* (Eydoux et Gervais) 1837, (d) The monotypic genus *Fordonia* Gray 1842 type *F. leucobalia* (Schlegel) 1837, (e) The monotypic genus *Bitia* Gray 1842 with the type *B. hydroides* Gray 1842, (f) genus *Cantoria* Girard 1857 with two species *C. violacea* Girard 1857 and *C. annulata* de Jong from New Guinea.

## THE FAMILY HYDROPHIDAE Boie, 1827

This family comprises the most specialized of the sea snakes and later authorities such as Bourret (1936) and others had regarded this family as a subfamily of the Family Colubridae or of the Family Elapidae and assigned them to two subfamilies

namely the Laticaudinae and the Hydrophiinae. The discovery of the Australian genus *Ephalophis* Smith 1931 has since shown that there is no salient character by which the two are separable and Boie's view that there are no subfamilies in this Family is upheld. A comparison of the lists published by Kinghorn 1929, Pope 1935, Bourret 1941, M. A. Smith 1943 and others, reveals that the Indian subregion possess 12 genera comprising 29 species, the Malayan and Indo-Chinese area possesses 11 genera comprising 26 species. The Chinese area possesses 6 genera with 12 species and the Australian region possesses 11 genera with 20 species. The number of species declines both westwards and eastwards from India and the Malayan area, and only a single species *Pelamis platyura* ranges as far as the eastern coast of Africa and the Western one of America. It is also noticeable that Australia possesses two endemic genera and about ten endemic species.

This family contains all the true sea snakes with a compressed paddle-like tail which enables them to dash off at speed by keeping body rigid and flicking the paddle tail swiftly from side to side. Only the cleft portion of the tongue is protrusible and the ventral scutes are greatly reduced or wanting. The more slender necked of these snakes feed mainly upon eels and eel-like fishes. All are venomous, some being even more deadly than the cobra. They are ovoviviparous.

The first distinctive generic name assigned to this family is *Laticauda* which was conferred by Laurenti upon *L. scutata* in 1768. Two species *L. laticaudata* (Linné) 1758 and *L. celubrina* (Schneider) 1799 occur along the coasts of south east-Asia to Japan, Australia and the Pacific Islands. The genus contains about three other species that do not occur in these waters.

The genus *Aepyurus* originally termed *Aipysurus* Lacépède 1804 was created for *A. laevis*. A single species *A. eydouxi* (Gray) is Asian but *tenuis* Lonnberg et Anderson, *duboisii* Bavay and *laevis* occur off Australia and the Pacific Islands. There are two monotypic genera created by Gray in 1849 namely the genus *Kerilia* for *K. jerdoni* Gray, and *Enhydrina* for *E. schistosa* (Daudin). Other monotypic genera are *Praescutata* Wall 1921 for *P. viperina* (Schmidt), *Acalyptophis* Dumeril for *A. peronii*, *Thalassophis* for *anomalous* Schmidt 1852, *Kolpophis* for *K. amandalei* Smith 1926, *Astrotia* Fischer 1856 for *A. stokesi* (Gray) which is the heaviest of the sea snakes and *Pelamis* Daudin 1803 for *P. platyura* (Linné) which possesses the most extensive range of all the sea snakes, as it occurs from East Africa to the west coast of America.

The genera *Lapemis* (Gray) 1835, and *Microcephalophis* Lesson 1834 contain two species each. The genus *Hydrophis* Latrielle 1802 contains about 22 species, one of which *H. cyanocincta* Daudin 1803, is the longest of all the sea snakes, attaining to 1885 mm (Bourret). The other species of this genus are *Caerulscens*, *major* and *spiralis* Shaw 1802, *torquata* and *stricticollis* Gunther 1864, *Klossi* Boulenger 1912, *elegans*, *ernata* and *inornata* Gray 1842, *parviceps* Smith 1935, *brookii* Gunther 1872, *fasciata* Schneider 1799, *nigrocincta* and *obscura* Daudin 1803, *bituberculata* Peters 1872, *lapemoides* and *melanocephalus* Gray 1849 and *kingi* Boulenger.

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