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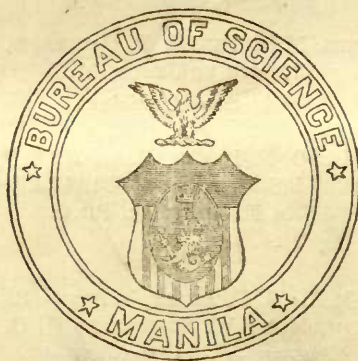
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THE PHILIPPINE JOURNAL OF SCIENCE

VOLUME 16

JANUARY TO JUNE, 1920

WITH 61 PLATES AND 35 TEXT FIGURES



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CONTENTS

No. 1, January, 1920

[Issued April 20, 1920.]

	Page.
HAUGHWOUT, FRANK G., and HORILLEN, FÉ S. The intestinal animal parasites found in one hundred sick Filipino children.... One text figure.	1
HAUGHWOUT, FRANK G., and YOUNGBERG, STANTON. A trypanosome associated with a fatal disease in the carabao..... Three plates and two text figures.	77
FERNANDEZ, RICARDO. Remote manifestations of focal dental infections, with case reports.....	89
ANGELES, SIXTO DE LOS, and VILLEGAS, ANASTACIA. A case of human synophthalmia Two plates.	99
REVIEW	109

No. 2, February, 1920

[Issued May 29, 1920.]

TAYLOR, EDWARD H. Philippine turtles..... Seven plates.	111
COCKERELL, T. D. A. Some bees from Panay.....	145
FISHER, WILLARD J. Low-sun phenomena in Luzon..... Two text figures.	151
REINKING, OTTO A. Higher Basidiomycetes from the Philippines and their hosts, II.....	167
SANTOS Y ALVAREZ, FRANCISCO O. A biochemical study of copra meal	181
SCHULTZE, W. Eighth contribution to the Coleoptera fauna of the Philippines One colored plate and one black plate.	191
COCKERELL, T. D. A. Supplementary notes on Philippine bees.....	205
REVIEWS	209

No. 3, March, 1920

[Issued June 29, 1920.]

TAYLOR, EDWARD H. Philippine Amphibia..... Ten plates and nine text figures.	213
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THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 16

FEBRUARY, 1920

No. 2

PHILIPPINE TURTLES

By EDWARD H. TAYLOR
Of the Bureau of Science, Manila

SEVEN PLATES

INTRODUCTION

As compared with Borneo, Java, Sumatra, or Japan, the Philippine Islands are not rich in either genera or species of terrestrial turtles. In fact only three genera, represented by four species, are positively known; these are *Cyclemys*, *Heosemys*, and *Pelochelys*. Several species representative of other genera have been reported, but there appears to be no specimen to substantiate any of the records. Borneo has representatives of nine genera and about fifteen species; Java, seven genera and nine species; Sumatra, ten genera and thirteen species; Japan and Formosa, six genera and seven species. On the other hand only two genera and two species are known from Celebes.

One new species, *Heosemys leytenensis*, from the southern part of Leyte, is described in this paper. Two specimens were collected there by Gregorio Lopez, together with other turtles to be used for dissecting in the zoölogical department of the University of the Philippines. He obtained forty specimens belonging to three species; namely, *Cyclemys dhor*, *C. amboinensis*, and *Heosemys leytenensis*. It would appear that these land turtles are plentiful in that locality. In most localities they are rare; in collecting during seven years I have found less than a half dozen specimens, all of which belonged to *Cyclemys amboinensis*.

According to Manobo accounts a large turtle with a hard shell occurs in Agusan River. Rewards offered for specimens failed to bring forth this turtle; nevertheless, it is extremely

probable that some species of aquatic turtle is present in Agusan River.

The small land turtles already mentioned are seemingly of small economic value. They feed on insects, fruit, what flesh they can find, and sometimes on plants. I do not know that these turtles are ever eaten by man.

The soft-shelled turtle, which occurs in Luzon and very probably in other large islands, is very rare. This is eaten when found, but the number taken is probably so small that its economic food value is scarcely worthy of mention. Individuals of this species are said to attain nearly a meter in length.

Four species of marine turtles are known from Philippine seas. All of these are widely distributed in the Pacific Ocean, the Indian Ocean, and the tropical waters bordering these. The identity of these turtles is in doubt. Boulenger¹ has lumped many of the names, not differentiating between Pacific and Atlantic species. Stejneger and Garman on the other hand recognize the Pacific species as distinct from those in the Atlantic. My treatment of this group is of a preliminary and superficial nature. An examination of numerous carapaces of the green turtle shows three different forms and colors of the shells; but without head, legs, and plastron it is futile to generalize or to attempt a separation of the varieties.

HISTORICAL

One of the earlier writers on the Philippines says:

There are also very large sea turtles in all the islands. Their shells are utilized by the natives, and sold as an article of commerce to the Chinese and Portuguese, and other nations who go after them and esteem them highly, because of the beautiful things made from them.²

Other writers say:

The fisheries of fine-shelled turtles are also abundant, and they also form a conspicuous product. Some of the shells have markings as deep red as a fine garnet; and the four principal shells are of an extraordinary size.³

In this land are very many turtles, of great size; they are larger than a shield. Here is a marvellous thing: when the male and the female have intercourse, they remain thus joined together for twenty or twenty-

¹ Cat. Chel. Rhyn. Croc. Brit. Mus. (1889).

² Morga's Sucesos (1609). From Blair and Robertson, *The Philippine Islands*. The Arthur H. Clark Company, Cleveland, Ohio 16 (1904) 103.

³ Early Recollect Missions (1624). Translated by Blair and Robertson, op. cit. 21 (1905) 308.

five days. They become so stupefied during this act that the Indians dive into the sea, and tie the feet of the turtles without their perceiving it, and draw these creatures ashore. I have even done this myself.⁴

He went in quest of the father, and carried him as a gift a turtle, the shell of which required two men to lift it—so monstrous in size are the turtles in those seas; some of them I have seen and eaten.⁵

Eschscholtz appears to have been the first writer actually to identify a Philippine turtle. He published in his Atlas in 1835 a drawing of a turtle from Manila Bay under the name *Chelonia olivacea*. Only a few other writers have recorded species of turtles from the Philippine Islands.

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Lists *Cuora amboinensis* Daudin [= *Cyclemys amboinensis* (Daudin)], *Chitra Indica cumingi* Gray (= *Pelochelys cantorii*), and three marine turtles belonging to the Cheloniidae.

BOETTGER, OSKAR. Ber. Senck. Nat. Ges. (1890) 34.

Lists *Pelochelys cantorii* from the Philippines.

BOETTGER, OSKAR. Ber. Senck. Nat. Ges. (1890) 43.

Lists *Cyclemys amboinensis* from the Philippines.

BOETTGER, OSKAR. Herpetologische Kenntniss der Calamianen Philippinische Inseln. Abh. Ber. Königl. Zool. Anthr. Eth. Mus. Dresden 7 (1894-95) 1-6.

Lists *Cyclemys amboinensis* Daudin from Mindoro.

BOULENGER, GEORGE ALBERT. On the herpetological fauna of Palawan and Balabac. Ann. & Mag. Nat. Hist. VI 14 (1884) 81-90.

Lists *Cyclemys dhor* Gray from Palawan and Balabac.

BOULENGER, GEORGE ALBERT. Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (1889) 1-311, pls. 1-6.

Lists a few Philippine specimens.

CASTO DE ELERA. Catálogo sistemático de toda la Fauna de Filipinas conocida hasta el presente, etc. Manila. Vertebrados 1 (1895) 399-407.

Lists *Dermochelys coriacea* Linnæus, *Platysternum megacephalum*, *Callagur picta* Gray, *Ocadia sinensis* Gray, *Damonia reevesii* Gray, *Bellia crassicola* Gray, *Nicoria spengleri* Gray, *Cyclemys trifasciata* Gray, *C. amboinensis* Daudin, *C. flavomarginata* Gray, *C. platynota* Gray, *Chelone mydas* Linnæus, *C. imbricata* Strauch, *Thalassochelys caretta* Linnæus, *Trionyx subplanus* Geoffroy, *T. sinensis* Wiegmann, *Pelochelys cantorii* Gray, and *Chitra indica* Gray. Some of these species, certainly *Cyclemys amboinensis*, *Pelochelys cantorii*, and the four sea turtles, occur in the Islands; but I do not know of authentic preserved specimens of the other species here listed.

⁴Relation of the Filipinas Islands, Miguel de Loarca. Translated by Blair and Robertson, op. cit. 5 (1903) 167.

⁵Chirino's Relation. Translated by Blair and Robertson, op. cit. 13 (1904) 211.

DE ROOIJ, NELLIE. Reptiles of the Indo-Australian Archipelago 1 (1915) 283-332 (turtles).

Most of the species listed by Casto de Elera are also attributed to the Philippine Islands by de Rooij.

GRAY, JOHN EDWARD. Catalogue of the Tortoises, Crocodiles and Amphibians in the collection of the British Museum London (1844).

The following species are attributed to the Philippines: *Caouana olivacea* (= *Chelonia olivacea* Eschscholtz), *Chitra indica* Gray (= *Pelochelys cantorii*), *Testudo stellatus* var. (= *Testudo elegans* Gray), *Cistudo amboinensis* Gray (= *Cyclemys amboinensis* (Gray)). *Testudo stellatus* is a doubtful record. Boulenger does not recognize it.⁶

GÜNTHER, ALBERT. List of mammals, reptiles and batrachians sent by Mr. Everett from the Philippine Islands. Proc. Zool. Soc. London (1879) 74-79.

Records *Cuora amboinensis* (= *Cyclemys amboinensis* Daudin) from Dinagat.

SIEBENROCK, F. Synopsis der rezenten Schildkröten. Zool. Jahrb. Suppl. 10 (1909) 427-618.

Attributes a number of species to the Philippine Islands, probably on the strength of Casto de Elera's records.

ECONOMIC IMPORTANCE OF TURTLES

The sea turtles are of distinct economic importance to the Philippines, the export of the shell amounting to several thousand pesos annually. During the fiscal year 1909 the export of tortoise shell reached 2,040 kilograms valued at 34,942 pesos.

The tortoise shell of commerce consists of the hard, bony plates taken from the carapace of the hawksbill turtle, *Eremochelys imbricata* Linnæus. The two largest costals are the most valuable, as they are thicker and heavier than the other shields.

Practically all the Philippine tortoise-shell is brought into the market by native fishermen. Now, while a small number of these turtles is captured by fair means, with hook, net, spear, or trap, by far the greater number is taken when they come ashore to deposit their eggs. The fishermen are so eager to secure their prizes that as a rule they do not give the poor turtle a chance to deposit her eggs before they kill her. This short-sighted policy eventually will result in the destruction of the fisheries unless the turtles are protected during the breeding season, which is from May to August. The turtle fishermen go to small, uninhabited islands, frequently many miles from the large islands surrounding the Sulu Sea, and wait perhaps days for the turtles to come ashore to deposit their eggs.

⁶ There is a carapace in the Santo Tomás collection belonging to a species of *Testudo*, and there is a living specimen in the Mehan Gardens in Manila. Very probably these are not Philippine specimens.

If the men are in no especial hurry they may wait until the turtle has deposited her eggs, which sometimes are 150 to 200 in number, and about the size of hens' eggs, with tough leathery shells. The fishermen then kill her before she can reach the water, and dig up the eggs which they use as food. The islands of Bancoran, Lumbucan, Arena, Cavilli, and others in the Sulu Sea, are well-known nesting places of the turtle, and it is only necessary to visit these islands to see the destruction wrought during the nesting period.

The best method of removing the tortoise-shell from the back of the turtle is to immerse the back in boiling water until the shell loosens; another method is to bury the body in the sand for eight days, when the shell becomes loosened; still another is to hold the shell over a slow fire until loosened. This latter process usually is employed. In some countries the live animal is held over the fire until the shell is loosened; it is then turned loose "to grow another shell." This method is barbarous, not only for its cruelty but also for its lack of utility, for the animal promptly dies.

The methods employed in the working of tortoise-shell are quite similar to those used in working horn. As a matter of fact, horn frequently is used as an imitation of tortoise-shell. Slow heat or steam is employed, the shell becoming plastic by immersion in water of 90°C. for two minutes. When cool, it retains any shape given it while hot.¹

The shell taken from the other marine turtles, *Chelonia japonica* and *Caretta olivacea*, is of little value. It is thin and its only value lies in using it for veneering and inlaying. The flesh of these two species, however, is much more frequently eaten than is that of the hawksbill. There are occasional cases recorded where persons have been poisoned by eating the flesh of these turtles. Sir J. E. Tennent² reports a case of poisoning from a specimen of *Chelonia virgata*.

At certain seasons the flesh of the turtle on the southwestern coast of Ceylon is avoided as poisonous, and some lamentable instances are recorded of deaths ascribed to its use. At Pantura, to the south of Colombo, twenty-eight persons who had partaken of turtle in October, 1840, were immediately seized with sickness, after which coma supervened, and eighteen died during the night. Those who survived said there was nothing unusual in the appearance of the flesh except that it was fatter than ordinary.

In November, 1917, there occurred in the Philippines a case of poisoning, from eating the flesh of a large turtle. Fourteen deaths resulting were reported out of thirty-three cases of poisoning. The following is the official communication. It was suspected that the flesh had been poisoned by some one, but an

¹ Seale, A., Philip. Journ. Sci. § D 6 (1911) 293.

² The Natural History of Ceylon. London, Longman, Green Longman, and Roberts (1861) 292.

examination of the flesh failed to reveal the presence of any poison.

BANTAYAN, November 28, 1917.

Dr. AUGUSTO P. VILLALON,
Oficial Sanitario del Distrito,
Cebú, Cebú.

SEÑOR: Bajo cubierta por separado tengo el honor de remitir a V. un ejemplar de la carne de tortuga, que, según anterior comunicación ha producido 33 envenenamientos, con 14 defunciones. Hemos considerado 33 envenenamientos porque éstos 33 son los únicos, que han tenido síntomas de tal.

Pero ahora estamos descubriendo otros, que sienten los síntomas después de 8 días. Felipa Espina y Cesario Espina han estado sin síntomas del envenenamiento por espacio de 8 días después de la ingestión de dicha carne, pero últimamente han tenido manifestaciones análogas a las de los fallecidos y fallecieron también después de 3 y 6 días respectivamente con gran tendencia al sueño y marcada debilidad.

Otro niño de dos años está en estado grave, pero hay esperanzas de curación.

Refiriéndome a los síntomas observados, consisten en mareos y vomitos persistentes, dolores en la garganta y los labios y somnolencia irresistible parecido al envenenamiento por la morfina. Pero lo más notable es la recidiva después de un tiempo bastante dilatado de curación. También es de notar la repentina tendencia al sueño desde el momento, que se observan las manifestaciones y aunque, al parecer, mejoran bajo los tratamientos empleados, sin embargo, vuelvan otra vez a agravarse hasta que por fin fallecen.

Someto a su consideración las anteriores observaciones y puedo someterle más informes, si fuese necesario.

Muy respetuosamente,

[Fdo.] SEGUNDO ISAAC,
Médico de Distrito Interino,
Sección Sanitaria No. 6.

Whether or not the species is poisonous only at this season (the case reported by Tennent occurred in October) or whether the animal becomes diseased is impossible to say.

Little is known regarding the large leatherback *Dermochelys schlegelii*. It is a very rare visitor to the Philippine coasts. I believe the specimen in the Ateneo de Manila is the only authentic Philippine specimen now preserved.

DISTRIBUTION OF TURTLES

The distribution of the genera of turtles occurring in south-eastern Asia, Japan, and the Malay Archipelago is shown in Table 1. It is reasonable to expect that representatives of certain genera occurring in adjoining land masses will be eventually

recorded from the Philippine Islands. Three of the species occurring in the Philippine Islands, *Cyclemys dhor*, *C. amboinensis*, and *Pelochelys cantorii*, are widely distributed in southeastern Asia and the Malay Archipelago. The fourth land species, *Heosemys leytensis*, is known only from Leyte.

TABLE 1.—Distribution of eastern genera of turtles.

Genus.	Japan.	Philippines.	Borneo.	Sumatra.	Java.	Malay Peninsula.	Celebes.	New Guinea.	Australia.
<i>Devisia</i>								×	
<i>Ocadia</i>	×								
<i>Clemmys</i>	×								
<i>Callagur</i>			×			×			
<i>Orlitia</i>			×	×					
<i>Batagur</i>				×		×			
<i>Geoclemys</i>	×				×	×			
<i>Bellia</i>			×	×		×			
<i>Geocemyda</i>	×		×	×					
<i>Heosemys</i>	×	×	×	×	×	×			
<i>Cyclemys</i>	×	×	×	×	×	×	×		
<i>Testudo</i>			×	×		×	×		
<i>Chelodina</i>								×	
<i>Emydura</i>								×	×
<i>Carettochelys</i>							×	×	
<i>Chelonia</i>	×	×	×	×	×	×	×	×	
<i>Caretta</i>	×	×		×	×	×	×	×	
<i>Eretmochelys</i>	×	×	×	×	×	×	×	×	
<i>Dermochelys</i>	×	×	×	×		×			
<i>Dogania</i>			×	×	×	×			
<i>Pelochelys</i>		×	×	×		×		×	
<i>Amyda</i>	×		×	×	×	×			

LOCAL PHILIPPINE NAMES OF TURTLES

Antipa (Tagalog) is *Pelochelys cantorii*.

Bao (Visayan) is *Cyclemys amboinensis* and *C. dhor*.

Bayuyuco (Tagalog) is *Cyclemys amboinensis*.

Cala (Tagalog) is a name applied to marine forms, especially *Eretmochelys imbricata*.

Pagong (Tagalog) is *Cyclemys amboinensis* and *C. dhor*.

Paucan (Tagalog) is a name applied to marine forms.

Pao (Pampanga) is *Cyclemys amboinensis*.

Sisican (Visayan) is *Eretmochelys imbricata*.

CLASSIFICATION OF THE TURTLES

Stejneger's ⁹ system of classification is followed in this paper.

Class REPTILIA

Reptilia LAURENTI, Synops. Rept. (1768) 19.

Subclass SYNAPSIDA

Synapsida OSBORN, Science 17 (1903) 276.

Order TESTUDINATA

Testudinata OPPEL, Ordn. Rept. (1811) 3.

*Key to the Philippine suborders of Testudinata.*⁹

- a*¹. No solid carapace, the vertebræ and ribs being separated from a shell consisting of a mosaic of numerous small polygonal bony plates embedded in a leathery skin; no descending process of the parietal bone; limbs without claws..... *Atheca*.
- a*². A solid carapace, of a few large symmetrical bony plates, not separated from the underlying vertebræ and ribs; parietals with descending processes; limbs with at least one claw each.
- b*¹. Body covered with horny scutes arranged differently from the bony plates beneath; epiplastra and hyoplastra in contact, not separated by entoplastron; center of last cervical and first dorsal vertebræ articulating with each other; fourth digit never with more than three phalanges; jaws covered by horny sheaths not concealed under fleshy lips..... *Laminifera*.
- b*². Body covered by an undivided leathery skin without scutes; epiplastra separated by entoplastron from hyoplastra; last cervical vertebra articulating with first dorsal by zygapophyses only; fourth digit with more than three phalanges; jaws concealed under fleshy lips. *Chilotæ*.

*Key to the Philippine families of turtles.*¹⁰

- a*¹. Limbs clawless; skin with very numerous polygonal plates; back with five longitudinal keels or ridges (*Atheca*)..... *Dermochelidæ*.
- a*². Limbs with at least one claw each; skin with or without large regular plates; back, if keeled, with at most only three longitudinal keels.
- b*¹. Outer body covering a soft skin without horny plates (*Chilotæ*). *Trionychidæ*.
- b*². Outer body covering consisting of symmetrical horny plates (*Laminifera*).

⁹ Bull. U. S. Nat. Mus. 58 (1907) 483 and 484.

¹⁰ A species belonging to the *Platysternidæ* has been incorrectly reported from the Philippines by Casto de Elera and by Siebenrock.

- c¹. Limbs not paddle-shaped; four or five claws on each leg. Testudinidæ.
 c². Limbs paddle-shaped; one or two claws on each leg..... Cheloniidæ.

Suborder ATHECÆ

Athecæ COPE, Proc. Am. Assoc. Adv. Sci. 19 (1871) 235.

DERMOCHELIDÆ

Dermochelidæ STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485.

Genus DERMOCHELYS Blainville

Dermochelys BLAINVILLE, Jour. de Phys. 83 (1816) 259; Bull. Soc. Philom. (1816) 119; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 7; Fauna India, Rept. (1890) 50; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485, figs. 373-376.

Sphargis MERREM, Tent. Syst. Amph. (1820) 19; FITZINGER, Neue. Class. Rept. (1826) 5; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 559; GRAY, Cat. Tort. (1844) 51; Cat. Shield Rept. 1 (1855) 71; Suppl. Cat. Shield Rept. (1870) 119.

Coriudo FLEMING, Philos. Zool. 2 (1822) 271.

Scytina WAGLER, Isis (1828) 861.

Dermatochelys WAGLER, Nat. Syst. Amph. (1830) 133; STRAUCH, Chel. Stud. (1862) 58; GÜNTHER, Rept. Brit. India (1864) 55.

Chelyra RAFINESQUE, Atlan. Jour. 1 (1832) 64.

* Dorsal shield completely bony, exoskeleton consisting of irregular, juxtaposed, mosaiclike plates. Plastral elements eight; no entoplastron; legs paddle-shaped, clawless, digits of foreleg much elongated; phalanges without condyles; beak with two triangular cusps, between three deep notches; no enlarged alveolar surface, jaws simply sharp-edged; head covered with small shields; carapace with seven keels, plastron with five.

It is extremely difficult to determine whether there is more than one species belonging to this genus. Specimens belonging to the genus are found in temperate and tropical parts of the Atlantic and Pacific Oceans and in the Indian Ocean and the Mediterranean Sea. Certain authors maintain that the Atlantic and Pacific forms are identical. Garman has separated the Atlantic and the Pacific forms and has given the name *D. schlegelii* to specimens found in the Pacific and Indian Oceans, and Stejneger follows him in the retention of this name. R. A. Philippi has described a species, *Sphargis angustata*, from Chili.¹¹

¹¹ Ann. de Univers. Mem. Cient. Lit. (1899) 102-104, 730, 2 plates.

Until it can be proved that *D. schlegelii* and *D. coriacea* are identical, I believe that Garman's name should stand for the species occurring in the western Pacific and Indian Oceans.¹²

Dermochelys schlegelii (Garman).

Sphargis mercurialis TEMMINCK and SCHLEGEL, Fauna Japon., Rept. (1835) 6, pl. 1; pl. 2, figs. 3-5; pl. 3; OKADA, Cat. Vert. Japan (1891) 71.

Sphargis coriacea BLEEKER, Natuurk. Tijds. Neder. Indië 15 (1850) 260; TICKEL, Journ. As. Soc. Bengal 4 (1862) 367; McCox, Nat. Hist. Victoria 2 (1885) 1.

Dermochelys coriacea GÜNTHER, Rept. Brit. India (1864) 55; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 10; Fauna Brit. India, Rept. (1890) 50; BURNE, Proc. Zool. Soc. London 1 (1905) 291.

Sphargis coriacea var. *schlegelii* GARMAN, Bull. U. S. Nat. Mus. 25 (1884) 303.

Sphargis schlegelii GARMAN, Bull. U. S. Nat. Mus. 25 (1884) 295; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 485.

Description of species.—Head covered with small horny plates, usually with a transverse row across snout posterior to nostrils; a rather large parietal plate and a row of elongate scales in supra-ocular region; scales on occipital and temporal regions small, irregular; carapace covered with small, irregular, angular shields of nearly equal size; a small supracaudal extension of carapace; five dorsal keels composed of larger quadrangular shields; two lateral keels; plastron continuous with carapace below, composed of small shields; plastron with five keels, outer keels forming an angle near axilla and continuing to anterior point of plastron; legs large, paddle-shaped; forelegs without claws, in young about as long as carapace, shorter in adult; mouth with a strong beak, with two triangular cusps between three deep notches; jaws sharply edged; alveolar region not enlarged.

Color.—Dark brown above, with or without yellow spots; longitudinal keels yellow in the young, and the legs bordered with yellow.

¹² Garman, Bull. U. S. Nat. Mus. 25 (1884) 294, says: "However, there is only one case in which there is any doubt, that of *Sphargis*, of which specimens from the different oceans are so much alike that writers are still undecided whether there is more than one species. Certain respects in which the Pacific "Trunkbacks" differ from those of the Atlantic have induced me to separate them, distinguishing the former by the name *Sphargis schlegelii*, and the latter by that by which it is commonly known, *Sphargis coriacea*."

Measurements of Dermochelys schlegelii (Garman).¹³

	mm.
Total length	1,500
Length of carapace	1,238
Width of plastron	842
Length of foreleg	763
Length of plastron	1,000
Length of hind leg	422
Transverse diameter of eye	52
Length of head	200
Width of head	176

Remarks.—This huge sea turtle, commonly known as *Sphargis coriacea*, is included here on the strength of a large stuffed specimen in the Ateneo de Manila, which was caught at Malabon, Manila Bay, and has been in the museum for a number of years. It is adult and measures more than 2 meters from head to end of carapace.

Suborder LAMINIFERA

Laminifera HEMPRICH, Grundr. Naturg. (1820) 102.

TESTUDINIDÆ

Testudinidæ GRAY, Ann. Phil. 10 (1825) 210.

EMYDINÆ

Emydinæ, GRAY, Ann. Phil. 10 (1825) 210, part.

Turtles without paddle-shaped legs, and with more than two claws on each digit.

Many genera are associated under this subfamily, and these constitute most of the species of known turtles. They are widely distributed in all temperate and tropical countries. They are terrestrial and aquatic and are both vegetable and animal feeders.

There are only two genera positively known from the Philippines; these are *Cyclemys* and *Heosemys*. Representatives of several other genera are attributed to the Philippine Islands by Casto de Elera,¹⁴ Siebenrock,¹⁵ and de Rooij.¹⁶ Among these are *Callagur*, *Bellia*, *Geöemyda*, *Ocadia*, and *Damonia*. It is not impossible that representatives of some of these genera will be found in the Philippine Islands, but I believe there are no authentic specimens preserved in any collection.

¹³ After Schlegel, Fauna Japon. (1835) 9.

¹⁴ Cat. Fauna Filipinas 1 (1895) 400, 401.

¹⁵ Zool. Jahrb. Suppl. 10 (1909) 450-508.

¹⁶ Rept. Indo-Aust. Arch. 1 (1915) 288-307.

Key to the Philippine genera of the Emydinæ.

a¹. A temporal arch; plastron not attached solidly to carapace.

Cyclemys.

a². No temporal arch; plastron attached solidly to carapace..... Heosemys.

Genus CYCLEMYS Bell

Terrapene MERREM, Tent. Syst. (1820) 27; BELL, Zool. Journ. (1825) 308, part; FITZINGER, Neue Class. Rept. (1826) 6; STRAUCH, Chel. Stud. (1862) 25.

Kinosternon BELL, Zool. Journ. 2 (1825) 302, part.

Sternothærus BELL, Zool. Journ. 2 (1825) 305, part.

Emys WAGLER, Nat. Syst. Amph. (1830) 138, part; STRAUCH, Chel. Stud. (1862) 27; Mém. Acad. Sci. St.-Petersburg 38 (1890) 14.

Sternothærus WAGLER, Nat. Syst. Amph. (1830) 137. -

Cistudo GRAY, Syst. Rept. (1831) 17, part; DUMÉRIL and BIBRON, Erp. Gén. 2 (1834) 207; GRAY, Cat. Tort. (1844) 29.

Cyclemys BELL, Proc. Zool. Soc. London (1834) 17; GRAY, Cat. Shield Rept. 1 (1855) 42; GÜNTHER, Rept. Brit. India (1864) 15; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 22; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 128; Fauna India, Rept. (1890) 28; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 503; SIEBENROCK, Sitzb. Ak. Wiss. Wien 112 (1903) 340; Zool. Jahrb. Suppl. 10 (1909) 500; MOCQUARD, Rev. Colon. Rept. Indo-Chine 10 (1907); DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 301.

Cuora GRAY, Cat. Shield Rept. 1 (1855) 22; GÜNTHER, Rept. Brit. India (1864) 11; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 21.

Pysidea GRAY, Proc. Zool. Soc. London (1863) 175; GÜNTHER, Rept. Brit. India (1864) 16; GRAY, Suppl. Cat. Shield Rept. (1870) 20.

Pysiclemys GRAY, Proc. Zool. Soc. London (1863) 176.

Cystoclemmys GRAY, Suppl. Cat. Shield Rept. (1870) 20.

Notochelys GRAY, Suppl. Cat. Shield Rept. (1820) 21; GÜNTHER, Rept. Brit. India (1864) 17.

Head normal, with smooth leathery skin, undivided into plates or tubercles; choanæ between eyes; skull with a bony temporal arch and a broad postorbital arch; neural plates hexagonal; plastron united to carapace by a ligament, divided into two lobes, movable between hyoplastron and hypoplastron; alveolar surfaces without median ridge; entoplastron intersected by humeropectoral suture; digits webbed or nearly free; four clawed digits on hind foot, five on forefoot; tail short.

The two Philippine species, *Cyclemys amboinensis* and *C. dhor*, are widely distributed from southern and southwestern Asia throughout the Malay Archipelago. Casto de Elera also lists *Cyclemys platynota* Gray, *C. flavomarginatus* Gray, and *C. trifasciata* Gray. I have been unable to verify these records.

Key to the Philippine species of Cyclemys.

a¹. Plastron not completely closing shell; posterior margin of carapace serrated *C. dhor* Gray.

a². Plastron nearly completely closing shell in adult; posterior margin of carapace not serrated..... *C. amboinensis* Daudin.

Cyclemys amboinensis (Daudin). Plate 1, figs. 1 and 2; Plate 2, figs. 3 and 4; Plate 3, figs. 2 and 3.

Testudo amboinensis DAUDIN, Rept. 2 (1802) 309.

Emys amboinensis SCHWEIGGER, Prodr. (1824) 45.

Emys couro SCHWEIGGER, Prodr. (1824) 46; SCHLEGEL, Fauna Japon., Rept. (1833) 63.

Terrapene amboinensis MERREM, Tent. Syst. Amph. (1820); STRAUCH, Chel. Stud. (1862) 99; Verth. Schildkr. (1865) 47; SOWERBY and LEAR, Tort. (1872) pl. 23.

Kinosternum amboinensis BELL, Zool. Journ. (1825) 305.

Terrapene bicolor BELL, Zool. Journ. (1825) 484, pl. 16.

Terrapene couro FITZINGER, Neue Class. Rept. (1826) 45.

Cistudo amboinensis GRAY, Syn. Rept. (1831) 19; Ill. Ind. Zool. 1 (1832) pl. 57, fig. 2; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 215, pl. 15, fig. 2 (Manila); GRAY, Cat. Tort. (1844) 30 (from Philippines); GEIBEL, Zeit. f. ges. Natur. 27 (1866) 11.

Cuora amboinensis GRAY, Cat. Shield Rept. 1 (1855) 41; GÜNTHER, Rept. Brit. India (1864) 12, pl. 4, figs. a, b; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 21; Appendix (1872) 10; THEOBALD, Cat. Rept. Brit. India (1876) 7; GÜNTHER, Proc. Zool. Soc. London (1879) 75 (Dinagat); MÜLLER, I Nachtr. Cat. Herp. Samml. Mus. Basel (1880) 49 (Luzon, Negros); BOETTGER, Ber. Senck. Nat. Ges. (1886) 92.

Cyclemys amboinensis BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 133; Fauna India, Rept. (1890) 31, fig. 10; Fascic. Mal. Zool. 1 (1903) 343; FLOWER, Proc. Zool. Soc. London (1896) 859; (1899) 614; WERNER, Zool. Jahrb. Syst. 13 (1900) 482; LAIDLAW, Proc. Zool. Soc. London 2 (1901) 582; BOETTGER, Abh. Senck. Ges. Frankfurt 25 (1901) 364; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 343; Zool. Jahrb. Suppl. 10 (1909) 503; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 302; BARBOUR, Mem. Mus. Comp. Zool. Harvard Coll. 44 (1912) 143.

Description of species.—(From No. 1460, Bureau of Science collection; collected on Polillo, P. I., October, 1909, by C. Cananizado.) Head moderately large, completely retractile; snout bluntly pointed, nostrils anterior, very close together; eyes diagonally set; upper jaw with only slight hook, finely denticulated; top of head covered with smooth leathery skin, undivided; a very slight elevation on skull just behind eyes; carapace smooth, convex, with a single median keel, dim anteriorly, but distinct posteriorly; five vertebral shields, only third longer than wide, all narrower than costals; latter shields wider than long, four on each side; eleven marginals on each side; a small nuchal, longer than wide; supracaudals small, longer than wide, slightly notched; posterior edge of carapace not or but very slightly serrate; plastron about the size of opening of shell, only slightly pointed

behind with notch in posterior part; gular shields small, longer than wide, without notch, suture between them much longer than that between humerals; transverse suture between humerals and pectorals curved, the curve convex anteriorly; pectorals as broad as long, their mutual suture as long as or a little shorter than mutual suture of abdominals; femorals broader than long, suture between them and abdominals curved, the curve convex posteriorly; anals longer than broad, triangular, their mutual suture as long as that between abdominals; hinge between pectorals and abdominals very flexible; sutures between pectorals and marginals about same as that between abdominals and marginals; foreleg moderately long, with five clawed digits, claws more than half the length of digits; a short web between digits; forearm with numerous broadened scales; two large scutes and two small ones on inner side of arm, four large unequal-sized scutes on underside of foreleg; bottom of foot covered with small equal-sized scales; toes covered with imbricate plates, five above longest toe; hind leg longer than foreleg, with four clawed digits; a few enlarged scutes on posterior side of leg; no large scales on upper or anterior side; a few enlarged scales on heel and numerous unequal-sized scales on foot, larger than those on forefoot; tail short, with a double series of subcaudal plates, twelve or thirteen pairs in all; exposed skin of body covered with fine tubercles.

Color in life.—(From a living specimen in the Bureau of Science aquarium.) Brown above, with very indistinct darker areas on back; below, marginals yellow, each with a large black area on outer posterior edge; plastral scales each with a large irregular black blotch covering about one-third of each scute; head uniform dark brown above; a broad brown stripe as wide as head continuing on neck; a yellow stripe from point of snout along canthus rostralis through upper part of orbit and across temporal region where it widens slightly; a dark brown line begins below the yellow one on point of snout, runs through eye, then widens and continues on side of neck to body; a second yellow stripe begins on snout, below the brown line, and passes through eye to ear where it is lost in the yellow of side of neck; below this a brown line crosses lower part of orbit to ear; below this another yellow line with a thin brown line below it; a brown line borders lower jaw and continues to below ear; chin and throat yellow to flesh color; a short black stripe on posterior part of neck on side; legs mottled with gray; forelegs usually with dim light stripes, continuing on toes.

Measurements of Cyclemys amboinensis (Daudin).

	mm.
Total length, head extended	238
Total length of carapace	158
Greatest width of carapace	110
Height of body	70
Length of plastron	150
Width of plastron	78
Length of posterior lobe	84
Length of anterior lobe	65
Length of tail, behind anus	20
Length of head	38
Width of head	24

Variations.—In the Bureau of Science collection there are three other adult specimens from Polillo and five young ones. The adults all agree in the smoothness of the carapace; in two (Nos. 1463 and 1464) the trace of the dorsal keel is almost effaced, and the anal shields are fused into a single large shield. In the specimen described they are only partially fused. In the fourth specimen (No. 1462) the two plates are distinct. This specimen has a broad regular depression along the middle of the plastron, while in the other three the plastrons are gently convex. A specimen (No. 1475) from Laguna Province, Luzon, exhibits a partial fusion of the anal shields and only a dim trace of the dorsal keel. The amount of black on the plastron varies considerably. In certain specimens the black almost covers the entire plastron; in others it is almost wanting.

Young.—The young differ rather markedly from the adults. A very strong, blunt keel from nuchal plate to end of last vertebra; vertebral shields distinctly wider than long, very nearly as wide as costals; two fine distinct keels passing along upper half of costals; marginals very much broader proportionally than in the adult; carapace very finely sculptured; plastron with a distinct, transverse depression across hinge; anal plates distinct, suture of abdominal plate with the marginals larger than that of pectoral with the marginals. Carapace uniform dark brown; dark color on plastron forming a single continuous figure and not reaching outer edge of scutes; dark areas at union of plastron with marginals, and dark spots on underside of marginals.

There are two other adult specimens in the Bureau of Science collection. In a living specimen in the Bureau of Science aquarium the carapace retains the three keels; the shields are roughly sculptured on the upper posterior parts and the concentric growth lines are very distinct, with a few, slight, radiating ridges. The posterior edge of the carapace is distinctly serrate

and there is a distinct notch between the supracaudals; there is a small notch in the plastron between the anals. The very important character of the posterior serrations on the carapace suggests a distinct geographic race. The locality from which the specimens came is unknown.

Remarks.—Turtles of this species are fairly common in the Philippine Islands or at least are frequently seen, because they are often kept as pets. The adults are often found at a considerable distance from water; the young, however, are aquatic. The species is known from Luzon, Polillo, Dinagat, and Mindanao. It ranges from southeastern Asia through the Malay Archipelago to Celebes and Amboina. The name for the species in the Visayan dialects is *baò*.

Cyclemys dhor Gray.¹⁷ Plate 2, figs. 1 and 2; Plate 4.

Emys dhor GRAY, Syn. Rept. (1831) 20, part.

Cyclemys orbiculata BELL, Proc. Zool. Soc. London (1834) 17; Mon. Test. (1842) pls. 24 and 25; GRAY, Proc. Zool. Soc. (1863) 178; THEOBALD, Journ. Linn. Soc. 10 (1870) 12.

Emys dentata GRAY, Ill. Ind. Zool. 2 (1834) pl. 58, fig. 2.

Cistudo diardii DUMÉRIL and BIBRON, Erp. Gén. 2 (1834) 227.

Cistudo dentata GRAY, Cat. Zool. (1844) 32.

Emys diardii SCHLEGEL, Verli. Natuurk. Afbeeld. 44 (1849) figs. 6 and 7.

Cyclemys dentata GRAY, Cat. Shield Rept. 1 (1855) 42, pl. 19; JERDON, Proc. As. Soc. Bengal (1820) 68; THEOBALD, Cat. Rept. Brit. India (1876) 8.

Emys dhor STRAUCH, Chel. Stud. (1862) 28; Verth. Schildkr. (1865) 58.

Cyclemys oldhami GRAY, Proc. Zool. Soc. London (1863) 178; GÜNTHER, Rept. Brit. India (1864) 15, pl. 5, fig. 6; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 23.

Cyclemys ovata GRAY, Proc. Zool. Soc. London (1863) 178; Suppl. Cat. Shield Rept. 1 (1870) 23.

Cyclemys bellii GRAY, Proc. Zool. Soc. London (1863) 179.

Cistudo orbiculata GEIBEL, Zeits. f. ges. Natur. 27 (1866) 13.

Cyclemys dhor GRAY, Suppl. Cat. Shield Rept. 1 (1870) 23; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 131; Fauna India, Rept. (1890) 30; Ann. & Mag. Nat. Hist. VI 14 (1894) 82 (Palawan); BARTLETT, Note Book Sarawak 1 (1894) 3; FLOWER, Proc. Zool. Soc. London (1899) 613; CARRUCCIO, Boll. Soc. Zool. Ital. II 1 (1900) 95; WERNER, Zool. Jahrb. Syst. 13 (1900) 482; BROWN, Proc. Acad. Nat. Sci. Philadelphia 54 (1902) 176; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 341; Zool. Jahrb. Suppl. 10 (1909) 501; MOCQUARD, Rev. Col. Paris (1907) 11; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 302.

¹⁷ Stejneger is of the opinion that the name *dentata* should be retained rather than *dhor*, see Mem. Mus. Comp. Zool. 44 (1912) 143. Gray, in his later work, chose *dhor* as the name for retention.

Description of species.—(From a living adult specimen,¹⁸ belonging to W. Schultze, Manila, P. I., collected in Palawan.) Head moderately large, completely retractile. Snout slightly peaked just above nostrils, curving in profile from nostrils to mouth; nostrils anterior, very close together; upper jaw with a distinct bicuspid hook; top of head covered with smooth skin, skin in temporal region and on side of head distinctly lined and broken; a slight elevation across skull just behind eyes; head somewhat depressed in occipital region; carapace smooth, distinctly flattened on top, with an obscure keel from nuchal along median line to supracaudals, more prominent posteriorly; a slight broad depression on each side of keel; five vertebral shields, all distinctly broader than long, except first, which is as broad as long, all narrower than the three anterior costals; costals distinctly broader than long, except last, which is longer than broad; eleven marginals on each side; nuchal very small, a little longer than broad; supracaudals moderate, not or scarcely notched behind; carapace somewhat serrated on posterior border, smoothly rounded laterally and with an irregular border anteriorly; plastron about as large as opening of shell, anterior part extending a little beyond anterior edge of carapace, posterior part not extending as far as carapace; a transverse hinge between hyoplastron and hypoplastron, this hinge not corresponding to suture between pectoral and abdominal shields; however, plastron flexible on suture between pectorals and abdominal shields; gular shields triangular, their anterior edges truncate, forming a straight line, their mutual suture much longer than that between humerals; a slight but distinct notch between humerals and gulars on edge of plastron; suture between humerals and pectorals forming a wavy line; suture between pectorals and abdominals curving strongly, convex posteriorly; mutual suture of pectorals longer than that of other shields; suture of pectorals with marginals much shorter than that of abdominals with marginals; suture between abdominals and femorals curved slightly convex posteriorly; suture between anals and femorals strongly curved convex anteriorly; anals with a curved notch, their mutual suture longer than that of femorals; intercalary, axillary, and inguinal shields very small; on anterior part of humerals a trace of a straight suture corresponding to hinge; the two elements formed by the suture are entirely coalesced; anterior part of foreleg covered with irregular enlarged shields; digits five, partly

¹⁸ I am under obligation to Mrs. W. Schultze for the privilege of describing this specimen.

webbed, all covered above with transverse scales, each equipped with a strong curved claw; forefoot with small irregular scutes on sole; on underside of foreleg only a few enlarged scutes; hind leg with four digits, each equipped with strong curved claws; hind leg with no enlarged scales except on heel; tail with eight pairs of enlarged subcaudal scales.

Color in life.—Above, carapace light brown, with a few darker spots and a few dim longitudinal spots along keel; plastron and marginals brownish yellow, with distinct radiating lines on each plastral shield; head brownish yellow, with small dark spots on neck with numerous lines of black and yellow; a prominent yellowish line begins in occipitotemporal region, continuing the length of neck; a second prominent line begins immediately behind eye and continues above ear to body; chin and throat lined with black and yellow; upper part of legs somewhat reddish.

Measurements of Cyclemys dhor Gray.

	mm.
Length of carapace	192
Width of carapace	145
Height of carapace	70
Length of plastron	187
Width of plastron	117
Tail, from anus	40

Variation.—Besides the specimen described I have at hand two preserved specimens; ¹⁹ one is medium-sized, the other young.

The medium-sized specimen appears somewhat abnormal or diseased, and it is almost impossible to discern the suture between the shields of the carapace; the keel is obliterated save on the posterior part of the carapace. Head brown, strongly mottled with black, markings on side of head and neck somewhat obscured; each abdominal shield divided completely by a straight suture corresponding to hinge of plastron; elements thus formed not contiguous.

The young specimen has a very strong blunt keel the entire length of the carapace; middle costal shields with a small keel on their posterior parts; all shields rugose; marginals distinctly broader proportionally than in adults; posterior part of carapace very strongly serrate, posterior marginals forming sharp points; a very distinct notch between supracaudals; anterior part of carapace serrate; plastron apparently without hinge; no trace

¹⁹ These specimens are unnumbered and belong to the University of the Philippines. They were loaned by Prof. Artemas Day and Dr. R. P. Cowles.

of suture across abdominal shields; a small axillary and a small inguinal shield; no intercalary scutes evident; humerals and abdominals forming direct sutures with marginals; plastral shields rugose. Carapace above olive or yellowish brown, with no dark markings; below very light brown, with dark brown radiating lines around the edges of each shield of plastron and marginals; head with a slight median keel from tip of snout, surface of occipital region finely sculptured; markings on head and neck similar to those of the adult.

There is a carapace of an adult specimen in the Bureau of Science collection which differs from the shell of the adult specimen described, in having the entire outer part of the carapace almost entirely dark blackish brown, and the upper part of the costals and the vertebrals with radiating dotted lines; the carapace is rugose, showing distinctly the lines of growth; the abdominal shields have a strong trace of a suture on their anterior parts.

TABLE 2.—List of Philippine specimens of *Cyclemys dhor* Gray.

No.	Collection.	Locality.	Collector.	Age.
1	W. Schultze	Palawan	W. Schultze	Adult
2	University of the Philippines	Leyte	G. Lopez	do
3	Do	do	do	Young
4	Bureau of Science	Palawan	do	Adult

No.	Condition.	Carapace.			Plastron.	
		Length.	Width.	Height.	Length.	Width.
		mm.	mm.	mm.	mm.	mm.
1	Living	192	145	70	187	117
2	Preserved	154	115	68	146	93
3	Do	75	70	22	64	48
4	Shell	180	148	73	177	120

Remarks.—Individual variation in this widely distributed species is strongly marked. It varies greatly at different ages. One can scarcely find two specimens that are wholly alike. The species is terrestrial in habit, apparently only the young frequenting water. In the Philippines the species is known from Palawan, Balabac, and Leyte. It probably occurs on other large islands. It was first reported from the Philippine Islands by Boulenger²⁰ in 1894, on the strength of specimens collected by Everett. The species is known from Java, Borneo, Sumatra,

²⁰ Ann. & Mag. Nat. Hist. VI 14 (1894) 82.

and Nias, Natuna Islands, Banka, Malay Peninsula, Burma, Siam, Annam, and northern India.

Genus *HEOSEMYS* Stejneger

- Geoemyda* GRAY, Proc. Zool. Soc. London (1834) 100, part; Cat. Tort. (1844) 14; Cat. Shield Rept. (1855) 16; GÜNTHER, Rept. Brit. India (1864) 18; GRAY, Suppl. Cat. Shield Rept. 1 (1870) 25; ANDERSON, Zool. Res. Yunnan (1879) 716; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 135; Fauna India, Rept. (1890) 23; STRAUCH, Mém. Acad. Sci. St.-Petersburg 38 (1890) 15; SIEBENROCK, Sitzb. Akad. Wiss. Wien 112 (1903) 340; MOCQUARD, Rev. Colon. (1907) 11; DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 298.
- Emys* DUMÉRIL and BIBRON, Erp. Gén. 2 (1834) 232, part.
- Clemmys* STRAUCH, Chel. Stud. (1862) 28, part.
- Heosemys* STEJNEGER, Proc. Biol. Soc. Washington 15 (1902) 238; SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 506.

Neural plates mostly hexagonal, short-sided behind; plastron extensively united to carapace by suture; entoplastron intersected by humeropectoral suture; skull lacking a bony temporal arch; anterior part of head covered with undivided smooth skin, posterior occipital and temporal regions with skin divided into scale-like elements; triturating surface of upper jaw rather narrow, without a median ridge; digits fully or partly webbed; five clawed digits on forefoot, four on hind foot; tail very short.

The generic name *Heosemys* was made by Stejneger to include the three species long known under the generic name *Geoemyda*. The latter name, as shown by Stejneger, must stand for the species associated under the name *Nicoria* Gray.

There are three well-known species belonging to the genus *Heosemys*; namely, *H. spinosa* Gray, widely distributed from Burma to the Malay Peninsula and Archipelago; *H. grandis* Gray, found in Burma, the Malay Peninsula, and French Indo-China; and *H. depressa* Anderson, known from Arrakan. A fourth species, from Leyte, Philippine Islands, is here described.

Key to the species of *Heosemys* Stejneger.

- a*¹. Anterior margin of carapace serrated.
 - b*¹. Plastron strongly narrowed in front, with a strong notch between gular and humeral shields; plastron uniform yellow or reddish brown *H. leytenensis* sp. nov.
 - b*². Plastron moderately narrowed in front, with no notch or only a slight one between gular and humeral shields; plastral shields with radiating lines *H. spinosa* Gray.
- a*². Anterior margin of carapace not serrated.
 - b*¹. Carapace arched or tectiform in a transverse section.
 - H. grandis* Gray.
 - b*². Carapace depressed, flat on vertebral region.
 - H. depressa* Anderson.

Heosemys leytensis sp. nov. Plate 1, figs. 3 and 4; Plate 3, fig. 1.

Type.—An unnumbered specimen in the zoölogical laboratory, University of the Philippines; collected at Cabalian, southern Leyte, P. I., by Gregorio Lopez.

Description of type.—Adult male. Head large, anterior part covered with smooth undivided skin; skin on posterior part of head and in temporal region divided into scalelike elements; snout bluntly pointed, nostrils anterior, separated by a distance equal to or greater than diameter of a single nostril; eye rather small, slit diagonally, diameter of orbit distinctly less than length of snout; upper jaw with a distinct hook, slightly bicuspid; triturating surface of upper jaw narrow, with an indistinct short ridge or keel near inner edge; choanæ between eyes; ear slightly farther from eye than eye from end of snout; carapace smooth above, rather flattened, with no trace of a keel; vertebral shields all wider than long (fifth anomalous and very irregular and broken, forming an extra costal between it and fourth costal on left side); costals four on each side normally, much broader than long, much broader than vertebrae; eleven marginals on each side; nuchal triangular, broadest posteriorly; anterior marginals touching nuchal, extending far anterior to nuchal and about five times as large as nuchal; supracaudal plates not or but slightly notched, partially fused; anterior part of carapace deeply notched and serrate; laterally smooth, rounded; posteriorly moderately serrate; plastron narrower, very much smaller than opening of shell, not as long as carapace and not extending as far anteriorly, narrowed in front; plastron joined to carapace by strong bony suture; no intercalary shields; a small axillary and an inguinal shield; narrowest part of bridge contained in total length of plastron a little more than two and one-half times; gular shields quadrilateral, outer sides parallel for a distance equal to about half the length of shield; a large angular notch between gular shields and another between gulars and humerals; mutual suture of gulars longer than that of humerals, the latter somewhat less than suture between pectorals; abdominal shields large, not as broad as pectorals, their mutual suture longer than pectoral or femoral; a deep, more or less semicircular notch between anal shields, suture between anals abnormal; foreleg with transversely somewhat enlarged irregular scales; four prominent scales on upper edge of arm, the two median much the largest; a large transverse scale on heel of forefoot and a few small scales on back part of scale; five digits, each with a strong curved claw, digits fully webbed, foot cushionlike; one or two small scales at

base of claws; four digits on hind foot with strong curved claws; enlarged scutes on upper edge of hind leg and a few small ones on heel, none on sole; two or three enlarged scutes above digits near ends; tail very short, without enlarged scales above or below; skin on legs, body, and neck with minute tubercles, giving it a feel like sandpaper.

Color in alcohol.—Above reddish rusty brown, darker on anterior marginals; uniform reddish brown on plastron, darkest on bridge and on anterior part; head uniform dark brown, slightly lighter posteriorly; a narrow transverse yellow line crossing posterior part of head and continuing to posterior border of ear; upper part of neck dark; lighter, more or less reddish brown on sides and underside of neck; legs dark above, lighter below.

Measurements of Heosemys leytensis sp. nov.

	mm.
Total length, tip of snout to end of tail	330
Length of carapace	210
Width of carapace	145
Height of carapace	70
Length of plastron	180
Width of plastron	115
Length of head	55
Width of head	42
Depth of head	31
Eye to ear	15
Eye to tip of snout	13

Variation.—A second specimen from the same locality is medium-sized and differs in a number of characters from the adult. A dim keel in posterior part of carapace; distinct diagonal grooves in upper part of costal shields, parallel to their sutures with vertebrals; all shields of carapace showing lines of growth; carapace dimly serrate anteriorly, nuchal notch rather shallow; marginals bordering nuchal not extending anterior to nuchal more than half its length (in the adult they extend beyond the nuchal a distance about equal to its length); a distinct notch between supracaudals; plastron similar to that of adult; carapace brown; plastron yellow; top of head brown, dimly mottled in temporal region; two very distinct transverse yellow lines on sides of head which barely fail to meet dorsally, these lines continuing below ear; a yellow spot on each side of lower jaw. Length of carapace, 126 millimeters; of plastron, 118.

Remarks.—Only these two specimens are known. Both are from the same locality in Leyte. The species can be readily

distinguished by the absence of the temporal arch and by the yellow ring on the posterior part of the head.

CHELONIIDÆ

Cheloniidæ COPE, Proc. A. Philos. Soc. 20 (1882) 143.

Large turtles with paddle-shaped legs; nine plastral bones covered with epidermal horny shields; caudal vertebræ procœlous; neck not completely retractile; temple roofed over, parietal bone in contact with squamosal; one or two claws on each leg.

Genus ERETMOCHELYS Fitzinger

Caretta RITGEN, Nova Acta Acad. Leop.-Carol. 14 (1828) 270 (not of Rafinesque).

Eretmochelys FITZINGER, Syst. Rept. (1843) 30.

Onychochelys GRAY, Proc. Zool. Soc. London (1873) 397.

Marine turtles, having paddle-shaped legs, each with two claws; carapace with four pairs of costals and two pairs of prefrontal scales; scales of carapace imbricating, with three keels; two keels on plastron.

The turtles of this genus furnish the precious tortoise-shell of commerce, which is an important article of export from the Philippine Islands.

Eretmochelys imbricata (Pennant). Plate 5, figs. 1 and 2; Plate 6, figs. 5 and 6.

Testudo imbricata PENNANT, Ind. Zool. (1769) 87.

Chelonia Eretmochelys imbricata FITZINGER, Syst. Rept. (1843) 30.

Eretmochelys imbricata AGASSIZ, Contr. 1 (1857) 381; STEJNEGER, Report U. S. Nat. Mus. for 1902 (1904) 719.

Chelonia imbricata SCHWEIGGER, Prodr. Mon. Chel. (1814) 21.

Caretta imbricata MERREM, Syst. Amph. (1820) 19.

Onychochelys kraussii GRAY, Proc. Zool. Soc. London (1873) 398.

Chelonia virgata WAGLER, Icon. et Desc. Amph. (1833) pl. 29.

Chelonia multiscutata KUHL, Beitr. (1820) 78.

Chelone imbricata BOETTGER, Ber. Senck. Nat. Ges. (1886) 93 (Jolo).

Eretmochelys squamata AGASSIZ, Contr. Nat. Hist. U. S. Am. 1 (1857) 382; GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 25 (1883) 300.

Caretta imbricata KELAART, Rept. Ceylon 1 (1852) 180.

Caretta squamosa GIRARD, U. S. Expl. Exp., Rept. (1858) 442.

Caretta rostrata GIRARD, U. S. Expl. Exp., Rept. (1858) 446.

Eretmochelys squamosa STEJNEGER, Bull. U. S. Nat. Mus. 53 (1907) 511.

Description of species.—(From No. 1474, Bureau of Science collection; collected at Aparri, Luzon, November, 1908.) Snout beaked, somewhat projecting over lower jaw; nostrils small, vertical; postnasal shields moderate, five-sided, entering orbit;

prefrontals much larger than postnasals, pentagonal, forming a straight median suture; azygous prefrontal hexagonal; frontal large, eight-sided, with a small suture entering anteriorly, forming its longest sutures with supra-ocular, wider than long; two equal-sized parietals, distinctly shorter than frontal; a large temporal scale bordering frontal; supra-ocular and parietal on each side; three postocular shields entering orbit, two lower largest; these bordered by temporals; two upper temporal elements larger than lower; a large elongate shield on either side of lower jaw; region above eye with small irregular scales; lower lid with tubercular scutes; carapace covered with large imbricating shields; five vertebral shields; four pairs of costal shields; eleven marginal shields on each side; a single nuchal shield; a pair of supracaudal shields; vertebrals with a strong vertebral keel; two lateral keels on upper part of costal; posterior edge of each shield with a thornlike point; posterior edge of carapace strongly serrate; plastral elements normal; a single azygous scute between gulars; pectoral and abdominal shields largest; plastron separated from carapace by a series of four enlarged intercalary shields; a few small axillary shields, largest between humeral and first intercalary; a single small inguinal scale; plastron with two strong keels with a prominent depression between them; legs paddlelike, anterior much larger than posterior; inner side of leg with eight shields, broader than long; tip of leg with two enlarged shields, separated by a smaller shield; outer side of leg with sixteen scutes, two of which bear distinct claws; hind legs with eleven scutes on anterior edge, two of which bear small claws; tail very short, not extending to tip of carapace.

Color in alcohol.—Above deep brown, streaked or mottled with amber of varying shades; legs similar; head shields blackish brown, lighter on sutures; lateral shields amber, with brown spots; plastron yellow to amber, with a brown spot on posterior part of each shield.

Measurements of Eretmochelys imbricata (Linnæus).

	mm.
Total length	244
Length of carapace	173
Width of carapace	130
Length of plastron	134
Width of plastron, across pectorals	81
Length of foreleg	98
Length of hind leg	53
Length of head	47
Width of head	30

Variation.—A very young specimen, measuring 105 millimeters to end of carapace, is dark blackish brown to black; tips of marginals and outer edges of legs yellowish; plastron black; body skin blackish; scutes of head, carapace, and plastron identical with those of the described specimen. A carapace in the Bureau of Science collection measures 395 millimeters. There are three specimens living in the Bureau of Science aquarium.

Remarks.—The turtle here described appears to be of the species figured by Stejneger²¹ under the name *Eretmochelys imbricata*. Between Stejneger's drawing and the described specimen in the Bureau of Science collection there is no appreciable difference.

Genus CARETTA Rafinesque

Caretta RAFINESQUE, Specchio Sci. Palermo 2 (1814) 66.

Thalassochelys FITZINGER, Ann. Wien Mus. 1 (1835) 121.

Caoudna COCTEAU in Sagra's Hist. Fis. Pol. Nat. Cuba, Rept. 4 (1838) 31.

Marine turtles with paddle-shaped legs; two pairs of prefrontals present; five or more pairs of costal shields; shields on back not imbricate.

Caretta olivacea (Eschscholtz). Plate 6, figs. 1 and 2.

Chelonia olivacea ESCHSCHOLTZ, Zool. Atlas 1 (1829) pl. 3 (Manila Bay).

Caouana olivacea GRAY, Cat. Tort. (1844) 53 (Philippines); GÜNTHER, Rept. Brit. India (1864) 52 (seas of Philippines).

Caretta olivacea GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 52 (1908) 9.

Thalassochelys olivacea BOETTGER, Ber. Senck. Nat. Ges. (1886) 93.

Thalassochelys caretta CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 404 (Manila Bay).

Description of species.—(From a specimen living in the Bureau of Science aquarium.) Anterior pair of prefrontals distinctly smaller than second pair; a small, rather elongate azygous prefrontal between the two supra-oculars; frontal large, much wider than long, followed by four parietals; a large temporal (or parietal) element follows supra-ocular shield and borders frontal and outer parietal; three postocular shields, upper smallest, middle largest, lower elongate; postoculars bordered by four temporals, second from top largest; a distinct median keel on carapace, more prominent posteriorly; six pairs of costals; nuchal divided; six vertebral shields, fifth very small; thirteen marginals on each side; two supracaudals; plastron normal;

²¹ Report U. S. Nat. Mus. for 1902 (1904) 718, figs. 193-197.

four large shields between carapace and plastron; a small inguinal shield and a group of eight axillary shields, four of which touch pectorals and humerals; a small round shield behind anal shields.

Color in life.—Above olive drab to gray, rather lighter about suture; sides and underside of neck whitish; plastron whitish.

Measurements of Caretta olivacea (Eschscholtz).

	mm.
Length of carapace	340
Width of carapace	325
Height of carapace	110
Length of foreleg	260
Width of foreleg	70
Length of hind leg	180
Width of hind leg	70
Length of plastron	275
Width of plastron	280
Length of tail, from anus	15
Length of head, to end of parietals	90
Depth of head	55

Variation.—This species is known to be subject to a great amount of variation. Thus the usual number of costals is five; but in the Manila specimen figured by Eschscholtz there appear to be seven on one side and six on the other, with seven vertebrals; there are thirteen marginals on each side. I am uncertain whether the nuchal is divided. There are several characters about Eschscholtz's figure that differ markedly from my specimen, but these may be due to poor drawing. The squamation of the neck, the position of the nostrils, the shape of the occipital region, and the squamation of the legs—all appear to differ greatly.

Remarks.—This species and an agamid lizard appear to be the first recorded Philippine reptiles. The species is not rare and is taken frequently in Manila Bay.

Genus **CHELONIA** Latreille

Chelonia BRONGNIART, Bull. Soc. Philom. Paris 2 (1800) 89 (*nomen nudum*); LATREILLE, Hist. Nat. Répt. 1 (1802) 22; WAGLER, Syst. Amph. (1830), 132, part; GRAY, Syn. Rept. (1831) 51; DUMÉRIL and BIBRON, Erp. Gén. 2 (1835) 530; Cat. Zool. (1844) 54; Cat. Shield Rept. 1 (1855) 74; GIRARD, U. S. Expl. Exped., Herp. (1858) 452; GÜNTHER, Rept. Brit. India (1864) 52; GRAY, Suppl. Cat. Shield Rept. (1870) 119; STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 509.

Chelone BRONGNIART, Mem. Sav. Etrang. 1 (1806) 610; STRAUCH,

Chel. Stud. (1862) 59; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 180.

Chelonias RAFINESQUE, Specchio. Sci. Palermo 2 (1814) 66.

Caretta MERREM, Tent. Syst. Amph. (1820) 19, part; GRAY, Cat. Tort. (1844) 53; Cat. Shield Rept. (1855) 73.

Mydas COCTEAU, in Sagra's Hist. Fis. Pol. Nat. Cuba 4 (1838) 22; GRAY, Suppl. Cat. Shield Rept. (1870) 119.

Chelonia japonica (Thunberg). Plate 7, figs. 1 to 4.

Testudo japonica THUNBERG, Svensk. Vetensk. Acad. Nya Handl. 8 (1787) 178, pl. 7, fig. 1.

Chelonia japonica SCHWEIGER, Prodr. Mon. Chel. (1814) 21.

Chelonia virgata SCHWEIGER, Prodr. Mon. Chel. (1814) 21.

Chelonia viridis TEMMINCK and SCHLEGEL, Fauna Japon., Rept. (1835) pl. 4, figs. 4, 5, 6; pl. 6, figs. 1, 2.

Chelonia japonica STEJNEGER, Bull. U. S. Nat. Mus. 58 (1907) 509; GARMAN, Bull. Mus. Comp. Zool. Harvard Coll. 52 (1908) 8.

Description of species.—(From a living specimen in the Bureau of Science aquarium.) Head large; beak somewhat hooked; a single pair of large prefrontals, longer than wide, that on right side partially broken; a small azygous hexagonal prefrontal between supra-oculars, which are larger; four postoculars on left side, five on right side, lowest largest; frontal large, somewhat notched in front, bordered behind by five parietals; frontal and parietals bordered by two temporals; postoculars bordered by four shields, two upper largest; this series of temporals followed by five or six unequal-sized shields and two or three very small ones, making a total of about twenty shields in temporal region behind eye; supra-ocular region with a series of small shields; lower jaw with narrow mental followed by a large elongate shield which is followed by several smaller ones; carapace smooth; five vertebral shields; four pairs of costals; eleven pairs of marginals, first pair in contact with first vertebral on either side of nuchal, which is single; a pair of supracaudals; legs long, with a single claw, anterior edge of front leg with fifteen shields, about ten on posterior edge; a round isolated shield near upper part of underside of leg not bordering outer edge; anterior part of hind leg with eight shields; a single claw present; plastron smooth, attached to carapace by four large intercalary plates; six distinct axillary scales; pectoral shields widest on plastron.

Color in life.—Above rusty reddish brown, each shield streaked with amber, head shields distinctly reddish, each edged with black; shields on side of head dark, with yellow along sutures; shields on legs with black centers; plastron yellow.

Measurements of Chelonia japonica (Thunberg).

	mm.
Total length	735
Length of carapace	555
Width of carapace	470
Height of carapace	180
Length of plastron	448
Width of plastron, across pectoral	290
Length of head	125
Width of head	90
Depth of head	100
Tail, behind anus	28

Variations.—The head shields of this species are subject to more or less variation. In a second specimen living in the aquarium there is a second pair of prefrontals bordering the nasal area but not touching the beak. These shields are small and irregular.

Remarks.—The species is common in the Philippine Islands. Specimens have been kept alive in the aquarium. They are very frequently taken in Manila Bay. They are fed on fish.

Suborder CHILOTÆ

Chilotæ WIEGMANN, Handb. Zool. (1832) 167.

This suborder consists of one family.

TRIONYCHIDÆ

Trionychidæ BELL, Zool. Journ. 3 (1828) 515.

Carapace and plastron without outer scales or shields and not entirely ossified, covered with leathery skin; head completely retractile; no external ear; bony part of jaws concealed under thick lips; three digits with claws; nostrils at end of a flexible proboscis.

Only a single genus of this family is positively known from the Philippine Islands. Species of three other genera have been reported but probably erroneously. They are the following:

Dogania subplana (Geoffroy Saint Hilaire.) Reported by Casto de Elera²² as *T [rionyx] subplanus*, from Mindanao and Palawan, with specimens in the Santo Tomás Museum and in turn listed from the Philippines by Siebenrock²³ and de Rooij,²⁴ on the strength of Casto de Elera's record. No specimen is now in the Santo Tomás Museum.

Chitra indica Gray. This species was first reported from the Philippine Islands by Gray, who later made the specimen the type

²² Cat. Fauna Filipinas 1 (1895) 407.

²³ Zool. Jahrb. Suppl. 10 (1909) 606.

²⁴ Rept. Indo-Aust. Arch. 1 (1915) 326.

of *Pelochelys cumingii*, which is now regarded as synonymous with *P. cantorii*. Casto de Elera also reports the species from the Philippines, locality Palawan, with a specimen in the Santo Tomás Museum. This specimen is no longer extant.

Trionyx sinensis Wiegmann. Reported by Casto de Elera from the Batan Islands, and later by Siebenrock on the strength of the former record. The specimen reported as present in the Santo Tomás Museum is no longer extant.

Dogania subplana occurs in Java and Borneo; Stejneger regards its presence in Formosa as doubtful. *Chitra indica* is known only from India. *Trionyx sinensis* occurs in Formosa, and a specimen has been reported from Timor.

Genus PELOCHELYS Gray

Chitra GRAY, Cat. Shield Rept. 1 (1855) 70, part; GÜNTHER, Rept. Brit. India (1864) 50.

Pelochelys GRAY, Proc. Zool. Soc. London (1864) 89; (1873) 40; Suppl. Cat. Shield Rept. 1 (1870) 90; BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 262; Fauna India, Rept. (1890) 15; STRAUCH, Mém. Acad. Sci. St.-Petersburg VII 38 (1890) 34; BAUR, Ann. & Mag. Nat. Hist. VI 7 (1891) 445; Proc. Am. Phil. Soc. 31 (1893) 221; OGILBY, Proc. Roy. Soc. Queensland 19 (1905) 29; SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 606.

"Outer extremities of the nuchal plate overlying the second dorsal rib; neural plates well developed. Limbs completely exposed. Hyoplastron distinct from hypoplastron; not more than five plastral callosities. Bony choanæ between the orbits; jaws weak; postorbital arch as broad as the diameter of the orbit; pterygoids posterior border free, without ascending process." (Boulenger.)

Only one species of the genus is known.

Pelochelys cantorii Gray. Plate 6, figs. 3 and 4.

Chitra indica GRAY, Cat. Tort. (1844) 49, part; Cat. Shield Rept. (1855) 49; GÜNTHER, Rept. Brit. India (1864) 50, pl. 6, fig. C.

Gymnopus indicus CANTOR, Cat. Mal. Rept. (1847) 10.

Pelochelys cantorii GRAY, Proc. Zool. Soc. London (1864) 90, figs. 9 and 10; (1869) 215; THEOBALD, Journ. Linn. Soc. (1868) 10; Cat. Rept. Brit. India (1876) 28; BAUR, Proc. Am. Phil. Soc. 31 (1893) 221; OGILBY, Proc. Roy. Soc. Queensland 19 (1905) 29; SIEBENROCK, Zool. Jahrb. Suppl. 10 (1909) 607.

Pelochelys cumingii GRAY, Proc. Zool. Soc. London (1864) 90; Cat. Shield Rept. Suppl. (1870) 91 (type locality Philippines).

Pelochelys bibronii GRAY, Proc. Zool. Soc. London (1864) 90; Cat. Shield Rept. Suppl. (1870) 91.

Pelochelys cantoris BOULENGER, Cat. Chel. Rhyn. Croc. Brit. Mus. (1889) 263; Fauna India, Rept. (1890) 15; CASTO DE ELERA, Cat. Fauna Filipinas 1 (1895) 406; FLOWER, Proc. Zool. Soc. London

(1899) 621; WERNER, Zool. Jahrb. 13 (1900) 483; SIEBENROCK, Sitz. Ber. Wiss. Wien 111 (1902) 832, fig. 12; 112 (1903) 350; Zool. Jahrb. Suppl. 10 (1909) 607.

Pelochelys cantorii DE ROOIJ, Rept. Indo-Aust. Arch. 1 (1915) 331.

Description of species.—"Costal plates eight pairs, the last well developed and forming a median suture; a single neural between the first pair of costals; plates coarsely pitted and vermiculate. Dorsal skin of young tuberculate. Epiplastra small and widely separated; entoplastron forming a right or an acute angle; plastral callosities largely developed. Head moderate; snout very short and broad; proboscis very short; interorbital space broader than the greatest diameter of the orbit; mandible narrowest at the symphysis, olive above, uniform or spotted with darker; lips and throat of young olive, speckled with whitish; plastron whitish." (*Boulenger.*)

A living specimen in the Bureau of Science aquarium has the following measurements:

Measurements of Pelochelys cantorii Gray.

	mm.
Length of carapace	350
Width of carapace	315
Height of carapace	76
Length of plastron	295
Width of plastron	290
Total length, head extended	630

The following characters are evident in the living aquarium specimen: Carapace moderately flat, composed of a bony inner part surrounded by a wide, soft, cartilaginous rim, the part above the neck bending down strongly, more or less covered with fine sculpturing and rounded tubercles; bony part sculptured and more or less pitted; soft part of carapace posteriorly with lines crisscrossed at nearly right angles; on the sides these lines longitudinal and not crossing; a depressed area running lengthwise of carapace medially; three inner toes of fore and hind legs with long, strong claws, the claw of inner toe largest; the two outer toes not extending beyond the edge of the strong web which extends along the leg; a small callosity at base of inner toes on both feet; a strong scalelike callosity across outer part of foreleg, three callosities in the web on outer side of foreleg; one large, elongate callosity in the web on posterior side of hind leg, a heavy widened scalelike callosity on heel; head very large, much widened in temporal region; proboscis short; lips very thick; eye small, with a dark line in front and behind pupil; tail very short behind anus.

Color in life.—Head above olive, with minute black dots; carapace olive, with a few darker and lighter striations along the median dorsal part; outer edge olive, with small spots of darker and lighter color; plastron flesh color, with a few white dots on anterior part; chin and throat with minute dots of black and white.

Remarks.—The specimen ²⁵ in the aquarium was captured in 1918 at San Miguel, Bulacan Province, Luzon, by Mr. Genesio Pating, and was presented to the aquarium by Mr. George Symmonds, of Manila. The turtle does very well in captivity and takes food regularly. The food given is small dead fish. In the same tank are kept specimens of *Cyprinus carpio* (Chinese carp), and *Megalops cyprinoides* (buan-buan), and these living fish are not molested. When living specimens of *Ophiocephalus striatus* (the mud fish, or *dalag*), were placed in the same aquarium they were frequently killed. In Luzon the species is known as *antipa*; it appears to be rare. Individuals grow to be more than a meter long.

²⁵ The turtle here mentioned died since this paper was written.

ILLUSTRATIONS

[Photographs by E. Cortes.]

PLATE 1

- FIG. 1. *Cyclemys amboinensis* (Daudin); a medium-sized specimen, showing serrations on posterior part of carapace.
2. *Cyclemys amboinensis* (Daudin); an old specimen, without serrations and with differently shaped carapace.
3. *Heosemys leytenensis* sp. nov.; from the type, dorsal view.
4. *Heosemys leytenensis* sp. nov.; from the type, ventral view.

PLATE 2

- FIG. 1. *Cyclemys dhor* Gray; young, dorsal view, somewhat reduced.
2. *Cyclemys dhor* Gray; young, ventral view.
3. *Cyclemys amboinensis* (Daudin); young, dorsal view, somewhat reduced.
4. *Cyclemys amboinensis* (Daudin); ventral view.

PLATE 3

- FIG. 1. *Heosemys leytenensis* sp. nov.; head of the cotype, from Leyte, enlarged.
2. *Cyclemys amboinensis* (Daudin); ventral view of an old specimen, showing no serrations on the posterior border of the carapace.
3. *Cyclemys amboinensis* (Daudin); ventral view of a variety with the posterior border of the carapace serrated; reduced.

PLATE 4

- FIG. 1. *Cyclemys dhor* Gray; dorsal view of a carapace in the Bureau of Science collection, with rather distinct posterior serrations.
2. *Cyclemys dhor* Gray; ventral view.
3. *Cyclemys dhor* Gray; a living specimen owned by Mr. W. Schultze, of Manila; dorsal view, reduced.
4. *Cyclemys dhor* Gray; ventral view, reduced.

PLATE 5

- FIG. 1. *Eretmochelys imbricata* (Pennant); a young specimen from Aparri, Luzon; dorsal view.
2. *Eretmochelys imbricata* (Pennant); ventral view.

PLATE 6

- FIG. 1. *Caretta olivacea* (Eschscholtz); a young specimen in the Bureau of Science aquarium; dorsal anterior view, reduced.
2. *Caretta olivacea* (Eschscholtz); ventral posterior view.
3. *Pelochelys cantorii* Gray; a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.
4. *Pelochelys cantorii* Gray; ventral posterior view.

- FIG. 5. *Eretmochelys imbricata* (Pennant); a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.
 6. *Eretmochelys imbricata* (Pennant); ventral posterior view.

PLATE 7

- FIG. 1. *Chelonia japonica* (Thunberg); a living specimen, in the Bureau of Science aquarium; dorsal anterior view, reduced.
 2. *Chelonia japonica* (Thunberg); ventral anterior view.
 3. *Chelonia japonica* (Thunberg); young dorsal view.
 4. *Chelonia japonica* (Thunberg); ventral view.

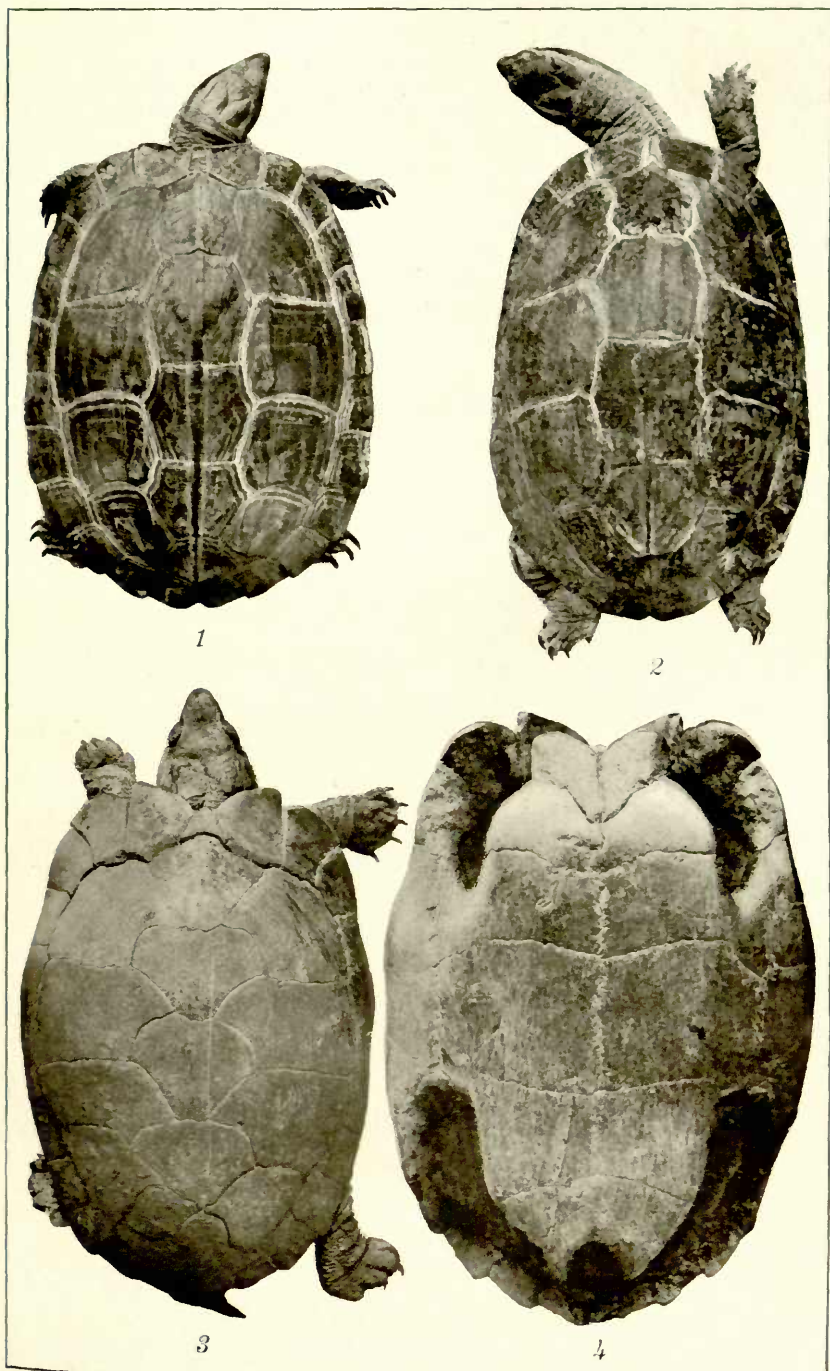
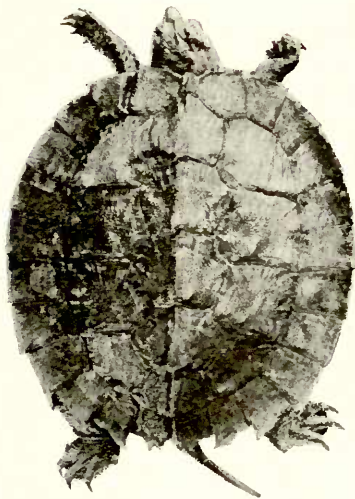
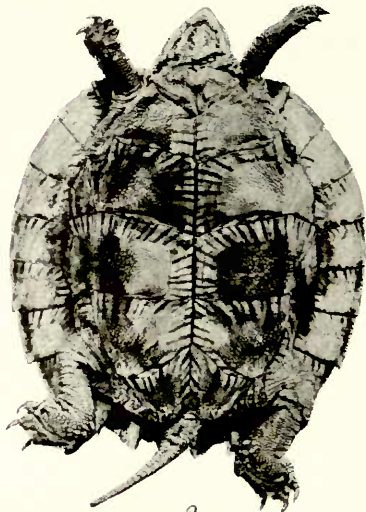


PLATE 1. PHILIPPINE TURTLES.



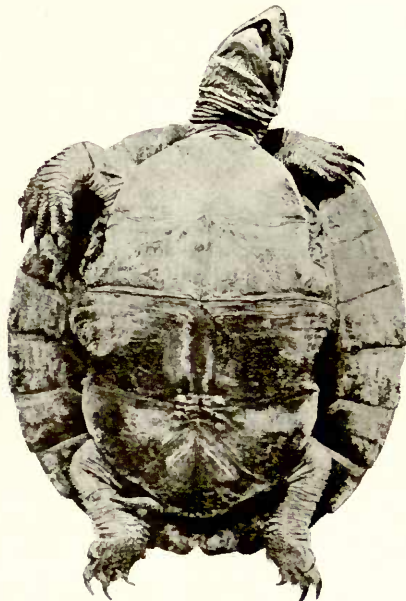
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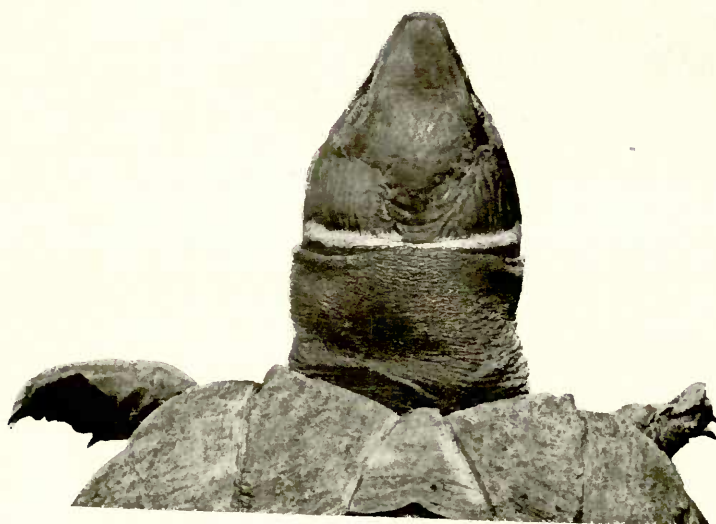


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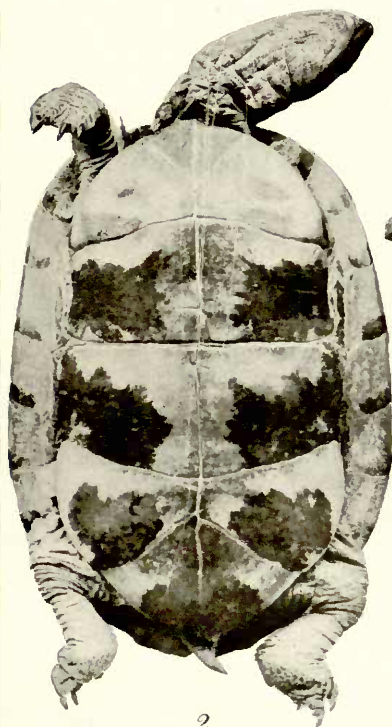


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PLATE 2. TWO SPECIES OF CYCLEMYS.



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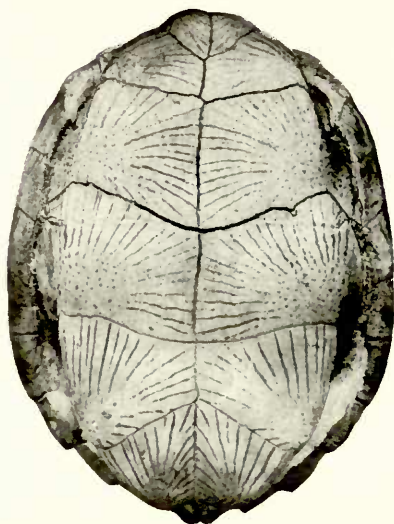
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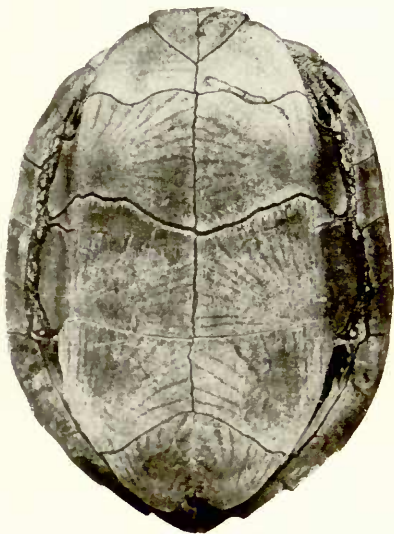
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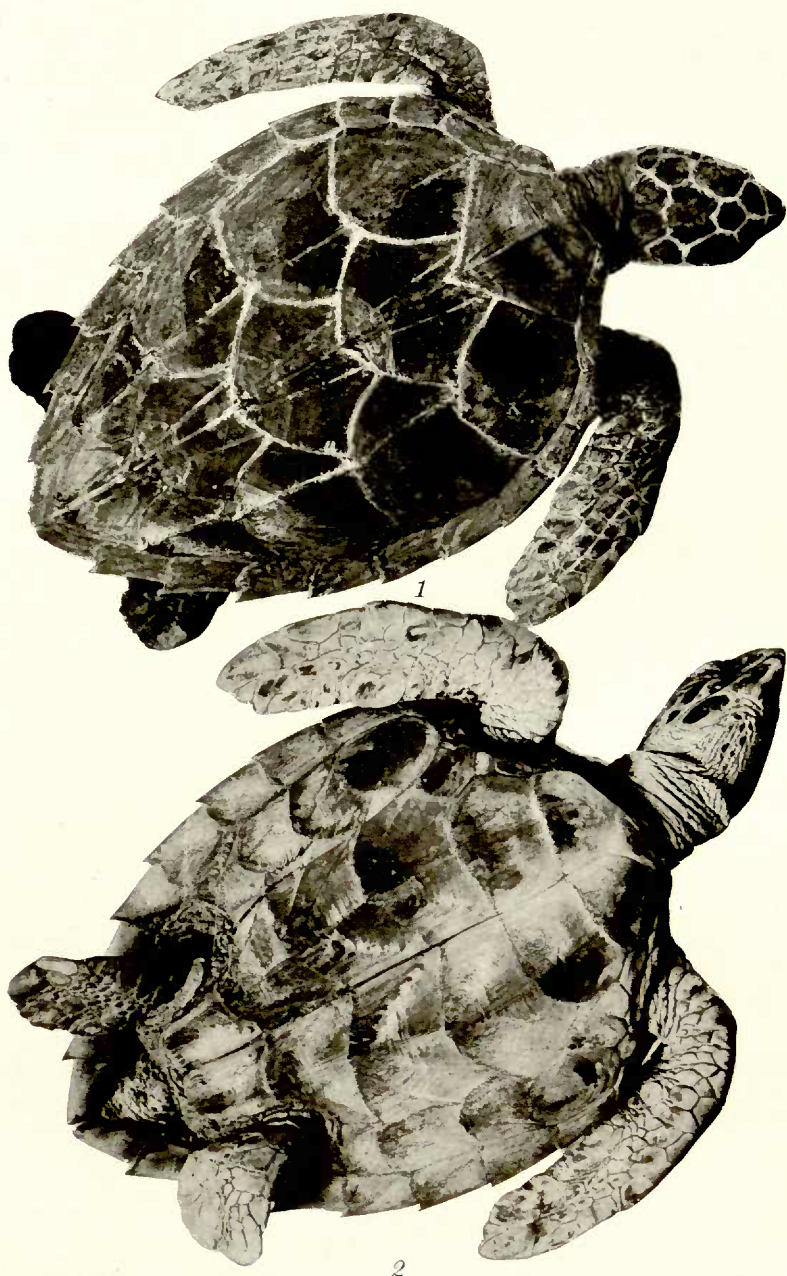


PLATE 5. ERETMOCHELYS IMBRICATA (PENNANT).

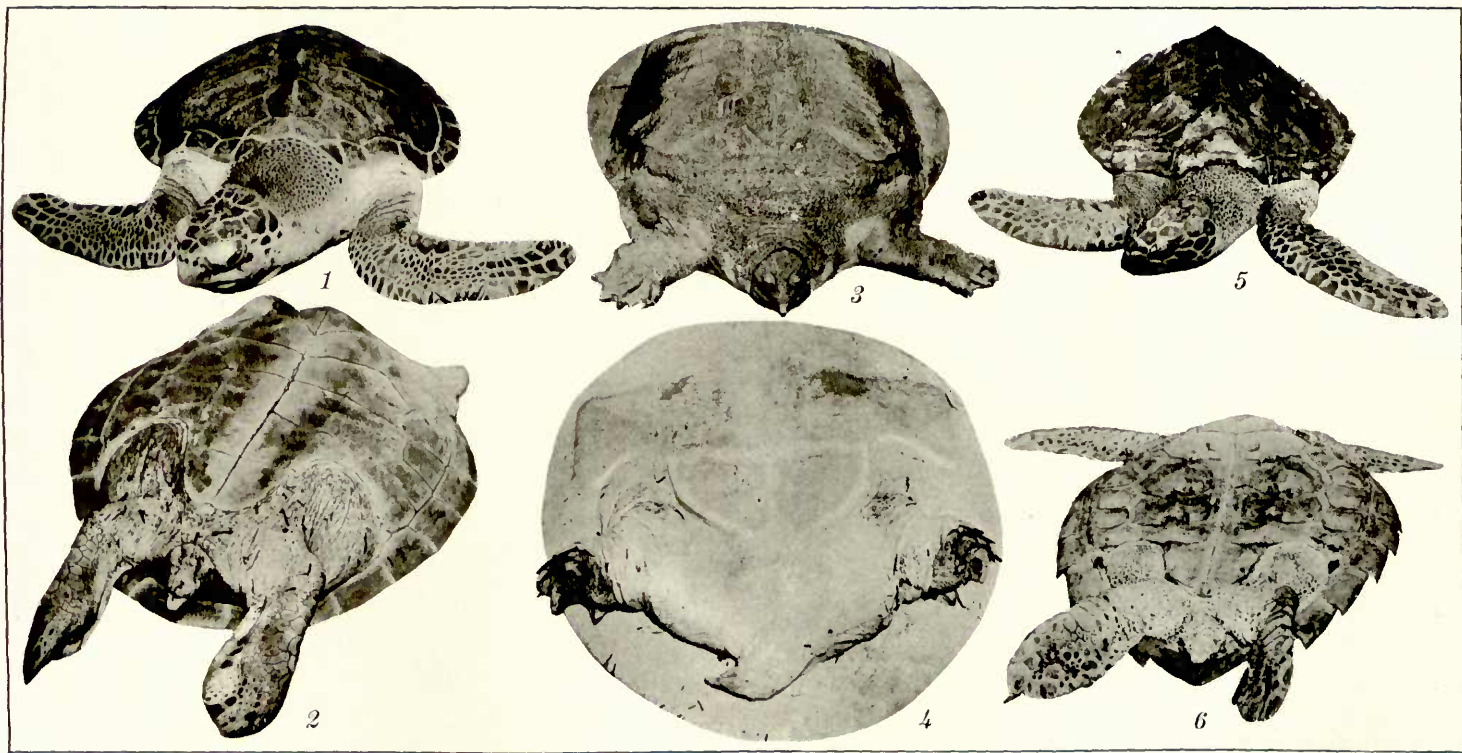


PLATE 6. PHILIPPINE TURTLES.

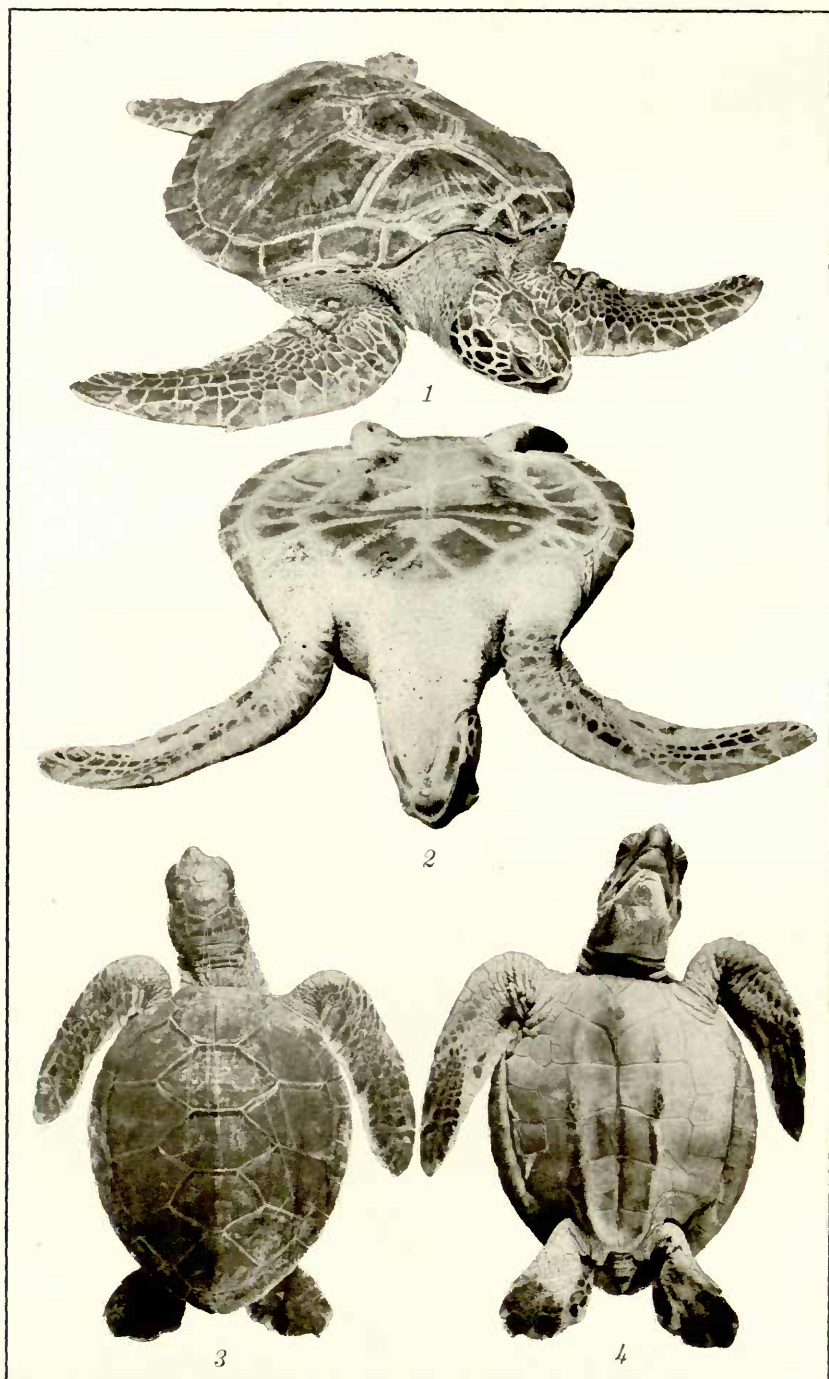


PLATE 7. CHELONIA JAPONICA (THUNBERG).