

**OBSERVATIONS ON THE GIANT SOFTSHELL TURTLE,
PELOCHELYS CANTORII, WITH DESCRIPTION
OF A NEW SPECIES**

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(with one text-figure)

ABSTRACT.— The population of *Pelochelys* in northern New Guinea (Papua New Guinea and Irian Jaya, Indonesia) is described herein as a new species; it is diagnosed by the unique juvenile carapace pattern of contrasting, close-set, dark markings. The new species differs from the distinctive *P. bibroni* in lowland parts of southern New Guinea, and from the geographically isolated *P. cantorii* in south-east Asia. The early history of some specimens of *P. cantorii* (including holotype), previously treated as *Chitra*, is discussed. *Pelochelys cantorii* in western Thailand may be distinctive. The occurrence of *P. cantorii* in the Philippines is discussed.

KEYWORDS.—Testudines, Trionychidae, *Pelochelys* taxonomy, New Guinea, Thailand, Philippines.

INTRODUCTION

Previous study of giant softshell turtles (*Pelochelys*) in New Guinea resulted in restriction of *P. bibroni* to southern New Guinea (Webb, 1995) with all other known populations referred to *P. cantorii*. The distinctive population of *Pelochelys* confined to the lowlands of northern New Guinea is described as a new species. Previous commentary has indicated two distinctive populations of *Pelochelys* in New Guinea (Rhodin et al., 1993; Webb, 1995, 1997; Rhodin and Genorupa, 2000).

MATERIALS AND METHODS

All specimens and specific localities of the new taxon from northern New Guinea were previously discussed by Webb (1995, as *P. cantorii*); no new material has been forthcoming so that the map in Webb (1995: 306, Fig. 5) still suffices for the known distribution of the new taxon. Measurement abbreviations include CL- carapace length, CW- carapace width, PL- plastron length and HW— head width (CL and CW both straight-line). Mu-

seum codes include BMNH- British Museum (Natural History), London, now The Natural History Museum but BMNH retained for cited specimens in publications (Colin McCarthy, in litt.); CUMZ(R)- Chulalongkorn University Museum of Zoology (Reptile Collection), Bangkok; MNHN- Muséum National d'Histoire Naturelle, Paris; NMW- Naturhistorisches Museum, Vienna; MCZ- Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; SMF- Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt-am-Main; UMMZ- Museum of Zoology, University of Michigan, Ann Arbor, Michigan; and USNM- National Museum of Natural History (formerly U.S. National Museum), Smithsonian Institution, Washington, D.C.

SYSTEMATICS

In allusion to the unique juvenile pattern of close-set, dark markings on the carapace the new species may be known as (Latin, *signifer*, -a, -um, bearing marks, figures, signs):

Pelochelys signifera sp. nov.
 Variegated Giant Softshell Turtle
 (Fig. 1)

Holotype.- BMNH 1921.11.11.4, unsexed juvenile in fluid (paper tag with inked number 216 tied to right ankle), from the "Wanggar River, Weyland Range, Geelvinck Bay, N. New Guinea" (Papua Province, Indonesia), presented by C. B. Pratt. The holotype has a CL of about 111 mm, CW of 113 mm, and a PL of 85 mm (precise maximal HW measurement prevented by skin folds). Girgis (1961: 77, as *P. bibroni*) mentioned the holotype noting its weight as 122.7 gm and carapace dimensions of 10.6 and 10.2 cm. The holotype is illustrated in Webb (1995: 304, Fig. 3, upper right).

Diagnosis.- *Pelochelys signifera* differs from the other two species of the genus, *P. bibroni* and *P. cantorii*, in having (in combination) a juvenile carapace with a close-set, indistinct, reticulated pattern emphasized by distinct, small dark dots and markings, and the adult carapace patternless, uniformly olive-brownish (see Comparisons).

Description.- Juvenile pattern aspects of *Pelochelys signifera* are based on the holotype (BMNH 1921.11.11.4) and colour slides (A. Rhodin, P-354) of MCZ 153921 when alive (photographs in Rhodin et al., 1993: 27, Fig. 8; no measurements, now skeletal material). Small turtles are prominently patterned with dark markings on the head, neck, and carapace; the dorsal soft body parts and carapace overall are olive or green-brown. The carapace may be narrowly edged in yellow (except anteriorly), but usually lacks any pale margin. The juvenile carapace pattern is a close-set irregular reticulation (with intervening pale areas), parts of which vary in pigment intensity (pale to dark); the conspicuous aspect of the juvenile pattern is the small dark brownish dots and markings, which overlie the subdued reticulated background (Fig. 1). Dark markings on the head occur on the snout, side of head, upper and lower lips, with a few dark spots on the underside of the head. Small dark markings on the neck (somewhat subdued) occur ventrolaterally. This dorsal, dark variegated pat-

tern is reduced on the forelimbs, absent on hind limbs. The nuchal region of the carapace has some small, low knobby tubercles that are more diffuse laterally. The carapace otherwise is smooth, except for longitudinal ridges of varying length (not individual tubercles) confined to the central bony disc area.

Larger specimens have smooth, uniformly brownish carapaces, lacking longitudinal ridges and dark-spotted patterns, but retain small dark markings on the head. The carapace of the smallest overall brownish specimen (UMMZ 68808, CL 174 mm, CW 162 mm, PL 135 mm, HW 30.0 mm) lacks a definite pattern; a dorsal view photograph of this specimen is in Webb (1995: 304, Fig. 3, lower right). The largest turtle is "uniformly brown with very indistinct paler markings" (data from Andrew Stimpson, in litt, BMNH 1978.2179, CL 315 mm, CW 305 mm, PL 295 mm, HW ca. 48 mm; bony CL 240 and CW 245 mm).

Data on skulls or bony plastra of *P. signifera* are not available. Rhodin et al. (1993) commented on some bony carapaces of *P. signifera* noting eight neurals (n = 6, first neural not here counted as two) in their discussion of neural reversal.

Distribution.- Lowlands of northern New Guinea extending from the Madang region in Papua New Guinea (Sepik and Ramu drainages) westward to the Wanggar River (Nabire region, southern shore of Cenderawasih Bay) in Irian Jaya, Indonesia (Rhodin and Genorupa, 2000: 131). The extent of range encompasses the known localities (not repeated here) listed and mapped in Webb (1995, as *P. cantorii*).

New Guinea species of *Pelochelys* are isolated. Specimens of *Pelochelys* are undocumented from the intervening islands west of New Guinea and east of Java and Borneo (localities in De Rooij, 1915: 332). However, Anders Rhodin (pers. convers.) observed a *Pelochelys* in a market in Ujung Pandang, Sulawesi. Personal travel (with Anders Rhodin in 1993) to some of the Lesser Sunda Islands tended to confirm negative evidence of occurrence (complete ignorance on

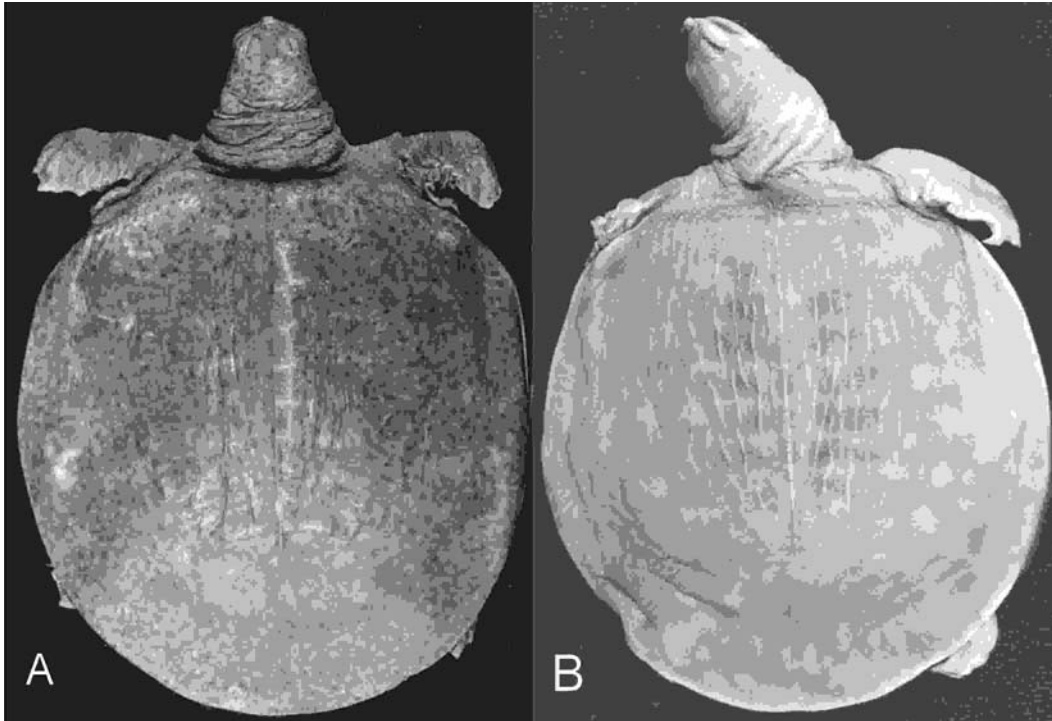


FIGURE 1: Juvenile carapace patterns of *Pelochelys*. A, holotype of *P. signifera* (BMNH 1921.11.11.4, CL about 111 mm, Wanggar River, Irian Jaya, Indonesia). B, *P. cantorii* (NMW 30327, CL about 78 mm, “Phuc Son” Vietnam).

the part of guides and native residents regarding photographs of trionychid turtles) on at least western Timor, Roti, Flores, and Sumba.

Comparisons.- Of the three species of *Pelochelys*, *P. bibroni* in southern New Guinea is most distinctive, differing from the other two species (*P. signifera* and *P. cantorii*) in juveniles having an overall rough-textured (tuberculate) brownish carapace, and large adults having contrasting, irregularly arranged, yellow markings on the carapace and yellow neck stripes. *Pelochelys signifera* most closely resembles *P. cantorii*. Adults of both species have smooth, uniform brownish or olive carapaces with no distinct pattern, but with some small dark markings on the head. Juveniles of *P. signifera* and *P. cantorii* have smooth carapaces, except for some small, low, knobby tubercles in the nuchal region and longitudinal ridges over the central bony disc area, but differ in carapace patterns. *Pelochelys signifera* has a distinct pattern of small, close-set, dark markings (also on

head-neck), whereas *P. cantorii* is overall uniformly brownish, but may have some indistinct pale spots (Fig. 1). Juveniles of *P. cantorii* may have a few tiny black dots on the carapace (see photographs in Ernst et al., 2000). *Pelochelys signifera* also seems to differ from *P. cantorii* in juveniles having the longitudinal rows of ridges confined to the central bony disc area, whereas these ridges in *P. cantorii* extend anteriorly into the tuberculate nuchal region of the carapace.

Dorsal view photographs of juvenile and adult patterns of the two New Guinea species, *P. signifera* and *P. bibroni*, are compared in Webb (1995: 304, Fig. 3). Juvenile patterns of *P. signifera* (holotype) and *P. cantorii* are compared in Fig. 1 (this report). Siebenrock (1903: 350-351) described the specimen of *P. cantorii* depicted here in Fig. 1, NMW 30327, ca 58 mm PL, 78 mm CL (curvature), from Vietnam-“Annam (Phuc Son).”

Three species of *Pelochelys* are recognized (*P. bibroni*, *P. cantorii*, *P. signifera*). Farkas and

Fritz (1998) discussed the taxonomic status of Zhang's *Pelochelys taihuensis* (1984) and Zhou's use of *P. maculatus* (1997), and concluded that both names refer to *Rafetus swinhoei*. The three species of *Pelochelys* can be distinguished by the following brief key:

- 1A. Juveniles with overall rough-textured, tuberculate carapace; adults with yellow neck stripes and contrasting yellow markings on carapace.....*P. bibroni*.
- B. Juvenile carapace smooth, except for low tubercles in nuchal region and longitudinal ridges over central bony disc area; adult carapace uniformly brownish (no distinct pattern).....2.
- 2A. Juvenile carapace covered with distinct, dark pattern of close-set, small dots and markings (Fig. 1).....*P. signifera*.
- B. Juvenile carapace lacking distinct, close-set variegated pattern of dark markings, mostly uniform brownish, may have indistinct, pale spots (Fig. 1).
.....*P. cantorii*.

HISTORY OF *PELOCHELYS CANTORII*

Specimens of *Pelochelys cantorii* were treated as *Chitra* prior to Gray (1864) distinguishing *Chitra* and *Pelochelys* and describing *P. cantorii*. Gray's account of *Chitra indica* (1844: 49) was a composite of *Chitra* and *Pelochelys*; his two listed specimens "a" and "b" ultimately became the two syntypes (BMNH 1947.3.4.5, stuffed and BMNH 1946.1.22.13, young in fluid) of *Pelochelys cumingii* [= *P. cantorii*] (Gray, 1864: 90), whereas Gray's new genus *Chitra* was based on examination of a *Chitra* skull (BMNH 1849.2.5.1, now lost). These same two specimens (also cited "a" and "b") and the skull were listed as *Chitra indica* in Gray's Catalogue ("1855"[1856]: 70) and the skull illustrated (Pl. XLI).

Likewise, Cantor's account of *Gymnopus indicus* (1847: 616) from "Pinang" is based on the now stuffed holotype of *P. cantorii* (BMNH 1947.3.6.21). Gray's (1864) recognition of *Pelochelys* was based primarily on a comparison of the earlier-accessed *Chitra* skull (again illus-

trated, Gray 1864: 92, Figs. 11 [dorsal] and 12 [ventral view]; Gray, 1870: 90, Fig. 28; and same in Boulenger, 1889: 264, Fig. 70) and the skull (BMNH 1947.3.6.22) that was removed from the holotype of *P. cantorii* and illustrated by Gray (1864: 90, Figs. 9 and 10; Gray, 1870: 91, Fig. 29; and same in Boulenger, 1889: 262, Fig. 69).

Günther's report of *Chitra indica* (1864: 50), written prior to Gray's (1864) distinction of *Chitra* and *Pelochelys*, has been regarded as a composite. Günther (1864: 50) reiterated some of the same information that appeared in Cantor (1847) and illustrated (Fig. VI, Fig. C) the holotype of *P. cantorii*; however, Gray (1870: 91) noted that "the markings and colour [were] added from General Hardwicke's figure of the living *Chitra indica*. Dr. Günther believed they represented the same animal." This strange composite of a *Pelochelys* body form/*Chitra* pattern has been maintained by subsequent authors (Theobald, 1876; Boulenger, 1889; and Smith, 1931).

As a side issue, the type-locality of *P. cantorii* ("Pinang," Cantor, 1847), as well as Gray's "Penang" for an unidentified Henderson specimen (1831: 47, as *Trionyx indicus*), may be incorrect. The Henderson specimen (see Farkas, 1994), perhaps *Chitra* but might well have been a *Pelochelys*, was in the fluid collection of the Royal College of Surgeons (Owen, 1859: 104, entry 685) and was destroyed during the London bombing in World War II. Smith (1931: 6) noted Cantor's localities, "particularly those labelled Penang—are incorrect." Although circumstances of collection are unknown, the Pinang (Cantor, 1847) and Penang (Gray, 1831) labelled specimens may be of unknown origin and sourced from a Chinese temple on Pinang Island that keeps various kinds of captive turtles acquired from different geographic areas (Annandale, 1912: 165).

VARIATION IN *PELOCHELYS CANTORII*

The foregoing descriptive comments may not be applicable to all populations of the widespread *Pelochelys cantorii* (see comments in Niekisch et al., 1997: 30, and Thirakhupt and van Dijk,

“1994”[1995]: 247). A general lack of specimens (especially juveniles) from certain areas has hampered a thorough and convincing appraisal of geographic variation.

The general concept is that juveniles of *Pelochelys cantorii* have a mostly uniform olive to brownish carapace but may have some discernable, indistinctly margined, pale circular spots. Gray (1844: 49, as *Chitra indica*) noted the carapace of the small syntype of *P. cumingii* (see above) as “Olive,...; head olive, minutely black-dotted; throat olive, minutely white-dotted.” In my examination of this syntype in 1973, I recorded the head, lips, and limbs as patternless, brownish, and the brownish carapace lacking a definite pattern with ridging on the central disc area; the CL is about 81 mm, the PL 61 mm. Cantor (1847: 616, as *Gymnopus indicus*) described the stuffed holotype of *P. cantorii* (see above), PL about 215 mm, as having the carapace “greenish-olive, vermiculated and spotted with brown or rust colour”.

A distinctive population may occur in the Mae Klong drainage in western Thailand. A large adult *Pelochelys* (examined by author, BMNH 1921.4.1.179, head, limbs, part of carapace, in fluid, Malcolm A. Smith No. 1868) from this drainage (Thirakhupt and van Dijk, “1994”[1995]: 238) is unlike all other adult *Pelochelys* (few examined and published photos) in having distinct white dots and spots on the carapace and soft body parts. Smith (1931: 160, 161) noted “Olive above, dotted all over with yellow” presumably in reference to the “four specimens from central Siam” he had seen. Nutphand (1979: 206), in referring to Thailand *Pelochelys*, noted “Carapace of young leaf-green with yellow spots all over.” Mocquard (1907: 14) reported a *Pelochelys* from “Siam” (now MNHN 8003, as *Chitra* in MNHN catalogue; not examined, large, mounted), which Roger Bour (in litt., 9 March 1988) related as a *Pelochelys* having a pattern of “very small round whitish spots...probably near Bangkok, in 1867” These white or yellow-spotted *Pelochelys* may be confined to the Mae Klong (and Chao Phraya) drainage in Thailand. Cox et al. (1998: 6) noted a probable barrier of “an elevated plateau with ex-

tensive sandstone outcrops” between the valleys of the Chao Phraya and (adjacent eastward) the Mekong River drainage, which is inhabited by non white-spotted *Pelochelys* (CUMZ(R) 1993.1.7.5 and CUMZ(R) 1993.2.15.1). However, Thirakhupt and van Dijk (“1994”[1995]: 246) reported that *Pelochelys* seems to have disappeared from the Chao Phraya and Mae Klong, and van Dijk and Palasuwan (2000: 144) noted the species as “locally extinct Chao Phraya and Mae Klong systems and probably from other minor river systems”.

OCCURRENCE OF *PELOCHELYS* IN THE PHILIPPINES

General statements of distribution of Giant Softshell Turtles, *Pelochelys*, have included the Philippines for many years, since Gray (1844) to the present (Meylan, 1987; Iverson, 1992; Ernst et al., 2000).

Gray (1844: 49) first mentioned the two syntypes of *Pelochelys cumingii* (Gray, 1864: 90) as specimens “a. Adult stuffed. Philippine Islands. From Mr. Cuming’s collection.” and “b. In spirits, very young...India.” This same information accompanied specimens “a” and “b” in Gray (“1855”[1856]: 70), except that the locality of specimen “b” (the young in spirits) was changed from India to the Philippine Islands. In neither report (1844 or “1855”[1856]) was Cuming associated with specimen “b.” In the description of *P. cumingii*, Gray (1864: 90) linked Cuming with the young specimen. The Philippine Islands and Cuming were associated with both syntypes by Gray (1873: 76) and Boulenger (1889: 263). Thus, there may be some question concerning at least the locality of the young syntype in fluid, initially recorded from India and not associated with Cuming. Old registration BMNH numbers were not associated with the two Cuming specimens now catalogued as 1946.1.22.13 (young) and 1947.3.4.5 (stuffed).

Hugh Cuming (1791-1865), ardent shell collector, did visit the Philippines and vicinity. Dance (1966: 154) noted that he arrived in Manila on 24 July 1836, and visited “Bantoyan, Bohol, Burias, Camiguin de Misamis, Capul, Cebu, Corregidor in the mouth of Manila Bay,

Cuyo, Guimaras, Leyte, Lubang, Masbate, Mindoro, Negros, Samar, Siquijor, Tablas, Temple and Ticao. On the island of Mindanao he visited the Province of Misamis and on the island of Luzon the Provinces of Albay, Bulacan, Cagayan, South Camarines, North and South Ilocos, Laguna, Nueva Ecija, Pampanga, Pangasinan, Tayabas, Tondo [Rizal] and Zambales." Dance (1966: 157) also noted that "About 11 November 1839 Cuming left Manila for Singapore and from there he paid short visits to Malacca and Sumatra before...[arriving]...back in London on 5 June 1840." Dance (1966: 165) also quoted a letter of Cuming to the Trustees of the British Museum (offering the sale of his shell collection) in which Cuming noted his voyage to "the Eastern Ocean (when the Philippine Islands were carefully explored), in 1836, 1837, 1838 and 1839; and to Sincapore [sic], Sumatra, and the Malayan Peninsula, in 1840."

Dance (1966: 167) also commented that "several authorities have questioned the accuracy of the statements of habitat accompanying the original published descriptions of many species (shells) described from the Cuming collection,...[and further that]...many other Cumingian localities have been shown to be completely erroneous, so many in fact that the accuracy of all Cuming's data is seriously impugned."

Baur (1891) mentioned a *Pelochelys* skull in the Philadelphia Academy from the Philippines (No. 111). This skull cannot be found. Baur presumably referred to the Academy of Natural Sciences, Philadelphia, where no *Pelochelys* skull now exists (Edmond Malnate, in litt.).

Taylor (1921: 186) mentioned the Philippine trionychid turtles cited by Casto de Elaras (1895, not seen by author), who listed *Dogania subplana*, *Chitra indica*, and *Trionyx sinensis*. Taylor noted the *Chitra* record based on Gray's account (1844) of *C. indica* and dismissed occurrence of the other species. Taylor (1921: 188) transcribed data of collection of a captive Philippine *Pelochelys* in the Bureau of Science Aquarium (Manila) as "captured in 1918 at San Miguel, Bulacan Province, Luzon, by Mr. Genesis Pating, and was presented to the aquarium by Mr. George Symmonds, of Manila"; he

noted that this specimen (footnote) died, was preserved, but destroyed by a fire in 1920. Taylor (1921: 187) provided measurements (CL 350 mm, CW 315 mm, and PL 295 mm) and photographs (Pl. 16, Figs. 3 [dorsal], 4 [ventral view]) of this specimen, and used the description and photographs of the same specimen in his account of Thailand turtles (1970: 151, Fig. 13).

Smith (1931: 161-162) noted that specimens of *Pelochelys* examined by him from "the Philippine Islands have seven neural plates and the last two pairs of costals in contact with one another." It is not certain as to which specimens Smith refers; some of Malcolm A. Smith's specimens at least are now in the BMNH and MCZ. The only BMNH "Philippine" specimens are the two syntypes of *P. cumingii* (Colin J. McCarthy, in litt., 2 May 2002); the stuffed syntype has eight neurals and only the eighth pair of costals in medial contact. No Philippine specimens of *Pelochelys* are catalogued in MCZ (José Rosado, in litt., 3 May 2002).

Three museum catalogue entries indicate occurrence of *Pelochelys* in the Philippines. MNHN 1883-416 is a mounted specimen from Luzon; received from Marche. SMF 8069 (SMF number when visited in 1973) is listed in Boettger (1893: 16, as *Pelochelys cantoris*) with the number "3163" from "Laguna de Bay, Luzon (Philippinen). Gesch. 1890 von Konsul Dr. O. Fr. von Moellendorff, Manila." Finally, the only USNM (Ron Crombie) specimen from the Philippines was "purchased from local apothecary" (Traci Hartsell, in litt., March 2002). None of these were examined by the author.

The above-mentioned excerpts imply that *Pelochelys* occurs or may have occurred in the Philippine Islands. However, Alcalá (1986) did not mention *Pelochelys* in his survey of the Philippine herpetofauna, and remarked (in litt., 15 July 1992) that "I can say that there has been no recent publication or written record to indicate that this genus is found on Luzon or elsewhere in the country. Considering the past (post-Taylor) and present collecting activity of field workers on Luzon and other parts of the country, it is very likely that *Pelochelys* does not occur in the Philippines." Records of past occurrence may have

been based on waifs, escapees, market purchases, or on populations now extirpated. Feral populations of *Pelodiscus sinensis* (import date unknown) do occur on the islands of Luzon and Cebu (Indraneil Das, and photos, in litt., 17 December 1993). The occurrence of viable, reproducing populations of *Pelochelys* in the Philippines is uncertain. Extensive trapping activities in the major rivers (especially Luzon) and monitoring of the markets are necessary to fortify conclusions of presence or absence. It is hoped this discussion will stimulate colleagues to focus on the status of *Pelochelys* in the Philippine Islands.

Thus, the overall "Philippines" type-locality of *Pelochelys cumingii* is questionable, especially in view of the spurious data of collection associated with at least some of Cuming's shell collections. Characteristics of the two syntypes of *P. cumingii* do not negate their assignment to *P. cantorii*. The type-locality may well be one of the other places visited by Cuming (Singapore, Sumatra, Malayan Peninsula) in 1840.

However, *Pelochelys* most probably does occur in the Philippines in the vicinity of the small islands (Sulu Archipelago) off the north-east coast of Sabah (Borneo). The only here-accepted record of occurrence of *Pelochelys* in the Philippines is from Balabac Island (Siebenrock, 1903: 351), north of Sabah and just south of Palawan.

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LITERATURE CITED

ALCALA, A. C. 1986. Guide to Philippine flora and fauna. Vol. X. Amphibians and reptiles. Natural Resources Management Centre, Ministry of Natural Resources, Univ. Philippines, Manila. 195 pp.

ANNANDALE, N. 1912. The Indian mud-turtles (Trionychidae). *Rec. Indian Mus.*, 7: 151-180, 2 pls.

BAUR, G. 1891. Notes on the trionychian genus *Pelochelys*. *Ann. Mag. nat. Hist.*, Ser. 6, 7: 445-446.

BOETTGER, O. 1893. Katalog der Reptilien-Sammlung im Museum der Senckenbergischen Naturforschenden Gesellschaft in Frankfurt am Main. I. Teil (Rhynchocephalen, Schildkröten, Krokodile, Eidechen, Chamäleons). Gebrüder Knauer, Frankfurt a. M. x + 140 pp.

BOULENGER, G. A. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). Taylor & Francis, London. x + 311 pp.

CANTOR, T. E. 1847. Catalogue of reptiles inhabiting the Malayan Peninsula and islands. *J. Asiatic Soc. Bengal*, 16: 607-656, 897-952, 1026-1078. (Reprinted A. Asher, Amsterdam, 1966.)

COX, M. J., P. P. VAN DIJK, J. NABHITABHATA & K. THIRAKHUPT. 1998. A photographic guide to snakes and other reptiles of Peninsular Malaysia, Singapore and Thailand. New Holland Publ. (UK) Ltd., London. 144 pp.

DANCE, S. P. 1966. Shell collecting. An illustrated history. University of California Press, Berkeley. 344 pp., 35 pls.

DE ROOIJ, N. 1915. The reptiles of the Indo-Australian Archipelago. I. Lacertilia, Chelonia, Emydosauria. E.J. Brill Ltd., Leiden. 384 pp.

ERNST, C. H., R. G. M. ALTENBURG, & R. M. BARBOUR. 2000. Turtles of the world. ETI (Expert Center for Taxonomic Identification), World Biodiversity Database, CD-Rom Series (Windows Version 1.2), University of Amsterdam, Amsterdam.

FARKAS, B. L. 1994. Notes on type and type locality of the narrow-headed softshell turtle,

- Chitra indica* (Gray, 1831) (Testudines, Trionychidae). *Misc. Zool. Hungarica* 9: 117-119.
- _____ & U. FRITZ. 1998. On the identity of *Rafetus swinhoei* (Gray, 1873) and *Pelochelys maculatus* (Heude, 1880) (Reptilia: Testudines: Trionychidae). *Zool. Abh. Staatlich. Mus. Tierkunde Dresden* 50: 59-75.
- GIRGIS, S. 1961. Observations on the heart in the Family Trionychidae. *Bull. British Mus. (nat. Hist.)*, *Zool.* 8: 73-107.
- GRAY, J. E. 1831. Synopsis Reptilium; or short descriptions of the species of reptiles. Part I.- Cataphracta. Tortoises, Crocodilians, and Enaliosaurians. Treuttel, Wurtz; G.B. Sowerby; and W. Wood, London. viii + 85 + [2] pp; 10 pls.
- _____. 1844. Catalogue of the tortoises, crocodiles, and amphisbaenians in the collection of the British Museum. E. Newman, London. viii + 80 pp.
- _____. "1855"[1856]. Catalogue of shield reptiles in the collection of the British Museum. Part I. Testudinata (Tortoises). Taylor & Francis, London. [3] + 79 + [2] pp., 50 pls. (published 8 March 1856.)
- _____. 1864. Revision of the species of Trionychidae found in Asia and Africa, with the descriptions of some new species. *Proc. Zool. Soc. London* 1864: 76-98.
- _____. 1870. Supplement to the catalogue of shield reptiles in the collection of the British Museum. Part I. Testudinata (Tortoises). With figures of the skulls of 36 genera. Taylor & Francis, London. ix + [1] + 120 pp.
- _____. 1873. Hand-list of the specimens of shield reptiles in the British Museum. E. Newman, London. iv + 124 pp.
- GÜNTHER, A. C. L. G. 1864. The reptiles of British India. Ray Society, London. xxvii + 452 pp., 26 pls. (Reprint edition about 1982, Oxford & IBH Publ. Co., New Delhi.)
- IVERSON, J. B. 1992. A revised checklist with distribution maps of the turtles of the world. Privately published, Richmond, Indiana. xiii + 363 pp.
- MEYLAN, P. A. 1987. The phylogenetic relationships of soft-shelled turtles (Family Trionychidae). *Bull. American Mus. Nat. Hist.* 186: 1-101.
- MOCQUARD, F. 1907. Les reptiles de L'Indo-Chine. Revue Coloniale, Librairie Maritime et Coloniale, Paris. 59 pp.
- NIEKISCH, M., B. FARKAS, U. FRITZ, & H. D. DÚC. 1997. Rekordgrößen bei weichschildkröten im stadtzentrum von Hanoi, Veitnam. *Herpetofauna* 19: 28-34.
- NUTPHAND, W. 1979. The turtles of Thailand. Siam Farm Zool. Garden, Bangkok. [8] + 1-222 pp.
- OWEN, R. 1859. Descriptive catalog of the specimens of natural history in spirit contained in the Museum of the Royal College of Surgeons of England. Vertebrata: Pisces, Reptilia, Aves, Mammalia. Taylor & Francis, London. xxii + 148 pp.
- RHODIN, A. G. J. & V. R. GENORUPA. 2000. Conservation status of freshwater turtles in Papua New Guinea. In: Asian turtle trade: proceedings of a workshop on conservation and trade of freshwater turtles and tortoises in Asia. pp: 129-136. P. P. van Dijk, B. L. Stuart & A. G. J. Rhodin (Eds). *Chelonian Res. Monogr.* No. 2.
- _____, R. A. MITTERMEIER & P. M. HALL. 1993. Distribution, osteology, and natural history of the Asian giant softshell turtle *Pelochelys bibroni* in Papua New Guinea. *Chelonian Conserv. & Biol.* 1: 19-30.
- SIEBENROCK, F. 1903. Schildkröten des östlichen hinterindien. *Sitzungsber. Kaiserl. Akad. Wissensch. Wien* 112: 333-352.
- SMITH, M. A. 1931. The fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. I.- Loricata, Testudines. Taylor and Francis, London. xxviii + 185 pp.; 2 pls.
- TAYLOR, E. H. 1921. Amphibians and turtles of the Philippines. *Philippine J. Sci.* 15: 1-193, 17 pls. (Reprinted A. Asher & Co., Amsterdam, 1966.)
- _____. 1970. The turtles and crocodiles of Thailand and adjacent waters with a synoptic herpetological bibliography. *Univ. Kansas Sci. Bull.* 49: 87-179.
- THEOBALD, W. 1876. Descriptive catalogue of the reptiles of British India. Thacker,

Spink and Co., Calcutta. x + 238, i-xxxviii [synopsis]; i + xiii [index] pp.; 3 pls.

THIRAKHUPT, K. & P. P. VAN DIJK. "1994"[1995]. Species diversity and conservation of turtles of western Thailand. *nat. Hist. Bull. Siam Soc.* 42: 207-259 (issued July 1995.)

VAN DIJK, P. P. & T. PALASUWAN. 2000. Conservation, status, trade, and management of tortoises and freshwater turtles in Thailand. *In: Asian turtle trade: proceedings of a workshop on conservation and trade of freshwater turtles and tortoises in Asia.* pp: 137-144. P. P. van Dijk, B. L. Stuart & A. G. J. Rhodin (Eds). *Chelonian Res. Monogr.* No. 2.

WEBB, R. G. 1995. Redescription and neotype designation of *Pelochelys bibroni* from southern New Guinea (Testudines: Trionychidae). *Chelonian. Conserv. & Biol.* 1: 301-310.

_____. 1997. Geographic variation in the giant softshell turtle, *Pelochelys bibroni*. Linnaeus Fund Research Report. *Chelonian Conserv. & Biol.* 2: 450.

ZHANG, M. 1984. A new species of *Pelochelys* from Zhejiang, with subfossil description. *Acta Herpetol. Sinica, Chengdu [new ser.]* 3: 71-76. [Chinese text, English abstract.]

ZHOU, K. 1997. Studies on the classification of Chinese soft-shelled turtles (Trionychidae). *In: Chinese Chelonian Research*, pp. 55-64. E. Zhou, J. Zhou & T. Zhou (Eds). *Herpetol. Ser.* 9; *Sichuan J. Zool.* 15 (suppl.), [6] + 1-159 + [3] pp. [Chinese text, English summary.]

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