

ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN
(MINISTERIE VAN WELZIJN, VOLKSGEZONDHEID EN CULTUUR)

Deel 58 no. 15

16 november 1984

ISSN 0024-0672

LAND TORTOISE TYPES IN THE RIJKSMUSEUM VAN NATUURLIJKE HISTORIE WITH COMMENTS ON NOMENCLATURE AND SYSTEMATICS (REPTILIA: TESTUDINES: TESTUDINIDAE)

by

MARINUS S. HOOGMOED

and

CHARLES R. CRUMLY

Hoogmoed, M. S. & C. R. Crumly. 1984. Land tortoise types in the Rijksmuseum van Natuurlijke Historie with comments on nomenclature and systematics (Reptilia: Testudines: Testudinidae).

Zool. Med. Leiden, 58(15), 16-xi-1984: 241-259, figs. 1-8, tables 1-2. — ISSN 0024-0672.

Key words: Testudinidae; holotypes; lectotypes; taxonomy; nomenclature.

The holotype of *Testudo vosmaeri* Fitzinger, 1826 [= *Geochelone vosmaeri*] is RMNH 6001. The holotype of *Testudo forstenii* Schlegel & Müller, 1840 [= *Indotestudo forstenii*] is RMNH 3811. *I. forstenii* is considered a senior synonym of *T. travancorica* Boulenger, 1907 because plastral colour pattern, gular measurements, and general shell morphology do not distinguish Indian populations from Indonesian populations. The lectotype of *Testudo emys* Schlegel & Müller, 1840 [= *Manouria emys*] is RMNH 3808. *Indotestudo* and *Manouria* are recognized as separate genera and briefly diagnosed. In order to avoid nomenclatural confusion and conserve current usage, the pre-Linnaean figure in Piso (1658: 105) is selected as the lectotype for *Testudo geometrica* Linnaeus, 1758 [= *Psammobates geometricus*]. The holotype of *Testudo strauchi* Van Lidth de Jeude, 1893, is RMNH 6011, and is an unusual specimen of *Psammobates geometricus*.

M. S. Hoogmoed, Rijksmuseum van Natuurlijke Historie, Postbus 9517, 2300 RA Leiden, The Netherlands;

C. R. Crumly, Division of Amphibians and Reptiles, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A. (present address: Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138, U.S.A.).

INTRODUCTION

During a study of the intergeneric relationships of land tortoises (family Testudinidae) one of us prepared a checklist of the living species (Crumly, 1984; in prep.). During the preparation of this checklist type specimens of as many species as possible were located and examined. Several holotypes and some syntypes were found in the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH) and independently examined by both authors, leading to some systematic and distributional corrections. In addition, a nomenclatural problem more serious than undesignated types and which had been occupying the senior author for some time, was brought to the attention of the junior author. If this latter problem remains uncorrected, undesirable and unnecessary changes in nomenclature might effect some well-known tortoises. In order to avoid this chaos, we designate a pre-Linnaean lectotype.

The generic names employed here are those supported by the recent studies of one of us (Crumly, 1984); we provide brief diagnoses for *Indotestudo* and *Manouria*. We use the museum acronyms recommended by Duellman et al. (1978).

***Geochelone vosmaeri* (Fitzinger, 1826)**
(fig. 1)

Geochelone vosmaeri is one of the extinct tortoises that once inhabited Rodriguez in the Mascarene island group. The holotype is RMNH 6001 and is the shell of a male that has been varnished (see fig. 1). According to a personal communication by Vosmaer to Schoepff (1792: 120), this specimen was sent to Holland from the Cape of Good Hope without any further data. The specimen was described and figured by Schoepff (1792: pl. 22b) under the name *Testudo indica* Vosmaeri (i.e. *Testudo indica* sensu Vosmaer). Following Fitzinger's (1826) description, Temminck & Schlegel (1838) also mentioned this specimen, repeating the locality given by Vosmaer, and stated that the species did not occur in the Cape region. Their remark that this same specimen was the type of *Chersine retusa* Merrem, 1820, is only partly true (RMNH 6001 can be considered one of the syntypes). Günther (1877) suggested that the specimen figured by Schoepff (1792) (i.e. the holotype) probably came from Rodriguez. Hubrecht (1881) again discussed this specimen, provided measurements (some of which cannot be duplicated), and stated that it had been sent from the Cape in transit "from its original habitat Rodriguez." (p. 43). The following measurements (in mm) apply to this specimen:

Straight carapace length	795
Curved carapace length	920
Plastral mid-seam lengths	
Single gular	
Humeral mid-seam	107
Pectoral mid-seam	35
Abdominal mid-seam	190
Femoral mid-seam	70
Anal mid-seam	72

Bour (1980b) suggested that the Mascarene tortoises be recognized as a distinct genus and elevated the subgenus *Cylindraspis* Fitzinger, 1835, to generic rank. Although Bour's evidence indicates that *Cylindraspis* is a monophyletic group, we prefer to follow Arnold (1979) and continue to allocate this species to the genus *Geochelone*. We do this because recognition of *Cylindraspis*, whose affinities clearly lie with *Geochelone* (sensu Auffenberg, 1974), would require the recognition of other genera for which there is no evidence of monophyly (e.g. the subgenus *Chelonoidis* would be elevated to generic rank, see Crumly, 1984).

Indotestudo forstenii (Schlegel & Müller, 1840)

(figs. 2, 3, 4)

Testudo forstenii was named in a footnote by Schlegel & Müller (1840). Their description was not long, but was clear. Below, this description is quoted verbatim and also translated into English.

The original Dutch description (p. 30):

"*Testudo Forstenii*, nobis, van Gilolo (*). [in the text]. [in a footnote]. (*) Deze nieuwe soort, door den onlangs overledenen reiziger, Dr. Forsten ontdekt, en van welke wij in het vervolg eene uitvoerige beschrijving en afbeelding zullen geven, heeft een langwerpig en zeer bol schild; er is geen nek-schildje aanwezig; de twee achterste schilden van het buikschild zijn klein. De staart is buitengewoon kort en heeft de gedaante van eenen kegelvormigen stomp. De pooten zijn met gekorrelde schubben bezet; die op den buitenrand der voorpooten zijn groot, maar smal en puntig, en hebben eene nagelvormige gedaante. De snuit is van voren een weinig gebogen, vormende zijne lijn schier een' regten hoek met de bovenlijn. Van boven is de snuit slechts door

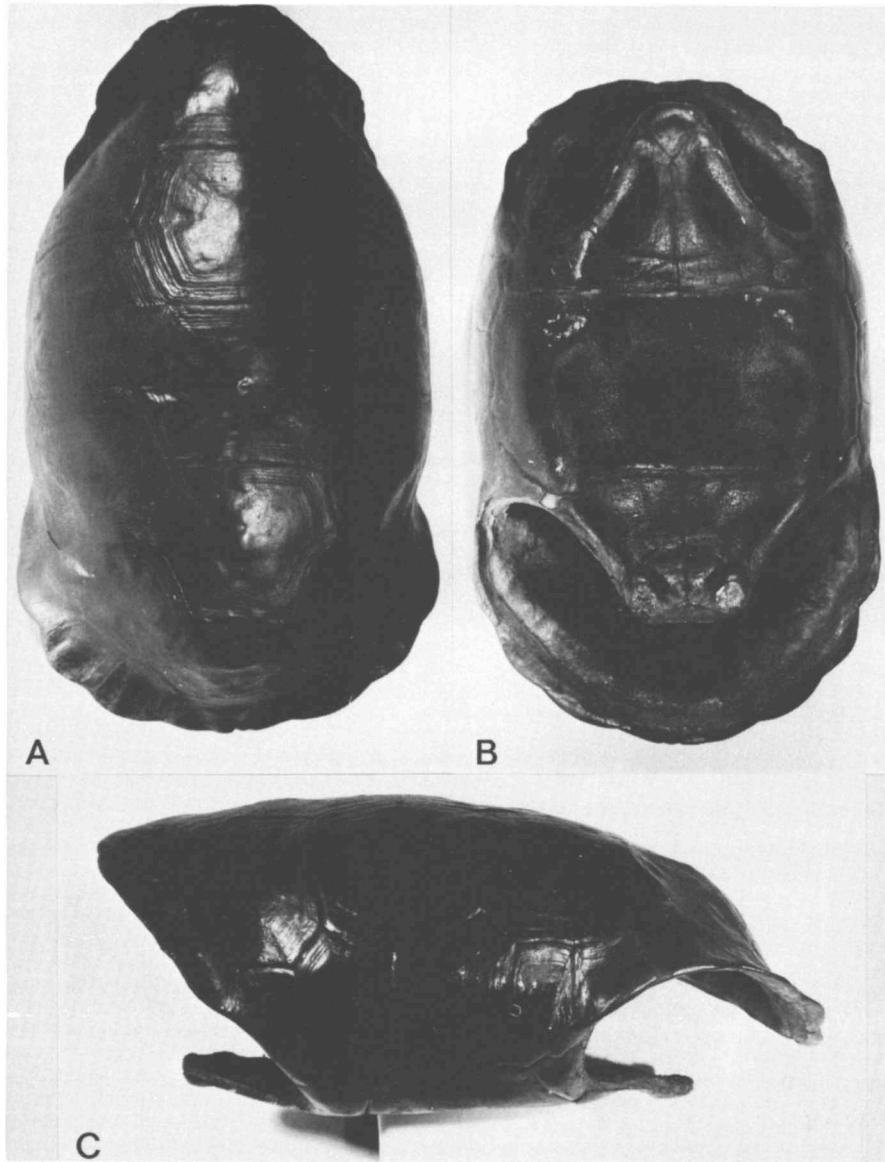


Figure 1. The holotype of *Geochelone vosmaeri*, RMNH 6001. A, the dorsum of the carapace; B, the plastron; C, a lateral view. ($\times 0.12$).

een paar groote schilden bedekt; op deze volgt het kruinschild, hetwelk aan weërszijde door een schild van middelmatige grootte vergezeld is; de overige schilden van den kop zijn vrij onregelmatig. Het ruggeschild van dit dier is

omstreeks elf duim lang en, door de licht bruine kleur, welke door onregelmatig verspreide, grootere of kleinere zwarte vlekken afgewisseld wordt, merkwaardig; op het buikschild is aan weërszijde slechts eene groote, diergelijke zwarte vlek voorhanden."

An English translation (paranthaletical remarks are interpretation):

"This new species, discovered by the recently deceased traveller Dr. Forsten, and from which we will later on provide an extensive description and illustration, has a long and very convex shell; there is no cervical scute; the two posteriormost shields of the plastron [= anals] are small. The tail is extremely short and has the shape of a conical stump [?= tail spine present]. The legs are covered with granular scales, which on the outer edge of the fore limbs are large, but narrow and pointed, and having a nail-shaped appearance. Anteriorly the snout is slightly curved, its outline nearly forming a right angle with the upper surface. Dorsally the snout is covered by a few large scales; these are followed by the crown shield [? = frontal], which on both sides is accompanied by a scale of medium size; the remaining scales on the head are rather irregular. The carapace of this animal is about eleven "inches" long and, because of the light brown colour, which is alternated by irregularly dispersed larger or smaller black spots, peculiar; on the plastron only a single large, similar black spot is present."

From the preceding description we conclude that only a single specimen was described, which thus is the holotype. This specimen, preserved in alcohol, is still part of the RMNH collection (reg. no. 3811) and bears the following label:

"aTestudo Forstenii
voy Forsten Gilolo"

A photograph of the dorsum and venter of this specimen was published in the RMNH annual report for 1980 (Vervoort, 1981). Schlegel & Müller (1840) never provided an illustration of *Indotestudo forstenii*. Included here are photographs of the holotype (fig. 2). The following measurements (in mm) apply to this specimen:

Straight carapace length	235
Plastral mid-seam lengths	
Gular mid-seam	23
Humeral mid-seam	29
Pectoral mid-seam	15
Abdominal mid-seam	83
Femoral mid-seam	40
Anal mid-seam	0

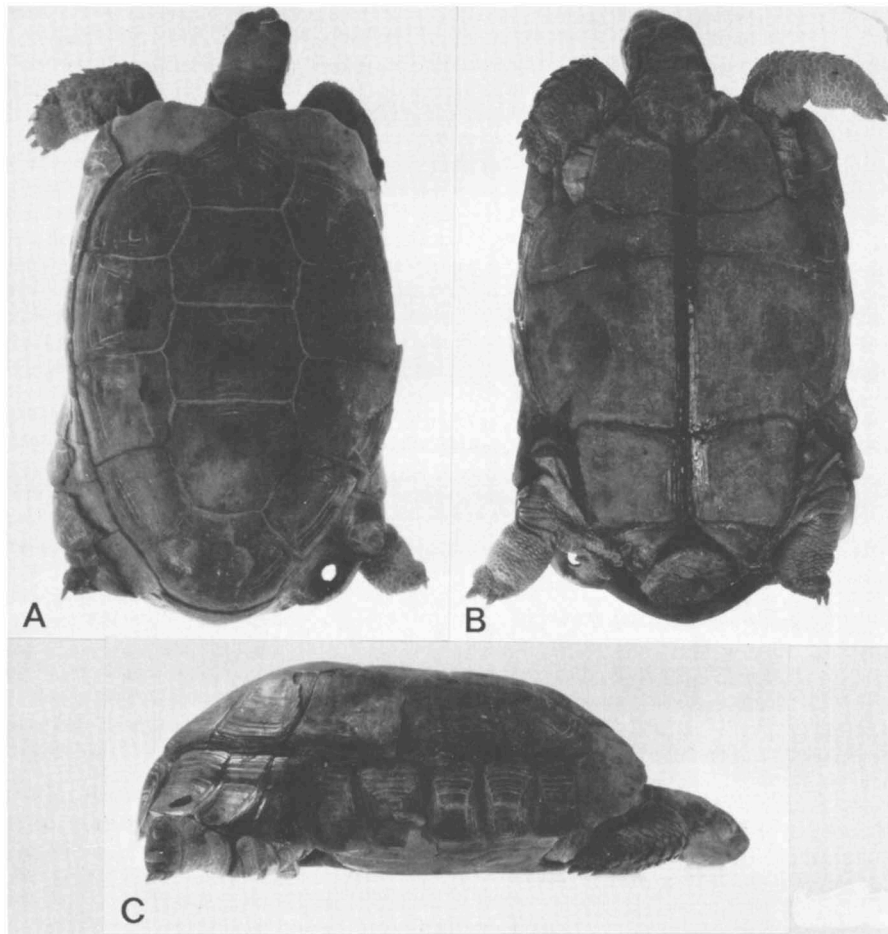


Figure 2. The holotype of *Indotestudo forstenii*, RMNH 3811. A, the dorsum of the carapace; B, the plastron; C, a lateral view ($\times 0.28$).

Only five specimens of East Indian *Indotestudo forstenii* are known to us. These are the holotype (RMNH 3811), a stuffed specimen in the Naturhistorisches Museum Basel (NHMB 137), a stuffed female and a preserved specimen in the British Museum (BM(NH) 1872.4.6.116 and 1896.12.9.1, respectively), and a preserved specimen in the National Museum of Natural History, Washington, D.C. (USNM 52973). Because there are so few specimens, it is difficult to assess the taxonomic status of *I. forstenii*¹). This is especially troubling because *I. forstenii* is the only testudinid that occurs east of Wallace's Line in the East Indies. Only the holotype comes from Halmahera [= Gilolo]; the other specimens come from Sulawesi [= Celebes]. Only three of the Sulawesi speci-

mens have specific locality data: BM(NH) 1872.4.6.116 and USNM 52973, Boliahoeta [= ? Mt. Boliahutu], North Salamatta, Celebes; BM(NH) 1896.12.9.1, Buol, North Celebes. Groombridge & Wright (1982) noted that W. H. Timmis had seen four specimens in or near the Morowali Reserve of central Sulawesi.

It seems useful to stress that the type locality of *Indotestudo forstenii* is Gilolo (an old name for the island of Halmahera) and not "Mt. Boliohuto, near Sulamatta, Buol, in the extreme north" (of Sulawesi) as Groombridge & Wright (1982: 75) stated. Perhaps they misinterpreted De Rooij's (1915: 307) list of localities which was apparently based on BM(NH) and RMNH material.

The strange distribution of *Indotestudo* (see fig. 3) and the extreme rarity of this species has prompted suspicion that *I. forstenii* is not native to Sulawesi or

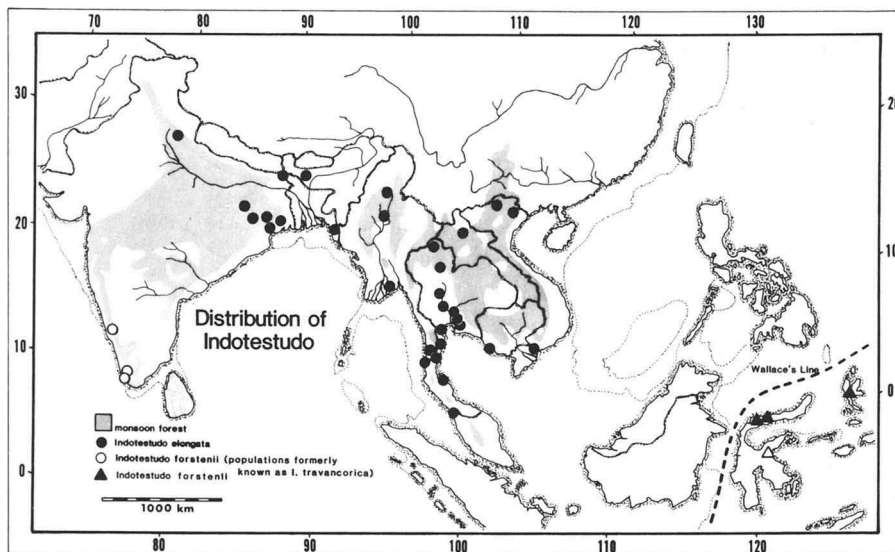


Figure 3. The distribution of *Indotestudo*. The open triangle represents a literature record (Groombridge & Wright, 1982).

¹⁾ Through the kindness of Mr. Peter Meylan (Florida State Museum), we have just learned of the importation (into the USA) of about 60 specimens of *Indotestudo* that supposedly came from Sulawesi. These specimens were imported from Jakarta. Mr. Meylan tells us that they exhibit darker carapaces and lighter plastra than characteristic *I. elongata*.

Furthermore, Meylan reports that many of these specimens, which are supposedly *I. forstenii*, have a cervical scute. However, the colour pattern of *I. elongata* is notoriously variable and we suspect that some of the *I. "forstenii"* are, in fact, specimens of *I. elongata* that became confused with Sulawesi specimens by the pet traders (added in proof).

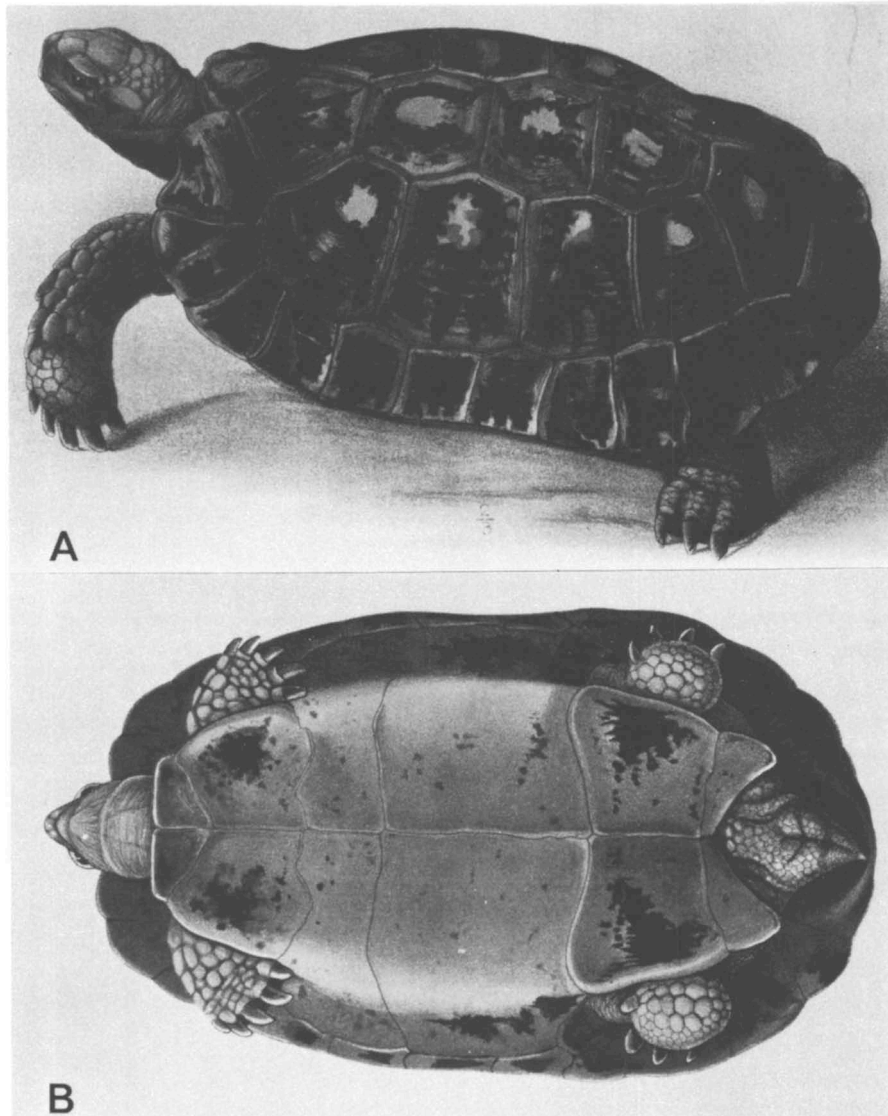


Figure 4. Copies of Boulenger's (1907) original colour plates of "*Testudo travancorica*", a junior synonym of *Indotestudo forstenii* (Schlegel & Müller, 1840). A, habitus; B, the plastron. Del. J. Green.

Table 1. A comparison of the ineffective characters used to distinguish *Indotestudo travancorica* from *Indotestudo forstenii*. Data from USNM specimens of *Indotestudo elongata* are included as a comparison. Some gular measurements were taken from published figures and from colour transparencies (indicated by*) and may be in error due to paralax or disproportionality.

Halmahera (Auffenberg, pers. comm.; Groombridge & Wright, 1982; Pritchard, 1979), but may have been occasionally introduced by man. The characters that distinguish the Indian *I. travancorica* (Boulenger, 1907) from *I. forstenii* contribute to this doubt about the status of the two taxa. Wermuth & Mertens (1961) noted that *I. forstenii* has a dark blotch on each abdominal scute near its anterior border and each gular scute is as broad as long. In *I. travancorica*, the abdominal blotches were supposed to be absent and each gular should be broader than long (fig. 4). However, Pritchard (1979) stated that abdominal blotches were present in most specimens of *I. travancorica*. Pritchard (1967) had previously incorrectly allocated *I. forstenii* to the subgenus *Manouria*. This mistake was corrected in Pritchard (1979).

To demonstrate that gular proportions are not diagnostic, we performed a two-tailed t-test for significance between two means for the measurements reported in table 1. The means of *I. forstenii* and *I. travancorica* are not statistically different (critical $t_{0.05,(2),27} = 2.05$; calculated $t = 0.19$). Thus, the supposedly diagnostic gular proportions are not statistically significant. In addition, other elements of the shell morphology of *I. travancorica* are very similar to *I. forstenii* (see the plates of *I. travancorica* in Boulenger, 1907, reproduced in fig. 4). The means for the gular measurements for *I. travancorica* and *I. elongata* are not statistically different (critical $t_{0.05,(2),36} = 2.03$; calculated $t = 0.83$).

Conversely, the features that distinguish *I. elongata* from *I. forstenii* (plus *I. travancorica*) are reasonably good. The best distinguishing feature is the presence or absence of a cervical scute; *I. elongata* possesses this scute, whereas *I. forstenii* and *I. travancorica* lack a cervical scute. In regard to the inadequate features used to distinguish *I. forstenii* from *I. travancorica*, *I. elongata* has abdominal blotches and each gular is usually slightly longer than broad.

If *Indotestudo forstenii* was introduced east of Wallace's Line by man and is not different from *I. travancorica*, then an irritating situation arises. *I. forstenii* was named nearly seventy years before Boulenger (1907) named the naturally occurring source population, *I. travancorica*. We have no incontrovertible evidence that *I. forstenii* was in fact introduced; nevertheless, the morphological and geographic evidence strongly suggests that *I. travancorica* and *I. forstenii* are identical. We therefore designate *Testudo travancorica* Boulenger, 1907, a junior synonym of *I. forstenii*. A comparison of the gular and abdominal blotch characteristics of *I. travancorica* and *I. forstenii* is presented in table 1. It is clear from table 1 that specimens do not always possess the proper combination of features which supposedly distinguish the Indonesian and peninsular Indian populations.

Indotestudo has been considered a subgenus of *Geochelone* (see Auffenberg,

1971, 1974); Wermuth & Mertens (1977) consider *Indotestudo* a subgenus of *Testudo*. It has been elevated to generic level because *Indotestudo* can be distinguished from other *Geochelone* by its short trachea, undifferentiated marginal scutes, three of which contact the second costal scute, and a humeropectoral sulcus that crosses the entoplastron in a transverse direction (Crumly, 1984).

***Manouria emys* (Schlegel & Müller, 1840)**
(figs. 5, 6)

Schlegel & Müller (1840) also named *Testudo emys* [= *Manouria emys*] and provided both a good description and an outstanding colour plate (see fig. 5). Currently, four of the original six specimens are in the Rijksmuseum van Natuurlijke Historie, Leiden. Only one of these specimens, RMNH 3808, is preserved in alcohol. Since we feel that this specimen was the basis for the plate, we designate it the lectotype (see fig. 6). The lectotype bears the following exterior jar label:

“*Testudo emys*

158

S. Müller Sumatra”

All the remaining specimens are either skeletons or stuffed. These specimens are designated paralectotypes and bear the following labels:

RMNH 6005 & 6030

(both stuffed)

“*Testudo Emys* Schl. & M.

Batang, Singalang

Müller, 1834 [Sumatra]”

(On the bottom of the base board of 6005)

“Rivière anie Jullet 1834 Müller”

[= River Anai or Aneh, July 1834]

RMNH Cat. ost. a

= 17967 (skeleton)

“*Testudo emys* Müll. & Schleg.

Cat. ost. a type

Coll. de M. S. Müller Batang, Singalang
Sumatra”

Measurements for these four specimens are given in table 2. Another paralectotype is in the Paris Museum (MNHN 9422). Duméril & Duméril (1851) noted that this specimen was received from the Leiden Museum. A photocopy of the Paris tortoise holdings, provided through the kindness of Roger Bour, indicates that this specimen came from Salomon Müller's voyage.

Van Lidth de Jeude (1895) provided the first extensive discussion of the morphology and affinities of *Manouria emys*. He established the date of publication of the presently recognized binomial and synonymized many names

with the senior name (*Testudo emys* Schlegel & Müller, 1840), including: *Testudo emydoides* Duméril & Duméril, 1851; *Manouria fusca* Gray, 1852; *Testudo phayrei* Blyth, 1853; *Teleopus luxatus* Leconte, 1854; and *Testudo (Scapia) falconeri* Gray, 1869.

Mus. No.	Straight Carapace Length	Gular	Humeral	Plastral Mid-seam Abdominal	Lengths Femoral	Anal
Lectotype: 3808	160	22	32	61	20	23
Paralectotypes: 6005	181	25	32	67	20	28
6030	308	40	62	110	38	39
17967	320	*33	56	116	35	36

* damaged

Table 2. Measurements from the lectotype and paralectotypes of *Manouria emys* in the Rijksmuseum van Natuurlijke Historie, Leiden (all measurements are in mm). The pectoral scutes do not have mid-seam lengths because they do not contact one another medially.

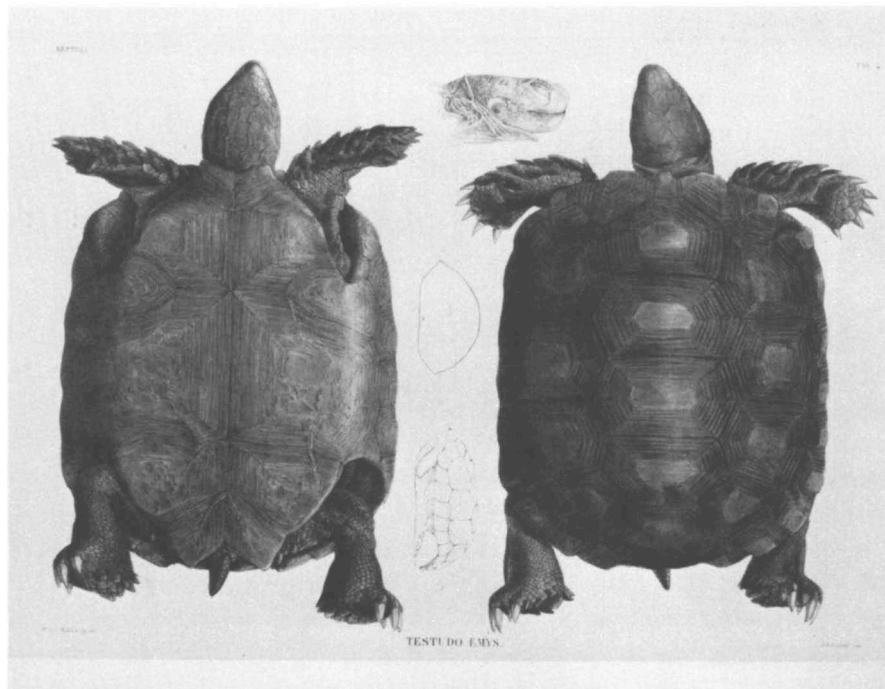


Figure 5. Copy of plate 4 of Schlegel & Müller (1840), which illustrates *Manouria emys*.

Recently, *Manouria* has received some overdue attention. Bour (1980a) suggested the elevation of *Manouria* to generic level from its previous status as a subgenus of *Geochelone*. In fact, Bour recommended that all the subgenera of *Geochelone* (sensu Auffenberg, 1974) be elevated to generic level. However, Bour's opinion was not supported with data. Furthermore, using cranial osteological data, Crumly (1982) showed that some of the subgenera may be unnatural (i.e. not monophyletic). More recent evidence (Crumly, 1984) does support the generic status of *Manouria* and *Indotestudo*, but not of many other subgenera of *Geochelone*.

Hutchison & Bramble (1981) used *Manouria* as an example of reduction of the pectoral scute, but made no mention of their reasons for considering *Manouria* a separate genus. Without comment, they also recognized *Manouria*

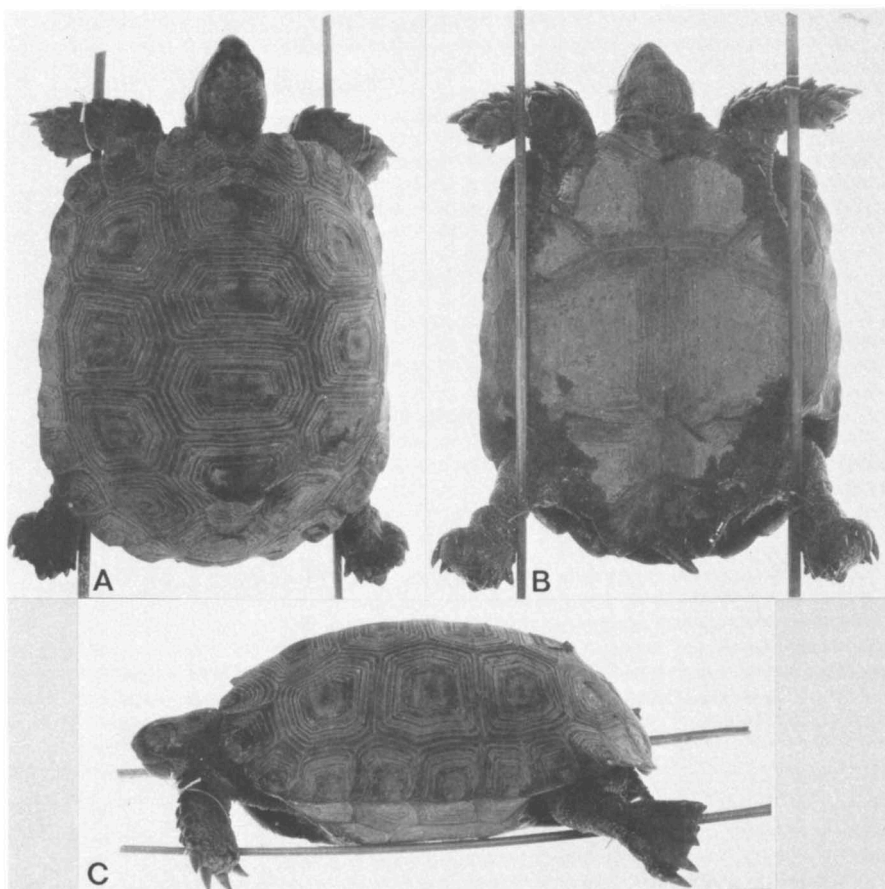


Figure 6. The lectotype of *Manouria emys*, RMNH 3808. A, the dorsum of the carapace; B, the plastron; C, a lateral view ($\times 0.36$).

and *Hadrianus* as separate genera, despite Auffenberg's (1971) contention that they were synonymous.

Obst (1983) provided the most extensive recent discussion of *Manouria*. He discussed the recent description of a new species, *Testudo nutapundi* Nutaphand, 1979. Obst showed convincingly that this form is a subspecies of *Manouria emys*. As will be shown by Bour & Crumly (in prep.), *Manouria emys nutapundi* is a junior synonym of *Testudo phayrei* Blyth, 1853, but Nutaphand (1979) should be congratulated for drawing attention to a long unrecognized race of *Manouria emys*. For a more detailed account of the events surrounding the naming of *Testudo nutapundi* see Bour & Crumly (in prep.). Because *Manouria* has received this recent attention and because recent work has demonstrated that *M. emys* may comprise two subspecies, we feel it is important to designate a lectotype for *Manouria emys* (Schlegel & Müller, 1840).

Manouria was elevated to generic level because of its broad triangular cervical scute, its split supracaudal scute (split both dorsally and ventrally), its primitive mental glands (Class II type of Winokur & Legler, 1975), the absence of the surangular process (Crumly, 1982, 1984), and the presence of an enlarged foramen caroticum laterale (Crumly, 1984; anterior epipterygoid foramen of Crumly, 1982).

***Psammobates geometricus* (Linnaeus, 1758)**
(figs. 7, 8)

Wallin (1977) recently noted that Linnaeus (1758) based his description of *Testudo geometrica* a.o. on an individual of *Geochelone elegans*. However, Linnaeus (1758) also relied on other published material including Grew (1681), Seba (1734), Piso (1658), Worm (1655), Ray (1693) and Linnaeus (1749, 1754).

Both *Psammobates geometricus* and *Geochelone elegans* are tortoises with starred carapacial patterns, but *P. geometricus* is from the Cape region of South Africa, whereas *G. elegans* lives in India. Although Wallin (1977) has convincingly shown that the shell seen by Linnaeus is an individual of *Geochelone elegans*, he failed to note the serious nomenclatural consequences of his discovery. If he had designated this Linnaean specimen the lectotype of *Testudo geometricus*, the following problems might have ensued: 1) the proper name for the Indian starred tortoise would have become *Geochelone geometricus*, and 2) *Testudo luteola* Daudin, 1802, would have become the valid specific name for the species now called *P. geometricus*. [This might not have happened because such a lectotype designation, as implied by Wallin, with such a

broad impact, would probably have gone before the Commission.] But luckily, Wallin did not formally designate the specimen of *G. elegans* seen by Linnaeus the lectotype of *P. geometricus*. Therefore, the chaotic results outlined above can be avoided by designating a lectotype from among the many descriptions cited by Linnaeus and which are as much part of his (composite) type series as is the material he actually had in hand (Article 73 (c) (i) Int. Code Zool. Nomencl., 1964).

This composite type series includes several species. In addition to Wallin's (1977) findings, Andersson (1900: 22) showed that another specimen of the composite type series is actually *Phrynops gibbus* (Schweigger). However, among the literature cited by Linnaeus there are several descriptions of the species presently known as *Psammobates geometricus*. Both Seba (1734: pl. 80, fig. 8) and Piso (1658: 105 (figure of Iaboti I), 106 (description)) illustrated this species. In order to conserve current usage and prevent nomenclatural chaos, we designate the specimen described and figured by Piso (1658) as the lectotype of *Testudo geometricus* Linnaeus, 1758 (fig. 7).

The fact that a South African species was mentioned in a book on the natural history of Brazil (i.e. Piso, 1658) is not strange, since there was lively traffic between these two Dutch-occupied regions (M. Boeseman, pers. comm.). The material collected in Brazil and South Africa by Piso and Marcgrav was sent to Holland to be incorporated into the collections of the Stadtholder. We know from old documents that some of the chests with specimens and docu-

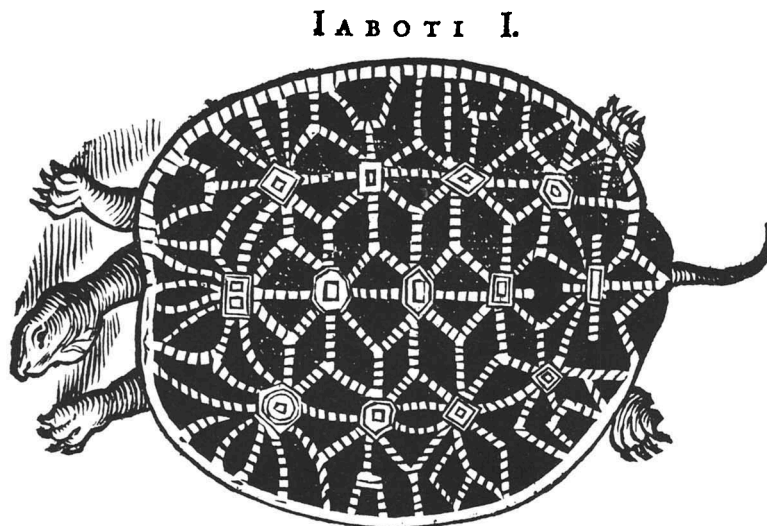


Figure 7. The figure in Piso (1658) which is here designated the lectotype of *Psammobates geometricus* (Linnaeus, 1758).

ments arrived safely, but thereafter all records have been lost. It is possible that some of the Stadtholder material which arrived safely, included specimens of *Psammobates geometricus*. Also, we know that some of the Stadthol-

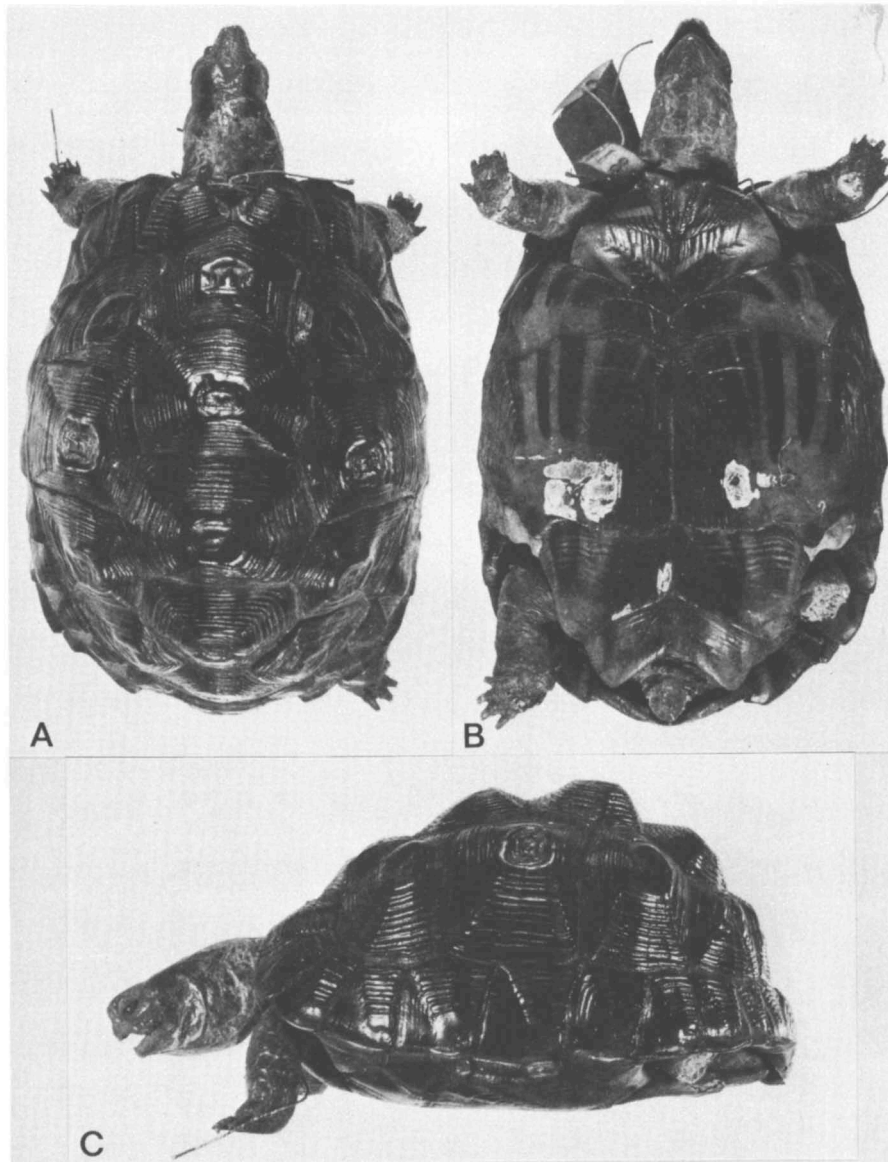


Figure 8. The holotype of *Testudo strauchi*, RMNH 6011. A, the dorsum of the carapace; B, the plastron; C, a lateral view ($\times 0.5$).

der material was later deposited in the RMNH, comprising the "Ancien Cabinet". However, none of the RMNH *Psammobates geometricus* bear labels that mention either Stadtholder or the "Ancien Cabinet", and none have a carapacial colour pattern like the specimen depicted by Piso (1658). From this we infer that the specimen that formed the basis of Piso's (1658) figure and description is irretrievably lost. However, it is possible that one of the other "syn-types" is still in existence. Therefore, we do not designate a neotype. Future studies of tortoise systematics may require the designation of a neotype.

It is particularly desirable to maintain present usage of the name *Psammobates geometricus*, because *P. geometricus* has concerned conservationists due to its endangered status and restricted range (Eglis, 1965; Groombridge & Wright, 1982: 115 (and literature cited by them); Mertens, 1962; Rau, 1969, 1971a, 1971b). An unnecessary name change and unstable systematics would only serve to confuse conservationists and might hamper ongoing efforts to preserve small populations of *Psammobates geometricus* now on the brink of extinction (Greig, 1984).

Van Lidth de Jeude (1893) described *Testudo strauchi*. We agree with Duerden (1907), Loveridge & Williams (1957) and Wermuth & Mertens (1966, 1977), who considered this species a junior synonym of *Psammobates geometricus*. The holotype is RMNH 6011, a stuffed and varnished specimen whose left leg is missing (fig. 8). Van Lidth de Jeude (1893) distinguished *T. strauchi* from *P. geometricus* by means of an absent cervical scute and gular proportions. However, the plastral pattern (i.e. triangular pectoral scutes, radiating colour pattern and large anal scutes) confirms that the holotype is only an unusual specimen of *P. geometricus*.

ACKNOWLEDGEMENTS

We thank Leslie Overstreet for assistance with library research. The junior author is grateful for funds from a National Science Foundation Dissertation Improvement Grant (DEB 81-14467), a Deutscher Akademischer Austauschdienst Kurzustipendium, and a Smithsonian Predoctoral Fellowship. George Zug, Ron Crombie, Carl Ernst, Ken Dodd, Sam McDowell and John Iverson read the manuscript. We thank Peter Meylan for measuring the FSM specimens of *Indotestudo "travancorica"*, and Dr. M. Boeseman for discussions on the Piso/Marcgrav material. The photographs of fig. 1 were made by the late Mr. Chr. Hoorn, those of figs. 2 and 6 by Mr. E. L. M. van Esch and those of fig. 8 by Mr. V. C. W. van 't Wout, all of the RMNH.

LITERATURE

Andersson, L. G., 1900. Catalogue of Linnaean type specimens of Linnaeus's Reptilia in the Royal Museum in Stockholm. — Bihang K. Svenska Vet. Akad. Handlingar 26 (1): 1-29.

- Arnold, E. N., 1979. Indian Ocean giant tortoises: their systematics and island adaptations. — Phil. Trans. Roy. Soc. London B. 286: 127-145, figs. 1-8.
- Auffenberg, W., 1971. A new fossil tortoise, with remarks on the origin of South American Testudinines. — Copeia 1971 (1): 106-117, figs. 1-9, 4 tables.
- Auffenberg, W., 1974. Checklist of fossil land tortoises (Testudinidae). — Bull. Florida State Mus. 18 (3): 121-251, figs. 1-10.
- Boulenger, G. A., 1907. A new tortoise from Travancore. — J. Bombay Nat. Hist. Soc. 17: 560-561, 2 pls.
- Bour, R., 1980a. Essai sur la taxinomie des Testudinidae actuels (Reptilia, Chelonii). — Bull. Mus. natn. Hist. nat., Paris, 4e sér., 2, section A, no. 2: 541-546.
- Bour, R., 1980b. Systématique des Tortues terrestres des îles Mascareignes: genre *Cylindraspis* Fitzinger, 1835 (Reptilia, Chelonii). — Bull. Mus. natn. Hist. nat., Paris, 4e sér., 2, section A, no. 3: 895-904.
- Bour, R. & C. R. Crumly, [in prep.]. The systematics of primitive tortoises, genus *Manouria*.
- Crumly, C. R., 1982. A cladistic analysis of *Geochelone* using cranial osteology. — J. Herp. 16 (3): 215-234, figs. 1-8, 4 tables.
- Crumly, C. R., 1984. The evolution of the Testudinidae. Unpublished Ph.D. dissertation, Rutgers-The State University: i-xxi, 1-584, figs. 1-70, 17 tables, pls. 1-32.
- Crumly, C. R., [in prep.]. A revision of land tortoises (family Testudinidae). — Bull. Amer. Mus. Nat. Hist.
- Duellman, W. E., T. Fritts & A. E. Leviton, 1978. Museum acronyms. — Herp. Rev. 9 (1): 5-9.
- Duerden, J. E., 1907 (1906). Variations in the *Geometrica* group of South African tortoises. — Rep. S. Afr. Assoc. Advanc. Sci. for 1905-1906: 178-208.
- Duméril, [A.] M. C. & A. Duméril, 1851. Catalogue Méthodique de la Collection des Reptiles du Muséum d'Histoire Naturelle de Paris: 1-224. Paris.
- Eglis, A., 1965. Ein Wiederfund der Geometrischen Landschildkröte (*Testudo geometrica*). — Natur und Museum 95: 383-387, figs. 1-2.
- Fitzinger, L. J. F. J., 1826. Neue Classification der Reptilien nach ihren natürlichen Verwandtschaften . . . : I-VIII, 1-66, 1 pl. Wien.
- Greig, J., 1984. In: Anonymous: Tortoises. — Spec. Surv. Com. Newsletter 3: 29.
- Grew, N., 1681. Museum regalis societatis; or, a catalogue and description of the natural and artificial rarities belonging to the Royal Society and preserved at Gresham Colledge; whereunto is subjoynted the comparative anatomy of stomach and guts. 2 vols. folio. illust. London.
- Groombridge, B. & L. Wright, 1982. The IUCN Amphibia-Reptilia Red Data Book. Part I. Testudines Crocodylia Rhynchocephalia: i-xliii, 1-426. Gland.
- Günther, A., 1877. The gigantic land tortoises (living and extinct) in the collection of the British Museum: 1-96, pls. 1-54. London.
- Hubrecht, A. A. W., 1881. On certain tortoises in the collections of the Leyden Museum. — Notes Leyden Mus. 3 (12): 41-50.
- Hutchison, J. H. & D. B. Bramble, 1981. Homology of the plastral scales of the Kinosternidae and related turtles. — Herpetologica 37 (2): 73-85, figs. 1-9.
- Lidth de Jeude, T. W. van, 1893. Note XLIII. On a new species of the genus *Testudo*. — Notes from the Leiden Mus. 15: 312-313, pl. 9.
- Lidth de Jeude, T. W. van, 1895. Note XXVIII. On *Testudo emys* Schleg. & Müll. and its affinities. — Notes from the Leiden Mus. 17: 197-204, pls. 5-6.
- Linnaeus, C., 1749. Amoenitates Academicæ, seu Dissertationes variae . . . collectæ et auctæ [by P. Camper]. vol. 1. Holmiae, Lipsiæ.
- Linnaeus, C., 1754. Museum S. R. M. Adolphii Fridericii Regis . . . in quo Animalia rariora imprimis, et exotica . . . describuntur, etc. Folio. 33 pls. Holmiae.
- Linnaeus, C., 1758. Systema Naturæ, 10th edition 1: 1-824. Holmiae.
- Loveridge, A. & E. E. Williams, 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. — Bull. Mus. Comp. Zool. 115 (6): 163-557, figs. 1-62, 10 tables, 18 pls.
- Mertens, R., 1962. Zur Kenntnis der Geometrischen Landschildkröte, *Testudo geometrica*. —

- Deutsche Aquarien und Terrarien Zeitschrift 15 (10): 317.
- Nutaphand, W., 1979. The turtles of Thailand: 8 pp., 1-222, figs. 1-143, 4 tables, 30 maps. Bangkok.
- Obst, F. J., 1983. Beitrag zur Kenntnis der Landschildkröten-Gattung *Manouria* Gray, 1852 (Reptilia, Testudines, Testudinidae). — Zool. Abh. staatl. Mus. Tierk. Dresden 38 (15): 247-256, figs. 1-7, 1 table.
- Piso, W., 1658. Historiae Naturalis & Medicae Indiae Occidentalis. Libri Quinque. In: Piso, W., De Indiae Utriusque re naturali et medica. Libri Quatordecim: 1-327, 5 pp., figs. Amstelaedami.
- Pritchard, P. C. H., 1967. Living turtles of the world: 1-288, figs. Jersey City.
- Pritchard, P. C. H., 1979. Encyclopedia of Turtles: 1-895, figs. Jersey City.
- Rau, R., 1969. Über die Geometrische Landschildkröte (*Testudo geometrica*). — Salamandra 5 (1/2): 36-45, figs. 1-12.
- Rau, R., 1971a. Weitere Angaben über die Geometrische Landschildkröte, *Testudo geometrica*. — Salamandra 7 (3/4): 123-136, figs. 1-10, 1 table.
- Rau, R., 1971b. Cape reserve for one of the world's rarest tortoises. — Afr. Wildlife 25: 95-96.
- Ray, J., 1693. Synopsis methodica Animalium Quadrupedum et Serpentinii generis . . . Praemituntur nonnulla de Animalium in genere, sensu, generatione, divisione, etc. Londini.
- Rooij, N. de, 1915. The reptiles of the Indo-Australian Archipelago. I. Lacertilia, Chelonia, Emydosauria: i-xiv, 1-384, figs. 132. Leiden.
- Schlegel, H. & S. Müller, 1840. Over de Schildpadden van den Indischen Archipel, en beschrijving eener nieuwe soort van Sumatra. In: Temminck, C. J. Verhandelungen . . . natuurlijke geschiedenis Nederlandsche Overzeesche Bezittingen: 29-36, pl. 4. (Published in parts from 1838-1844). Leiden.
- Schoepff, J. D., 1792. Historia Testudinum: i-xii, 1-136, pls. 1-31. Erlangen.
- Seba, A., 1734. Locupletissimi Rerum Naturalium Thesaurii Accurata descriptio, et iconibus artificiosissimis expressio, per universam physicis historiam. Vol. I: 34 pp., 1-178, 2 pls., pls. 1-111. Amsterdam.
- Temminck, C. J. & H. Schlegel, 1838. Reptilia. In: Ph. F. von Siebold, Fauna Japonica: i-xxi, 1-144, pls. 1-27, 1 map. Leiden.
- Vervoort, W., 1981. Verslag van de directeur over het jaar 1980. Rijksmuseum van Natuurlijke Historie te Leiden. — Nederlandse Rijksmusea 102: 246.
- Wallin, L., 1977. The Linnean type-specimen of *Testudo geometrica*. — Zoon 5: 77-78, fig. 1.
- Wermuth, H. & R. Mertens, 1961. Schildkröten, Krokodile und Brückenechsen: i-xxvi, 1-422, figs. 1-271. Jena.
- Wermuth, H. & R. Mertens, 1977. Liste der rezenten Amphibien und Reptilien. Testudines, Crocodylia, Rhynchocephalia. — Das Tierreich 100: i-xxvii, 1-174.
- Winokur, R. M. & J. M. Legler, 1975. Chelonian mental glands. — J. Morph. 147 (3): 275-291, 1 table, 3 pls.
- Worm, O., 1655. Museum Wormianum; seu, Historia rerum rariorum, tam naturalium, quam artificialium, tam domesticarum, quam exoticarum, quae Hafniae Danorum in aedibus authoris servantur. Folio, 2 pl., text figs. Lugdunum Batavorum.