

A New Subspecies of Box Turtle,

Cuora amboinensis lineata,

from Northern Myanmar (Burma), with remarks
on the distribution and geographic
variation of the species.

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PHOTOS BY THE SENIOR AUTHOR.

ABSTRACT: A series of live specimens of the Asian box turtle *Cuora amboinensis* from northern Myanmar (Burma) showed noteworthy differences, especially in carapacial coloration, from the three subspecies of this species currently recognized. They are considered to constitute a new subspecies, *Cuora amboinensis lineata*, described herein.

KEY WORDS: Reptilia; Testudines; Bataguridae; *Cuora amboinensis lineata* ssp. nov.; turtle; taxonomy; new subspecies; China; Burma; Myanmar.

Background

Taylor (1970) recognized only four species of Asian box turtles within the genus *Cuora*, and as recently as the early 1980's, *Cuora* (together with the related *Cistoclemmys*) was considered to include just three widely distributed species (*C. amboinensis*, *C. trifasciata*, and *C. flavomarginata*), and three "questionable" forms known from little more than small type series (*C. yunnanensis*, *C. hainanensis*, and *C. galbinifrons*). But during the last two decades, Chinese, German, and American workers have described numerous new taxa within this genus [Song, 1984; Ernst and McCord,

1987; Ernst 1988 a,b; Luo and Zong, 1988; Ernst and Lovich, 1990; Zhao, et al., 1990; McCord and Iverson, 1991; Rummier and Fritz, 1991; Iverson and McCord, 1992; Obst and Reimann, 1994], and *Cuora* is now recognized as probably the most complex batagurid genus of all.

The type species, *Cuora amboinensis* [Daudin, 1801 (1802)], was long considered monotypic despite early suggestions (e.g., by Gunther, 1864) that some variation existed, and it was not until 1991 that Rummier and Fritz made the first, preliminary attempt to document geographic variation in this very widespread species and to name subspecies. By these authors' own admission, reference material was unavailable from nu-

merous key areas, and further subspecies than those they described surely existed.

The overall distribution of the species has been described by Khan (1982), Moll and Vijaya (1986), and Ernst and Barbour (1989), and documented localities were plotted by Iverson (1992) and Rummier and Fritz (1991). The overall range is extraordinarily wide, with localities concentrated in Indonesia (east to Timor, Sulawesi, Cerma, and Amboina), most islands of the Philippines (Alcala, 1988), and peninsular Malaysia, but records are available as far west as central Thailand (Rummier and Fritz, 1991) and Assam, India. The presence of *C. amboinensis* in India was first documented by Berger, 1965; ignored by

Subadult female *Cuora amboinensis lineata*.



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Cuora amboinensis lineata, all from Kachin Province, Myanmar.



Top to bottom: "Three-lined" male; "single-lined" female; juvenile female.



Tikader and Sharma (1985, possibly because of a lack of reference specimens in the Zoological Survey of India collections); but reaffirmed by Das (1985, 1991), who documented localities in both Assam and the Nicobar Islands.

Gunther (1864) had specimens from "Pinang, Singapore, the Tenasserim Provinces, Gamboja, Sumatra, Java, Amboyna, Gilolo, and the Philippine Islands." It is thus somewhat confusing that he considered the species to occur "in nearly all the tropical parts of India, at least near the coasts," but it must be remembered that the term "India" was loosely used in the 19th century to include vast tracts of both South and Southeast Asia. As late as 1931, Malcolm Smith included the fauna of Siam, French Indo-China, and southern China in his book titled *Fauna of British India. Reptilia and Amphibia*.

New Data

In their studies leading to the description of the subspecies *C. a. couro* and *C. a. kamaroma*, Rummler and Fritz (1991) lacked specimens from anywhere north or west of a point about 50 km north of Bangkok, Thailand, although Taylor (1970) reported specimens having been taken as far north as Chiang Mai, Thailand, and "presumed it was not especially rare." Thus, Rummler and Fritz had no opportunity to examine specimens from India, Myanmar, or Bangladesh, all of which (possibly China also) have populations of *C. amboinensis*. The present authors independently obtained good representation of specimens from the border area between northeastern Myanmar and Yunnan, China, in early 1997. The series included a total of 46 specimens and had been obtained from the markets of Ruili, Yunnan, by Mr. Oscar Shiu. These markets, and the probable area of collection of the turtles sold there, are discussed by Kuchling (1995). Inquiries by Mr. Shiu at the time of purchase indicated that all of them came from the Myanmar side of the border, generally from Kachin Province. Mr. Shiu (pers. comm.) has also confirmed that specimens have been caught by collec-



Details of plastra of *Cuora amboinensis*. Left: *C. a. lineata*; note small inguinal scute. Right: *C. a. cuoro*, adult female from Java; note inguinal scute.

ing to the methodology proposed by Carr (1952). To facilitate comparisons, we took the same measurements and ratios as were utilized by Rummeler and Fritz (1991) and McCord and Iverson (1991). In addition to the sex, the following were noted for each specimen: 1) Carapace length. 2) Carapace width. 3) Location of maximum carapace width. 4) Carapace height a) at the plastral hinge; b) at the seam between costals 2 and 3. 5) Location of the highest point of the carapace. 6) Plastral length. 7) Width of anterior plastral lobe at humero-pectoral seam. 8) Width of posterior plastral lobe at abdominal-femoral seam. 9) Lengths of plastral scutes: a) gulars; b) humerals; c) pectorals; d) abdominals; e) femorals; f) anals. 10) Width of gulars. 11) Maximum plastral width (at rear of marginal 4). 12) Plastral width at the hinge.

In that most specimens were measured while alive, and that they retracted all extremities and raised the plastral lobes when handled, "straight" plastral length could not normally be measured directly, but was determined by addition of the lengths of the two plastral lobes. Antero-posterior measurements of the closed (flexed) plastron also were taken, and these may be compared with the calculated straight-line measurements with plastral hinge relaxed.

Morphometric data for the 21 males and 26 females examined are presented in Table 1.

Coloration and Markings

The carapace was black in the live specimens examined; it was dark brown

to black in the preserved holotype. A yellowish white middorsal stripe is invariably present, and lateral stripes of a similar color often also are present, especially on costal scutes 2 and 3. The mid-dorsal stripe was present in the two Pegu (Bago) specimens examined by Theobald (1869).

Systematic Implications

In the key features of dorsal pigmentation, the available specimens from Myanmar are remarkably uniform. Furthermore, the isolation of the Myanmar turtles from other populations of the species by mountain ranges provides a classic setting for subspeciation to occur, and we hereby name the Myanmar populations of the Asian box turtle, *Cuora amboinensis*, as a new subspecies:

CUORA AMBOINENSIS LINEATA SSP. NOV.

Synonymy

Cuora amboinensis Theobald, 1869 (*partim*)

Cyclemys amboinensis Boulenger, 1890 (*partim*)

Distribution

Northeastern to southern Myanmar (Burma). The available material is primarily or entirely from the Province of Kachin, in the extreme northeast, but Theobald (1869) described two specimens from the southern province of Pegu (Bago), and observed that "...this species is not an abundant one in Pegu, and the above are the only two I ever procured..." Shiu (pers. comm.) has seen specimens in the markets in the

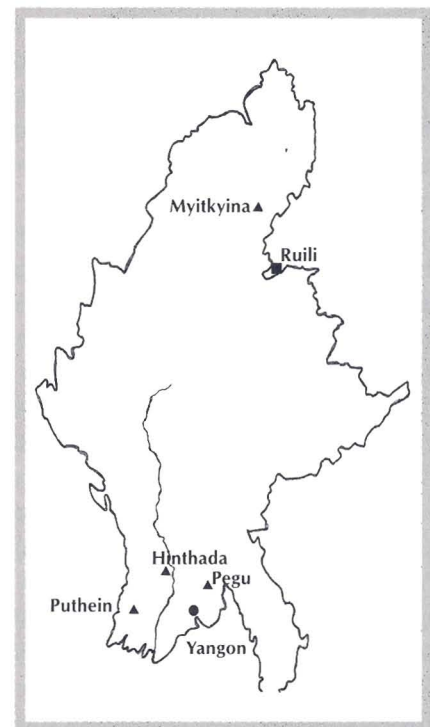
southern towns of Pegu, Hinthada, and Puthein, and inquiries indicated that in all cases the turtles had been locally collected. Shiu did not purchase any turtles from these markets, and none have been available to us.

Available Material

The holotype is USNM 122189, an adult male from Myitkyina, Kachin Province, Myanmar (Burma), collected in 1945. Paratypes are ZMA 19223, an adult male, and ZMA 19224, a juvenile female. All are liquid-preserved.

Other Material: Two specimens in the live collection of Philippen, to be deposited in the Museum fur Tierkunde Dresden (MTKD) upon their demise, and 42 live specimens in the collection of McCord, to be deposited in the collections of the Florida Museum of Natural History (Gainesville), and of Peter C. H. Pritchard (Oviedo, Florida).

Northern Myanmar, showing the localities mentioned in the text and Ruili, Yunnan, China.



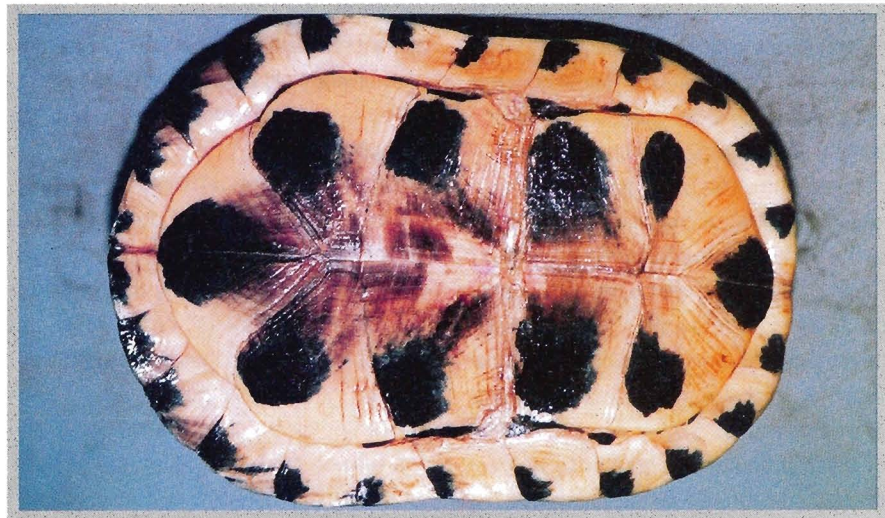
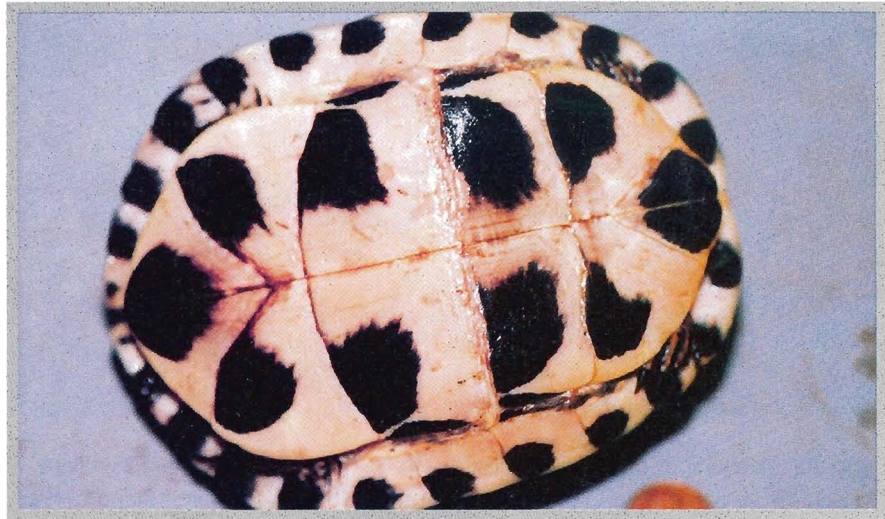
Cuora amboinensis lineata, all from Kachin Province, Myanmar, plastral views. Top: Juvenile female; bottom: adult male.

tors operating out of the towns of Pegu (Pegu Prov.), Hinthada (Ayeyarwady Prov.), and Puthein (Ayeyarwady Prov.)—all in southern Myanmar and within about 170 km or less of Yangon. Thus, *Cuora amboinensis* appears to have a rather wide distribution from southern to northeastern Myanmar.

Our specimens apparently represent the first live specimens of *Cuora amboinensis* from Myanmar to have reached the West in over a century, and the first new chelonian taxon from Myanmar to be described since 1869. The numbers seen in the markets are increasing steadily, and we strongly suspect that significant over-exploitation of the species in Myanmar is occurring. Moreover, this population represents a distinctive new subspecies, described below.

Intraspecific Variation

Gunther (1864) recognized *C. amboinensis* to be a variable species, but he reckoned that virtually all of the differences could be attributed to ontogenetic change or to individual variation ("age or accident"), although he noted that only his specimen from the island of Gilolo (i.e., the island of Halmahera, northeastern Indonesia) "might be called depressed." In this judgment he was prescient, and in recent decades the differences (in shell depth and other features) between some of the island populations and those of the Asian continent have been well known at least within the herpetocultural community [Pauler, 1980; Mudde, 1987], although they were not nomenclaturally recognized until 1991. Rummler and Fritz (1991) resurrected the name *Testudo couro* Schweigger, 1812 (type locality: Java) for the Indonesian populations (excluding Borneo and Sulawesi) and proposed the new name *Cuora amboinensis kamaroma* for those of the Asian mainland and Borneo. The typical race was



then restricted to the Philippines, Sulawesi, and the Moluccas, reflecting Daudin's reported type locality for *Testudo amboinensis* of "Amboyna" (now called Ambon), in the Moluccas, although the type specimen is unavailable for examination, having been lost by shipwreck *en route* to Paris (Bour, *in* Rummler and Fritz, 1991).

We endorse the general breakdown of populations offered by Rummler and Fritz, but we are also aware that, in addition to the new form from Myanmar described below, new subspecies also remain to be recognized from Assam/Bangladesh and in the Nicobar Islands, and these will be described in a later work (Philippen and McCord, *in prep.*).

Distribution

The reported Myanmar localities for *Cuora amboinensis lineata* are shown on

the included map. These reflect the localities of the holotype and the paratypes and live specimens utilized in this study. In addition, Theobald (1869) reported the species to occur, but to be very rare (only two specimens available) in Pegu (Bago), a city and province of southern Myanmar very close to Yangon, and the information cited above under "new data" serves to confirm the Pegu locality. Theobald's mention of a light middorsal line along the carapace suggests that his specimens may indeed be allocable to the new subspecies.

Materials and Methods

We have had access to a total of 47 live and preserved specimens of the new subspecies from Burma. Morphometric parameters were measured with Vernier calipers to the nearest 0.1 mm, and carapace measurements were taken accord-

Top: *C. a. lineata* male at left, female at right; *C. a. kamaroma* at center. Center: Female *C. a. kamaroma* from Vietnam. Bottom: Plastron of female *C. a. kamaroma* from Malaysia.

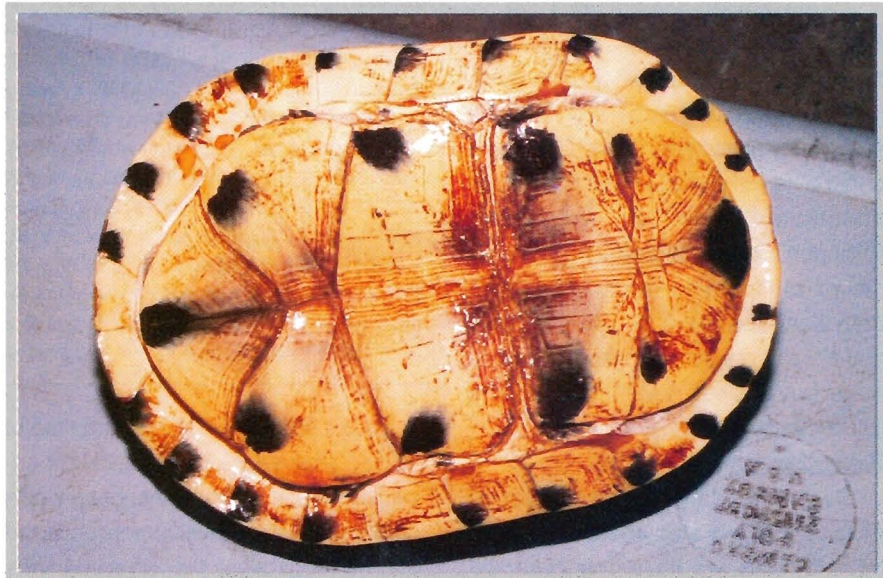
Description of Holotype

Carapace highly domed, nearly rectangular in vertical profile. CL 166.3 mm, CW 82.8 mm (between marginals 8 and 9), CH 66 mm (at vertebral 3). CL/CH 2.52. CW/CH 1.77. PL 153.8 mm. Carapacial keels absent. Costals strongly convex. Lateral marginals reverted. Anterior and posterior marginals prominent from directly above, but mid-marginals concealed by convexity of sides of carapace. Well-developed transverse plastral hinge between pectoral and abdominal scutes (i.e., between hyo- and hypoplastra), and posterior plastral lobe large, completely closing posterior shell opening when raised. Anal notch absent; posterior lobe of plastron smoothly rounded. Plastral formula: AN>HUM>ABD>GUL>FEM>PECT. Axillary and especially inguinal scutes diminished in size.

Comments upon Hypodigm

The majority of the live specimens in hand show quite extensive superficial abrasion and damage as a result of rough handling during transfer to market and while awaiting sale. Nonetheless, the crucial linear markings on the carapace remain obvious, and plastral abrasion or damage was in general minimal. The fact that most specimens are fully adult may be a reflection of actual population structure or of successful concealment by juveniles, but more probably it simply is a result of the fact that animals sold for food are priced by size, with very small ones having little value.

We noted some morphological variation attributable to ontogeny or to sexual dimorphism. Thus, the ratio of humeral length/pectoral length is greater than 4.0 in mature males and less than 4.0 in mature females. Males progressively develop a plastral concavity with age, as is evident in other subspecies also, and adult males have a much thicker tail than



adult females. We detected no sexual dichromatism.

The pattern of plastral pigmentation is relatively constant and is similar to that illustrated in Rummeler and Fritz (1991) for the other continental subspecies, *Cuora amboinensis kamaroma*, in which a rounded dark spot is present on each scute, although the abdominals may be immaculate (see, e.g., Smith, 1931, p. 85). However, *C. a. lineata* shows a minor difference in having the gulars almost completely pigmented with black or dark brown, with at most only a very restricted yellow margin along the seams. There is also some difference between the two mainland subspecies in the deployment of dark pigmentation on the undersides of the marginal scutes: prominent black spots are evident in *C. a. lineata*, but not in *C. a. kamaroma* or in either of the insular subspecies (Rummeler and Fritz, 1991).

The total lack of carapacial keels, the diminished inguinal scutes, and the more flared posterior plastral lobe allowing a more completely closed posterior shell opening, all help distinguish *C. a. lineata* from the other three subspecies.

Etymology

The name *lineata* (Latin: "lined") refers to the most prominent external feature of the new subspecies, namely the universally present middorsal light stripe and the typically present lateral (costal) stripes.

Captive Observations

Cuora amboinensis lineata apparently is amphibious; it can swim, but prefers very shallow water where it can walk while only partially immersed. The two authors maintain their captive specimens under different conditions: McCord's are maintained in shallow water, and Philippen's in vivaria containing 10 to 15 cm of mulch, with some logs and branches, and two water dishes, 5 cm and 15 cm deep respectively. The turtles have never been seen to enter the deeper water.

Reproduction

Despite the large series of captive animals that includes about two dozen adult females, we have only observed

Table 1.

Selected Measurements of *Cuora amboinensis lineata* (all in mm). Specimen Number precedes all measurements. a) Carapace length; b) Carapace width; c) Carapace height (hinge); d) Carapace height (C2-3); e) Plastron length (added); f) Plastron length (closed); g) Gular length; h) Pectoral length; i) Humeral length; j) Abdominal length; k) Femoral length; l) Anal length; m) Gular width; n) Plastron front lobe width; o) Plastron rear lobe width; p) Plastron width (hinge); q) sex (m/f). **1.**: a) 210; b) 139; c) 98; d) 94; e) 189; f) xx; g) 31; h) 9; i) 40; j) 46; k) 10; l) 53; m) 36; n) 96; o) 109; p) 102; q) f. **2.**: a) 213; b) 145; c) 98; d) 92; e) 194; f) xx; g) 32; h) 13; i) 41; j) 47; k) 14; l) 47; m) 38; n) 92; o) 111; p) 108; q) f. **3.**: a) 205; b) 134; c) 91; d) 82; e) 193; f) 176; g) 34; h) 9; i) 43; j) 44; k) 18; l) 45; m) 37; n) 94; o) 103; p) 101; q) f. **4.**: a) 211; b) 132; c) 92; d) 90; e) 202; f) 193; g) 37; h) 9; i) 43; j) 47; k) 12; l) 54; m) 42; n) 94; o) 103; p) 105; q) f. **5.**: a) 212; b) 140; c) 83; d) 88; e) 198; f) 196; g) 33; h) 8; i) 45; j) 47; k) 18; l) 47; m) 38; n) 95; o) 106; p) 103; q) f. **6.**: a) 192; b) 129; c) 77; d) 74; e) 169; f) 171; g) 35; h) 5; i) 37; j) 39; k) 11; l) 42; m) 38; n) 86; o) 100; p) 92; q) m. **7.**: a) 199; b) 134; c) 81; d) 82; e) 183; f) 183; g) 34; h) 10; i) 36; j) 49; k) 12; l) 42; m) 36; n) 88; o) 102; p) 101; q) f. **8.**: a) 220; b) 149; c) 92; d) 94; e) 206; f) xx; g) 37; h) 7; i) 47; j) 47; k) 15; l) 53; m) 41; n) 101; o) 101; p) 117; q) f. **9.**: a) 212; b) 140; c) 92; d) 89; e) 203; f) xx; g) 32; h) 11; i) 41; j) 51; k) 13; l) 55; m) 42; n) 96; o) 107; p) 106; q) f. **10.**: a) 193; b) 126; c) 76; d) 77; e) 164; f) 174; g) 31; h) 8; i) 36; j) 35; k) 9; l) 45; m) 36; n) 88; o) 104; p) 94; q) m. **11.**: a) 178; b) 123; c) 72; d) 72; e) 152; f) 163; g) 30; h) 7; i) 32; j) 38; k) 12; l) 33; m) 34; n) 80; o) 91; p) 91; q) m. **12.**: a) 187; b) 126; c) 81; d) 80; e) 169; f) 180; g) 29; h) 7; i) 35; j) 44; k) 11; l) 43; m) 35; n) 86; o) 99; p) 92; q) m. **13.**: a) 176; b) 124; c) 76; d) 72; e) 165; f) 157; g) 30; h) 10; i) 34; j) 43; k) 8; l) 40; m) 36; n) 79; o) 91; p) 92; q) f. **14.**: a) 145; b) 104; c) 68; d) 69; e) 130; f) 138; g) 23; h) 8; i) 26; j) 32; k) 12; l) 29; m) 27; n) 68; o) 80; p) 72; q) f. **15.**: a) 221; b) 141; c) 97; d) 93; e) 210; f) 206; g) 35; h) 10; i) 45; j) 53; k) 14; l) 53; m) 41; n) 102; o) 109; p) 100; q) f. **16.**: a) 192; b) 132; c) 89; d) 88; e) 187; f) 173; g) 32; h) 9; i) 40; j) 48; k) 13; l) 45; m) 39; n) 90; o) 99; p) 93; q) f. **17.**: a) 159; b) 111; c) 72; d) 73; e) 149; f) 147; g) 26; h) 9; i) 30; j) 39; k) 11; l) 34; m) 31; n) 70; o) 80; p) 78; q) f. **18.**: a) 207; b) 134; c) 83; d) 84; e) 186; f) 195; g) 35; h) 9; i) 39; j) 40; k) 18; l) 45; m) 45; n) 90; o) 103; p) 98; q) m. **19.**: a) 191; b) 124; c) 91; d) 92; e) 180; f) 189; g) 26; h) 15; i) 36; j) 47; k) 10; l) 46; m) 38; n) 90; o) 96; p) 89; q) f. **20.**: a) 183; b) 124; c) 80; d) 77; e) 167; f) 176; g) 27; h) 7; i) 38; j) 36; k) 13; l) 46; m) 40; n) 89; o) 98; p) 90; q) m. **21.**: a) 173; b) 119; c) 74; d) 74; e) 156; f) 166; g) 30; h) 9; i) 29; j) 39; k) 10; l) 39; m) 38; n) 78; o) 90; p) 85; q) m. **22.**: a) 172; b) 109; c) 69; d) 67; e) 147; f) 155; g) 25; h) 6; i) 35; j) 32; k) 18; l) 31; m) 33; n) 73; o) 80; p) 81; q) m. [ZMA 19223] Paratype. **23.**: a) 163; b) 116; c) 75; d) 76; e) 157; f) 160; g) 27; h) 9; i) 30; j) 44; k) 9; l) 38; m) 30; n) 76; o) 87; p) 84; q) f. **24.**: a) 200; b) 142; c) 95; d) 95; e) 185; f) 195; g) 31; h) 11; i) 38; j) 50; k) 8; l) 47; m) 39; n) 90; o) 105; p) 102; q) f. **25.**: a) 194; b) 130; c) 89; d) 92; e) 182; f) 192; g) 31; h) 12; i) 35; j) 48; k) 13; l) 43; m) 40; n) 88; o) 100; p) 98; q) f. **26.**: a) 187; b) 129; c) 74; d) 70; e) 179; f) 175; g) 27; h) 10; i) 34; j) 37; k) 25; l) 46; m) 35; n) 83; o) 92; p) 89; q) m. **27.**: a) 176; b) 124; c) 77; d) 73; e) 160; f) 163; g) 29; h) 7; i) 31; j) 38; k) 12; l) 43; m) 35; n) 80; o) 92; p) 85; q) m. **28.**: a) 213; b) 142; c) 96; d) 93; e) 209; f) 207; g) 33; h) 15; i) 41; j) 48; k) 14; l) 58; m) 40; n) 95; o) 105; p) 101; q) f. **29.**: a) 230; b) 149; c) 105; d) 108; e) 224; f) 205; g) 38; h) 13; i) 47; j) 60; k) 15; l) 51; m) 48; n) 105; o) 121; p) 119; q) f. **30.**: a) 190; b) 139; c) 90; d) 87; e) 184; f) 181; g) 34; h) 11; i) 37; j) 45; k) 10; l) 47; m) 41; n) 90; o) 98; p) 99; q) f. **31.**: a) 216; b) 143; c) 97; d) 91; e) 193; f) 192; g) 34; h) 7; i) 44; j) 47; k) 14; l) 47; m) 45; n) 92; o) 107; p) 102; q) f. **32.**: a) 201; b) 142; c) 80; d) 80; e) 178; f) 181; g) 33; h) 7; i) 40; j) 38; k) 15; l) 45; m) 39; n) 94; o) 105; p) 104; q) m. **33.**: a) 205; b) 140; c) 90; d) 85; e) 201; f) 211; g) 35; h) 9; i) 45; j) 44; k) 14; l) 54; m) 45; n) 95; o) 107; p) 109; q) f. **34.**: a) 202; b) 139; c) 89; d) 89; e) 182; f) 192; g) 34; h) 11; i) 36; j) 41; k) 15; l) 45; m) 44; n) 89; o) 103; p) 96; q) m. **35.**: a) 176; b) 107; c) 77; d) 75; e) 155; f) 163; g) 27; h) 8; i) 32; j) 36; k) 11; l) 41; m) 35; n) 81; o) 85; p) 83; q) m. **36.**: a) 121; b) 90; c) 53; d) 54; e) 111; f) 118; g) 20; h) 7; i) 21; j) 27; k) 6; l) 30; m) 25; n) 59; o) 68; p) 66; q) m. **37.**: a) 130; b) 89; c) 56; d) 56; e) 113; f) 124; g) 21; h) 11; i) 18; j) 28; k) 6; l) 29; m) 25; n) 58; o) 64; p) 64; q) f. **38.**: a) 123; b) 91; c) 57; d) 56; e) 118; f) 134; g) 19; h) 10; i) 20; j) 29; k) 9; l) 31; m) 22; n) 61; o) 67; p) 67; q) f. [ZMA 19224] Paratype. **39.**: a) 122; b) 86; c) 51; d) 50; e) 110; f) 117; g) 20; h) 8; i) 19; j) 29; k) 7; l) 27; m) 24; n) 58; o) 61; p) 63; q) m. **40.**: a) 150; b) 102; c) 56; d) 57; e) 135; f) 141; g) 25; h) 12; i) 22; j) 35; k) 6; l) 35; m) 30; n) 70; o) 79; p) 75; q) m. **41.**: a) 136; b) 98; c) 59; d) 59; e) 131; f) 135; g) 23; h) 8; i) 24; j) 33; k) 8; l) 35; m) 26; n) 65; o) 72; p) 73; q) f. **42.**: a) 123; b) 92; c) 54; d) 54; e) 118; f) 123; g) 22; h) 7; i) 22; j) 32; k) 5; l) 30; m) 25; n) 60; o) 67; p) 67; q) f. **43.**: a) 121; b) 87; c) 57; d) 53; e) 109; f) 116; g) 20; h) 5; i) 21; j) 28; k) 8; l) 27; m) 25; n) 60; o) 64; p) 62; q) m. **44.**: a) 147; b) 111; c) 68; d) 66; e) 145; f) 151; g) 27; h) 6; i) 31; j) 35; k) 8; l) 38; m) 31; n) 62; o) 79; p) 78; q) m. **45.**: a) 197; b) 137; c) 78; d) 75; e) 174; f) 184; g) 31; h) 9; i) 37; j) 45; k) 14; l) 38; m) 34; n) 84; o) 104; p) 95; q) m. **46.**: a) 181; b) 131; c) 83; d) 82; e) 164; f) 173; g) 27; h) 8; i) 36; j) 41; k) 15; l) 37; m) 35; n) 82; o) 98; p) 93; q) f. **47.**: a) 166.3; b) 78; c) 65.4; d) 66; e) 153.8; f) xx; g) 29.2; h) 5.6; i) 36.3; j) 34.4; k) 11.4; l) 40.9; m) 36.7; n) 78; o) 82.8; p) xx; q) m. [USNM 122189] Holotype.

two eggs (from one turtle) at the time of writing. These eggs had identical dimensions of 48 X 30 mm. Incubation was attempted, but no development occurred and the eggs were preserved. Various

other authors [Inskip, 1984a, b; Praedikow, 1985; Mudde, 1987; and Banks (in Das, 1991)] have published data on egg dimensions for *Cuora amboinensis*, but the eggs were derived

Top: Subadult female *C. a. lineata* from Kachin Province, Myanmar, at right. Adult female *C. a. cuoro* from Java at left. Bottom: Plastral views of adult female *C. a. lineata* at left and adult female *C. a. cuoro* at right; same localities as above.

from captive stock of uncertain and possible hybrid origin. However, Bhaskar (1981) gave the dimensions of a single egg from a clutch of two on the island of Trinkat in the Nicobar Islands as 50 X 25 mm.

Survival Status and Conservation

Few first-hand data about the status of wild populations of turtles in Myanmar are available, but the great numbers of turtles currently exported from Myanmar to the markets of Ruili, Yunnan, China, alone give rise to great concern, and in particular the new subspecies of *Cuora amboinensis* described in this paper features heavily in the trade. Although it must have been, and still may be, locally numerous, the population dynamics of this species, and especially the very low clutch size of only one or two eggs, suggest that continued exploitation will lead to population collapse. Data received from Mr. Shiu indicate that the pattern of collection already is changing in response to local depletion, and as populations close to Ruili have been decimated, collectors have moved to points further south, in some cases as far as Bago (Pegu).

Protection of *C. a. lineata* by listing on one of the Appendices of the CITES Convention will have no bearing upon domestic consumption. Although such listing would theoretically limit shipment of the turtles from Myanmar to China, in practice the location of the village of Ruili, located as it is on a site surrounded by Myanmar territory on all sides except the northeast, and with the nearest part of the border less than 10 km away, makes enforcement of customs or international wildlife traffic regulations very improbable. Vigorous national action by Myanmar or by China (or both) will be necessary to limit the trade.



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In view of the help and courtesies received in the course of this and other chelonian research, it is our pleasure to deposit the paratypes of *Cuora amboinensis lineata* in the Zoological

Museum of Amsterdam collection—the first chelonian type material to be deposited there.

We also acknowledge the pioneering work of Rummler and Fritz (1991) in elucidating the geographic variation of *Cuora amboinensis*.

Zusammenfassung

Anhand von 47 lebenden und konservierten Sammlungsexemplaren, sowie im qualitativen und quantitativen Vergleich schon untersuchten Formen von Rummler und Fritz (1991), wurde eine neue, geografische Unterart, *Cuora amboinensis lineata* nov. ssp., beschrieben. Daten über Variabilität, geografische Verbreitung als auch zur Reproduktion werden gemacht. Weitere Untersuchungen, sowohl für den Bereich des westlichen Verbreitungsareals, als auch für die Gebeite Vietnam, Laos und Kambodja sind in Vorbereitung.



C. a. amboinensis from Kartimar market, Manila, Philippines. Photo: John Mertens.

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