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**ON THE OCCURRENCE OF THE ASIATIC SOFTSHELL
 TURTLE, *AMYDA CARTILAGINEA* (BODDAERT,
 1770), ON SULAWESI, INDONESIA**

(with four text-figures)

Sulawesi, in central Indonesia, is home to three species of indigenous, non-marine turtles (Iskandar and Tjan, 1996; Platt, 2006; Vetter and van Dijk, 2006): the widespread Southeast Asian box turtle, *Cuora amboinensis*, the Sulawesi tortoise, *Indotestudo forstenii* and the Sulawesi forest turtle, *Leucocephalon yuwonoi*; the last two endemic to the island. According to Rummeler and Fritz (1991), the Sulawesi box turtle population belongs to the nominotypic subspecies *Cuora a. amboinensis* which is abundant throughout the island (Iskandar and Tjan, 1996; A. Koch and E. Arida, pers. obs.). In contrast, the documented ranges of *L. yuwonoi* and *I. forstenii* are restricted to the northern peninsula and parts of central Sulawesi (Iskandar and Tjan, 1996; Iskandar, 2000; Riyanto, 2006; Vetter and van Dijk, 2006). In addition, the red-eared slider, *Trachemys scripta elegans*, an invasive species introduced by pet trade to fresh water bodies nearly all over the world has recently been listed for Sulawesi (Samedi and Iskandar, 2000).

The Asiatic softshell turtle, *Amyda cartilaginea* (Boddaert, 1770) is currently the only recognized species of the genus *Amyda* Geoffroy Saint-Hillaire, 1809 (Iverson, 1992; Fritz and Havaš, 2006; Vetter and van Dijk, 2006). It was removed from the genus *Trionyx* Geoffroy Saint-Hillaire, 1809 by Meylan (1987), who at the same time classified *Trionyx nakornsrithammarajensis* Wirot, 1979 from Thailand as a synonym of *A. cartilaginea*.

The Asiatic softshell turtle shows a typical oriental distribution ranging from extreme eastern India, through Myanmar, Vietnam, Laos, Cambodia, Thailand and the Malay Peninsula, to the Sunda shelf islands of Borneo, Sumatra, Bangka, Belitung, Java, and Bali (Iverson, 1992; Choudhury et al., 2000; Iskandar, 2000; Pawar and Choudhury, 2000; Kuchling et al., 2004; Vetter and van Dijk, 2006). Records from Bangladesh,

however, are non existent. Farkas and Ziegler (2002) reviewed the distribution of the species in Vietnam. They confirmed the northernmost-known genuine locality for *A. cartilaginea* as being the Sé Bang Hien (Mekong side) and Kon Tum (coastal Annamite side) records (Fig. 1). The occurrence of the Asiatic softshell turtle in Maluku (Ambon/Ceram) as originally reported by Gray (1855) and subsequently adopted by later authors (e.g., Boulenger, 1889; de Rooij, 1915) remains unconfirmed (CITES, 2004). The record of a specimen from Lombok (NHMB 10626) as illustrated by Iverson (1992) is most probably incorrect. In 1931, the partly albinotic specimen was donated to the Basel collection by Dr. P. Wirz. In the catalogue entry, the locality, Lombok, is followed by a question mark and thus, is doubtful (R. Winkler, pers. comm.). Consequently, in the absence of genuine, recent records from eastern Indonesia, there is no proof that *A. cartilaginea* succeeded in crossing the boundary of the Sunda Shelf, better known as Wallace's Line. However, Iskandar (2000) and Samedi and Iskandar (2000) suggested the occurrence of *A. cartilaginea* on Sulawesi. As this was hitherto unconfirmed, we report here on *A. cartilaginea* for the first time from the Indonesian island of Sulawesi, representing the apparently easternmost locality for this species and the fourth (respectively fifth) non-marine Sulawesi turtle species.

During field expeditions in 2001, early 2005 and summer 2006, several live specimens and some skeletal remains of *A. cartilaginea* were found at a local reptile trader in Palu, the capital of the province Sulawesi Tengah and in the village of Palolo, Kabupaten Donggala, near the northern border of the Lore Lindu National Park (Fig. 1). A photograph taken in 2003 by local inhabitants near the village Palolo confirms our observations (Fig. 2). A nearly adult specimen with a carapace length of ca. 50 cm and a weight of ca. 10 kg was discovered at a reptile trader in Palu in July 2006 (Fig. 3). At the same time, numerous adult and subadult specimens of *I. forstenii* and *L. yuwonoi* were awaiting their shipment for the international pet trade. According to the trader's statement, the specimen of *A. cartilaginea* was not from outside Sulawesi but originated from a lake in Central Sulawesi. However, he could not specify the exact local-

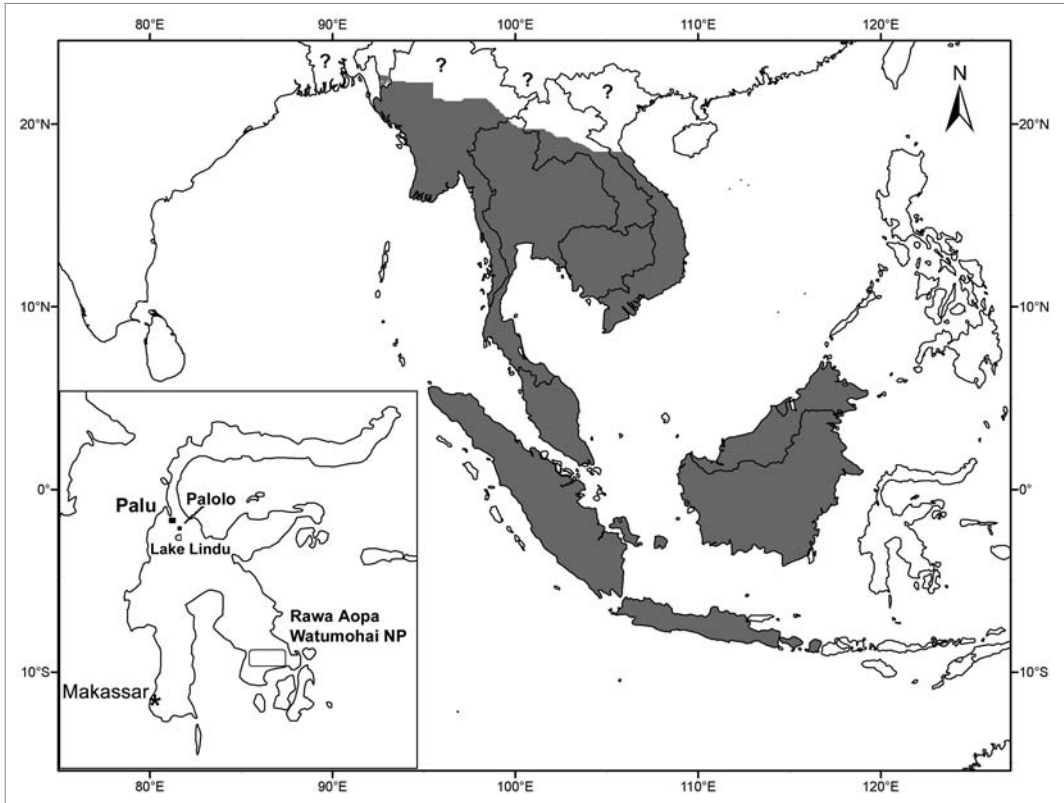


Figure 1. Map of south-east Asia, showing the distribution of *Amyda cartilaginea* (shaded areas) according to Iverson (1992), Choudhury et al. (2000), and Vetter and van Dijk (2006). Insert, map of Sulawesi, showing known localities of *A. cartilaginea* in central Sulawesi Province near Palu. Asterisk indicates the specimen of *Pelochelys* sp. found at a market in Makassar (Ujung Pandang) as reported by A. Rhodin in Webb (2002). Rectangle, south-eastern peninsula, indicates Rawa Aopa Watumohai NP a possible habitat of *A. cartilaginea* as suggested by Wibowo (1999) and Samedi and Iskandar (2000).

ity. Due to its large size and weight, it was not possible to preserve this specimen as a voucher. Digital photographs are deposited in the private collection of the authors and the Zoologisches Forschungsmuseum A. Koenig Bonn, Germany. Nevertheless, there exist two voucher specimens of *A. cartilaginea* originating from Sulawesi in the herpetological collections of the Museum Zoologicum Bogoriense (MZB) and the Louisiana Museum of Natural History (LSUMZ). Specimen MZB Test 257, a juvenile, was collected in Sulawesi Tengah by a trader 20 September 2001. Its carapace is 137.53 mm long and 115.3 mm wide.

Amyda cartilaginea shows great ecological plasticity and inhabits a variety of permanent freshwater bodies. Thus, it is found in lowland rivers, ponds, canals, peat swamps, hill streams, and lakes up to 900 m altitude (Iskandar, 2000; CITES, 2004). The largest lake in the vicinity of

Palu and a possible habitat for *A. cartilaginea* is Danau (= Lake) Lindu, located in the Lore Lindu National Park, which is ca. 50 km south-east of Palu. Another permanent freshwater habitat may be Danau Poso, the largest lake of Central Sulawesi. In their listing of Indonesian wetland sites, Samedi and Iskandar (2000) further predict (“not reported but surely present”) the occurrence of *A. cartilaginea* for Rawa Aopa Watumohai National Park at the tip of the south-eastern peninsula of Sulawesi (Fig. 1).

Within its entire range, three different phenotypes of *Amyda cartilaginea* are recognized according to van Dijk (1992) and Vetter and van Dijk (2006). These are the “Mainland form” from continental south-east Asia, the “Borneo-Sumatra form” from both these islands (see also Auliya, 2000), and the “Javanese form” from Java. Due to the loss of characteristic features in colouration with increased body size, the



Figure 2. A specimen of *Amyda cartilaginea* taken at a pond near the village Palolo, south-east of Palu, central Sulawesi. Local people regularly trap softshell turtles at this site for food supply.



Figure 3. A specimen of *Amyda cartilaginea* at a local reptile trader in Palu. According to the trader, the specimen originated from a lake in Central Sulawesi, possibly Lake Lindu, ca. 50 km south-east of Palu.

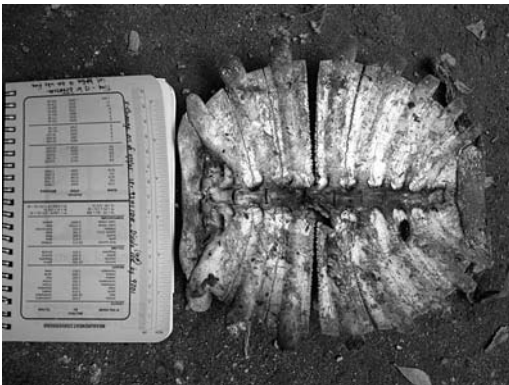


Figure 4. Vertebral column of a subadult softshell turtle (carapace width ca. 20 cm), probably *Amyda cartilaginea*, found in the yard of a house of a Chinese family in the village of Palolo, Kabupaten Donggala, central Sulawesi. The family frequently prepares dishes made from softshell turtle meat.

Sulawesi specimen from 2006 (Fig. 3) can not be assigned to any of the three known phenotypes of *A. cartilaginea* (P. P. van Dijk, pers.

comm.). The oval carapace was olive to greenish brown with fading dark streaks. The distal end of the soft carapace displayed a deep cut but the wound had already healed. Yellow dots and longitudinal rows of small tubercles typical for juvenile specimens were lacking. The head was brownish with little dark and yellowish spots. Neck and limbs were unicoloured greyish without any pattern of light dots. Laterally, the neck became orange green to the ventral side which was whitish-grey to flesh-coloured. The plastral colouration in combination with the tail extending beyond the carapace margin and bulging well before the cloaca suggests that the specimen was probably a male (P. P. van Dijk, pers. comm.). In contrast, several adult specimens examined at the trader in Palu in 2001 matched the Bornean form (D. T. Iskandar, pers. obs.). The specimens had the distinct butterfly marking on the first half of the carapace as mentioned by Auliya (2000) or figured in de Rooij (1915:329). In contrast to the aforementioned specimen from 2006, the plastron in these specimens was uniform dark grey or blackish, possibly the only distinguishing character compared to most other populations of *A. cartilaginea* outside Sulawesi.

When visiting Palolo village, south-east of Palu in February 2005, remains of softshell turtles were found in the yard of a Chinese family home (Fig. 4). The family reported that they prepared dishes made from turtle meat, either from *I. forstenii* or softshell turtles, once a week (Ives, 2006). The family's oldest son would trap softshell turtles in a nearby pond for the family's consumption and for sale to other local Chinese cooks. Escorted by the Chinese locals to a nearby pond, a specimen of the Asiatic softshell turtle was observed (I. Ives, pers. obs.). Photographic evidence confirms the existence of *A. cartilaginea* in ponds around the village since at least 2003.

It seems reasonable to suggest that *A. cartilaginea* was introduced to central Sulawesi by human transportation, possibly from the nearest natural occurrence of the species along the east coast of Kalimantan. Public ferries and trading vessels regularly cross the 300 km wide Makassar Strait between Borneo and Sulawesi but even more important is the ship trade with Java or Bali. Therefore, it is more likely that the in-

roduced *Amyda* would have the Javanese characteristics and not the Kalimantan phenotype.

The Makassar Strait, with its deep ocean trench, served as natural barrier for the migration of many Asiatic fauna for at least the last 40 My (Hall, 1998; Moss and Wilson, 1998). This period of long geological isolation resulted in the evolution of a high percentage of endemism on Sulawesi, such as the endemic Geoemydid turtle genus *Leucocephalon*. Although the herpetofauna of Sulawesi is still far from being completely inventoried (Iskandar and Tjan, 1996; Gillespie et al., 2005; J. McGuire, pers. comm.; A. Koch and E. Arida, unpubl. data), the natural occurrence of a large-sized softshell turtle such as *A. cartilaginea* would not have been unnoticed by herpetologists since the exploration of the herpetofauna of Sulawesi started 150 years ago (Bleeker, 1857). However, the discovery of *L. yuwonoi* in the US pet trade as recently as 1986 (described by McCord et al., 1995) proves that even large turtles may be overlooked by scientists (Fritz and Obst, 1999).

Alternatively to a human mediated transportation, it may be worth considering that specimens of *A. cartilaginea* from Kalimantan were flushed out from Mahakam or Kutai rivers which flow into the Macassar Strait opposite Palu bay. After heavy rainfall such large streams transport huge amounts of fresh water, trees and other vegetation onto the open sea (D. T. Iskandar, pers. obs.). Together with the strong, temporary west-east current, these floating islands may serve as natural rafts that facilitated the crossing of Wallace's line and thus the colonization of Sulawesi by Oriental faunal elements in the past (Inger and Voris, 2001; Whitten et al., 2002). With reference to the amphibians and reptiles of Sulawesi, Boulenger (1897) already recognized that there is "... a greater agreement with the Western than with the Eastern islands of the [Indo-Australian] Archipelago, as already pointed out by Peters and Doria [1878]". Moreover, it is known that softshell turtles are tolerant to salt water as most large species occur in estuaries (Iskandar, 2000). Consequently, their successful oversea dispersal does not even depend on natural rafts.

Due to the lack of substantiated evidence for a natural trans-oceanic dispersal over Macassar Strait (but see Gerlach et al., 2006), our

observations suggest that specimens of *A. cartilaginea* were introduced to Sulawesi for food supply mainly for the Chinese population who frequently eat softshell turtles and *I. forstenii* (I. Ives, pers. obs.). However, if *A. cartilaginea* was introduced to Sulawesi, one might expect to find the species primarily around Macassar and Manado, the two main ports of Sulawesi. This assumption is substantiated by the occurrence of many introduced species near both these cities (see Iskandar and Tjan, 1996).

At any rate, the assertions of the reptile trader at Palu and the local Chinese people as well as the juvenile voucher specimen suggest that, at least in central Sulawesi, *A. cartilaginea* has established reproducing populations.

The first record of a live softshell turtle in Sulawesi refers to a short communication of A. Rhodin in Webb (2002), who found a specimen of *Pelochelys* sp. in a market in Makassar (Ujung Pandang), the capital of South Sulawesi Province on the south-western peninsula (Fig. 1). This finding of *Pelochelys* in Sulawesi closes the gap of the disjunct distribution of the genus in continental south-east Asia, the Greater Sunda Islands, the Philippines and New Guinea in the east of the Indo-Australian Archipelago (Iverson, 1992). Samedi and Iskandar (2000) had already suggested the occurrence of *P. cantorii* on Sulawesi. Fossil, presumed late Pliocene, trionychid material from Cabenge, Soppeng District, Southwest Sulawesi, ca. 115 km north-east of Makassar had been reported by Hooijer (1954, 1958), which was cited by Whitten et al. (2002) as "*Chitra ?indica*". According to Webb and van Dijk (2004), however, these fossil remains are consistent with *Pelochelys* although an exact determination is impossible. Recent *Pelochelys* records from the Moluccas or the Lesser Sunda Islands are lacking, but may follow in the future.

All these evidences discussed above provide strong evidence for the existence of a second and probably genuine species of softshell turtle on Sulawesi. Nevertheless, transportation by human activities cannot be excluded. Therefore, further fieldwork and morphological as well as molecular studies are required to clarify the origin and taxonomic status of *A. cartilaginea* and possibly other softshell turtles in Sulawesi.

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**REJECTION OF AN AUSTRALIAN DISTRIBUTION
OF THE SOLOMON ISLANDS AGAMID LIZARD
HYPASILURUS LONGII (MACLEAY, 1877)**

Manthey and Denzer (2006) recently revised the agamid lizard genus *Hypsilurus*, and divided *Hypsilurus godeffroyi* (Peters, 1867) into four species. They restricted *Hypsilurus godeffroyi* to a population purportedly from Micronesia that may be extinct, and resurrected from synonymy the names *Hypsilurus longii* (Macleay, 1877), *Hypsilurus macrolepis* (Peters, 1872) and *Hypsilurus schoedei* (Vogt, 1932) for populations that had been assigned to *H. godeffroyi* by previous authors. The latter three species were considered to have non-overlapping distributions: *H. macrolepis* in the eastern part of the Solomon Islands, *H. schoedei* in the Admiralty Islands, and *H. longii* in the Bismark Archipelago and Bougainville, possibly extending east as far as the Shortland and Treasury Islands.

They included north Queensland in the distribution of *H. longii* on the basis of two specimens: the holotype of *Tiaris longii* Macleay, stated to have been presented to Macleay's collection by "Mr Mark H. Long, of Williamstreet [presumably William Street, Sydney], and ... taken in some part of Northern Queensland" (Macleay, 1877), and a second specimen, newly reported by Manthey and Denzer (2006), in the collection of the Zoologisches Museum, Museum für Naturkunde, Berlin (ZMB 19898, from "Queensland", though stated by Manthey and Denzer, 2006: 16 as "North Queensland").

The provenance of the holotype of *Tiaris longii* has long been doubted (McCoy, 1978; Cogger, 1979; Cogger et al., 1983; Covacevich et al., 1982), as it is geographically highly disjunct from the rest of the distribution of *H. godeffroyi* auctorum. Manthey and Denzer (2006) considered that the ZMB specimen confirmed the occurrence of *H. longii* (and hence the *H. godeffroyi* complex in general) in Australia.

In contrast, I do not accept the accuracy of this second record, and believe it is no more reliable than the nominal type locality.

The ZMB record has no precise locality other than Queensland. It is part of a small collec-