

# Distribution patterns of batagurid turtles in the Philippines

(Testudines: Bataguridae: *Cuora*, *Cyclemys*, *Heosemys*)

Verbreitungsmuster batagurider Schildkröten auf den Philippinen  
(Testudines: Bataguridae: *Cuora*, *Cyclemys*, *Heosemys*)

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## KURZFASSUNG

Derzeit sind fünf Schildkrötentaxa aus der Familie Bataguridae für die Philippinen bekannt (*Cuora amboinensis amboinensis*, *C. amboinensis kamaroma*, *Cyclemys dentata*, *Heosemys leytensis*, *H. spinosa*). Nur *Cuora amboinensis amboinensis* besitzt auf den Philippinen eine weite Verbreitung, während die anderen Formen auf wenige Inseln beschränkt sind. Die Philippinen wurden über zwei verschiedene Einwanderungsrouten besiedelt: *Cuora amboinensis kamaroma*, *Cyclemys dentata* und *Heosemys spinosa* drangen von Borneo aus auf die Philippinen vor. *Cuora amboinensis amboinensis* muß dagegen von Sulawesi (Celebes) oder von den Molukken her eingewandert sein, also aus einer Region, die ansonsten nur eine geringe herpetofaunistische Beziehung zu den Philippinen aufweist. Die ausgesprochen seltene *Heosemys leytensis* ist die einzige auf den Philippinen endemische Schildkrötenart. Ihre phylogenetischen und zoogeographischen Beziehungen sind unklar.

## ABSTRACT

At present, five taxa of batagurid turtles are known to occur in the Philippines (*Cuora amboinensis amboinensis*, *C. amboinensis kamaroma*, *Cyclemys dentata*, *Heosemys leytensis*, *H. spinosa*). Only one of them, *Cuora amboinensis amboinensis* occupies a wide range there, whereas the others are restricted to a few islands. Two different migratory routes were used for colonizing the Philippines: *Cuora amboinensis kamaroma*, *Cyclemys dentata* and *Heosemys spinosa* reached the islands from Borneo. *Cuora amboinensis amboinensis* colonized the Philippine Archipelago either from Sulawesi or from the Moluccas, a region that otherwise has only slight herpetofaunistic affinities with the Philippines. The extremely rare *Heosemys leytensis* is the sole chelonian species endemic to the Philippines. Its phylogenetic and zoogeographic relationships are poorly understood.

## KEY WORDS

Testudines, Bataguridae; *Cuora amboinensis amboinensis*, *Cuora amboinensis kamaroma*, *Cyclemys dentata*, *Heosemys leytensis*, *Heosemys spinosa*; zoogeography, distribution patterns and colonization pathways in the Philippines; Philippine Islands.

## INTRODUCTION

The senior author conducted continued herpetological field surveys in different regions of the Philippines since 1984. During eight stays with durations varying between two months and one year, most of the major islands (Bohol, Cebu, Leyte, Luzon, Mindanao, Negros, Palawan, Panay, Samar) and several smaller ones (Bongao, Busuanga, Calait, Masbate, Sangasanga, Siasi, Sibutu, Siquijor, Tawitawi, Ticao) were visited. During these surveys special emphasis was laid on batagurid turtles (cf. GAULKE 1995).

In addition, both authors examined voucher specimens of Philippine turtles in several museum collections (California Academy of Sciences, San Francisco; Muséum National d'Histoire Naturelle, Paris; Naturhistorisches Museum Wien; Senckenberg-Museum Frankfurt; Staatliches Museum für Tierkunde Dresden; Zoological Museum Copenhagen; Zoologisches Museum Berlin; Zoologisches Museum Hamburg).

Below, a review of distribution patterns based on published records and our own observations is presented.

## DISTRIBUTION

For most turtle species reported from the Philippines in earlier times (e.g. DE ELERA 1895; DE ROOIJ 1915) there are no Philippine voucher specimens represented in scientific collections and the Philippines are far outside the known geographic range of these taxa: *Callagur borneoensis* (SCHLEGEL & S. MÜLLER, 1844), *Chinemys reevesii* (GRAY, 1831), *Cuora trifasciata* (BELL, 1825), *C. flavomarginata* (GRAY, 1863), *Geoemyda spengleri* (GMELIN, 1789), *Notochelys platynota* (GRAY, 1834), *Ocadia sinensis* (GRAY, 1834), *Platysternon megacephalum* GRAY, 1831, *Siebenrockiella crassicolis* (GRAY, 1831), *Chitra indica* (GRAY, 1831), *Dogania subplana* (GEOFFROY, 1809), *Pelodiscus sinensis* (WIEGMANN, 1835). Therefore, the Philippine distribution of these species is not acknowledged by consecutive workers (TAYLOR 1920, 1921; ALCALA 1986; DAS 1996 a).

At present, the following batagurid taxa are known from the Philippines: *Cuora amboinensis amboinensis* (DAUDIN, 1802), *C. amboinensis kamaroma* RUMMLER & FRITZ, 1991, *Cyclemys dentata* (GRAY, 1831) sensu stricto, *Heosemys leytensis* TAYLOR, 1920, and *H. spinosa* (GRAY, 1831). However, considering the extremely high diversity of other Philippine reptile orders and the recent additions of previously unreported taxa, the future discovery of batagurids new to the Philippine fauna, even undescribed ones, is most likely (see also DAS 1996 a). As we intended to base our considerations on original data only, we did not uncritically include the largely sourceless locality records plotted in IVERSON (1992).

*Cuora amboinensis* is the most widespread batagurid species in the Philippines. According to ALCALA (1986) it occurs on virtually all islands. However, ALCALA (l.c.) lists neither localities nor voucher specimens or references. RUMMLER & FRITZ (1991) demonstrated that *C. amboinensis* is a polytypic species. The Moluccas, Sulawesi, and most Philippine islands are inhabited by the flat subspecies *C. amboinensis amboinensis*, whereas on Borneo and the Southeast Asian mainland the domed subspecies *C. amboinensis kamaroma* occurs. A third subspecies, *C. amboinensis*

*couro* (SCHWEIGGER, 1812), is distributed over Sumatra, Java, and nearby islands. Recently a further mainland subspecies (*C. amboinensis lineata*) was described from Myanmar (MCCORD & PHILIPPEN 1998), closely resembling *C. amboinensis kamaroma*.

*Cuora amboinensis amboinensis* has been recorded from Luzon, Mindoro, the bigger islands of the Visayan region and Mindanao (fig. 1). In detail, the following references exist: Cebu (BROWN & ALCALA 1986; RUMMLER & FRITZ 1991), Dinagat (BOETTGER 1886; TAYLOR 1920, 1921; ROSS & LAZELL 1990), Leyte (RUMMLER & FRITZ 1991), Luzon (BOETTGER 1886; TAYLOR 1920, 1921; RUMMLER & FRITZ 1991; BROWN & al. 1996), Masbate (GAULKE 1995, voucher specimen in the collection of the Staatliches Museum für Tierkunde Dresden), Mindanao (TAYLOR 1920, 1921; RUMMLER & FRITZ 1991), Mindoro (RUMMLER & FRITZ 1991), Negros (BOETTGER 1886; BROWN & ALCALA 1986; RUMMLER & FRITZ 1991), Polillo (TAYLOR 1920, 1921), Samar (RUMMLER & FRITZ 1991; GAULKE 1994).

*Cuora amboinensis kamaroma* has reached only one small Philippine island chain, the Sulu Archipelago in the southeastern part of the country (fig. 2). This subspecies was for the first time recorded for the Philippines by GAULKE (1995). In 1990 she found *C. amboinensis kamaroma* on the islands of Sangasanga and Tawitawi, in 1992 on Jolo (= Sulu). The two specimens from Jolo in the Muséum National d'Histoire Naturelle, Paris (MNHN 6152, MNHN 1994.1172), listed under *C. amboinensis amboinensis* by RUMMLER & FRITZ (1991), proved to be misidentified small juveniles of *C. amboinensis kamaroma*.

*Cyclemys dentata* occurs throughout the islands of the Palawan Province, on the Sulu Archipelago (Tawitawi) and on Leyte (fig. 3). It is not known whether the population on Leyte is native or introduced (FRITZ & al. 1997). References for islands in alphabetical order are: Balabac (BOULENGER 1894; TAYLOR 1920, 1921; ALCALA 1986; FRITZ & al. 1996, 1997), Busuanga (FRITZ & al. 1997), Calautit (FRITZ &

al. 1997), Leyte (TAYLOR 1920, 1921; ALCALA 1986), Palawan (BOULENGER 1894; TAYLOR 1920, 1921; ALCALA 1986; FRITZ & al. 1996, 1997), Tawitawi (GAULKE 1995; FRITZ & al. 1996, 1997).

*Heosemys leytensis*, an endemic species, is known so far only from two islands (fig. 4), Leyte (TAYLOR 1920, 1921; BUS-

KIRK 1989) and Palawan (TIMMERMAN & AUTH 1988), from a single locality each.

*Heosemys spinosa* is the most recently recorded batagurid of the Philippines (fig. 5). It is now known to occur on Mindanao (DAS 1996 b) and on Tawitawi Island in the Sulu Archipelago (FRITZ 1997).

## DISCUSSION OF DISTRIBUTION PATTERNS

It is evident that the batagurid turtles colonized the Philippines via two different immigration routes. *Cuora amboinensis kamaroma*, *Cyclemys dentata*, and *Heosemys spinosa* reached the country from Borneo, where they are widespread. Two connections between Borneo and the Philippines have constituted the main gateways for the Philippine herpetofauna as well as for other faunal groups: the Borneo-Palawan Bridge in the North, and the Sulu Archipelago in the South. Even though the Borneo-Palawan connection formed a continuous landbridge during the Pleistocene glaciations, while the Borneo-Sulu Archipelago bridge was probably discontinuous due to one or two sea channels even during the peak times of the glaciations, the latter was more important as a migratory route for amphibians and reptiles (e.g. INGER 1954; LEVITON 1963; BROWN & ALCALA 1970; GAULKE & ALTENBACH in press). Palawan seems to be more or less a dead end. From here only few species migrated further inwards into the Philippines, while from the Sulu island chain immigration continued via Mindanao through the eastern Visayan Islands up to Luzon in the North. Considering turtles, *C. dentata* apparently used both gateways, the Palawan and the Sulu region, and perhaps has migrated via Mindanao up to Leyte. However, as outlined in FRITZ & al. (1997), it is possible that the population of *C. dentata* on Leyte is introduced by man. If the population proves to be native in future, it is likely that *C. dentata* will be discovered also on Mindanao and probably other islands in the area.

As far as documented with certainty, *C. amboinensis kamaroma* has reached only the Sulu region and not the islands of the Palawan chain. If *C. amboinensis* is

present on the latter islands, the populations there are likely to belong to the subspecies *kamaroma* because the Palawan region has more faunistic affinities to Borneo than to the other Philippine islands.

We have severe doubts on the correctness of the *C. amboinensis* records indicated for Palawan and Busuanga on the distribution map in IVERSON (1992). After all, one of us (MG) did not encounter a single *C. amboinensis* during extensive field work on Busuanga, Calauit, and Palawan during several visits to the area between 1984 and 1996. It may be possible that IVERSON's records are actually based on misidentified *Cyclemys*, a genus which was for a long time thought to include the species *amboinensis*. However, in the Muséum National d'Histoire Naturelle, Paris, there is indeed a stuffed *C. amboinensis* (MNHN 1884.59, ad., plastron lacking), bearing the old label "No. 1795, Bacoco, Ile de la Paragua, Philippines, ALF MASCHÉ", which perhaps was the source of IVERSON's Palawan record (in former times Palawan was called Paragua). Nevertheless, this specimen not only belongs to the "wrong" subspecies (*C. amboinensis amboinensis*), but there is neither a locality named "Bacoco" nor any place with a similar spelling on Palawan. Most probably the locality data of MNHN 1884.59 stand for "Bacolor, Pampanga". Pampanga was the name of the former Spanish province around Bacolor in south-western Luzon. This would be consistent with the subspecific identity of MNHN 1884.59. Additional *C. amboinensis* from Palawan in the collection of the United States National Museum, Washington, D.C., are believed to represent introduced specimens (R. I. CROMBIE, Washington - pers. comm.).

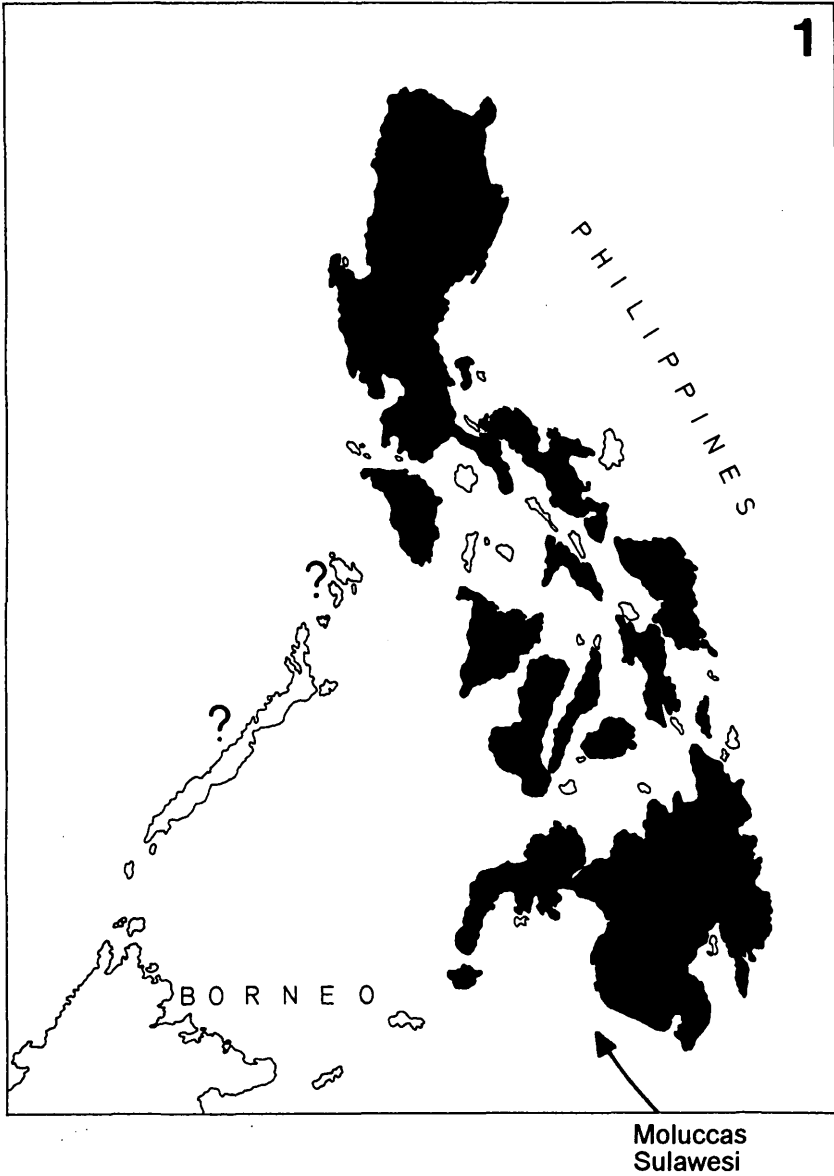


Fig. 1: *Cuora amboinensis amboinensis* (DAUDIN, 1802).  
Distribution on the Philippines and hypothetical immigration route.  
The question marks refer to the doubtful records discussed in the text.

Abb. 1: *Cuora amboinensis amboinensis* (DAUDIN, 1802).  
Verbreitung auf den Philippinen und hypothetische Einwanderungsrouten.  
Die Fragezeichen beziehen sich auf im Text diskutierte, zweifelhafte Nachweise.

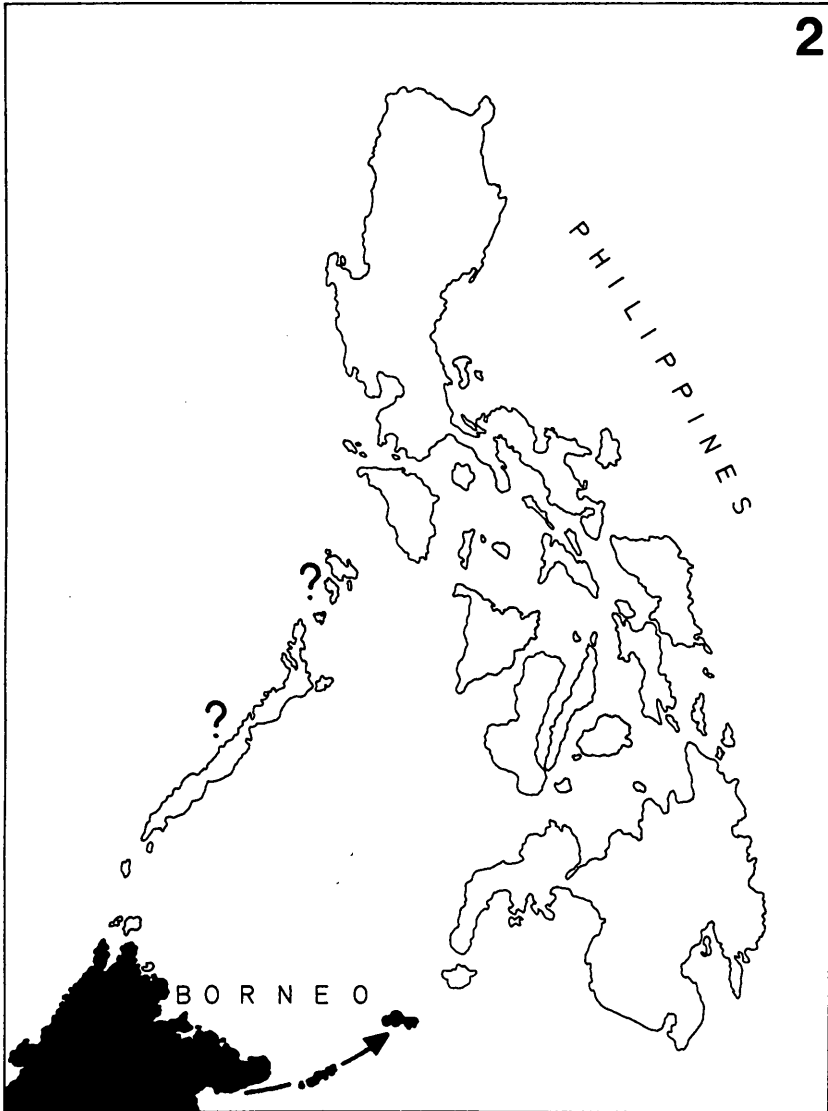


Fig. 2: *Cuora amboinensis kamaroma* RUMMLER & FRITZ, 1991.  
Distribution on the Philippines (Sulu Archipelago) and hypothetical immigration route.  
The question marks refer to the doubtful records discussed in the text.

Abb. 2: *Cuora amboinensis kamaroma* RUMMLER & FRITZ, 1991.  
Verbreitung auf den Philippinen (Sulu-Archipel) und hypothetische Einwanderungsrouten.  
Die Fragezeichen beziehen sich auf im Text diskutierte, zweifelhafte Nachweise.

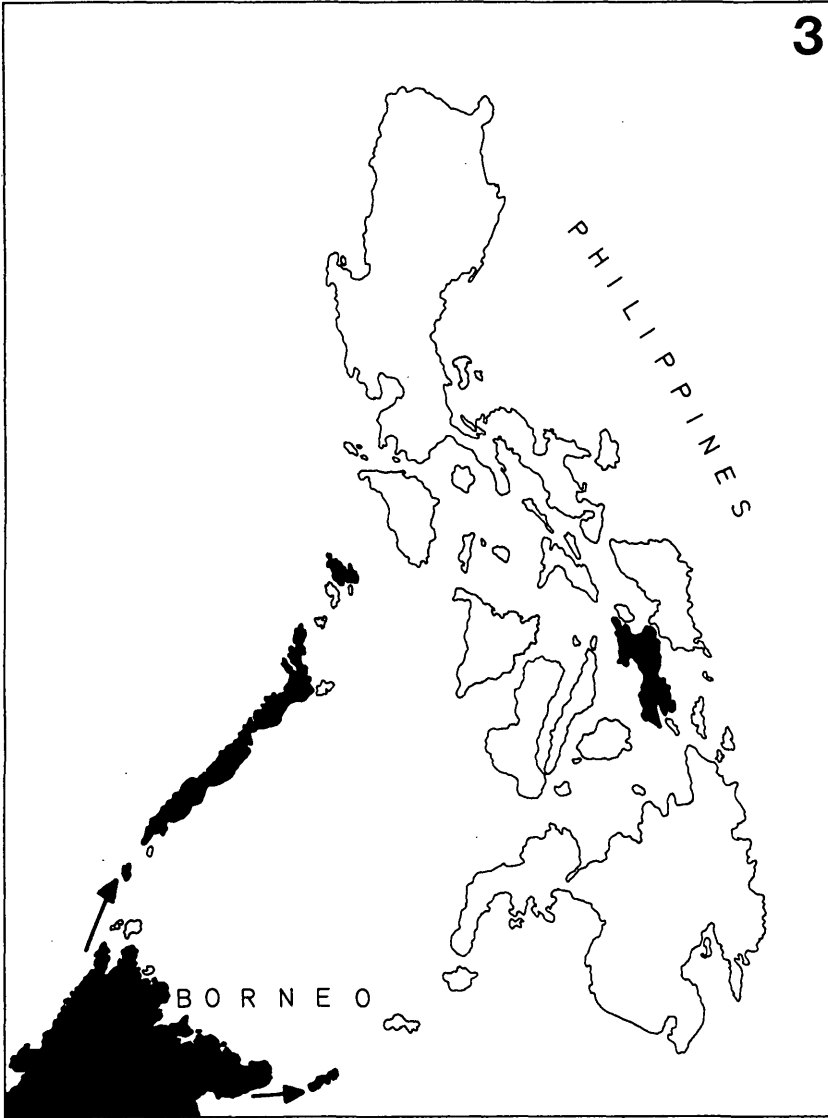


Fig. 3: *Cycllemys dentata* (GRAY, 1831).  
Distribution on the Philippines and hypothetical immigration routes.

Abb. 3: *Cycllemys dentata* (GRAY, 1831).  
Verbreitung auf den Philippinen und hypothetische Einwanderungsrouten.

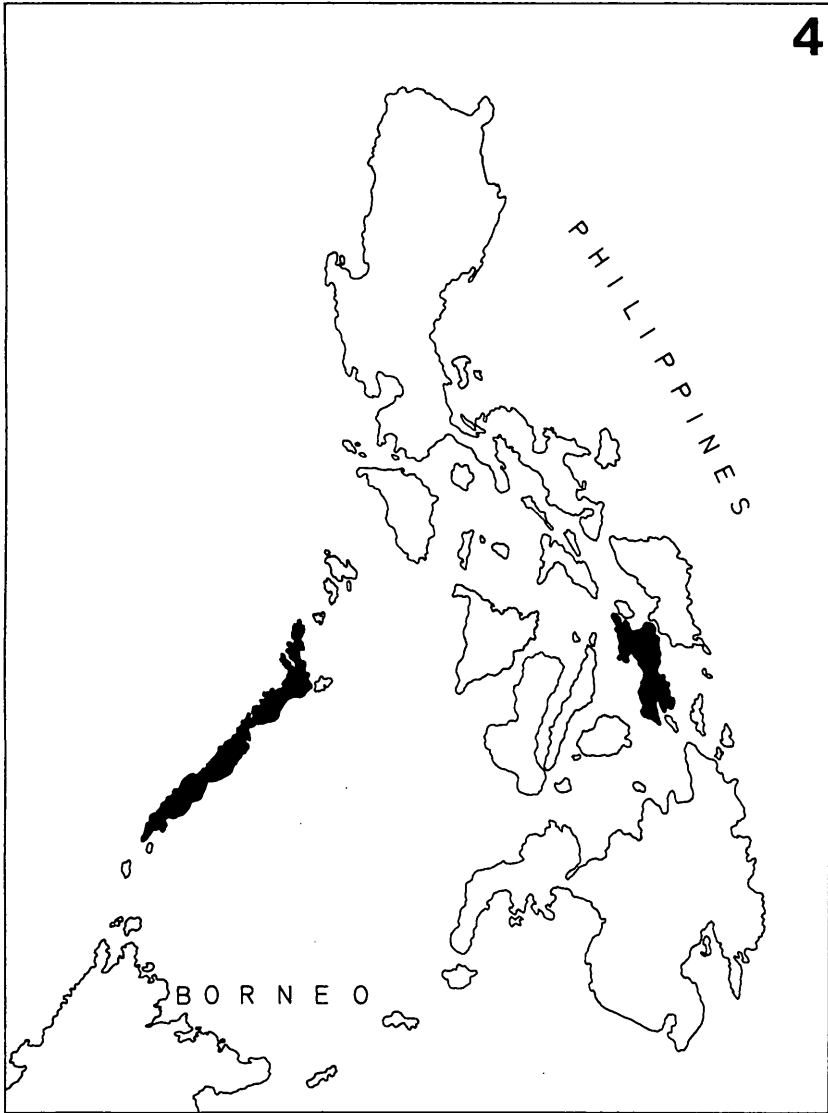


Fig. 4: *Heosemys leytensis* TAYLOR, 1920. Distribution on the Philippines.

Abb. 4: *Heosemys leytensis* TAYLOR, 1920. Verbreitung auf den Philippinen.

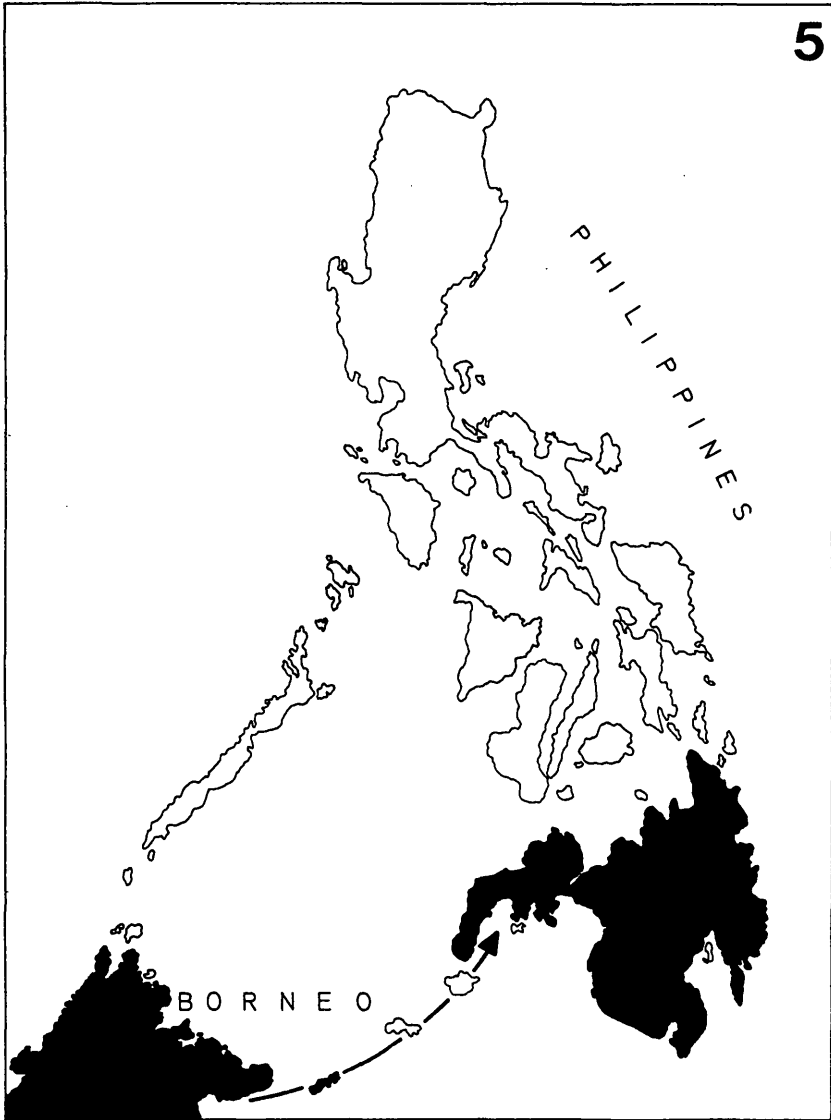


Fig. 5: *Heosemys spinosa* (GRAY, 1831).  
Distribution on the Philippines and hypothetical immigration route.

Abb. 5: *Heosemys spinosa* (GRAY, 1831).  
Verbreitung auf den Philippinen und hypothetische Einwanderungsrouten.



Like *C. amboinensis kamaroma*, also *H. spinosa* used the Sulu area as a migratory route. According to our present knowledge, it migrated up to Mindanao. It is somewhat surprising that this large and conspicuous turtle could escape discovery, or rather identification, until recently. Its discovery on other islands of the Mindanao region is likely.

Outside the Philippines, *C. amboinensis amboinensis* is only known from Sulawesi and the Moluccas (RUMMLER & FRITZ 1991) from where it must have reached the Philippines. Despite the fact that the herpetofaunal affinities between the Philippines and Sulawesi or the Moluccas are very slight (IN DEN BOSCH 1985), there is no other plausible geographic source for this turtle. Other taxa, which confirm at least a small herpetofaunal exchange between both regions, are for example the colubrid snake *Elaphe erythrura* (DUMÉRIL, BIBRON & DUMÉRIL, 1854), with four Philippine and one Sulawesian subspecies (LEVITON 1977), and the Sail finned Lizard *Hydrosaurus* sp., which occurs on the Philippines (except Palawan), Sulawesi and the Moluccas, but not on Borneo or other islands of the western Sunda region (GAULKE 1989; GAULKE & ALTENBACH in press).

An evaluation of the phylogenetic and zoogeographic relationships of the endemic *H. leytenensis* is not possible. The occurrence of this endemic turtle on the Philippines speaks either for an ancient immigration of its ancestors, taking the slow evolutionary change of chelonians into account, or for an allochorous origin.

The generic allocation of this rare turtle is rather doubtful. The elongated shell and the arrangement of the vertebral scutes easily separates it from all other species currently attributed to the genus *Heosemys* (cf. FRITZ & OBST 1996 for species list). Remarkably, the shape of its vertebral scutes closely resembles that in *Orlitia* and *Siebenrockiella*, two monotypic genera forming a natural group within the Bataguridae (MCDOWELL 1964; GAFFNEY & MEYLAN 1988). A similar shape of these scutes can be observed also in the batagurid genus *Kachuga*. So far, *H. leytenensis* is known only from Palawan in the West and Leyte in the East of the Archipelago. The herpetofaunal exchange between Palawan and other Philippine islands is greatly restricted. Most of the typical Philippine forms, like *Hydrosaurus pustulatus* (ESCHSCHOLTZ, 1829) or the skink genus *Brachymeles* are not found on Palawan (e.g. ALCALA 1986). Generally spoken, the faunal affinities of the islands of the Palawan chain are greater to Borneo than to any other Philippine island (e.g. BROWN & ALCALA 1970; GAULKE & ALTENBACH in press). Hence, the occurrence of *H. leytenensis* on Palawan and Leyte suggests either that it is, or at least once was, an extremely widespread turtle, or that it was transferred by humans. As in other countries, in the Philippines turtles are kept as pets or "living medicine" by many inhabitants. Therefore a dispersal by man cannot be excluded. Further findings of this interesting turtle are necessary before its distribution pattern and systematics can be explained better.

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