Status and Distribution of Nonmarine Turtles of the Philippines

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ABSTRACT. – We present updated accounts on the status and distribution of all known species of freshwater turtles in the Philippines, including information on taxonomy, natural history, exploitation, and conservation status. Six species of native nonmarine turtles (Dogania subplana, Pelochelys cantorii, Cuora amboinensis, Cyclemys dentata, Heosemys spinosa, and Siebenrockiella leytenensis) are recognized from the Philippines, 2 of which are trionychids and 4 are geoemydids. One of these (S. leytenensis) is an endemic species. There is some evidence to suggest that Philippine populations of P. cantorii, C. amboinensis, C. dentata, and H. spinosa may warrant further taxonomic study. The fauna also includes 3 introduced species (Pelodiscus sinensis, Trachemys scripta elegans, and Chrysemys picta). Pelodiscus sinensis, D. subplana, C. amboinensis, and S. leytenensis feature prominently in the domestic food and pet trade. Preliminary information indicates that these species are also illegally exported to supply international animal markets. The lack of basic information on the natural history of freshwater turtles in the Philippines stands as an obstacle to the implementation of effective conservation and management measures. We recommend that a national program for Philippine freshwater turtles be established to address priorities for research, conservation, and management of this threatened and poorly studied faunal assemblage.

KEY WORDS. – Reptilia; Testudines; Geoemydidae; Trionychidae; turtles; conservation; status; distribution; illegal wildlife trade; Southeast Asia; Philippines

Gray (1844) provided the earliest description of the testudine fauna of the Philippine Islands (Map 1). He reported on the presence of 3 freshwater and 1 marine species from the archipelago. Gray (1864) also published the description of Pelochelys cumingii, a Philippine endemic taxon that was later synonymized with P. cantorii (Boulenger 1889; see Species Accounts). Subsequent publications on Philippine turtles dealt largely with species lists based on museum collections and new distribution records (e.g., Günther 1879; Boulenger 1884; de Elera 1895; Siebenrock 1909). The work of de Elera (1895) contributed important records to the turtle fauna despite the questionable nature of some of the taxonomic decisions and species identifications (e.g., Taylor 1921; Das 1996b; Gaulke and Fritz 1998).

In the first modern review of Philippine turtles, Taylor (1920) recognized a total of 8 species comprised of 4 marine turtles and 4 freshwater turtles, including the endemic Heosemys leytenensis (= Siebenrockiella leytenensis; Diesmos et al. 2005), which he formally described in that monograph. Taylor (1920, 1921) also commented on the depauperate freshwater turtle fauna of the Philippines when compared with other regions of Asia but highlighted the possibility of discovering new species from unexplored freshwater ecosystems in the archipelago.

Current knowledge of the diversity and distribution of Philippine marine turtles is far more complete than that of the freshwater turtle fauna. For instance, field studies undertaken across many regions of the Philippines since the 1950s have increased significantly our understanding of the ecology, conservation status, and management of marine turtles (e.g., Domantay 1953; Alcala 1980; De Veyra 1997; Torres et al. 2004). Five species of marine turtles are known in Philippine waters, namely, Caretta caretta, Lepidochelys olivacea, Chelonia mydas, Eretmochelys imbricata (Cheloniidae), and Dermochelys coriacea (Dermochelyidae).

In contrast, information on Philippine nonmarine turtles is now outdated and has not been systematically reviewed in many decades. Consequently, the Philippines has one of the least known nonmarine turtle faunas in Asia. Even basic information on species richness and distribution remains uncertain (Das 1996b; van Dijk et al. 2000; Brown et al. 2002). The possibility of additional undocumented and/or undescribed Philippine taxa has been suggested by recent workers (Das 1996a; Gaulke and
Fritz 1998), but no systematic studies have been forthcoming.

As with most other regions in Southeast Asia, information on the fossil records of Philippine turtles is very limited, and this potentially rich source of data on diversity and biogeography of this group remains poorly studied. For instance, archaeological explorations of Cagayan Valley in northeastern Luzon Island have yielded apparent trionychine and testudinid fossils (de Vos and Bautista 2003). This discovery has significant implications as no extant species of Testudinidae is known from the Philippines (Alcala 1986; Ernst and Barbour 1989; Iverson 1992).

Here we review the status of all species of freshwater turtles that are currently known from the Philippines and provide updated information on their distribution, natural history, and conservation. For most species, we present recommendations on what we consider to be the most essential areas for scientific research and conservation efforts. The information we present is a result of our fieldwork throughout the Philippines and includes direct observations of turtles in the wild and examinations of voucher materials from numerous natural history collections. In addition, field biologists working on other aspects of Philippine biodiversity generously contributed valuable data to this effect (see Acknowledgments). This work is naturally far from complete, and we hope that our effort to synthesize available information will help facilitate much-needed conservation work and stimulate field studies on this poorly known group of turtles.

**METHODS**

General distributional data (i.e., names of islands and general geographic features such as mountains, lakes, or rivers) are provided in the species accounts, with more detailed locality data (based on vouchers, field observations, collectors’ notes, or photographic evidence) summarized in the Appendix. Philippine Pleistocene Aggregate Island Complexes (PAICs) harbor unique and often nonoverlapping fauna and correspond to paleoislands that existed during periods of reduced sea level during the Pleistocene (Brown and Diesmos 2002). Thus, we often refer to the PAIC, where we suspect a species might be found. Information on ecology and natural history of species is limited to Philippine populations; for more information on these subjects, refer to Ernst and Barbour (1989), Lim and Lim (1992), Cox et al. (1998), Lim and Das (1999), and Ernst et al. (2000). The global conservation status of species was based on the International Union for Conservation of Nature Red List of Threatened Animals (IUCN 2007; www.iucnredlist.org). We also included the legal status of internationally traded species based on the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES 2005; www.cites.org). Vernacular names and respective dialects (in parentheses) are preceded by common English names.

**NATIVE SPECIES**

**Trionychidae**

**Dogania subplana** (Geoffroy Saint-Hilaire, 1809) (Plate 1, Map 2)

*Common Names.* — Malayan softshell turtle, stream softshell turtle, hillstream soft-shelled turtle, pawikan (Tagalog), labi, labe (Pala’wan).

*Distribution.* — In the Philippines, *D. subplana* is known from the islands of Luzon, Palawan, Mindoro, and Mindanao. This highly disjunct distribution suggests that the species may yet be recorded from other islands in the country. Outside the Philippines, this species is known from southern Myanmar, Thailand, West Malaysia, Singapore, Sumatra, Borneo, Java, and associated islands in the Sunda Shelf (Iverson 1992; Cox et al. 1998; Lim and Das 1999; Fritz and Havas 2007).

*Remarks.* — De Elera (1895) first reported the occurrence of *D. subplana* in the Philippines and listed it from the islands of Mindanao and “Paragua” (= Palawan). Later authors (e.g., Siebenrock 1906, 1909; de Rooij 1915) subsequently summarized and included these records in
several monographs. At that time, the materials that form the basis of this account were deposited at the Museo de Santo Tomas of the University of Santo Tomas, Manila (de Elera 1895). Taylor (1920, 1921) doubted the authenticity of much of de Elera’s (1895) records and did not include *D. subplana* in his monograph and listings of Philippine turtle fauna, apparently because of his inability to locate voucher materials. Similarly, the species was excluded from more recent checklists and monographs of Philippine amphibians and reptiles (e.g., Brown and Alcala 1970; Alcala 1986).

We have encountered *D. subplana* in the field since the early 1990s and have examined living and preserved specimens from public and private zoos and zoological reference collections of universities. Field biologists conducting biodiversity surveys have likewise called our attention to their own observations of the species from different parts of the country. Gavino and Schoppe (2004) and Lopez and Schoppe (2004) gave detailed accounts of their field observations and morphological studies of *D. subplana* on Palawan.

*Natural History.* — *Dogania subplana* has been found in streams, rivers, and natural and artificial lakes and ponds in pristine and degraded forests and in nonforested habitats at elevations of near sea level to about 500 m. It
has occasionally been found in irrigation canals, ditches, and flooded rice fields.

Exploitation and Conservation. — This species is legally protected in the Philippines through Republic Act 9147 (Philippines Wildlife Act). The illicit trade in *D. subplana* within the Philippines is extensive. The species is also exported to several countries in Asia (Gavino and Schoppe 2004). Our data indicate that many wild-caught *D. subplana*, especially from Palawan, end up in the markets and restaurants in the cities of Manila and Cebu. These turtles are also popular in pet shops and are used for traditional medicine. Based on interviews gathered from local respondents, commercial breeding farms of *D. subplana* are presently operating in Palawan, Mindoro, and Manila in order to sustain the trade. Although some populations of *D. subplana* on Palawan appear to be thriving, the species is potentially threatened by a combination of overexploitation and habitat destruction (Regodos and Schoppe 2005).

Research Priorities. — Information on population estimates, life history, and the dynamics of illegal trade of the species are needed. Field surveys are also needed to gather additional information on the species’ true distribution in the Philippines.

*Pelochelys cantorii* Gray, 1864
(Plate 1, Map 3)


**Distribution.** — Philippine populations of *P. cantorii* are known thus far from the islands of Luzon (Cagayan River and Ilaguen River) and Mindanao (Agusan Marsh Wildlife Sanctuary and the Panabo River, Davao del Norte Province). Other areas on Mindanao where its occurrence has been reported to us but for which we lack verification include Liguasan Marsh (North Cotabato Province) and Laac (Compostella Valley Province). It may occur on other major islands of the Philippines and is likely to be found in the Sulu archipelago (Webb 2002). The species is historically known from Balabac in the Palawan island group (de Elera 1895; Siebenrock 1903) and from the following localities on Luzon: San Miguel River, Bulacan Province (Taylor 1920, 1921); Laguna de Bay, Laguna Province (SMF 8069; examined by I. Das, in litt., March 2006; also mentioned in Webb 2002), and “Manille” (= Manila) (MNHN 579; examined by I. Das, in litt., March 2006). No information, however, is forthcoming to indicate that the species still occurs in these localities. *Pelochelys cantorii* ranges from southern India through Bangladesh, southern China, Myanmar, Vietnam, Cambo-

Remarks. — The status and distribution of this large freshwater softshell in the Philippines has been shrouded in confusion for many years. Gray (1864) reported a large specimen and several small ones of a *Pelochelys* collected in the Philippines by Hugh Cuming (who visited the islands during the period 1836–1839), an English amateur conchologist and prolific collector of botanical and zoological specimens; Gray (1864) named the species as new, *P. cumingii*. This form was characterized as having the head olive, minutely black-dotted; the throat olive, minutely white-speckled (Gray 1864). *Pelochelys cumingii* was subsequently synonymized with *P. cantorii* by Boulenger (1889), an arrangement adopted by later authors (e.g., de Rooij 1915; Taylor 1920, 1921; Iverson 1992). In his extensive review, Webb (2002) doubted the authenticity of most Philippine records of *P. cantorii* because of the spurious collection data of some past workers, the lack of voucher materials from the Philippines, and the failure of recent workers to relocate the species in the wild. Webb (2002), however, accepted a record from the island of Balabac (Siebenrock 1903) in the Palawan island group, western Philippines, and suggested that it might occur on other nearby (Philippine) islands north of Borneo. He also emphasized that exhaustive field surveys with extensive trapping were needed to confirm that *Pelochelys* does occur in the Philippines.

We confirm the continued existence of *P. cantorii* in the Philippines based on voucher materials, our own field sightings of live animals, and examinations of shells and photographs of the species. We have observed the species at Ilaguen River, Isabela Province, in 1998 and at Cagayan River, Cagayan Province, in 2001 and 2006, both in northern Luzon. We have examined shells in the possession of villagers from turtles that were collected at the Ilaguen River, where the species is collected occasionally for food. In addition, we have examined photographs and specimens of *P. cantorii* from Agusan Marsh Wildlife Sanctuary, a national protected area in western Mindanao, and from the upper Cagayan River basin in Quirino Province, northern Luzon. In all instances, we recognized the turtles as *P. cantorii*; our identification was later verified by R.G. Webb (in litt., 10 September 2003).

Natural History. — *Pelochelys cantorii* inhabits freshwater marshes, lakes, and rivers. Adult and juvenile turtles have reportedly been incidentally caught in fishing nets placed across such habitats. An adult turtle was taken in 2002 from a 3-m-wide tributary of the Panabo River, Davao del Norte Province, Mindanao, during a dredging operation. Local residents near the rivers of Ilaguen and Cagayan on Luzon reportedly collect eggs of the species from sandy shores and sandbars, especially during the start of the rainy season (i.e., June or July). Turtles that were intended for consumption by collectors fed on fish, shrimps, and aquatic algae while in captivity. The general scarcity of confirmed records from field surveys and the lack of specimens indicate that this species may be uncommon to rare in the Philippines.

Exploitation and Conservation. — The most important threat to *P. cantorii* appears to be habitat disturbance and conversion, specifically the draining of wetlands for agricultural plantations and the widespread quarrying of gravel and sand from riverine habitats. The species is also collected for local consumption. Indigenous peoples groups on Luzon (e.g., *Ibanag*) and on Mindanao (e.g., *Mandaya*) make use of the carapace in traditional medicine. Local beliefs also dictate that keeping of body parts of the species brings good luck. Quantitative data on exploitation for the pet and food trade are not available, and this subject needs to be investigated. *Pelochelys cantorii* is currently listed as endangered (IUCN 2007) and is an Appendix II species (CITES 2005). It is legally protected under the Philippines Wildlife Act.

Research Priorities. — The taxonomic status of *P. cumingii* needs to be reevaluated. There is a possibility that this taxon may be a distinct, endemic form (Das 1996b; Ernst et al. 2000). Significant morphological differences pertaining to skull dimensions and neural bone counts had previously been reported between Philippine and mainland Asian populations of *P. cantorii* (Baur 1891; Taylor 1920, 1921). There is unquestionably a need for an in-depth taxonomic study, preferably with the use of molecular and genetic methods. The taxonomic status of Philippine *Pelochelys* cannot be reliably assessed without the study of additional material (live or preserved specimens from known localities; see Lehn et al. 2007). At present, we are aware of the existence of only 2 preserved specimens of *P. cantorii* from the Philippines (PNM 8487 and an uncataloged specimen). A quantitative and comparative study of the various populations of *P. cantorii* across the Asian region is also warranted. Further, information on its population biology and life history need to be collected. An assessment of the impact of habitat degradation and exploitation of the species should be considered a priority research action.

Geoemydidae

*Cuora amboinensis* (Daudin, 1801)

(Plate 2, Map 5)

Common Names. — Malayan box turtle, Southeast Asian box turtle, Amboina box turtle, pagong (Tagalog), siroman, bayu-o (Pala’wan), bakuku (bakoko), bari, krusan (Cuyonin), ba-o (Visayan), kumaw (Waray), pannu (Bagobo), kula-kula (Tausug).

Distribution. — *Cuora amboinensis* is widely distributed in the Philippines and is expected to be found on other islands that are not listed here. Details on localities are enumerated in the Appendix. In the Philippines, 2 subspecies are distributed as follows: *Cuora a. amboinensis* is found on Luzon (recorded from numerous
localities across the island, originally reported as *C. amboinensis*, e.g., Taylor 1920, 1921; Alcala 1986; Brown et al. 1996, 2000; Diesmos et al. 2004a), Polillo, Verde (Sison and Diesmos 2008), Mindoro, Sibuyan, Palawan, Dumaran, Panay (Ferner et al. 2000), Guimaras, Pan de Azucar, Negros, Cebu, Masbate, Leyte, Samar, Bohol, Dinagat, and Mindanao. *Cuora a. kamaroma* has been recorded from Sanga-sanga, Tawi-Tawi, Jolo (Gaulke 1995a, 1995b), Dumaran, and Palawan (PNM specimens; see Appendix). Nominate *C. amboinensis* ranges from eastern India, Bangladesh, Burma, Thailand, Vietnam, Malaysia, Timor, Borneo, Sulawesi, Ceram, and Amboina, Indonesia (Iverson 1992; Lim and Das 1999; Ernst et al. 2000; Fritz and Havas 2007).

**Remarks.** — *Cuora amboinensis* is the most wide-ranging freshwater turtle in the Philippines, being found on nearly all major islands of the archipelago, including small satellite islands (Taylor 1920, 1921; Alcala 1986; Ernst and Barbour 1989; Iverson 1992). Four subspecies of *C. amboinensis* are presently recognized (Rummler and Fritz 1991; McCord and Philippen 1998; Fritz and Havas 2007), and 2 of these occur in the Philippines, *C. a. amboinensis* and *C. a. kamaroma* (Gaulke 1995a; Gaulke and Fritz 1998). The 2 forms can be differentiated morphologically by the following characters: *C. a. amboinensis* has a relatively flat carapace with vertebral keels, and the plastron has prominent black blotches; *C. a. kamaroma* has a high-domed, relatively smooth carapace, and the plastron lacks or has few black markings. Gaulke (1995a)
and Gaulke and Fritz (1998) asserted that these 2 subspecies occupy disparate biogeographical zones in the Philippines and do not overlap in geographic distribution. Although C. a. kamaroma is apparently restricted to the Sulu and Palawan island groups (regions that are biogeographically traditionally associated with Sundaland: Heaney 1986; Brown et al. 2002; Diesmos et al. 2005; but see Brown and Diesmos, in press), recent herpetological surveys of Palawan have recorded both C. a. kamaroma and C. a. amboinensis in the same habitats (Diesmos et al. 2004b; Diesmos and Brown, unpubl. data). We have observed both forms occurring in sympatry in forest habitats on the island of Dumaran (in the Palawan island group) and in swamp forests on the island of Palawan. The hypothesis that Palawan populations represent a morphologically intermediate and currently undescribed taxon warrants additional study (S. Schoppe, pers. comm., 2007).

Natural History. — This species inhabits a wide variety of aquatic habitats, including marshes, swamps, rivers, streams, lakes, and ponds, and is occasionally found in man-made habitats, such as reservoirs, irrigation ditches, flooded rice fields, and even water buffalo wallows. Its recorded elevational distribution is from sea level to about 1000 m (Alcala 1986; Diesmos et al. 2004a). Both subspecies of C. amboinensis appear to be fairly common in areas where they are known to occur (pers. obs.). Alviola et al. (2003) observed that subadult C. amboinensis on Polillo Island dispersed more widely compared with juveniles and adults. In general, very few ecological studies of the species have been undertaken despite its apparent abundance and wide distribution in the Philippines.

Exploitation and Conservation. — This box turtle is extremely popular in pet shops in the cities of Manila, Cebu, and Davao. Both juvenile and adult turtles are sold with prices ranging from 50 to 250 pesos (about $1 to $5) per individual. We have received reports of wholesale wild collecting of this species on Sibuyan Island, where it was previously plentiful. One of us (RMB) interviewed residents of the island who reported that 10–15 50-kg rice sacks of live C. amboinensis were harvested weekly from the 1980s to the early 1990s for sale to Chinese and Taiwanese traders and that the species was now much less plentiful on Sibuyan Island compared to 20–30 years ago.

Based on interviews with wildlife collectors, we believe that most if not all turtles sold in animal markets are wild caught. Its meat is considered a delicacy in many regions of the country; hence, the turtle is regularly harvested for consumption. On the other hand, there is a prevalent belief that the species brings wealth and good luck, and animals are commonly kept as pets in many rural villages across the Philippines. Cuora amboinensis is listed as vulnerable (IUCN 2007) and is an Appendix II species (CITES 2005). It is a protected species under the Philippines Wildlife Act.

Cyclemys dentata (Gray, 1831)
(Plate 3, Map 6)

Common Names. — Asian leaf turtle, brown stream terrapin, bakuku (bakoko), kuritan (Cuyonin), bayu-o, kalumbagis (Pala’wan).

Distribution. — In the Philippines, C. dentata is restricted to the Palawan island group (Calauit, Busuanga, Culion, Dumaran, Palawan, and Balabac), the Sulus, and Tawi-Tawi. A specimen is known from the island of Siasi in the Sulu archipelago (MNHN 584; examined by I. Das, in litt., March 2006). As currently understood, C. dentata (sensu lato) ranges from eastern India through Myanmar, Vietnam, Laos, Cambodia, Thailand, Malaysia, Singapore (doubtful record: Lim and Lim 1992), Sumatra, Java, and Borneo (Iverson 1992; Lim and Das 1999; Ernst et al. 2000; Fritz and Havas 2007).

Remarks. — Cyclemys dentata has been reported from the island of Leyte (Taylor 1920, 1921; Alcala 1986; Ernst and Barbour 1989; Iverson 1992; Gaulke and Fritz 1998). However, herpetological surveys of Leyte and adjacent islands have repeatedly failed to find the species (e.g., Denzer et al. 1994; Gaulke 1994; Diesmos et al. 2004c). Because there is compelling evidence that the original Leyte account stems from a mislabeling of specimens (Diesmos et al. 2004b, 2004c) and no substantive subsequent records have been forthcoming in the intervening years, we suspect that, like Siebenrockiella leytensis (see the following discussion), the Leyte record for C. dentata is in error.
and should not be included further in faunal distribution lists and checklists of species on the island.

Natural History. — The species inhabits small streams in primary and secondary hill forests and freshwater swamps and is rarely found in artificial habitats and agricultural areas. During the day, when it is generally inactive, individuals can be found under rocks, buried under sand and gravel, or in crevices of boulders on the banks of streams or rivers. In the island of Dumaran, we observed adults and juveniles of the species feeding on ripe figs (*Ficus* spp.) that fell into streams. Turtles in captivity took pieces of meat, fruits, and the ubiquitous aquatic plant *Ipomoea aquatica*.

Exploitation and Conservation. — *Cyclemys dentata* is collected by indigenous peoples and rural villagers as a protein source and is commonly consumed because of the supposed medicinal properties of its meat. Wildlife traders from Palawan revealed that *C. dentata* is among the turtles that are regularly (and illegally) exported to supply the pet markets of Asia and Europe. The trade in *C. dentata* is extensive within Palawan but appears to be negligible elsewhere in the Philippines. This species can be occasionally seen in the pet shops of Manila (pers. obs.). *Cyclemys dentata* is fairly common in the Palawan island group, and many populations can be found inside protected areas (e.g., Puerto Princesa Subterranean River Natural Park, Puerto Princesa City). Gaulke (1995a) reported that it is “not rare” on Tawi-Tawi Island. This species is legally protected under the Philippines Wildlife Act.
Research Priorities. — *Cyclemys dentata* is probably a complex of several species (Fritz 1997; Iverson and McCord 1997; Guicking et al. 2002). Philippine *Cyclemys* may represent more than 1 lineage, particularly given the fact that they occur in the Palawan, Sulu, and Tawi-Tawi PAICs (Plate 3E–F) (P.P. van Dijk, in litt., December 2007). Taxonomic studies, preferably with the use of molecular data, could help resolve uncertainty concerning the true identity of Philippine *Cyclemys*.

*Heosemys spinosa* (Gray, 1831) (Plate 4, Map 7)


Distribution. — Tawi-Tawi Island in southern Philippines. It is likely to occur in other forested islands within the Sulu and Tawi-Tawi PAIC. We have demonstrated (see the following discussion) that the record of *H. spinosa* from Mindanao (Das 1996a) is in error; although, we strongly underscore the need for thorough faunal inventories of the island to gain a better understanding of its testudine fauna. *Heosemys spinosa* ranges from southern Thailand, Myanmar, Malaysia, Sumatra, Borneo, and many other Indonesian islands (Iverson 1992; Lim and Das 1999; Ernst et al. 2000).

Remarks. — Das (1996a) first reported *Heosemys spinosa* from the Philippines based on 2 preserved specimens at the National Museum of the Philippines that allegedly originated from Mindanao. In fact, the specimens in question originated from Tawi-Tawi and were taken during a faunal inventory of the island by biologists of the National Museum of the Philippines and the Cincinnati Museum of Natural History in 1991 (R.S. Kennedy, in litt., June 2003; PNM herpetological registry). Fritz (1997) independently validated the occurrence of *H. spinosa* on Tawi-Tawi, while a more recent “rapid biodiversity assessment” by biologists from Haribon Foundation (a Philippine-based conservation nongovernmental organization) confirmed the continued existence of the species there through photographic records (E.L. Rico, in litt., December 2004).

Natural History. — This turtle has been observed near streams and ponds in primary and logged-over lowland forest below 300 m elevation. Juveniles have also been found in these same habitats during the wetter months of the year (October–November). Seasoned wildlife hunters and collectors from Tawi-Tawi claimed they rarely encounter this turtle in their collecting trips, indicating that the species may naturally occur at low densities on the island or that its population may be declining because of continued habitat destruction.

Exploitation and Conservation. — Recent field reports from biologists suggest that the consumption of this turtle for food is not prevalent and that it is only occasionally collected for the wildlife trade. Overall, the level of exploitation of the species appears to be negligible, but more research is needed on this subject. *Heosemys spinosa* is globally threatened (endangered; IUCN 2007) and is an Appendix II species (CITES 2003). It is legally protected under the Philippines Wildlife Act.

Research Priorities. — Very little information is available on the status and distribution of the Philippine population of *H. spinosa*. Priority research activities must include habitat utilization studies, reproductive biology, population assessments, and distribution surveys, particularly in the Sulu island group. The unstable sociopolitical situation and perceived security risk in the region have successfully prevented biologists from conducting fieldwork there for over 30 years (see duPont and Rabor 1973). Biodiversity studies in this PAIC have been sporadic at best and limited to the Tawi-Tawi archipelago (e.g., Taylor 1923; Gaulke 1995b). The biologically unknown Sulu archipelago may possibly harbor a remarkable and unique herpetofauna (Brown et al. 2002) and possibly may support other unrecorded turtle species.

*Siebenrockiella leytensis* (Taylor, 1920) (Plate 5, Map 8)

Common Names. — Leyte pond turtle, Philippine pond turtle, Philippine freshwater turtle, Philippine forest turtle, *tumanog* (Tagbanua), *panyaen, bayu-o* (Pala’wan), *bakuku (bakoko) suyan* (Cuyonin).
Distribution. — *Siebenrockiella leytensis* is confined to the Palawan island group. It has so far been found only in the northern regions of Palawan (Taytay, San Vicente, Puerto Princesa) and from the island of Dumaran (Diesmos et al. 2004b, 2004c). This species may have a much wider distribution within this PAIC than is presently known and may eventually be found (if suitable habitats exist) on the islands of Busuanga, Coron, Culion, Linapacan, and possibly Balabac (Diesmos et al. 2004b).

Remarks. — The Philippine forest turtle formerly was one of the most enigmatic species of freshwater turtles in Southeast Asia. It has been surrounded with more confusion and misconception than any other geoemydid/batagurid turtle known from the region (Diesmos et al. 2004b). For over 80 years, its true geographic distribution in the Philippines remained a mystery; its apparent rarity and the rudimentary knowledge of its natural history had bestowed on it a mythical reputation (van Dijk et al. 2000). The decades-long belief that *Siebenrockiella leytensis* occurred on the island of Leyte (Taylor 1920) was finally shown to be erroneous, resulting from a mislabeling of the type specimens (Diesmos et al. 2004b). *Siebenrockiella leytensis* is confined to the Palawan PAIC (Timmerman and Auth, 1988; Diesmos et al. 2004b, 2005), which is biologically distinct from the rest of the Philippines and considered by some to be biogeographically affiliated with Sundaland (Heaney 1985, 1986) or composed of a mixed fauna with both Sundaic and oceanic Philippine origins (McGuire and Alcala 2000; Brown and Guttman 2002; Evans et al. 2003; Brown and Diesmos, in press). Regardless, this PAIC harbors high concentrations of endemic biodiversity not found in Southeast Asia (Widmann 1998; Diesmos and Palomar 2004).

Taxonomy. — Taylor (1920) described *S.* [orig. *Heosemys*] *leytensis* based on 2 specimens retrieved from a zoological laboratory at the University of the Philippines in Manila. He placed this taxon in the genus *Heosemys* on the basis of an absence of a temporal arch. Wermuth and Mertens (1961) suppressed *Heosemys* and allocated most of its member species to *Geoemyda*, a placement that was rejected by McDowell (1964), who cited the distinctive skull anatomy of turtles within this group. Nonetheless,
subsequent papers listed *leytensis* as a species of *Geoemyda* (Ernst and Barbour 1989; but see Buskirk 1989). McCord et al. (2000) proposed that *leytensis* remain in the genus *Heosemys* until more robust information on the systematics of these taxa indicated otherwise. A recent morphological and molecular phylogenetic study (Diesmos et al. 2004b, 2005) showed that *leytensis* is the sister lineage to the previously monotypic Sundaic turtle genus *Siebenrockiella*. Thus, *leytensis* is the sister species to *S. crassicollis*, which occurs from the middle Mekong to Borneo. Nonetheless, the high genetic divergence (ca. 13\% cytb) between *S. leytensis* and *S. crassicollis* and a suite of morphological differences prompted Diesmos et al. (2005) to erect the subgenus *Panyaenemys* to accommodate the distinct Philippine lineage.

**Natural History.** — The Philippine forest turtle is nocturnal and semiaquatic. Hatchings and small juveniles appear to rely on aquatic habitats more than adults (S. Schoppe, *pers. comm.*, 2007). This species inhabits riparian habitats (streams, creeks, medium-sized rivers) in pristine lowland forest but has also been found in disturbed forest fragments and second-growth vegetation near remnant original forests. It is known from freshwater swamps (Fidenci 2004) and may occur in inland lakes. *Siebenrockiella leytensis* has been recorded at elevations from near sea level to about 300 m. During the driest months of the year (November–April) when most streams and medium-sized rivers have dried up, it hides under limestone boulders or inside limestone caves, presumably to escape the heat and/or reduce dehydration (Diesmos et al. 2004c). On Dumaran Island, we found *S. leytensis* ensconced under large rocks and deep burrows on riverbanks during the day. At night, we observed them foraging on freshwater fish, crabs, shrimps (e.g., *Macrobrachium* spp.), algae, and ripe figs (*Ficus* spp.) along stream banks and deep stationary pools. In captivity, *S. leytensis* is crepuscular and takes leafy vegetables, soft fruits (banana, papaya), pieces of meat (chicken, pork, fish), and even dog food pellets (Diesmos 2004c; Yuyek 2004). Data on reproduction are still fragmentary. Egg laying has been recorded during the period June–August. Two eggs laid by a female turtle measured 45.5 × 23.2 mm and 57.8 × 24.3 mm and weighed 20 and 30 g, respectively. The eggs are brittle-shelled, oblong, and pale pink in color (Diesmos et al. 2004c; Yuyek 2004). Hatching appears to occur between January and April (S. Schoppe, unpubl. data). Wildlife trappers on Palawan claim that it oviposits in deep burrows on near-vertical banks of streams and rivers. *Siebenrockiella leytensis* is the largest and the heaviest geoemydid turtle known from the Philippines. Old adults have a carapace length of more than 300 mm and a plastron length of over 220 mm and can weigh well over 5 kg. We expect that data on this subject will be produced quickly, given the current research efforts of biologists including, regrettably, the (entirely illegal) proliferation of *S. leytensis* in the hands of wildlife collectors and herpetofaunal enthusiasts.

**Exploitation and Conservation.** — *Siebenrockiella leytensis* is currently listed as critically endangered by the IUCN Red List and is included in Appendix II of CITES (CITES 2005; IUCN 2007). It is a nationally protected species in the Philippines through the Wildlife Act, the violation of which carries a penalty of heavy fines, including imprisonment (PAWB 2004a, 2004b).

The greatest threats facing *S. leytensis* are overcollection for the illegal wildlife trade and the continuing destruction of its primary habitat. The former is presently the most serious threat and is certainly the most damaging to its populations. As was predicted previously (van Dijk et al. 2000), the rediscovery of *S. leytensis* has spurred a collecting frenzy among wildlife trappers and traders to supply illegal domestic and international markets. We have gathered compelling evidence that its populations in the region of Taytay and San Vicente in northern Palawan are declining rapidly because of indiscriminate collection (Diesmos et al. 2004c). Along with other wild vertebrate species, poachers sell *S. leytensis* collected from Taytay and San Vicente to collectors, middlemen, and traders. A majority of the turtles are purchased and smuggled into Manila, Cebu, or Davao. These cities serve as transshipment points where wildlife traffickers transport the animals to several destinations in Asia and Europe (Diesmos et al. 2004c; Gavino and Schoppe 2004; Yuyek 2004; Plate 6).
As with other turtles in the Philippines, *S. leytensis* is consumed for its meat, which is believed to possess medicinal properties. The carapace and plastron are also fashioned into indigenous musical instruments and various curios. Members of ethnic groups from Palawan (particularly the Cuyonin and Tagbanua) and the economically marginalized populace often carry out this form of utilization.

**Research Priorities.** — Priority research topics include population assessments, demography, and breeding biology and seasonality. In particular, baseline data on population size need to be established to have an accurate assessment of the impacts of habitat degradation and of collection for wildlife trade and local consumption. Additional field surveys, conducted with adequate documentation (Lehn et al. 2007), are essential to determine the extent of its distribution within the Palawan PAIC.

**INTRODUCED SPECIES**

**Trionychidae**

*Pelodiscus sinensis* (Wiegmann, 1835)
(Plate 1, Map 4)

Distribution. — Luzon, Mindoro, Panay, Cebu, Bohol, Leyte, and Mindanao. *Pelodiscus sinensis* is likely to be found in numerous other localities and islands across the Philippines, chiefly from the deliberate introduction for commercial farming. This species is native to mainland Asia and ranges from Russia, China, Taiwan, Hainan, Korea, Japan, and northern Vietnam. It has been introduced into many countries, including Hawaii, Guam, Indonesia, and Malaysia (Iverson 1992; Cox et al. 1998; Lim and Das 1999; Ernst et al. 2000; Fritz and Havas 2007).

Remarks. — The history of introduction of *P. sinensis* in the Philippines is undocumented; although, de Elera (1895) did report the species from the Batanes island group off northern Luzon. Later authors, however, did not include the species in their listings of Philippine herpetofauna (e.g., Taylor 1920, 1921; Brown and Alcala 1975; Alcala 1986) because of a lack of voucher materials and the suspect nature of much of the information provided by de Elera (1895; see comments by Das 1996b). A series of herpetofaunal inventories of the Babuyan and Batanes islands conducted in the late 1980s (e.g., Ota and Crombie 1989; Lazell 1992) and between 2004 and 2006 (Oliveros and Broad, unpubl. data; Oliver et al., unpubl. data) did not find the species. This softshell may certainly have been brought into the Philippines chiefly as a source of meat. Either escaping from confinement or intentionally released into the wild, feral populations of *P. sinensis* have now become successfully...
established in many regions of the country. Numerous distribution records for the species exist, and we have also examined many specimens from public and private zoos and pet shops.

**Natural History.** — This species occurs in both natural and artificial lakes and ponds, reservoirs, flooded rice fields, and irrigation ditches and has also been found in streams inside natural forests. It buries itself in mud during most of the day and is most active at night. Collectors and turtle breeders claim that it feeds on frogs, tadpoles, fish, crustaceans, worms, and the aquatic plant “kangkong” (water spinach, *Ipomoea aquatica*). *Pelodiscus sinensis* is common to abundant in areas where it has been recorded. Breeders indicate that it is a hardy species and requires a minimum of effort to farm in commercial quantities. Its ecological impact on native fauna is unknown and needs to be investigated.

**Exploitation and Conservation.** — The trade in *P. sinensis* for the food and pet market is widespread in the Philippines. This turtle is also popular in pet shops of Manila and Cebu. Reptile dealers sell each turtle from US$4–11 per kilogram (Sy et al. 2004); although, heavier and larger adults may command a premium price. Many local people ascribe various medicinal properties to this turtle, and, as a consequence, the consumption of its meat by rural villagers is common. Chinese softshell turtles are also served in the restaurants of Manila and Cebu (and likely in other cities) that specialize in turtle meat. Small-scale breeding facilities of the species are operating in Luzon, Mindoro, and Cebu; apparently, this industry is economically beneficial to local communities of these regions (Arevalo 2003). Interviews with turtle breeders and dealers revealed that “large numbers” of softshell turtles bred or collected from feral populations in the Philippines are exported to Asian countries, such as Taiwan, Japan, and Hong Kong. It is a vulnerable species (IUCN 2007) based on the status of remaining wild populations. As with all other species of Philippine freshwater turtles, *P. sinensis* is afforded legal protected status under the Philippines Wildlife Act.

**Emydidae**

*Trachemys scripta elegans* (Schoepff, 1792)

*Chrysemys picta* (Schneider, 1783) (Map 9)

**Common Names.** — *Trachemys scripta elegans*: red-eared slider, common slider, pond slider, *pagong* (Tagalog); *Chrysemys picta*: painted turtle, painted terrapin, *pagong* (Tagalog).

**Distribution.** — We have observed feral populations of *T. scripta elegans* and *C. picta* from Luzon (La Mesa Dam reservoir, Ipo Dam reservoir, Laguna de Bay, and
Lake Taal), Cebu (several localities in and around Cebu City), and Mindanao (Malgos and Davao City). They are probably more widespread than is presently known. *Trachemys scripta* is widely introduced in many countries in Central and South America, Europe, Asia, and Southeast Asia (Iverson 1992; Lim and Das 1999; Ernst et al. 2000).

**Remarks.** — Both *T. scripta elegans* and *C. picta* are native to North America. These colorful turtles were introduced to the Philippines for the pet trade and have become extremely popular among herpetoculturists. Feral populations of both species can now be found in parts of the country because of deliberate releases of unwanted pets or from escaped individuals. Compared with *C. picta*, *T. scripta elegans* appears to have adapted well to the local environment and has also successfully established breeding populations in some localities.

**Natural History.** — The 2 species are aquatic, inhabiting natural and man-made lakes, ponds, and reservoirs, and are occasionally seen in tributaries and ditches in the cities. Our field observations also show that feral populations of *T. scripta elegans* in the Philippines are not as sizable as those reported from other regions of Southeast Asia (Lim and Das 1999). Their impact on native fauna is unknown.

**Exploitation and Conservation.** — These turtles are ubiquitous in pet shops across the country. Feral turtles are collected occasionally for consumption by rural villagers. Both species are afforded legal protection under the Philippines Wildlife Act.

**DISCUSSION**

The nonmarine turtles of the Philippines are one of the least understood chelonian faunas of Asia. Information on life history and natural distribution is lacking for most indigenous species; what little information is available is based largely on non-Philippine populations. We have attempted to fill in some gaps in our knowledge of this fauna, but much remains to be done. A full understanding of the systematics and ecology of Philippine freshwater turtles is crucial in view of the prevailing Asian turtle crisis and the high conservation priority placed on many chelonian species from the region (van Dijk et al. 2000; Stuart and Thorbjarnarson 2003; IUCN 2007).

With intensive field surveys particularly of unexplored river systems, wetlands, and lakes, additional species may be recorded from the Philippines. Among the species that could possibly exist in these unexplored regions might be wide-ranging, secretive aquatic turtles such as *Amyda cartilaginea* and species of *Chitra* and/or *Cyclemys*. We recommend that thorough field surveys be conducted in Cagayan River, Chico River, Abra River, Lake Buhi, and Lake Bato on Luzon; Lake Manguao on Palawan; Jaldau River on Panay; Lake Danao on Leyte; and Ligwasan Marsh, Lake Lanao, Lake Mainit, Agusan River, and Pulangi River on Mindanao. Relatively well-studied wetland and lake ecosystems (e.g., Naujan Lake on Mindoro; Lake Taal, Lake Buhi, and Laguna de Bay on Luzon; and Agusan Marsh on Mindanao) may harbor previously undetected indigenous populations of turtles and hence should be reinvestigated. Basic studies on population ecology, reproductive biology, and life history, including focused research on phylogenetic relationships, are needed especially for globally threatened taxa. We highlight the importance of collecting well-documented voucher specimens of Philippine freshwater turtles from known localities (whole individuals, body parts, tissues, and/or photographs) and deposition of specimens in internationally accredited museums (Leviton et al. 1985; Brown et al. 2002; Simmons 2002; Lehn et al. 2007). Because most indigenous species of this fauna are underrepresented—or even completely lacking—in museum collections, the necessity of obtaining specimens cannot be overemphasized. For instance, the uncertainty surrounding the taxonomy and natural distribution of the Philippine endemic *S. leytensis* for over 80 years was unraveled only after fresh museum material and genetic samples became available (Diesmos et al. 2005). This example also demonstrates the advantage of combining molecular tools with active fieldwork and conventional morphological techniques in resolving some of the most perplexing issues at the interface of systematics and conservation.

Nonnative species of freshwater turtles have already established feral populations in various localities in the Philippines because of either deliberate or accidental releases through the pet trade. No comprehensive studies on the ecological impact of nonnative species to Philippine biodiversity currently exist, and this deficiency needs to be addressed with urgency. The introduction of nonindigenous species into natural habitats can be prevented through the enforcement (by wildlife authorities) of the national policies on biodiversity and active monitoring of the burgeoning pet trade industry. Educating consumers on the probable hazards of introduction of alien invasive species must complement these activities. Two nonnative species have established breeding populations in the Philippines (*T. s. elegans* and *P. sinensis*). One possibility, worthy of consideration by relevant government agencies, is the potential promotion of the Chinese softshell (*P. sinensis*) as an income-generating species suitable for commercial farming. The value of farming this species for its meat has already been demonstrated. *Pelodiscus sinensis* could be an important source of income for many rural villagers. We encourage the commercial utilization of this species because 1) it is nonnative to the Philippines and has the potential to negatively impact native populations of turtles if left unchecked in the wild, 2) this species has the potential to generate much-needed revenue (as already shown by the black market) that is otherwise lost to illegal trade, and 3) farming of this locally nonthreatened and commercially viable nonnative species may help ease the pressure of exploitative harvesting of native species (see...
van Dijk et al. 2000). However, because farming of exotic turtles often results in unintentional releases of animals into habitats of native species, the impact of commercial operations must be thoroughly evaluated before undertaking such high-risk endeavor.

Of the 6 species of indigenous freshwater turtles now known from the Philippines, at least 4 are found in the Palawan PAIC. Because this region is undergoing persistent destruction of its natural habitats and illegal trade of freshwater turtles is rampant (Widmann 1998; Anda and Tabangay-Balderas 2004; Diesmos and Palomar 2004; Diesmos et al. 2004b, 2004c; Gavino and Schoppe 2004; Regodos and Schoppe 2005), ongoing conservation efforts must center on curbing these factors. In particular, widespread mining activities (now in every municipality of the island) may severely threaten freshwater ecosystems of Palawan. We urge relevant environmental authorities of Palawan to develop a systematic program to actively monitor known populations of threatened turtles, determine the effects of mining on Palawan’s wild turtle populations, and halt the burgeoning black market trade that stems from this island. Further, in order to be more successful, this monitoring program should eventually be integrated with the numerous environmental programs of various government agencies and nongovernmental conservation groups operating in the region.

The unchecked exploitation of freshwater turtles and other wildlife species in the illegal trade stems from a near complete lack of enforcement and implementation of the relevant national and international laws on wildlife conservation and trade by Philippine wildlife authorities. There are indications that government authorities are generally unaware of the extent of illegal wildlife trade in the country and are ill equipped and undertrained to monitor and control this activity (Diesmos et al. 2004c; Lepiten-Tabao and Tabaranza 2004; Regodos and Schoppe 2005). Although data currently are not available on the volume of freshwater turtles that are caught from the wild and smuggled out of the Philippines, we anticipate the figures to be astounding. For instance, only a few months following the rediscovery of S. leytensis, we noted the presence of live animals for sale at exorbitant prices (US$1000–2000 per animal) throughout Asia and Europe. A careful investigation of the dynamics of the illegal trade and exploitation of freshwater turtles (and other wildlife species) is critical for conservation and management purposes. One recommendation might be to elevate the protected status of S. leytensis such that it would be included under Appendix I of CITES. We might expect that this action would offer another level of protection to wild populations and reduce illegal international trade of the species. However, given that trade and export of CITES Appendix II species is already prohibited by Philippine law (and yet trade continues), elevation to higher protection levels may not produce the desired effect. At present, we do not recommend captive breeding as a conservation action for threatened freshwater turtles in the Philippines. We believe that limited conservation resources should instead be directed to strategies of higher priority, such as in situ protection of species and their natural habitat. However, we support the establishment of “assurance colonies” comprised of threatened species that are presently being held in captivity by private wildlife collectors and government-confiscated animals from the illegal trade. Unfortunately, most of the animals that we know of that have been confiscated in recent years have died in captivity because wildlife law enforcers are untrained and poorly equipped to care for animals.

Finally, we recommend the creation of a national research and conservation program for Philippine freshwater turtles. Such a program could be responsible for designing a management and conservation action plan for species and the protection of critical habitats where important species are known to occur. Further, a strategic conservation plan of this sort could coordinate and implement research, conservation programs, and public education activities. We also believe that the conservation of threatened turtles in the Philippines can be achieved if wildlife collectors, traders, poachers, and other stakeholders are all considered as likely partners in such conservation efforts.

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**APPENDIX**

Data on species distributions are partly based on specimens housed at the National Museum of the Philippines (PNM), Field Museum of Natural History (FMNH), California Academy of Sciences (CAS), Raffles Museum of Biodiversity Research (ZRC), Texas Natural History Collection of the Texas Memorial Museum (TNHC), Natural History Museum of the University of Kansas (KU), Cincinnati Museum of Natural History (CMNH), Natur-Museum und Forschungs-Institut Senckenberg (SMF), Musée National d’Histoire Naturelle (MNHN), and the zoological reference collections of the following Philippine universities: Silliman University (Dumaguete City), University of the Philippines (at Los Baños City and Davao City), University of Santo Tomas (Manila), and Mindanao State University (at Iligan City and Marawi City).

*Dogania subplana.* — Luzon Island: Camarines Sur Province, Naga City, Barangay Concepcion Pequeno (FMNH 251711); Laguna Province, Municipality of San Pablo, Lake Bunot (ACD field obs., April 1999). **Palawan Island:** Palawan Province, Municipality of Rizal, Barangay Campung Ulay, Sitio Lolbokan (PNM 8230); Municipality of Quezon (unverified report of Fidenici 2005); Municipality of Bataraza (ACD and RVS field obs., November 2003). **Mindoro Island:** Oriental Mindoro Province, Municipality of Socorro, near Lake Naujan (PNM photo voucher); Municipality of Bongabong (PNM photo voucher). **Mindanao Island:** Compostella Valley Province, Laac (PNM photo voucher).

*Pelochelys cantorii.* — Luzon Island: Quirino Province, Municipality of Nagtipunan, Barangay Sangby, Sitio Maat-ad, Upper Cagayan River Basin (PNM 8487); Cagayan Valley Province, Municipality ofGattaran, Cagayan River (ACD field obs., June 2006); Isabela Province, Ilaguen River (ACD field obs., March 1995). **Mindanao Island:** Agusan del Sur Province, Agusan Marsh Wildlife Sanctuary (PNM photo voucher); Davao del Norte Province, Panabo City, Alejal (PNM photo voucher; uncataloged specimen with Roberto Puentespina, D.V.M., Davao City). **Pelodiscus sinensis.** — Luzon Island: Bataan Province, Municipality of Abucay (ACD field obs., March 1996); Bulacan Province, Ipo Dam (PNM photo voucher); Metro Manila, Quezon City, Parkway, Kamuning creek (PNM 892); Laguna Province, Lake Bunot (zoological collection, University of the Philippines
Bohol Island: Municipality of Talisay, Barangay Calumbangan (PNM 1427).


Cueva amboinensis. — Luzon Island: Nueva Viscaya Province, Municipality of Quezon, Barangay Maddangiat, Sitio Dayog: KU 308932; Ilocos Norte Province, Municipality of Burgos, Barangay Pao (PNM 917–922); “Zamblere Province (CAS 15376–82); Zamblere Province, Municipality of Olongapo, SBMA Naval Base, “Nav-mag” area, Nasabas River (TNHC 62989); Zamblere Province, Municipality of Olongapo, “Subic Bay” (CAS 15375); Cagayan Valley Province, Municipality of Solana, Barrio Nabbutuan (PNM 6730); Isabela Province, Municipality of San Mariano, Barangay Disulap, (PNM 658); Municipality of Palanan, Barangay Didian, Northern Sierra Madre Natural Park (PNM 6499); Aurora Province, Municipality of San Luis and Maria Aurora, Barangay Villa Aurora, Aurora National Park, Kabatangan River (PNM 5784); Aurora National Park, Kamantis River (PNM 5661, 5784); Bulacan Province, Municipality of Norzagaray, Barangay San Mateo, Sitio Anginan, Ipo Dam (PNM 3578); Municipality of Los Baños (CAS 61175–78); Laguna Province, Municipality of Los Baños, Mt. Maquilting (TNHC 54903); Camarines Sur Province, Municipality of Labo, Mt. Labo, Barangay Taluay na Lupa (KU 305164, 305166, 305561–62 plus 2 uncataloged specimens: RMB 9876–77); Municipality of Jovellar, Barangay Bautista (PNM 5005–06); Municipality of Baccay, Barangay Nahapunan (PNM 6072–73); Sitio Cauayan (PNM 4156); Sitio Limasan (PNM 4231); Barangay Manangcas, Sitio Inuringan (PNM 4324); Municipality of Bulusan, Barangay San Roque (PNM 3495, 3557, 3573); Municipality of Sorosong, Barangay Guinobatan (KU 300459, 300460). Polillo Island: Quezon Province, Municipality of Burdeos, “nursery area” (PNM 5485–89); Municipality of Polillo, Polillo Town Watershed, Barangay Pinalagbayubayan (KU 30056–58, 305144–47, 307449–50); “Polillo Island” (CAS 62438–44). Cagraray Island: Albay Province, Municipality of Bacacay, Barangay Manaet (PNM 6197–99). Verde Island: (ACD & RVS field obs., September 2003). Mindoro Island: Oriental Mindoro Province, Municipality of Baco, Barangay Lantuyan, Dulangan River (PNM 5640–41). Busuanga Island: Palawan Province (CAS 60549). Palawan Island: Palawan Province, Puerto Princesa City, “vicinity of Malabosog Creek” (CAS 157295, 157466); Municipality of Babuyan, “near sea level” (FMNH 52799); Palawan Province, “NE of Puerto Princesa” (CAS 157467); Municipality of Quezon, Barangay Carumputo (ACD & RVS field obs., November 2003). Panay Island: Aklan Province, Municipality of Tangalan, Barangay Panayanak, Sitio Kalubungan (PNM 1565–67); Sitio Bongol (PNM 1890–93); Barangay Lanyega, Sitio Buho’t-buwaya (PNM 1888–89, 1894–95); Municipality of Ibajay, Barangay Bukong-bato (PNM 913–914); Antique Province, Municipality of Culasi, Barangay Bagacay (PNM 1288), Municipality of Pandan, Barangay Duyong (KU 300446); Guimaras Island: Iloilo Province, Daan Banwa (CAS 185507); Municipality of Buenavista, Old Poblacion (KU 30447–48); Municipality of Jordan, Barangay Rizal (KU 30449); Pan de Azucar Island: Iloilo Province, Talotoan (CAS 153872); Semirara Island: Antique Province, Municipality of Caluya, Barangay Tinoboc (KU 300450–54). Tablas Island: Romblon Province, Municipality of Odiognan, Barangay Anahaw (2 uncataloged specimens deposited at KU: RMB 8753, 8802); Municipality of Calatrava, Barangay Balogo, Sitio Piqueno; 2 uncataloged specimen at KU (RMB 8807, 8857). Sibuyan Island: Romblon Province, Municipality of Magdiwang, Barangay Silum: KU 300460, 305173; Barangay Poblacion (KU 300456); Negros Island: Negros Oriental Province, Municipality of Zamboanguita (CAS 133090–92); Negros Oriental Province, Municipality of Daun (CAS 134330); Negros Oriental Province, “Tolong, Nalioni” (FMNH 62907); Negros Occidental Province, Municipality of Cuyan, Barangay Camalandaan: 2 uncataloged specimens at KU (CDS GS 009, 101). Bohol Island: “Cebu Province” (CAS-SU 11356, 11437–38). Bohol Province: Bohol Province, Municipality of Sierra Bullones, Barangay Magsaysay (PNM 915–916); Bohol Province, Municipality of Sierra Bullones, Barangay Dusita (CAS 147526). Samar Island: Eastern Samar Province, Municipality of Mercedes (CAS-SU 11442); Municipality of Bantayan, Sitio Cadapnan (PNM 107); Municipality of Catbigan (KU 305563); Municipality of Taft, Barangay San Rafael (KU 310427–31). Leyte Island: “Leyte Island” (KU 47173); Leyte Province, Municipality of Palo (FMNH 44984); Municipality of Baybay, Barangay Pilim, Sitio San Viscente (one uncataloged specimen at KU: CDS 3473); Southern Leyte Province, Municipality of Cabalian (CAS 60926–29). Dinagat Island: Surigao del Sur Province, Municipality of Loreto, Barangay Panamona, Sitio San Ramon (PNM 2838), Barangay Esperanza (KU 305165, 305167, 305557–58, 310179). Camiguin Norte Island: Camiguin Province, Municipality of Calayan, Barangay Balutabat, area = “Limandok” (KU 304656–59); area = “Mambit” (KU 304773–74, 304778–79); Mindanao Island: “Zamboanga” (FMNH 14331); CAS-SU 11439–40); Lanao del Sur Province, Marawi City, Lake Lanao (uncataloged specimens in Mindanao State University natural history collection); “Misamis Occidental Province” (CAS-SU 11324–37); North Cotabato Province, Kidapawan City, Kaituan (FMNH 52789); South Cotabato Province, Municipality of Lake Sebu (David et al. 2006); “Cotabato Province, Buayan, Sputon” (FMNH 52794–96); “Cotabato Province, Bugasan, near sea level” (FMNH: 52764–65); “Cotabato Province, Saub” (FMNH 121879–80); Davao del Norte Province, Tagum City, Madaum, “near sea level” (FMNH 52766–86); Maco, “near sea level” (FMNH 52756–60); Davao del Sur Province, Municipality of Malita, Lacayon, “near sea level” (FMNH: 52797–98); Davao Oriental Province, Municipality of Mati, “sea level” (FMNH 52790–93); Mt. Hamiguitan (PNM 108); Agusan del Sur Province, Agusan Marsh Wildlife Sanctuary (PNM photo voucher). Cyclomys dentata. — Busuanga Island: Palawan Province, Dimanang (FMNH 51600). Culion Island: Palawan Province, San Pedro (PNM 891, 893). Dumaran Island: Palawan Province, Municipality of Dumaran, Barangay Santo Tomas, Sitio Umyo (Diesmos et al. 2004c). Palawan Island: Municipality of Taytay, Barangay Poblacion, near Lake Manguao (ACD field obs., September 2002); Palawan Province, Puerto Princesa City, Mt. Bloomfield (PNM 6276–77, 6281); Barangay Cabuyagan, Sitio Martafe (PNM 6302); Barangay Tagabinit, Kayasan, Lamod River (PNM 6388); Barangay Iwahig, Baguio (FMNH 51597); Barangay Iwahig (CAS 134332); Barangay Iwahig, Iwahig watershed (KU 309079–80); S. slope of Thumb Peak, Malatag River (CAS 134331); Barangay Irawan, Bunton River
Heosemys spinosa. — Tawi-Tawi Island: Tawi-tawi Province Municipality of Languyan, Barrio Marang-Marang (PNM 2232–33).

Siebenrockiella leytensis. — Palawan Island: Palawan Province, Municipality of Taytay (PNM 8488); reportedly from the Municipality of Aborlan (salvaged specimen: KU 309175).

Dumaran Island: Palawan Province, Municipality of Dumaran, Barangay Santo Tomas, Sitio Umoy (Diesmos et al. 2004c).

“Leyte Island: Municipality of Cabalian” (= type locality, in error: Diesmos et al., 2004b) (CAS 60930; Neotype).

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