

**Initiation of a Species Recovery Plan for the
Critically Endangered Endemic Roti Snake-Neck Turtle
(*Chelodina mccordi* Rhodin, 1994), Roti Island, Indonesia.
Phase 1. Population Status, Systematic Relationships,
and Preliminary Protected Areas Assessments**

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This project represents the first phase of a new initiative that will lead to a comprehensive conservation program for the long-term survival of the Critically Endangered endemic Roti snake-neck turtle (*Chelodina mccordi* Rhodin, 1994). This isolated species occurs only on the tiny (1200 sq. km) island of Roti, Indonesia, where it is limited in its distribution to an area of occupancy of less than 100 sq. km. Since its description the species has been targeted by the international pet trade and has been heavily collected in its native habitat where, as a result, after less than 10 years of exploitation it is now considered commercially extinct. Based on this rapid population decline, the IUCN Red List in 2000 classified the species as Critically Endangered. Preliminary field work on Roti has demonstrated that the species occurs in three isolated populations. The largest population (described as *C. mccordi*) occurs on the central highland plateau in mesic habitat, inhabiting shallow ponds and adjacent rice paddies; two separate and much smaller populations, well-isolated by xeric habitat, occur in the southwestern and northeastern lowlands. At least one of these isolated populations appears to represent a distinct morphotype which may be an undescribed species even more endangered than the highland form. Systematic morphologic and genetic analysis is urgently needed to further delineate the evolutionarily significant diversity of *Chelodina* taxa present on Roti. Geologically, Roti is an ancient and isolated vicariant splintered fragment from the edge of Gondwanaland without marine sediments, suggesting an extremely ancient isolation of its Australian faunal elements (including its chelid turtle genus *Chelodina*). Preliminary analysis of its vertebrate fauna suggests a relatively high degree of endemism as a result of this long isolation.

This project represents the first phase of a planned comprehensive conservation program leading to an urgently-needed Species Recovery Plan for *C. mccordi*, focusing first on documenting the distribution and status of the three isolated populations on Roti and performing a systematic analysis of possible diversity using morphology and genetics. At the same time, preliminary scoping surveys of possible protected areas will be undertaken towards the ultimate goal of establishing protected areas for the species, focusing also on other endemic species and distinctive habitats on Roti which may also need protection. Further development of a conservation program for the species will also focus on working with the appropriate conservation and governmental agencies to improve legal protection for the species both in Indonesia and internationally, as well as establishing *ex situ* assurance colonies in-range in Indonesia for captive breeding and management until *in situ* protection on Roti achieves its goals of ensuring survival of the species into the future.

BACKGROUND

The freshwater turtles of Indonesia are poorly known and severely threatened. Systematically but incompletely investigated by De Rooij (1915), no synoptic works have appeared until a recent field guide by Iskandar (2000). Conservation and threats to Indonesian tortoises and freshwater turtles have recently been addressed and updated by Samedi and Iskandar (2000) and IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and Asian Turtle Trade Working Group (2000).

Most previous investigators working on reptiles in Indonesia have concentrated on marine turtles or the Komodo dragon. A few shorter contributions over the years have dealt with various aspects of the systematics and distribution of the freshwater turtles of different regions of Indonesia, usually dealing only with a single taxon. Of these, only a very few have dealt with the side-necked turtles of the family Chelidae.

The chelid turtles are restricted to South America and the Australia-New Guinea region. In the Australasian Archipelago they are found only in Australia, New Guinea (Papua New Guinea and Propinsi Papua, Indonesia), possibly the Aru Islands (not confirmed), and Roti Island, southwest of Timor in the Indonesian Lesser Sunda Islands. The occurrence of a chelid turtle on Roti has been known since 1891, when Ten Kate (1894) collected three specimens of what he called *Chelodina novaeguineae* (Boulenger, 1888) at Danau Naloek in central Roti. These specimens were subsequently described in greater detail by Lidth de Jeude (1895), and prior to 1994 all authors referred these specimens to *C. novaeguineae*, despite the fact that all other members of that taxon occur in southern New Guinea and northeastern Australia.

Recently, Rhodin (1994) performed a morphologic analysis comparing several specimens of *Chelodina* from Roti with all other *Chelodina*, and found that the Roti animals represented a distinct species, which was described and named *Chelodina mccordi*. The species is endemic to Roti and represents one of only three known species of freshwater turtles endemic to Indonesia (the other two being *Leucocephalon yuwonoi* from Sulawesi and *Chelodina reimanni* from southeastern Papua). All other known species of Indonesian freshwater turtles have extralimital distributions that include other nations as well.

Preliminary field observations on Roti by Rhodin in April 1993 demonstrated that *C. mccordi* was distributed primarily in the central highland plateau but with two isolated smaller populations in

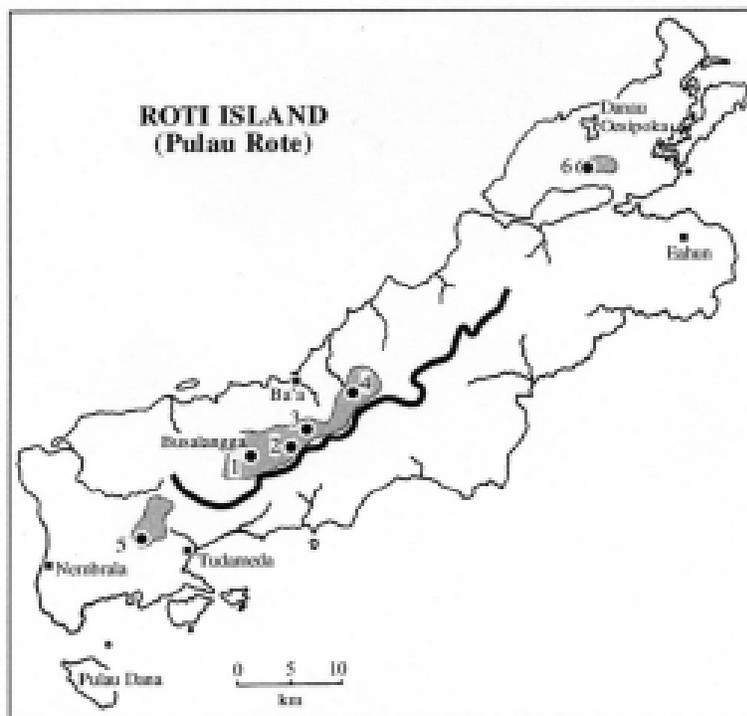


Fig. 1. Map of Roti Island, showing known distribution of freshwater turtles in three separate populations (shaded areas). Numbered localities as follows: *Chelodina mccordi* - 1. Danau Naloek, Busalangga (type locality), 2. Danau Manulae, 3. Oesamboka, 4. Danau Peto, Batoengalo; *Chelodina* sp. - 5. Oeina; *Chelodina* sp.? - 6. Danau Oendoei, Daeoerendale. Mid-island watershed limit of central plateau indicated with a heavy line. Principal villages marked.

the southwestern and northeastern lowlands (Rhodin, 1996) (Fig. 1). The area of occupancy of the species is restricted to only about 70 sq. km. By the IUCN Species Survival Commission's criteria for Red List Categories, *C. mccordi* was therefore classified as Vulnerable on the 1996 IUCN Red List (IUCN, 1996) and determined that it could easily achieve Endangered status with any significant decrease in its population (Rhodin, 1996).

Since its description as a new species, *C. mccordi* has unfortunately become targeted by the international pet trade and collection on Roti has markedly diminished its small and vulnerable populations. Samedi and Iskandar (2000) documented that the species was considered to have become commercially extinct and IUCN/SSC Tortoise and Freshwater Specialist Group and Asian Turtle Trade Working Group (2000) recommended that the species be classified as Critically Endangered on the 2000 IUCN Red List, which was subsequently adopted (Hilton-Taylor, 2000).

There are currently no protected areas on Roti that encompass known habitat for *C. mccordi* or other freshwater turtles. Two small reserves have been proposed, but neither has been gazetted or formally designated and neither is known to harbor any freshwater turtles nor do they occur in areas of known distribution of turtles. Tanjung Puku Watu (also known as Rukuwatu) Wildlife Reserve (6000 ha) is located at the far northeastern coastal tip of Roti. Landu Mangrove Swamp Wildlife Reserve (1000 ha) is located on the southwestern coast of Roti and includes small off-shore islands. Protected areas encompassing habitat for all three populations of *C. mccordi* are urgently needed.

The biodiversity on Roti is poorly known, especially the reptiles and amphibians. Only 16 species of reptiles and a single amphibian (a frog, *Fejervarya cancrivora*) have been recorded, of which 2 are known to be endemic to Roti (*C. mccordi* and the monitor lizard *Varanus auffenbergi*) and 3 others are endemic to a few adjacent islands including Roti and Timor (the monitor lizard *V. timorensis*, the agamid lizard *Draco timoriensis*, and the python *Liasis mackloti*). Other reptiles from the island may well be endemic but have not yet benefited from adequate systematic analysis to determine their phylogenetic relationships. More endemic species are highly likely to be discovered and identified pending further study.

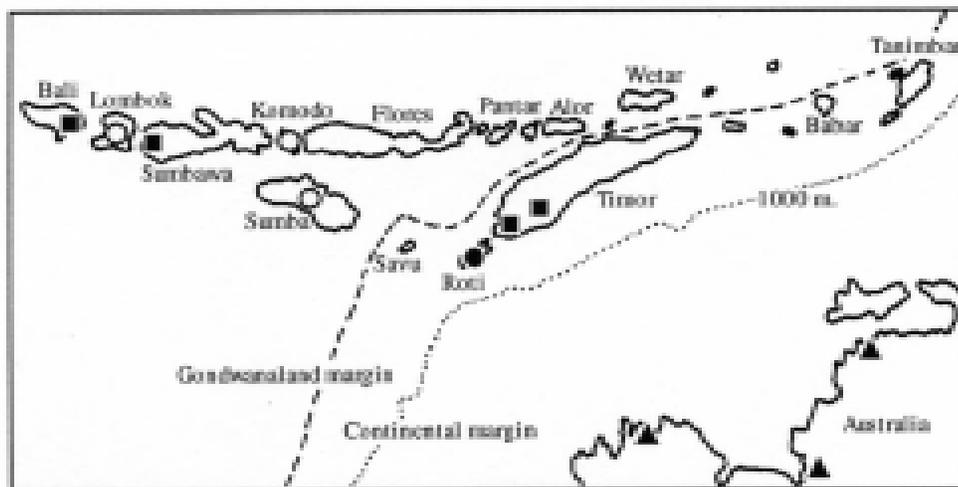


Fig. 2. Distribution of turtles along the Gondwanaland-Laurasia margin between southeastern Indonesia and northwestern Australia. The dotted line represents the Australian continental shelf margin at 1000 m depth, the dashed line represents the Jurassic rifted continental margin of Gondwanaland (Audley-Charles, 1988). Black dot = Gondwanan-originated chelids *Chelodina mccordi* and *Chelodina* sp. on Roti; black triangles = chelid *Chelodina rugosa* in Australia; black squares = Laurasian-originated batagurid *Cuora amboinensis* on Lesser Sunda Islands and Timor; open circles = areas without known freshwater turtles.

Geologically, Roti is a small splintered vicariant fragment of Gondwanaland separated from the Australian continental shelf for a very long time (Fig. 2). Its geological stratification demonstrates that Roti has never been inundated by marine encroachment, suggesting that its terrestrial Gondwanan fauna has been isolated and intact since the vicariant event many millions of years ago. In contrast, the adjacent island of Timor, also a splintered vicariant fragment of Gondwanaland, has been inundated by marine encroachment and its Gondwanan terrestrial fauna has been largely eliminated through time. The long and intact isolation of Roti makes it highly likely that retained Gondwanan faunal elements will be endemic.

OBJECTIVES and METHODS

1. To document the exact distribution and population status of *Chelodina mccordi* on Roti Island. Preliminary data suggest that the species is limited to three separate populations: a principal larger population in the central highlands plateau, a small separate population in the southwestern lake country lowlands, and another even smaller separate population in the northeastern lowland peninsula. This field survey work will be done primarily by Kuchling, Rhodin, and Iskandar (with an Indonesian student) on Roti Island starting approximately October or November, 2004 with two more return trips by Kuchling and a student over the ensuing year. During November, which is at the very end of the dry season, the lakes and ponds where *Chelodina* occurs are very shallow or nearly dry, and natives use this opportunity to fish in the ponds with nets. Turtles are often caught during this time (and in the past usually discarded, but now often collected for the pet trade). We intend to contact as many fishing villages as possible to document and examine turtles from the various locations on the island, paying particular attention to their distribution and abundance or scarcity of the animals to achieve insight into the population status of the species. In addition, we intend to set our own turtle-traps for live-trapping of turtles in smaller ponds and marshes where natives do not fish. All live specimens collected or obtained will be photographed, marked, and released back into their native habitats after gathering appropriate data.

2. To document possible systematic differences between the disjunct and isolated populations of the species from the different portions of its range on Roti. Preliminary observations suggest that at

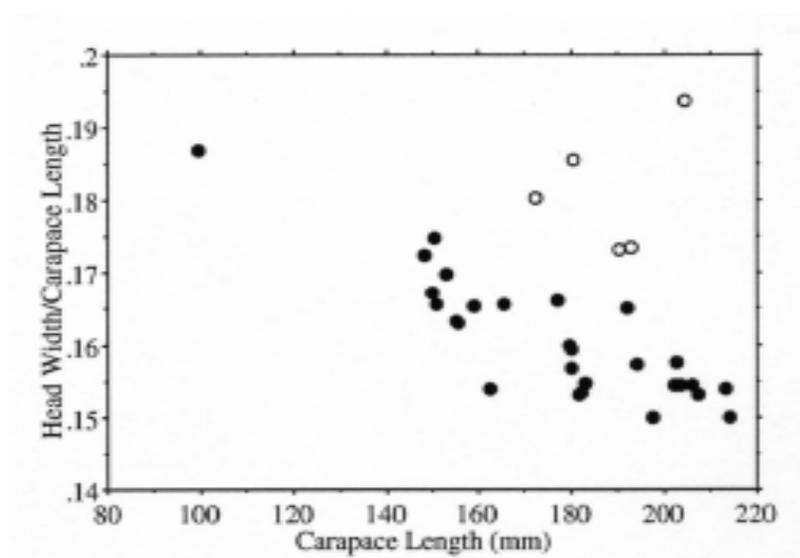


Fig. 3. Graph plotting morphometric variation in head width for *C. mccordi* from central highland plateau population (black dots) versus *Chelodina* sp. from southwestern lowland population (open circles). Head width ratio (head width/carapace length) plotted against carapace length (mm).

least one of those populations has undergone significant morphological differentiation and possibly speciation (Fig. 3). If this is true, then Roti might be found to support two or even three endemic freshwater turtles, all of which would be extremely rare and even more critically endangered than presently determined.

Systematic studies will be pursued partially through morphologic analysis of all specimens collected, utilizing the methodologies developed during the original description of *C. mccordi* from Roti (Rhodin, 1994). All specimens will be left alive, individually marked, and returned to their native habitat for possible later recapture in subsequent years. Small non-destructive tissue samples (skin scrapings) will be obtained from all animals for purposes of systematic genetic analysis in Indonesia (Iskandar) and Australia (Georges and FitzSimmons) using established methodologies (Georges and Adams, 1996; Seddon et al., 1997; Georges et al., 1998, 2002).

3. *To determine ecological parameters of the species as much as possible. No data are available on the reproduction, habitat, seasonal activity rhythms (aestivation), predation, diet, or growth of the species.* We hope to gain initial insight into some of these parameters through native interviews, field observations, measurements, and stomach flushings of captured specimens in the field, followed possibly by captive studies on live animals kept in Indonesia.

4. *To determine whether other freshwater turtles occur on Roti Island and Timor.* Preliminary field studies by Rhodin suggest that *Chelodina mccordi* is the only freshwater turtle on Roti, and that the semi-aquatic Laurasian-originated batagurid turtle *Cuora amboinensis* does not occur on Roti, whereas it does occur on neighboring Timor where *Chelodina* has not been recorded. The clarification of this zoogeographic question has importance for the understanding of the origin of *Chelodina* on Roti. Geologic history indicates that whereas Roti is not part of the Australian continental shelf, it is actually a small portion of the Australian Gondwanan tectonic plate that has reached its present position by vicariant splintering at the edge of the plate and then subsequently separated from the continental shelf margin by subduction formation of the narrow strait that separates Roti from the Australian continental shelf margin. If this scenario is accurate, then *Chelodina mccordi* on Roti could have reached its present location through original vicariance millions of years ago, possibly as early as Miocene times, when *Chelodina* already occurred in Australia, virtually indistinguishable from modern members of the genus. Alternatively, the species could have reached Roti by more recent dispersal across the narrow strait during a Recent inter-glacial period of sea level recession, possibly on the order of tens or hundreds of thousands of years ago. The absence of the Asiatic *Cuora amboinensis* on Roti would argue for an ancient vicariant event rather than a more recent dispersal or introduction. The possible presence of *Chelodina* on Timor also needs to be investigated, and if present, its taxonomic affinities.

5. *To determine to as great an extent as possible the composition of the herpetofauna of Roti through the acquisition of a generalized herpetological collection from the island.* This will be accomplished through collecting, photographing, and examining any encountered reptiles and amphibians. These data will help increase our understanding of the zoogeographic position and significance of Roti, especially in regard to its relationships with the Asian Sunda Plate and the Australian Sahul Plate.

6. *To better understand the threats to the survival of the species of *Chelodina* on Roti and what conservation efforts will be required.* There is no industry to speak of on Roti, and the human population is sparse, so habitat degradation does not at this time appear to pose a threat. However, the international pet market trade has significantly threatened the future survival of the species to the point where it is currently considered commercially extinct. International traders had previously sold small quantities of animals of what they called "*Chelodina novaeguineae*" from Roti. With the description of the Roti snake-neck turtle *C. mccordi* in 1994 as an endemic and isolated new species the trade demand for these animals increased dramatically. If systematic studies further indicate that more than one species

occurs on Roti, then pressures from the pet trade will increase accordingly. In view of the restricted distribution of the species and its already decimated population status, any further commercial exploitation will threaten final extinction in the wild of the species.

7. *To establish captive assurance colonies for breeding purposes in Indonesia as a natural outgrowth and continuation of the field work and as a safety net for survival if commercial trade pressures succeed in driving the species into extinction in the wild.* Such assurance colonies will yield additional life history data and serve as nuclei for *ex situ* in-range captive breeding populations of the species. Indonesian captive management and breeding efforts will be undertaken in coordination with other established *ex situ* assurance colonies already maintained out-of-range in the USA and Europe, where conservation efforts by the IUCN/SSC Turtle Survival Alliance and others are focusing on comprehensive conservation programs for Critically Endangered turtles, including prioritization of conservation initiatives for *C. mccordi* (Turtle Conservation Fund, 2002).

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