DISTRIBUTION OF THE LONG-NECKED FRESHWATER TURTLE *CHELODINA NOVAEGUINEAE* AND NEW INFORMATION ON ITS ECOLOGY

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Recent collections have extended the westerly distribution of *Chelodina novaeguineae*. The species occupies semi-permanent and seasonally ephemeral waterholes from coastal northeast Queensland to the Daly Waters region of the Northern Territory. *C. novaeguineae*, along with *C. longicollis* and *C. steindachneri*, may have speciated from a common ancestor whose widespread distribution around the periphery of the continent covered the present distribution of these species. *C. novaeguineae* aestivates or migrates overland to permanent water when the waterhole it occupies dries. Its reproductive pattern of dry season nesting, small egg size and long incubation period conflicts with a current interpretation of the phylogeny of Australian chelid turtles. □*Chelidae, Chelodina novaeguineae, ecology, distribution.*

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Chelodina novaeguineae was first described from the Binaturi River in New Guinea (Boulenger, 1888) and later found to occur also in north-eastern Queensland, Australia (Goode, 1967). Its distribution in Australia is poorly known. Covacevich and Couper (1991) provide a map showing its Queensland distribution based on specimens held in the Queensland Museum and these data together with anecdotal reports (Goode, 1967; Cann, 1978) suggest it is distributed not only on Cape York Penninsula but throughout the Gulf of Carpentaria, in Arnhem Land, and as far south as Newcastle Waters in the Northern Territory. More recent collections (King & Horner, 1987; Covacevich et al., 1990) confirm that the species' distribution extends into the Gulf country of western Queensland and the Northern Territory.

In this note, we provide a range extension for *C. novaeguineae*, review museum specimens to provide an updated map of the distribution of the species, and provide new information on its ecology.

RESULTS

On 29 April, 1990, we collected two live specimens and three shells of *C. novaeguineae* from Malogie Waterhole, a small permanent waterhole in the Roper River catchment near Scarlet Hill on Kalala Station (16°8'S 133°36'E) in the Northern Territory. Another three shells were collected from Stuart Swamp near the township of Daly Waters (16°14'S 133°27'E) (Table 1). The specimens were determined to be *C. novaeguineae* on the basis of the following characters:

- The plastron is greatly expanded anteriorly, less than 1.9 times longer than broad (unlike *Chelodina rugosa*, *C. expansa* and *C. oblonga*), but extends barely as far as the inner edges of the overlying marginal plates of the carapace (unlike *C. longicollis*).
- The intergular shield is markedly more than twice as long as the suture between the pectoral shields (unlike *C. rugosa*, *C. expansa* and *C. oblonga*).
- The common boundary of the 12th marginals is not raised to form a distinct inverted 'V' when viewed from the rear (unlike *C. longicollis*).
- The carapace is broadly oval (unlike *C. steindachneri*).

Stuart Swamp drains into Daly Waters Creek in the upper catchment of the Roper River. When full, the swamp covers several square kilometres but poor wet season rainfall over the previous three years had reduced the waterhole to a relatively small muddy hole about 75m in diameter at the time of our visit. The waterhole dried completely a few months later for the first time in many

TABLE 1. Details of *Chelodina novaeguineae* collected from Kalala Station, Northern Territory, April 1990.

Location where specimen is held	Specimen number	Carapace length	Carapace width	Plastron length	Plastron width	Shell depth	Sex
NT Museum	NTMR 16324	210	169	169	110	79	—
	NTMR 16325	230	188	190	118	88	—
Qld Museum	J 53635	231	175	181	118	74	—
R. Kennett (pers. coll.)		209	170	175	—	74	—
Australia Museum	R 132784	199	161	159	101	74	—
	R 132785	235	184	190	116	77	—
	R 135351	193	156	157	98	65	F

years (Bill Cook, Kalala Station, pers. comm.). Malogie Waterhole was the only waterhole in the area to retain water in 1990, while many others dried for the first time in living memory (Bill Cook, pers. comm.).

The turtles were transported to Canberra where abdominal palpation on 26 May, 1990 revealed the female to be gravid. Nine hard-shelled (calcareous) eggs were obtained on 28 May, 1990 by inducing oviposition with an injection of synthetic oxytocin (Ewert & Legler, 1978). A tenth egg was found in the holding tank weeks later but was not measured. Mean egg length was 31.4±0.2mm, egg width was 21.8±0.1mm and egg weight was 8.6±0.1g (mean, standard error, n=9). The eggs were incubated at 30°C in a plastic container on a bed of vermiculite moistened to a constant ratio of 4g vermiculite to 3g water. An opaque white patch appeared on each of the nine eggs within 36 hours indicating development had commenced (Thompson, 1985) and the eggs hatched on 25 September, 1990, 120 days later. Mean hatchling carapace length was 31.3±1.0mm, mean carapace width was 26.6±0.4mm and mean weight was 5.4±0.3g (mean, standard error, n=3).

DISCUSSION

Recent collections of *C. novaeguineae* (King & Horner, 1987; Covacevich et al., 1990; this paper) have substantially increased the known Australian range of the species. Formerly only known from northeast Queensland (Cogger, 1988), *C. novaeguineae* has now been recorded from the Gulf country near the Queensland and Northern Territory border (Covacevich et al., 1990) and from Maria Island in the Gulf of Carpentaria (King & Horner, 1987). King & Horner (1987) suggest that the population on Maria Island in the Gulf of Carpentaria may have been established by turtles swept out of rivers during flooding in either the Roper, Towns or Limmen-Bight Rivers. Our finding of *C. novaeguineae* in the upper reaches of the Roper River, is consistent with this suggestion and confirms Cann's (1978) reports of *C. novaeguineae* in the Daly Waters area and his reference to their presence in the lower reaches of the Roper River (Cann, 1972). A list of current holdings in Australian Museums (AM, Australian Museum; QM, Queensland Museum; SAM, South Australian Museum; NTM, Northern Territory Museum), excluding those of Table 1, is as follows:

AM R40700, 08°55'S 143°03'E, Kuru [Village], Western District, PNG; AM R129346, Greta Creek, near Bowen; QM J5269, 18°04'S 146°33'E, Palm Is., NEQ; QM J10265, 20°24'S 148°35'E, Proserpine, NEQ; QM J13326, 19°16'S 146°49'E, Townsville, Thornley Pk, NEQ; QM J15560, J15900, 19°13'S 146°38'E, Townsville, Black R., NEQ; QM J20627/28/30/31/33/35, 14°35'S 144°03'E, Wakooka Outstation, lagoon 6.4km W, NEQ, 29 Nov, 1970; QM J36751, 15°25'S 141°58'E, Mitchell R., NWQ, late 1978; QM J37566, 14°07'S 143°16'E, Stewart R. 23km NNW Mt Croll NEQ, 6 Aug, 1979; QM J37819, 17°53'S 142°34'E, Cape York Peninsula, Gilbert R., NEQ, 10 Aug, 1979; QM J45005, 19°14'S 144°02'E, Lynd Hwy, NEQ, 1 Dec 1981; QM J47923, 180°39'S 146°01'E, Ingham Q, 19 Mar, 1988; QM J50730, 19°16'S 146°49'E, Townsville Town Common , NEQ, 2 Jul, 1990; QM J50731, J50732, J50997, J50998, 16°58'S 138°05'E, 5km SW of Old Doomadgee, NWQ, 24 Jun 1990; SAM R14361, 17°56'S 138°49'E, Doomadgee Mission, NWQ, Jun, 1963; NTM R5753 , 14°53'S 135°43'E, Maria Is., NT, 11 Jul, 1972; NTM R5898, 14°53'S 135°43'E, Maria Is., NT, 26 Jul, 1972.

Chelodina longicollis, *C. novaeguineae* and *C. steindachneri* are closely related. Their distributions (Fig. 1) suggest that their common ancestor may have had a distribution extending around much of the periphery of the Australian continent. This widespread species may have exhibited clinal variation in morphology and reproductive parameters consistent with differences we observe

FIG. 1. A map of Australia showing the locations of collection of specimens held in Australian museums (●) and the likely distribution of *Chelodina novaeguineae* in stipple. Shown also are the distributions of *C. longicollis* and *C. steindachneri* (after Cogger, 1988). The exact boundary between *C. longicollis* and *C. novaeguineae*, while in the Burdekin drainage (John Cann, pers. comm.), is uncertain.

in these characters among the three species today. Progressive aridity in the Pleistocene, around 25,000 years ago, or earlier during similar periods of expanding aridity in the past 15 million years may have led to the separation of three isolated populations, the one in the west speciating to *Chelodina steindachneri*, the one in the north and New Guinea speciating into *C. novaeguineae* and related forms and the one in the southeast speciating into *C. longicollis*. Studies of populations of *C. longicollis* and *C. novaeguineae* in the Burdekin drainage where they are in sympatry or parapatry with possible hybridization (John Cann, pers. comm.) are worthy of further investigation.

Chelodina novaeguineae occupies semi-permanent and seasonally ephemeral waterholes throughout its range and occurs sympatrically with *C. rugosa* in the Gulf country (Covacevich et al., 1990). Unlike *C. rugosa* in these waterholes, *C. novaeguineae* will migrate many kilometres overland to permanent water rather than aestivate (Covacevich et al., 1990; later expanded in pers. comm.). This seems to be a hazardous strategy in waterholes that dry annually. *C. novaeguineae* in the Daly Waters area, on the other hand, appear to aestivate and can be dug out of the mud when the waterhole dries up (Bill Cook, pers. comm.)

The presence of *C. novaeguineae* in the Roper River was known to Aboriginal people at Jinduckin near Mataranka, who hunt for 'Nganymalin', the 'smelly armpit turtle', in small creeks well upstream (Jesse Roberts, Mangarrayi language group, pers. comm.). A pungent secretion exuded from glands in the auxillary and inguinal pockets is a distinctive feature of *C. novaeguineae* and its southern relative, *C. longicollis*. Four other species of freshwater turtle also inhabit the Roper River, 'Jarnamanjarr' (*C. rugosa*), 'Gorronani' (*Elseya dentata*), 'Marndirrin' (*Emydura 'australis'*) and 'Jabada' (Jesse Roberts, pers. comm.). Jabada is described as a flat-headed short-necked turtle and may possibly be *Elseya latisternum*, although *E. latisternum* has not been officially recorded from the Roper. Interestingly, Aboriginal people at Jinduckin claim that, contrary to other reports (e.g. John Bywater, cited in Georges & Kennett, 1989), the Pig-Nosed Turtle (*Carettochelys insculpta*) does not occur in the Roper, the nearest place they caught them was in the Victoria River at Timber Creek. The distribution of *C. insculpta* may be more restricted in the Roper River than in other drainages where it is found.

The eggs and hatchlings of *C. novaeguineae* (this study; Grossman, 1988) are similar in size and appearance to those of *C. longicollis* (Vestjens, 1969; Kennett & Georges, 1990). The bright orange stripes on the plastron of hatchlings may be aposematic which, allied with their pungent secretion, may act as a deterrent to predators. The colouration fades with age (Cann, 1981) and may not be as marked in captive raised juveniles (Grossman, 1988).

Our gravid specimen and a gravid female collected by John Cann (10 August, 1979) from the Gilbert River on the Cape York Peninsula north east Queensland (QM J37819) indicate that nesting may occur throughout the tropical dry season, equivalent to the temperate autumn and winter. If our observed incubation period of 120 days approximates the natural incubation period, then hatching would occur in the late dry or early wet season, equivalent to the temperate spring and summer. These results are in conflict with the conclusions of Legler (1981, 1985) who describes *C. novaeguineae* as a temperate breeder, nesting in spring with hatching before autumn. Legler (1981, 1985) recognizes two groups within the genus *Chelodina* and characterizes the groups as exhibiting a tropical reproductive pattern and a temperate reproductive pattern. *C. novaeguineae* effectively straddles both groups, with the small

egg size of the temperate pattern and the nesting and long incubation period of the tropical pattern. These data suggest that the reproductive pattern of *C. novaeguineae* may have changed as it has moved north from its hypothesised evolution in southern Australia (Legler, 1981, 1985) and that phylogenetic conclusions based on reproductive patterns may be unsound.

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