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The Diet of the Green Turtle, *Chelonia mydas* (L.), in Torres Strait

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Abstract

The principal genera of plants consumed by green turtles in Torres Strait were *Hypnea*, *Laurencia*, *Vidalia*, *Sargassum* and *Thalassia*. Although some selectivity for soft red algae was detected, no evidence was found to support the theory that turtles feed on algae only when seagrasses are unavailable, but nor do algae appear to confer a nutritional advantage on those animals that eat them. Geographical variation in green turtle diets appears to be determined by the relative availability of seagrass and algae and the structure of the local herbivore community.

Introduction

The green turtle *Chelonia mydas* is a large herbivorous reptile found in most tropical and subtropical seas. Immature and adult green turtles in the wild usually eat either seagrass or algae (Hirth 1971). In a recent review (Mortimer 1982) it was suggested that algae are consumed only when seagrass is not available. For green turtles in the Caribbean it has been suggested that this preference for seagrass has a physiological basis; that the turtles lack the gut microflora for digesting algae (Bjorndal 1980). It has also been implied that the feeding preferences of individual turtles are governed by similar differences in gut microflora (Mortimer 1982), as demonstrated by the distinction of traditional turtle-hunting societies between 'sweet' turtles that have eaten seagrass and 'bitter' turtles that have consumed algae (Felger and Moser 1973; Mortimer 1981; Nietschmann 1985). Despite the apparent preference for seagrass, it has also been suggested by Bjorndal (1982) that green turtles feeding on algae have an energetic advantage over those that feed on seagrass. Both Bjorndal (1982) and Moll (1983) assume that the high fecundity of green turtles nesting in Surinam (Schultz 1975), compared to those nesting in the Caribbean, is a consequence of a diet consisting largely of algae, as determined by gut analyses of turtles caught in Brazil (Ferreira 1968). In this paper the nutritional strategy of the green turtle is examined in the light of evidence from an Australian population of the species.

There have been no detailed analyses of the food eaten by green turtles in Australian waters, except for a preliminary report on the present work (Garnett and Murray 1981). However, there exist incidental reports of turtles feeding on both algae (Heinsohn *et al.* 1977; Limpus 1978; Wake 1978; Thompson 1980; Limpus in Mortimer 1982; Nietschmann 1985) and seagrass (Yonge 1930; Limpus in Mortimer 1982; Nietschmann 1985). Macrozooplankton are eaten when available (Limpus 1978). Around New Guinea, seagrass is thought to be the primary food of green turtles (Johnstone 1978; Spring 1982). The present work examines the diet of wild green turtles in the Torres Strait.

Table 1. Analysis of food eaten by wild *C. mydas* in the Torres Strait

Food type	No. of stomachs			Percentage of dry matter		
	Total	With >5% DM	With >50% DM	Badu	Yorke	Total
Rhodophyta						
Nemalionales						
Galaxaura sp.	1	0	0	tr		tr
Scinaia sp.	1	0	0	tr		tr
Gelidiales						
Gelidiella acerosa (Forsskål) Feldmann & Hamel	19	11	0	1·4	7·7	3·5
Cryptomeniales						
Halymenia sp.	11	3	0	0·7	tr	0·7
Prionites obtusa Sonder	1	0	0	tr		tr
Gigartinales						
Caulacanthus sp.	1	0	0	tr		tr
Eucheuma muricatum (Gmelin) Weber-van Bosse	1	0	0	tr		tr
Eucheuma sp.	2	1	0	0·3		tr
Gelidiopsis acrocarpa (Harvey ex Kützing) De Toni	1	0	0	0·2		tr
G. variabilis (Greville ex J. Agardh) Schmitz	16	3	0	1·1	1·0	1·1
Gracilaria crassa Harvey ex J. Agardh	7	2	0	3·4	0·1	1·2
Gracilaria sp.	10	2	0	0·5	0·7	0·7
Hypnea spp.	43	30	10	29·3	26·9	27·7
Rhodymeniales						
Botryocladia sp.	4	2	0	0·6	0·2	0·4
Champia sp.	10	2	0	0·2	2·4	1·6
Coelothrix sp.	1	0	0	tr		tr
Ceramiales						
Ceramiaceae						
Ceramium sp.	1	0	0		tr	tr
Griffithsia sp.	2	0	0		tr	tr
Spyridia filamentosa (Wulfen) Harvey	7	2	1		3·4	2·2
Dasyaceae						
Dasya sp.	1	0	0		tr	tr
Heterosiphonia sp.	3	0	0	tr	tr	tr
Delesseriaceae						
Hypoglossum sp.	1	0	0		tr	tr
Rhodomelaceae						
Acanthophora spicifera (Vahl) Boergesen	23	4	1	8·9	0·8	3·6
Acanthophora sp.	7	0	0	tr	0·1	0·1
Amansia glomerata C. Agardh	3	1	0		0·9	0·6
Amansia sp.	14	4	0	1·4	1·6	1·5
Chondria sp.	1	0	0		tr	tr
Laurencia brongniartii J. Agardh	3	0	0	0·3	0·1	0·2
Laurencia spp.	31	22	2	16·5	9·2	11·7
Lenormandiopsis lorentzii (Weber-van Bosse) Papenfuss	10	6	0	1·4	3·1	2·5
Lenormandiopsis sp.	6	0	0	tr	0·3	0·2
Leveillea jungermannioides (Martens & Hering) Harvey	28	1	0	0·1	0·7	0·5
Platysiphonia sp.	1	0	0	tr	tr	
Polysiphonia sp.	1	0	0	tr	tr	
Tolypiocladia glomerulata (C. Agardh) Schmitz	5	3	0	tr	1·8	1·2
Vidalia sp.	20	9	4	0·2	14·7	9·8
Total Rhodophyta	44	42	32	71·9	71·2	71·4

Table 1 *(continued)*

Food type	No. of stomachs			Percentage of dry matter		
	Total	With >5% DM	With >50% DM	Badu	Yorke	Total
Phaeophyta						
Ectocarpales						
Chnoospora implexa J. Agardh	0	0	0	tr	0·1	0·1
Hydroclathrus clathratus (C. Agardh) Howe	1	0	0	0·1		tr
Sphacelariales						
Sphacelaria sp.	14	0	0	tr	0·3	0·2
Dictyotales						
Dictyota sp.	30	1	0	1·0	0·8	0·8
Padina australis Hauck	10	0	0	0·6	0·2	0·4
Fucales						
Cystoseira sp.	3	0	0		0·1	0·1
Sargassum spp.	25	9	1	13·7	1·8	5·9
Turbinaria sp.	1	0	0	0·2		0·1
Total Phaeophyta	40	14	2	15·7	3·4	7·6
Chlorophyta						
Cladophorales						
Chaetomorpha sp.	1	0	0		tr	tr
Rhizoclonium sp.	1	0	0	tr		tr
Codiales						
Codium sp.	3	1	0	0·7		0·2
Caulerpales						
Caulerpa brachypus Harvey	1	0	0		tr	tr
C. cupressoides (Vahl) C. Agardh	9	1	0	tr	0·4	0·3
C. lentillifera J. Agardh	1	0	0	tr		tr
C. racemosa (Forsskål) J. Agardh	10	5	0	2·1	4·1	3·4
C. sertularioides (Gmelin) Howe	1	0	0		0·1	0·1
C. urvilliana Montagne	9	6	2	tr	8·9	5·9
Caulerpa sp. rhizoids	3	0	0		0·2	0·1
Halimeda sp.	7	0	0	0·2	0·1	0·1
Udotea sp.	2	0	0		tr	tr
Siphonoclades						
Anadyomene sp.	2	0	0	tr		tr
Total Chlorophyta	32	13	4	3·0	13·8	10·1
Cyanophyta						
Lyngbya sp.	9	0	0	0·1	0·3	0·2
Total Cyanophyta	9	0	0	0·1	0·3	0·2
Total algae	44	43	40	90·6	88·4	89·2
Seagrass						
Cymodocea sp.	1	0	0		tr	tr
Thalassia hemprichii (Ehrenb.) Aschers.	25	8	3	8·5	8·9	8·8
Halophila spinulosa (R.Br.) Aschers.	4	1	0	0·1	0·4	0·3
Total seagrass	26	8	3	8·6	9·3	9·1
Total plants	44	44	44	99·1	97·7	98·3
Animals						
Porifera	13	0	0	tr	0·4	0·3
Coelenterata	0	0	0		tr	tr
Mollusca	2	1	0	tr	0·2	0·2
Bryozoa	4	0	0	tr	0·1	0·1
Echinodermata	1	0	0		tr	tr
Urochordata	4	0	0	tr	0·1	0·1
Unknown animal	9	0	0	0·6	0·2	0·4
Total animals	23	1	0	0·7	1·0	0·9

Table 1 (*continued*)

| Food type | No. of stomachs | | | Percentage of dry matter | | |
	Total	With >5% DM	With >50% DM	Badu	Yorke	Total
Inorganic						
Calcium base	2	0	0	tr	tr	tr
Sand	5	1	0		0·3	0·2
Total inorganic	7	1	0	tr	0·3	0·2
Unknown	23	0	0	0·2	0·7	0·5

Materials and Methods

The stomach contents of 44 green turtles from Torres Strait were analysed. Of these 15 were from reefs near Yorke I. (9°55'S., 144°5'E.) in the centre of the Strait, and 29 were caught near Badu (10°9'S., 143°30'E.) among the western group of islands. Thirty-four were females of between 83 and 127 cm midline curved carapace length (mean $100·6 \pm 9·4$) and four were males between 88 and 102 cm long (mean $95·8 \pm 6·1$). Sex was determined by tail length and/or gonad examination. A further six turtles, three from each island group, were immatures of unknown sex ranging from 37 to 52 cm in length (mean $44·5 \pm 5·4$). Samples were obtained in all months of 1979 except January, March and December with a monthly maximum of 9 in October.

The stomach contents of turtles were obtained as soon as possible after they had been killed by islanders for food. Most individuals had been harpooned on reefs several kilometres from the islands, but some small turtles were taken in shallow water close to the beach. After capture the turtles were laid on their backs until ready for killing. Although they may have been slaughtered up to 5 days later, their stomachs almost always remained full. The entire contents of the stomach were removed immediately after death. The contents were then mixed thoroughly before a sample of 400 ml was preserved in 10% seawater formalin for subsequent analysis. Faeces of all slaughtered turtles were examined for undigested food.

Analyses were conducted on replicate subsamples of the preserved gut sample which were sorted by hand under a microscope. The gut sample was first spread out on a tray and mixed thoroughly until visually homogeneous. Two subsamples of about 5% of the wet weight of the contents were then chosen randomly and transferred to petri dishes with tweezers. Each subsample was sorted into separate food types which were then individually dried at 80°C for 24 h before being weighed. Further subsamples were analyzed if the difference in weights of important species (those making up more than 5% of the dry matter) exceeded 5%. After analysis examples of those species that could not be identified immediately were removed from the remaining gut sample for closer examination. The classification schemes of Clayton (1981), Kraft and Woelkerling (1981) and MacRaild (1981) were followed for the algae. It should be noted that only 39% of the plant material was identifiable to species; the remainder was differentiated to the level of genus.

Results

The results, as summarized in Table 1, are expressed in terms of both the number of stomachs in which a food type occurred and the percentage of the total dry matter in the stomach which each food type comprised. Since some turtles ate one species to the exclusion of all others, the variation about the mean conveyed less information than the number of stomachs in which a species made up more than half the dry matter. In addition, the number of stomachs in which a food type exceeded 5% of the dry matter is presented, as it was considered likely that only food that made up more than 5% of the intake was consumed deliberately. Over half of the food types found in stomachs never constituted more than 5% of the dry matter weight, and when the percentage occurrences of all food types in all stomachs were averaged, it was found that six genera contributed 73·5% of the total dry matter weight. These were the algae *Hypnea* (27·7%), *Laurencia* (11·9%), *Caulerpa* (9·8%),

Vidalia (9·8%) and *Sargassum* (5·9%), and the seagrass *Thalassia* (8·8%). About 70% of the food types had an average weight that was less than 1% of the total contents, and 52% were found in fewer than 10% of the stomachs.

Although red algae made up the bulk of most stomach contents, large amounts of brown or green algae were eaten by a few individuals. Among the adults, those of less than 100 cm curved carapace length were more likely to eat over 50% red algae than those longer than 100 cm ($t = 2·54$, 16 d.f., $P < 0·05$), although the correlation coefficient of the linear regression of carapace length on the angular transformation of the percentage of red algae in the stomach was not significant. Similarly, although algae made up 90% of the combined average dry matter and constituted more than half of the food types eaten by 91% of turtles, a few individuals had eaten seagrass, particularly *Thalassia hemprichii*. For eight turtles, ingestion of seagrass was classed as deliberate. These eight included half the immature turtles, which overall contained significantly more seagrass than the adults ($t = 5·85$, 5 d.f., $P < 0·01$). No differences in diet could be detected between the sexes and no trends were evident over time, probably because of the small numbers available and the wide variation between animals.

Turtles from near Yorke I. had eaten more brown algae ($t = 3·50$, 14 d.f., $P < 0·01$) and less green algae ($t = 3·14$, 14 d.f., $P < 0·01$) than those caught near Badu. The amount of red algae eaten was similar in both areas but near Badu a higher percentage of *Vidalia* ($t = 2·23$, 14 d.f., $P < 0·05$) and less *Gelidiella acerosa* ($t = 5·97$, 14 d.f., $P < 0·001$) and *Acanthophora spicifera* ($t = 5·34$, 14 d.f., $P < 0·001$) were eaten. The proportions present of the other two important algae, *Hypnea* and *Laurencia*, did not differ significantly between the two areas ($t = 0·11$ and 2·12, 14 d.f.).

Plant material constituted over 95% of the dry matter weight in all but two stomachs, in one of which there was a considerable quantity of sand, and in the other fragments of molluscan shell. Of the animals identified sponges were predominant, but, apart from the shell, no material of animal origin contributed more than 5% to any one stomach.

No undigested material was ever found in faeces.

Discussion

The green turtles of the Torres Strait appear to utilize both algae and seagrass. Although most animals had eaten only algae nearly 20% had also eaten seagrass. There was no evidence that part of the food remained undigested. It therefore seems unlikely that the dietary preference of the animals examined was affected by the specific digestive capability of the hindgut microflora, as suggested for turtles in the Caribbean (Mortimer 1976, 1981; Bjorndal 1979, 1980). The basis for that hypothesis appears to have been a comparison between analyses conducted by Ferreira (1968) for turtles caught near Brazil, and those by Mortimer (1981) for the Caribbean. The results of such a comparison may have been misleading.

Ferreira (1968) recorded only the presence or absence of food types in the stomach, rather than the relative contribution of each species, so it is difficult to assess the importance of seagrass to the Brazilian turtles. Nevertheless, at least 8% of the stomachs must have contained both algae and seagrass, and the seagrass *Diplanthera* [*Halodule*] cf. *wrightii* (Aschers.)Aschers. was considered to be a food of secondary importance (Ferreira 1968). The 11 stomachs in which no algae were observed presumably contained predominantly seagrass rather than animal matter.

The analyses of Mortimer (1981) on the stomachs of 243 Nicaraguan turtles are the most thorough so far published. Although most had been eating *Thalassia* and *Syringodium*, four, taken in a different area to the others, contained 36% *Hypnea* and 24% *Gracilaria*. Nevertheless, the other third of the food eaten was *Thalassia*. Both the data from the Torres Strait and the data from Ferreira (1968) and Mortimer (1981) provide evidence contrary to the theory that there exist nutritionally distinct populations of green turtles.

The results of this study also fail to support the theory that some individuals within a population eat seagrass and others algae (Felger and Moser 1973; Nietschmann 1985). Working on the island adjacent to Badu, Nietschmann (1985) claimed that islanders preferred green turtles that ate seagrass over those that had been feeding on algae. It has also been suggested that turtle movements within the Torres Strait area are governed by the availability of seagrass (Nietschmann and Nietschmann 1981). Certainly it is probable that certain types of turtle were selected by hunters; the sex and size distribution of green turtles caught near Badu and near Yorke I. was biased towards large females (Parmenter 1980; S. T. Garnett, personal observation). Our results, however, show that many of the turtles were eating both algae and seagrass, and it is doubtful that hunters could recognize those concentrating on one food type only. The animals most likely to have been eating seagrass were immature individuals, but according to Nietschmann and Nietschmann (1981) these are rejected because they have too little fat. Our observations suggest that small turtles were caught when the opportunity arose but, unlike the adults, were not to be found reliably at any one place.

The distinction made by traditional hunters between the flavour of the meat from turtles feeding on algae and those eating seagrass has also been used to support the theory of nutritionally separate subpopulations. Turtles that had eaten algae were said to be distasteful (Felger and Moser 1973; Mortimer 1981). Certainly some species of algae regularly eaten by green turtles contain compounds which may have tainted the turtles' flesh. Balazs (1980) suggested that *Caulerpa racemosa* was eaten in quantity only when no other species were available, because toxins (Doty and Aguilar-Santos 1966) affected palatability. Nevertheless *Caulerpa* spp., largely *C. racemosa*, have been reported from the diet of the green turtle not only from Hawaii and the Torres Strait but also in the Galapagos (Pritchard 1971), on Aldabra (Frazier 1971), in the Caribbean (Mortimer 1981) and off Brazil (Ferreira 1968), and so are a regular part of the green turtle's diet. Several other species taken in the Torres Strait and elsewhere are also known to contain compounds thought to act as chemical defences against other herbivores (Ogden 1976), including such favoured genera as *Laurencia* (Fenical 1975), *Sargassum* (Sieburth 1969) and *Gracilaria* (Hornsey and Hilde 1974). It is therefore not unlikely that at certain times of year in some places the flesh of the turtle can be flavoured by the algae that it has eaten. This does not, however, constitute evidence that there are distinct subpopulations.

Ecological interpretation of the results is difficult without knowledge of the standing crop of vegetation at the site of capture. The high percentage of seagrass in the gut contents of the small turtles probably reflects the place where they were caught. Seagrass in the Torres Strait usually grows in the intertidal zone (Bridges *et al.* 1982). *Eucheuma* spp., red algae characteristic of the intertidal mudflats, were found only in stomachs in which seagrass was also present. However, another intertidal alga, *Gracilaria crassa*, was negatively correlated with the presence of seagrass because it is more abundant on rocky shores. The majority of algal species found are usually members of reef flat and reef slope communities (Cribb 1981), which is the habitat in which most animals in this study were caught. Of particular interest, however, is *Lenormandiopsis lorentzii*, a red alga commonly reported at depths of around 40 m, that was present in 10 of the samples. In six cases it appeared to have been consumed deliberately (Table 1). Near Yorke I., however, where two of the turtles containing *Lenormandiopsis* were taken, the water is nowhere deeper than 20 m. Perhaps *L. lorentzii* grows in shallower water in the Torres Strait than generally recorded elsewhere, or the turtles had been feeding on algae drifting at the surface. Feeding on drifting plant material has been noted in Samoa (Witzell 1982), and these algae may have been made available to the turtles in shallow water at Yorke I. by the activities of prawn trawlers in the vicinity. Drifting *L. lorentzii* has been reported at 5 m from near Goode I. in the south-west of the Torres Strait (I. R. Price, personal observation).

On reef flats near Magnetic I. in north Queensland many of the sites examined by

Morrissey (1980) were dominated by Phaeophyta and Chlorophyta. Badu is topographically similar to Magnetic I. (Willmott *et al.* 1973) and a subjective visual assessment of the algal standing crop showed some similarities; *Sargassum* spp. were often the dominant algae near the islands, and extensive beds of *Caulerpa* spp. grew on the reef slopes. Calcareous Rhodophyta were also abundant in both places. It therefore seems that most turtles selected the filamentous and fleshy red algae in preference to some of the more abundant species. Although, overall, immature and adult green turtles eat the vegetation that is most available (Limpus 1978; Limpus in Mortimer 1982), some selectivity for certain food types was observed.

Selectivity, however, does not appear to operate between seagrass and algae. Evidence against the argument that algae are nutritionally superior to seagrass (Bjorndal 1982) takes two forms. First, the growth rates of immature green turtles feeding on *Thalassia* are higher (Mendonća 1981) than those for which only algae are available (Balazs 1979, 1980, 1982; Limpus and Walter 1980). Secondly, both seagrass and algae contain equally small amounts of protein. High levels reported from *Thalassia* (Burkholder *et al.* 1959; Bjorndal 1980) may be a consequence of using 6·25 as a factor for calculating crude protein from total nitrogen. Although this is legitimate for many terrestrial foodstuffs (McDonald *et al.* 1973), the amount of protein in the leaves of the seagrass *Zostera marina* was only 2·35 times that of the nitrogen (Harrison and Mann 1975). Using this value to calculate the percentage of protein in *Thalassia* from other published sources gave estimates of 4·6% (Bauersfeld *et al.* 1969), 4·9% (Burkholder *et al.* 1959) and 6·3% (Bjorndal 1980) protein, which all compare well with the direct protein measurement of 6·9% (Dawes *et al.* 1979). Other tropical seagrasses eaten by green turtles (Hirth *et al.* 1973; Mortimer 1982) also contain little protein (Birch 1975; Wake 1975; Hocking *et al.* 1980). On the other hand, algae contain no more protein than seagrass. Although, like seagrass, crude protein estimates calculated as N×6·25 sometimes exceeds 15% (Wallentius 1981), for genera commonly eaten by turtles, such as *Laurencia* and *Gracilaria*, calculated crude protein is 10% (Johnstone 1966; Chapman 1970). Direct measures of protein in red algae (Dawes *et al.* 1979) and *Caulerpa* spp. (Dawes and Goddard 1978) average only 5·3%. Since the nutritional value of algae declines with decreasing latitude (Chapman 1970; Drew 1980), it is unlikely that algae are of any greater value to the turtles than seagrass.

Nevertheless, the niche of the green turtles in the Torres Strait contrasts with that of the same species in the Caribbean. There, it is one of the few species that grazes on the extensive beds of *Thalassia* (Randall 1965; Mortimer 1976; Ogden 1980), and was probably once the most important herbivore in the ecosystem (Parsons 1962; Thayer *et al.* 1982). The difference between the two areas results from the interaction between the turtles and other benthic herbivores. In the Caribbean the filamentous and fleshy algae are heavily grazed by echinoids (Wanders 1977) or herbivorous fish (Bakus 1966). It is thought that the relative scarcity of these animals in shallow tropical Australian waters may have contributed to the predominance of soft algae near Magnetic I. (Morrissey 1980). Conversely, there are relatively few animals that eat seagrass in the Caribbean (Ogden 1980), whereas in the Torres Strait much seagrass is eaten by the dugong *Dugong dugon* (Nietschmann and Nietschmann 1981), an herbivorous marine mammal (Marsh *et al.* 1978). Heinsohn *et al.* (1977) noted that large concentrations of dugongs and turtles are usually separated geographically, and dugongs will eat the algae preferred by turtles only in extreme circumstances (Spain and Heinsohn 1973; Heinsohn and Spain 1974).

We conclude that green turtles in the Torres Strait eat, and are capable of digesting, a wide variety of soft algae and seagrass. Actual intake by any particular turtle is determined primarily by the food available at its site of residence rather than the food governing residence site. Geographical variation in the diet of green turtles would appear to be governed by relative availability of food types and the structure of the local herbivore community, rather than variation in digestive capability among individuals or populations.

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The Sensitivity of Australian Animals to 1080 Poison VIII.* Amphibians and Reptiles

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Abstract

Amphibian and reptile species that have been tested in Australia are generally more tolerant to 1080 poison than are most other animals. The most common signs of poisoning amongst both groups of animals are a lack of movement or convulsions. Visible signs of poisoning first appeared from 13 h to almost 7 days after dosing. Deaths followed from 15 h to almost 22 days after dosing. It is unlikely that amphibians and reptiles face any direct poisoning risk from pest-poisoning campaigns involving 1080, given their high tolerance and the enormous amounts of poisoned bait that would have to be eaten. Some individuals, however, could be detrimentally affected through ingesting sublethal quantities of 1080.

Introduction

Although amphibians and reptiles are reputedly very tolerant to 1080 poison (sodium fluoroacetate) (Chenoweth 1949), very few data are available to substantiate this. The objective of this study was to determine whether some reptiles and amphibians in Australia might be killed by 1080-poisoning campaigns directed against rabbits *Oryctolagus cuniculus*, dingoes *Canis familiaris* and feral pigs *Sus scrofa*. Although the species tested partly depended upon opportunistic collecting, an effort was made to include representatives of those species most likely to be exposed to poisoning. Sand goannas or Gould's monitors *Varanus gouldii*, lace monitors *V. varius*, shingle-back, bobtail or sleepy lizards *Tiliqua rugosa*, and blotched blue-tongued lizards *T. nigrolutea* have either been observed scavenging, or are likely to scavenge, poisoned meat baits intended for dingoes or pigs; shingle-back lizards, blotched blue-tongued lizards, and bearded dragons *Pogona barbatus* have either been observed eating, or are likely to eat, poisoned carrot bait intended for rabbits.

Methods

All species were caught by hand in the field. The spotted grass frogs *Limnodynastes tasmaniensis* were kept in a large plastic jar containing leaves and moist tissue paper, and were fed mealworms. The reptiles were kept in either indoor wire cages or outdoor enclosures (Table 1) and fed rotten fruit, canned pet food, boiled eggs, minced steak or young mice, guinea pigs and rabbits. Other details of the experimental conditions are shown in Table 1.

Because of limited numbers of test animals, median lethal doses (LD_{50}s) could be determined for only three species of reptiles. Four groups, each consisting of three blotched blue-tongued lizards and two Gould's monitors, were given doses of 1080, the dose each time differing by a factor of 1·26. Groups of