

SEA TURTLES



Sea turtles are hunted widely for food throughout tropical areas. They form a significant part of the diet of many coastal peoples and hundreds of thousands of sea turtles are eaten annually. Occasionally some turtles are toxic and when such a turtle is shared within a village community, it can be devastating causing the deaths and/or debilitation of entire families or even a major portion of a village. Fortunately such events do not occur often.

Turtle poisoning is now a rare event in northern Australia. It has not been reported from here during the last 40 years. While locals in Torres Strait talk of deaths from eating Hawksbill Turtles at 'about the Second World War' there appear to be no remaining medical records from the area from that time. The popular account by Hudson (1935) of the death of five breast-fed infants following the eating of a Hawksbill Turtle by their mothers appears to be the only first hand account of death due to turtle poisoning in Australia.

The Hawksbill Turtle is regarded as poisonous by most indigenous coastal-dwelling people and turtle poisoning has occurred often enough in the past for it to be evident in their traditions. It is rarely eaten but, if a Hawksbill is to be eaten, strict rules govern its preparation. Only selected persons in a community (usually elders) are permitted to prepare Hawksbill Turtle for eating. Care must be taken in the butchering of the turtle to remove poisonous parts prior to cooking. In different districts, different organs must not be cut during preparation: gall bladder, urinary bladder or a 'poison gland' in the ventral thoracic region, neck or shoulder. MacGillivray (1852), naturalist on HMS *Fly* in 1849, recorded that for the natives of Prince of Wales Island, Torres Strait, 'hawksbill turtle and its eggs are forbidden to women suckling'.

The Australian endemic Flatback Turtle has been identified as poisonous to eat only from Bamaga and then only in an unsubstantiated report (Limpus *et al.* 1983). Elsewhere in north Queensland, Northern Territory and Western Australia the Flatback has been eaten often, with no reported poisoning.

The Green Turtle has not been implicated in any poisoning case in Australia despite the fact that it is eaten frequently.

To better understand the potential for sea

Colin Limpus

Colin James Limpus, M.Sc., Ph.D., Dip.Ed., is a Senior Zoologist with the Queensland National Parks and Wildlife Service at Townsville. He has been studying and writing about marine turtles for about 20 years, virtually all his professional life. (National Parks and Wildlife Service, Pallarenda, Townsville, Qld. 4810).

◀ Sea turtles, which occur in all tropical seas, are a regular food of coastal peoples. Some turtles are toxic.

turtle poisoning the problem is here considered from a world wide perspective.

LIST OF SEA TURTLES REPORTED AS POISONOUS

The following species have been implicated in poisoning cases (see Silas and Fernando 1984; Halstead 1970 for reviews).

FAMILY CHELONIIDAE: *Caretta caretta* (Linnaeus) (Loggerhead Turtle*); *Chelonia depressa* (Garman) (Flatback Turtle*); *Chelonia mydas* (Linnaeus) (Green Turtle); *Eretmochelys imbricata* (Linnaeus) (Hawksbill Turtle).

FAMILY DERMOCHELIDAE: *Dermochelys coriacea* (Linnaeus) (Leatherback Turtle*).

The asterisk denotes doubt about the validity of the report or the validity of the species identification in reports available. Some Hawksbill Turtles and, less frequently, some Green Turtles are also poisonous to eat.

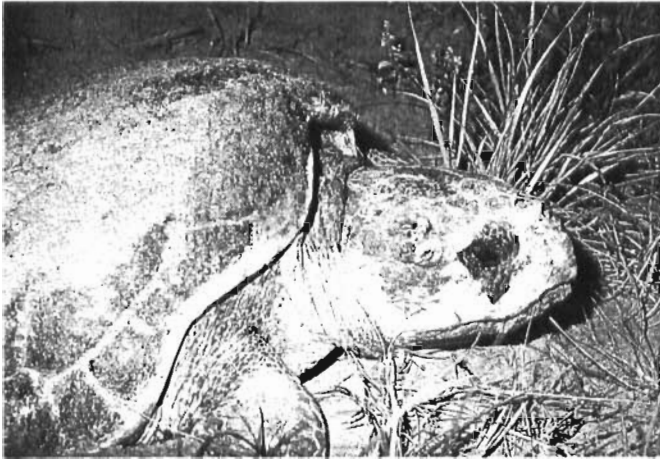
GEOGRAPHIC DISTRIBUTION OF REPORTED CASES OF TURTLE POISONING

The main problem areas in which fatalities from turtle poisoning occur appear to be within

Table 1: Incidence of fatalities among cases of sea turtle poisoning. ? denotes uncertainty in the data recorded.

Locality	Date	Species of turtle eaten	No. of cases	No. of deaths			Author
				Adults	Children (breastfed)	Total	
INDIA							
Tuticorin, Tamil Nadu	02 Jan 1961	<i>Eretmochelys imbricata</i>	9	1	2	3	S&F
Sakthikulangara, Quilon	27 May 1961	<i>Eretmochelys imbricata</i>	130	14	4	18	PNR&P, S&F
Punnaikayal, near Tuticorin	19 Apr 1977	<i>Chelonia mydas</i>	250	0	5 (2)	5	S&F
Manapad, near Tuticorin	03 Aug 1977	<i>Eretmochelys imbricata</i>	300	2	8 (1)	10	S&F
Mollachachi, Kanyakumari Dist.	1979	unknown	many	0	4	4	S&F
Tuticorin	Jun 1980	<i>Eretmochelys imbricata</i>	—	1	9 (1)	10	S&F
Tuticorin	22 May 1983	<i>Chelonia mydas</i>	6	0	4 (1)	4	S&F
SRI LANKA							
Panatura, S. of Columbo	Oct 1840	<i>Chelonia mydas</i>	28	—	—	18	Te
Karuppankudiyiruppu	Jun 1888	<i>Eretmochelys imbricata</i>	—	—	—	12	D
Mandativu, Jaffna	Jun 1921	<i>Eretmochelys imbricata</i>	24	—	—	7	D, Ha
Vaddukoddai, Northern Province	Apr 1923	<i>Eretmochelys imbricata</i>	—	—	—	4	D
TAIWAN							
Koryu	26 Apr 1939	unknown	57	—	—	7	Ha
PHILIPPINES							
Bantayan Is. near Cebu	Nov 1917	"large turtle" ? <i>Chelonia mydas</i>	33	—	—	14	Ta
Dinaig, Cotabato, Mindinao	05 Feb 1954	<i>Eretmochelys imbricata</i>	—	5	6	11	R&C
Kimini, Cotabato	1954	<i>Eretmochelys imbricata</i>	—	—	—	—	R&C
INDONESIA							
"Netherland Indies" Batavia	1933 1935	unknown "large turtle" ? <i>Caretta caretta</i> or <i>Eretmochelys imbricata</i>	2 4	— —	— —	1 1	Ha Ha
Wooi, Japan Is., West Irian	3 May 1935	<i>Eretmochelys imbricata</i>	52	—	—	9	Ha
Kaipuri, West Irian	24 Aug 1954	unknown	6	—	—	2	Ha
PAPUA NEW GUINEA							
Talasea Peninsula	before 1979	<i>Eretmochelys imbricata</i>	35	0	2	2	S
AUSTRALIA							
? Queensland	before 1908	<i>Eretmochelys imbricata</i>	1	0	0	0	B
Torres Strait	before 1935	<i>Eretmochelys imbricata</i>	5	0	5 (5)	5	Hu
CENTRAL PACIFIC							
Arorue, Gilbert Islands	about 1949	<i>Eretmochelys imbricata</i> group	—	—	—	5	Ha
CARIBBEAN							
Windward Islands	1697	unknown	2	0	0	0	Ha

Author code: B = Banfield (1913); D = Deraniyagala (1939); Ha = from a series of papers reviewed by Halstead (1970); Hu = Hudson (1935); PNR&P = Pillai *et al.* (1962); R&C = Ronquillo and Caces-Borja (1963); S = Spring (1982); S&F = Silas and Fernando (1984); Ta = Taylor (1921); Te = Tennent (1861).



Loggerhead Turtle, *Caretta caretta*.

the Indo-Pacific region (Table 1). All recorded fatalities have been confined to the region bounded by Torres Strait in northern Australia, Gilbert Islands in the central Pacific, Taiwan and India. In the western Indian Ocean, Hughes (1973, 1976) reported that it had been illegal to sell Hawksbill meat in Mauritius since 1884 as a result of numerous poisonings on the island. However, he could find no documented cases of Hawksbill Turtle poisoning in Madagascar where the species is eaten by some Malgache. Turtle poisoning is extremely rare in the Atlantic, Caribbean and east Pacific regions (Carr 1952). McKeown (1977) did not refer to the Hawksbill Turtle as poisonous when discussing the importance of the species as a food resource in the Solomon Islands. Bustard (1972) reported 'the hawksbill is eaten ... in Fiji without, to my knowledge, any ill effects being reported'.

TOXIN

The toxin responsible has been named chelonitoxin but it has not been isolated or studied. Good clinical studies of the effect of the toxin also are lacking. It is assumed to be a neurotoxin. While the apparent central neurological effects in the life threatening stages of severe turtle poisoning are reminiscent of ciguatera, the pronounced interaction with the upper gastro-intestinal tract during earlier stages is not. It can not be assumed that the same toxin is involved in turtle and ciguatera poisoning.

ORIGIN OF THE TOXIN

In some countries, e.g. western Philippines, Hawksbill Turtles are regularly eaten with no

known incidence of poisoning. In other places, e.g. south eastern India, and central Philippines, Hawksbill poisoning has been well documented. In areas where toxic Hawksbill Turtles occur, toxicity is sporadic and may occur at any time of the year. The origin of the toxin is unknown but the majority of researchers are of the opinion that the toxin is derived from poisonous marine algae or invertebrate animals eaten by the turtles. While there is no direct evidence to support this, it offers an explanation about why not all Hawksbill Turtles are toxic. The concept of the toxin passing along a food chain is further supported by the observation that the toxin has been passed to the breastfed babies from nursing mothers who have eaten part of a poisonous turtle. In extreme cases the breastfed babies have died without their mothers suffering any recognised symptoms (Silas and Fernando 1984). If these deaths are really the direct result of the toxin, then this is a unique toxin that can kill the breastfed babe without harming the mother.

In areas of the Philippines where Hawksbill Turtles are eaten regularly without ill-effects, it appears that the viscera are usually discarded and only the skeletal muscle is eaten. Elsewhere with reported poisoning cases, when the parts of the turtles eaten are identified, parts of the viscera have been eaten as well. While empirical evidence is lacking, this suggests that not all parts of a poisonous Hawksbill Turtle are equally toxic.

The eggs of sea turtles have not been found to be poisonous.

TOXICITY

Ingestion of poisonous turtle flesh can be lethal to humans and animals such as dogs and goats. Silas and Fernando (1984) reported six separate incidents of groups of people eating turtles — 723 individuals were poisoned with a fatality rate of 8%. Children appear to be more at risk than adults. Children younger than 12 years accounted for 49 (68%) of 72 fatalities from 12 turtle poisoning incidents for which the age structure of the fatal cases has been reported (Table 1). Breastfed babies who died following their mother's ingestion of poisonous turtle flesh accounted for 11 of these fatalities.

The freshness of the turtle meat appears to have no bearing on the toxicity. The toxic components are neither removed through

washing the meat during preparation nor destroyed during normal cooking procedures.

MEDICAL ASPECTS

The clinical aspects of sea turtle poisoning were reviewed by Silas and Fernando (1984). The symptoms which develop from within a few hours to even a week after the ingestion of poisoned turtle flesh are reported to consist usually of nausea, vomiting, diarrhoea, tachycardia, pallor, severe epigastric pain, sweating, coldness of the extremities and vertigo. Acute stomatitis consisting of a dry burning sensation of the lips, lining of the mouth and throat is sometimes reported; so also in some cases, a sensation of tightness of the chest. Though there is pronounced hypersalivation, swallowing becomes difficult and the patient may be lethargic and unresponsive. The oral symptoms are said to develop gradually and become increasingly severe after a few days resulting in the tongue developing a white coating and eventually becoming covered with multiple pinhead size reddened pustular papules. The pustules may break down into ulcers or persist for several months. Deep reflexes may be diminished. In severe cases somnolence is pronounced. It may be difficult to awaken the patient who gradually lapses into coma which is rapidly followed by death. Children may develop convulsions shortly before death. Death has often been attributed to respiratory failure.

The toxins/toxin appear/appears to have no direct action on the heart and has elicited no allergic responses to date.

TREATMENT

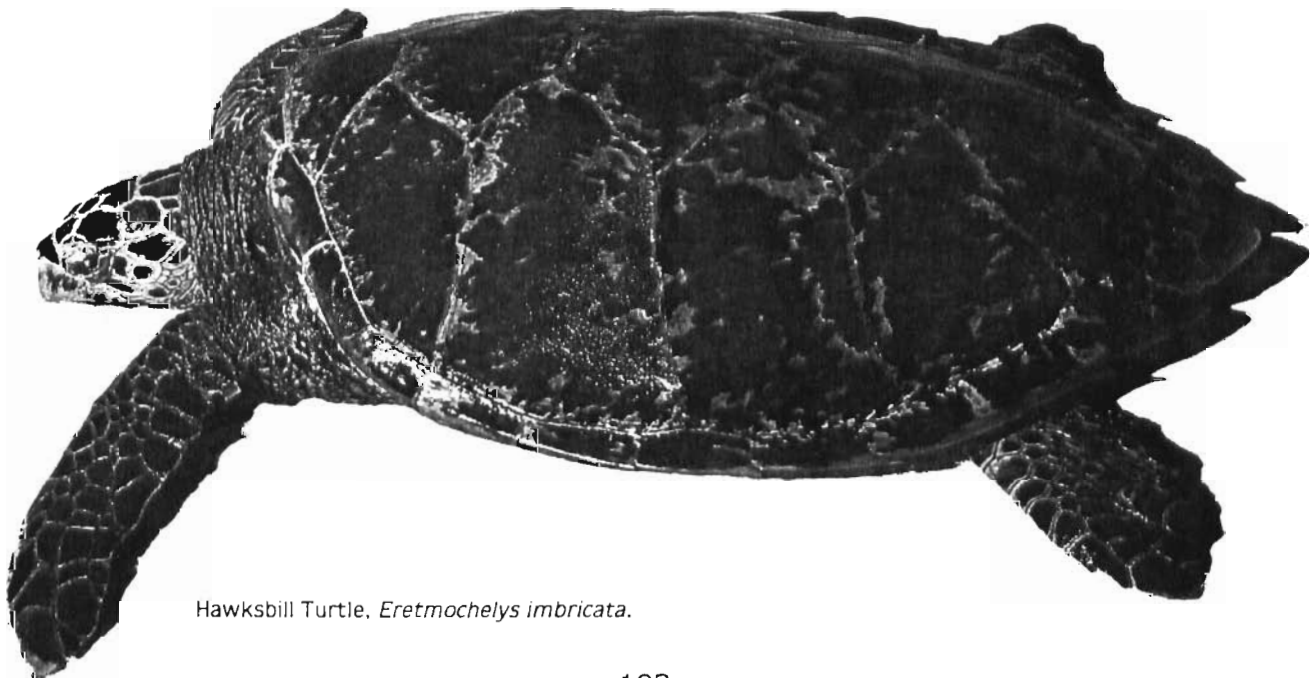
No specific treatment has been recommended for turtle poisoning. For emergency medical advice telephone the Marine Envenomation Hotline in the Townsville General Hospital Casualty Section: — telephone no. (008) 015160 (local call fee only, from anywhere in Australia).

Because so little is known of the problem the following steps are recommended in the event of a suspected turtle poisoning case:

1. Seek immediate medical assistance. While waiting for medical help, the patient should be kept calm, encouraged to drink (not alcohol) to offset dehydration, and observed for respiratory problems. Airways should be kept clear should vomiting or convulsions occur, and ventilatory support administered where necessary.

Where appropriate medical care is available the following generalised treatment should be considered:

- intravenous rehydration
 - prevention of hypoxia
 - monitoring of vital functions
 - in severe cases, suppression of convulsions with appropriate drugs.
2. Freeze any remaining turtle flesh (cooked or uncooked) as soon as possible for analysis.
 3. Recover the remaining parts of the turtle,



Hawksbill Turtle, *Eretmochelys imbricata*.

especially the head or carapace, for positive identification.

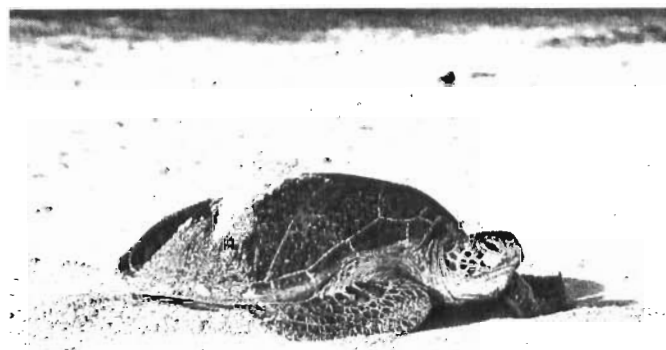
4. Contact the author, who will liaise with the medical personnel in further investigation of the problems of turtle poisoning.

PREVENTION

There are no distinctive features which allow the individual toxic turtle to be recognised. Within Australia, do not eat Hawksbill Turtles. In other countries, as a general rule eat only Green Turtle. If one is considering eating turtle in an area where the species has been reported to be toxic, then a portion of the meat should be tested. It is usually recommended that some of the turtle (I would suggest liver and muscle) be fed to a dog, cat or bird and that 24 hours elapse before the turtle is eaten. Nursing mothers and children should be discouraged from eating turtle flesh.

REFERENCES

- BANFIELD, E.J., 1908. 'Confessions of a Beachcomber'. (T. Fisher Unwin: London).
- BUSTARD, R., 1972. 'Sea Turtles. Natural History and Conservation'. 220 pp. (Collins: London).
- CARR, A., 1952. 'Handbook of Turtles. The Turtles of the United States, Canada and Baja California'. 542 pp. (Comstock Publishing Associates: Ithaca).
- DERANIYAGALA, P.E., 1939. 'The Tetrapod Vertebrates of Ceylon'. vol. 1. 412 pp., 24 pls., 137 figs. (Ceylon J. Sci. Colombo Mus. Nat. Hist.: Colombo).
- HALSTEAD, B.W., 1970. 'Poisonous and Venomous Marine Animals of the World'. vol. 3. (United States Government Printing Office: Washington, D.C.).
- HUDSON, H., 1935. Turtle for dinner. *Walkabout* 1: 34-5.
- HUGHES, G.R., 1973. The survival situation of the hawksbill sea-turtle (*Eretmochelys imbricata*) in Madagascar. *Biol. Conserv.* 5: 114-8.
1976. The St. Brandon turtle fishery. *Proc. Mauritius Roy. Soc. Arts & Sci.* 3: 165-89, 10 pls.
- LIMPUS, C.J., PARMENTER, C.J., BAKER, V., and FLEAY, A., 1983. The Crab Island sea turtle rookery in the north-eastern Gulf of Caprentaria. *Aust. Wildl. Res.* 10: 173-84.
- MACGILLIVRAY, J., 1852. 'Narrative of the Voyage of H.M.S. *Rattlesnake*'. vol. 2. (T. & W. Boone: London).
- McKEOWN, A., 1977. 'Marine Turtles of the Solomon Islands'. 48 pp. (Ministry of Natural Resources Fisheries Division: Honiara).
- PILLAI, V.K., NAIR, M.B., RAVINDRANATHAN, K. and PITCHUMONI, C.S. 1962. Food poisoning due to turtle flesh (a study of 130 cases). *J. Assoc. phys. India* 10: 181-87.
- RONQUILLO, I.A. and CACES-BORJA, P., 1963. Notes on a rare case of turtle poisoning. *Philipp. J. Fish.* 8: 119-24.
- SILAS, E.G. and FERNANDO, A.B., 1984. Turtle poisoning. *Central Marine Fisheries Research Institute (India) Bulletin* 35: 62-75.
- SPRING, C.S., 1982. Status of Marine Turtle Populations in Papua New Guinea. In Bjorndal, K.A., 'Biology and Conservation of Sea Turtles'. (Smithsonian Institution Press: Washington, D.C.).
- TAYLOR, E.H., 1920. Philippines turtles. *Philipp. J. Sc.* 16: 111-44. 7 pls.
- TENNANT, J.E., 1861. 'Sketches of the Natural History of Ceylon'. (Longman, Green, Longman and Roberts: London).



Green Turtle, *Chelonia mydas*.

TOXIC PLANTS & ANIMALS

A GUIDE FOR AUSTRALIA

Editors

JEANETTE COVACEVICH

PETER DAVIE

JOHN PEARN

1987