

MANAGEMENT AND TURTLES.

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ABSTRACT.

The potential problems facing flatback and green turtles are used to illustrate turtle conservation needs in Queensland. The principal problems involve controlled real estate and other development, elimination of feral predators from nesting beaches, sponsoring critical research to formulate sustained harvest levels for use by Australian and foreign coastal peoples dependent on turtles for food. International co-operation is essential for conservation of turtles which are shared between Australia and her neighbours.

INTRODUCTION.

Sea turtles are migratory, utilising feeding grounds that are usually far removed from the nesting beaches. The nesting turtles return repeatedly to traditional rookeries that are usually species specific¹. Hatchlings are believed to be dispersed to an oceanic planktonic life for an unknown period from which the juveniles shift to feeding ground habitats in continental shelf waters. Growth of immature turtles within these feeding grounds is slow^{2,3}, and the preliminary results from our growth studies in the southern Great Barrier Reef suggest that a green turtle will be over 50 yrs. old before it first breeds. The adult turtles display as strong a site fixity within a feeding ground as at the nesting beach, returning to the same feeding ground following breeding migrations. Each species has specific feeding requirements. Turtle populations have declined following excessive mortality at any one of several stages in the life cycle and past experience has shown that recovery following population crashes will be slow, perhaps requiring decades if not perhaps a century of extreme management^{4,5}. For us in Australia, where sea turtle populations appear to be healthy, the problem for sea turtle conservation centres on identifying potential critical situations before they arise and managing accordingly. It is better to avoid the usually costly and politically unsatisfactory situation of attempting to "rescue" a species after depletion as is occurring with Kemp's ridley turtle in Mexico⁶.

EXAMPLE PROBLEMS.

To highlight the potential problems for Great Barrier Reef turtles the specific problems for the flatback and green turtles are discussed.

Flatback turtle. *Chelonia depressa*.

Breeds only in tropical Australia and occurs in feeding grounds on the immediate Australian continental shelf and Gulf of Papua. Nesting occurs almost exclusively on the mainland coast and continental islands. Queensland has only three major rookeries:-

Great Barrier Reef Province (GBR)

Peak Is., off Yeppoon (300-500 females annually)

Wild Duck and Avoid Islands, off St. Lawrence (estimated 300-500 females annually)

Gulf of Carpentaria

Crab Is. off Bamaga (estimated several thousand females annually).

Low density nesting representing perhaps a quarter to a third of the total annual breeding numbers is wide spread on mainland beaches from Bundaberg to

Townsville and western Cape York Peninsula. At first glance the widely dispersed low density nesting may be interpreted as a possible security for the species. This is not so. From Bundaberg to Gladstone there is total destruction of more than 90% of clutches laid (all turtle species) by the introduced fox. At Curtis Is., where approximately 100 females nest annually, 77% predation of eggs by feral dogs occurred in the 1982-83 nesting season. Also at Curtis Is. motor bike riders have been observed to use the nesting females crossing the beach as jump ramps. This can split the turtle carapace from end to end and six females were reported killed last nesting season. The extensive use of off road vehicles on this and other central Queensland nesting beaches is resulting in some dune erosion and compaction of sand over nests with unknown consequences. On mainland beaches and adjacent islands near Mackay reports by local residents indicate a substantial illegal harvest of the fresh laid eggs. On three of these same beaches, dunes have been fenced with wire netting to exclude people from walking off the beach onto the vegetated dune. These same fences excluded nesting females from the optimal nest sites above spring high tide levels. In addition real estate development has been permitted onto the dune system and hatchlings have been disoriented to cross roads and circle under lights among the buildings. Such misorientation increases hatchling mortality. On the west coast of Cape York Peninsula all reports of examined turtle nesting are of near total clutch destruction by feral pigs.

The diversity and geographical extent of the management required to correct these problems suggest that the security for flatback nesting lies in the island rookeries. However the most important, Crab Is., is an aboriginal reserve where harvest of eggs and adults for consumption by local communities occurs at an undetermined level. Avoid Is. is privately owned (leasehold) as a holiday retreat. At Wild Duck Is. while some of the nesting beach is within a National Park, the remainder (about one third of the beach) is within a tourist resort development. Experience at Heron Is. suggests that major hatchling misorientation will occur as a result of light pollution of the beach and adjacent waters unless stringent controls are exercised. Of the major rookeries only Peak Is. National Park has no introduced predators, no encroachment of development at the nesting beach, and total habitat protection. In feeding grounds the flatback is taken regularly in prawn trawls. An undetermined proportion of these incidental catches results in death. The flatbacks trawled on North Queensland prawning grounds such as Princess Charlotte Bay form part of the "protected" Peak Is. and Wild Duck Is. nesting populations⁷.

As the situation exists, the long term future of the flatback turtle in Queensland is not secure and being an Australian endemic the conservation of this species rests solely with Australian (Federal and State) authorities.

Green turtle. *Chelonia mydas*.

A pantropical species which suffered substantial population declines in many countries in modern times⁴. The Queensland populations form one of the few, if not the largest, remaining large herds of green turtles. Within Queensland, nesting occurs almost exclusively on the coral cays of the outer GBR and remote sand islands of the southern Gulf of Carpentaria, the principal rookeries⁸ being:-

- Great Barrier Reef Province (GBR)

 - Raine Is. and Pandora Cay (estimated tens of thousands of females annually)

 - Capricorn Bunker Groups (estimated about 5000 females annually).

- Gulf of Carpentaria.

 - Bountiful, Pisonia and Rocky Islands (density unmeasured but expected to exceed 5000 females annually).

Most of the green turtle rookeries are without major recognisable problems at present - a consequence of being sited on remote small cays. Some localised problems exist e.g. at Heron Is. lights misorient hatchlings and cause substantial unnatural mortality while retaining walls exclude turtles from nesting on a significant portion of the principal female producing beach. Similarly at North West Is. the camping development continues to concentrate the tourist activities, with associated disturbance of nesting turtles, on the northern female producing beach. Reports from fishermen suggest Bramble Cay may have been a major green turtle rookery in the recent past. It is presently a minor rookery and the continuing regular harvest of nesting turtles by crews of passing Papua New Guinea (PNG) boats is believed to be the principal cause of this population decline. Many green turtle nesting beaches are reserves under the control of the Dept. of Aboriginal and Islander Advancement including Raine Is. (R4), Bramble Cay (R198). As such the local indigenous people have unrestricted rights to harvest these turtles. This is not resulting in a significant harvest of nesting females at present at the larger colonies.

The principal problems threatening this species are mainly associated with the feeding pastures. Many thousands of green turtles are harvested annually by Queensland indigenous people⁹, with most being taken in Torres Strait and along Cape York Peninsula. The green turtle unfortunately doesn't recognise international boundaries and tag recoveries show that females which nest on GBR rookeries are being caught for food from an area encompassing Gulf of Carpentaria, Arnhem Land, east Indonesia (Ambon, Aru), south Irian Jaya, north and south Papua New Guinea, New Hebrides and New Caledonia (Figure 1). The GBR green turtles are a resource we share with neighbouring countries. If tag recoveries have equal probability of return irrespective of the country of their recovery then the greater number of tags recovered from outside of Australia indicate that more GBR breeding green turtles are harvested outside of Australian waters than within. In particular in Torres Strait alone we estimated that in the late 1970s, approximately 10,000 greens were harvested annually in the area between Bamaga and the PNG coast. A major part of this harvest is caught by Papua New Guineans on the Warrior Reefs of Australia for sale in the Daru (PNG) markets. Reefs adjacent to aboriginal and islander communities are usually devoid of turtles as were the reefs examined near Daru in 1979. There are indications that the hunters are travelling further now than in the past to maintain catches. Our tagging program shows natural recruitment is slow and then mainly by small turtles.

We believe this over harvest of GBR breeding green turtles is because changes in technology have produced more efficient turtle hunting equipment (e.g. aluminium dingy, outboard motors, nylon rope, rifles, steel tipped harpoons) faster than traditional customs could change to maintain a sustainable harvest rate. There is a major difference between turtle harvesting from Queensland communities and harvesting at Daru. A Queensland Torres Strait Islander may only take for his own use - not for commercial sale. We have seen these islanders catch more turtles than needed, select the best and release the remainder. This does not happen out of Daru where the harvest is sold as a cash crop through the markets and every turtle is marketable. In pre-European days the turtles may have been exploited at a sustainable yield level (we assume this because they were still there in reasonable numbers after over 1,000 years of coastal and island settlement). The same skilled hunters given the removal of the social constraints which reduced the frequency of their fishing¹⁰ and who are now equipped with modern technology are now almost certainly over efficient and are over harvesting. It is our belief that the Torres Strait turtle resources are on the decline. Given that turtles are slow growing animals and that recruitment to depleted areas is slow, the recovery of a reef denuded of turtles may take many

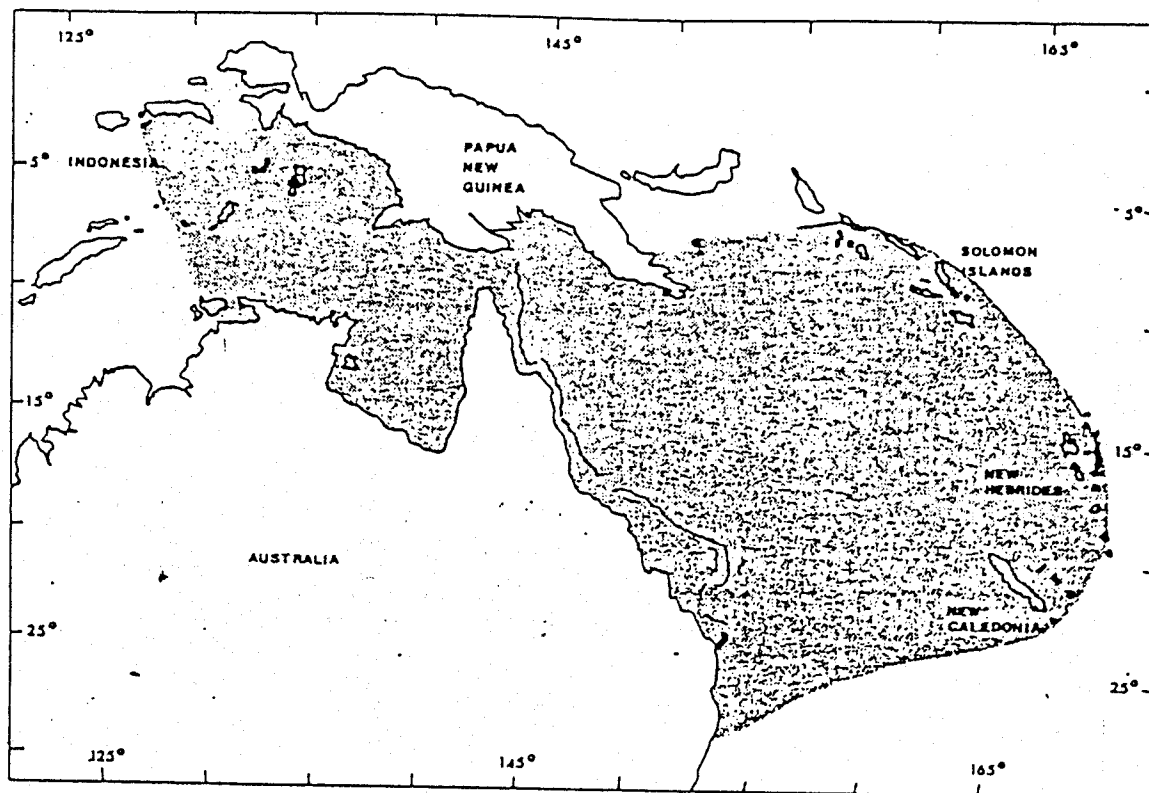


Figure 1. Turtles tagged while nesting on GBR rookeries migrate to feeding grounds encompassing a wide area and many countries (shaded area).

decades, perhaps in the order of a century to return to its original state. The extent of the take of the Gulf of Carpentaria breeding green turtles in the commercial and traditional harvests of northern Australia, New Guinea and Indonesia will not be known until a tagging program is initiated. The conservation of green turtles (and the other pan tropical species) can not be achieved by one country alone. It is an international problem requiring the co-operative efforts of Australia and near neighbours.

MANAGEMENT OPTIONS.

1. Species protection.

Within Australia all turtles are protected species with the exception that indigenous peoples may take them for their own use.

2. Habitat protection.

(a) A major portion of the breeding grounds for each species should be covered by strong habitat conservation legislation to ensure that turtles have the necessary beaches for nesting, that disturbance of the nesting adults and their eggs is minimised and that the hatchlings successfully disperse from these beaches. The following list includes the principal Queensland rookeries which are considered the minimal requirements for habitat protection (* = National Park or Environmental Park).

Loggerhead

Capricorn Group (Wreck*, Tryon*, Erskin* Islands)
Mainland (Mon Repos*, Wreck Rock beaches)
Swain Reef Cays.

Flatback

Gulf of Carpentaria (Crab Is.)
Central Queensland (Peak*, Wild Duck*, Avoid Islands)
Mainland (Curtis Island)

Green Gulf of Carpentaria (Bountiful, Pisonia, Rocky Islands)
Nth. Great Barrier Reef (Raine Is., Pandora Cay, Bramble Cay)
Capricorn-Bunker Group (North West*, Wreck*, Hoskyn* Islands)

Hawksbill Torres Strait (Long Island)
Nth. Great Barrier Reef (Milman, Bird Islands)
(Several other lower density rookeries are also needed)

Leatherback Wreck Rock beach

Pacific ridley No significant rookery known.

Species not identified but substantial nesting known from Turu, Deliverence and Kerr Island in northwestern Torres Strait.

(b) The special courtship areas for these rookeries once identified warrant management especially in Torres Strait where courting turtles are harvested, the female being preferentially taken.

(c) Large expanses of feeding grounds are needed to support our turtle herds. The declaration of Great Barrier Reef Marine Parks sections is contributing substantially in this regard. The problem areas needing consideration are Torres Strait and the trawling grounds generally.

The goal of sea turtle habitat protection should be to protect the turtles while permitting those activities not detrimental to the turtles. Controlled tourism at key places such as Mon Repos, Heron Is., Curtis Is. can have positive conservation value through a well planned environmental education program. Real Estate Development should be well buffered from turtle nesting beaches with minimal outside lighting within 1.5 km of the beach. Fencing on dunes to control people movement off the beach should include a turtle access way at least 0.75 m high.

3. Predator control.

A means of eradicating foxes, feral dogs and pigs from large expanses of coastal beach systems is needed. In the long term, protection of individual turtle nests is not economically viable.

4. Trawling incidental catch.

The impact of trawling on flatback, ridley and loggerhead habitat of the extensive prawn grounds off Queensland is not known. There have been developed devices for excluding turtles from capture in prawn trawls which may even improve trawling efficiency¹¹. The fitting of turtle excluders in trawl nets may be necessary in at least some flatback-rich prawning grounds.

5. Australian indigenous harvest.

Planning towards co-operative State and Federal legislation to ensure the conservation of turtles within the context of traditional harvests is needed. The alternative will be the loss of both the tradition and the turtles. To accomplish this a working group representing the indigenous people and the biological and conservation interests should be established to determine how a traditional turtle and egg harvest can be maintained in perpetuity for indigenous coastal people.

6. International harvests.

Sea turtles are in need of international conservation agreements comparable to those for other migratory species (birds, whales). In the meantime those involved in the Torres Strait Border Treaty negotiations need to consider the overharvest of turtles occurring in the shared area, and plan for turtle conservation. The term "traditional use" needs definition. The turtle harvests of Indonesia probably involve a major component of Australian turtles

and needs investigation.

7. Management oriented research.

Before we can advise indigenous communities and foreign governments on acceptable harvest rates, basic research on the underwater life of turtles is needed to determine population parameters e.g. turtle standing crop in reef communities, recruitment, growth rates, dispersal patterns. Turtle harvests from rookeries await the results of long term tagging studies to determine such parameters as reproductive life expectancy and recruitment rates. There is sufficient knowledge available to plan an egg harvest utilising that component of the egg production which normally dies on the beach through flooding and erosion¹².

Because the needed research is long term and largely reef based it will be expensive but without it we cannot plan for sustained yield harvests.

CONCLUSION.

Turtles are vulnerable species. The crux of the problem is not how a turtle is killed or where it breeds or whether it is for traditional or commercial use but rather 'HOW MANY TURTLES CAN A TURTLE CATCHER CATCH AND STILL HAVE TURTLES TO CATCH'. To put it in the terms of a Papua New Guinea slogan. We should be conserving turtles not only for our own sake and the sake of the turtle but also for the sake of our children and their children in turn.

REFERENCES.

1. C.J. LIMPUS in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington, D.C., 1982), p. 297.
2. C.J. LIMPUS and D.G. WALTER, Herpetologica 36, 162 (1980).
3. G.H. BALAZS in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington, D.C., 1982), p. 117.
4. F.W. KING in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington, D.C., 1982), p. 183.
5. P.C.H. PRITCHARD in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington, D.C., 1982), p. 503.
6. E.F. KLIMA and J.P. McVEY in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington D.C., 1982), p. 481.
7. C.J. LIMPUS, C.J. PARMENTER, V. BAKER and A. FLEAY, Aust. Wildl. Res. 10 (in press, 1983).
8. C.J. LIMPUS, J.C.U.N.Q. Res. Monog. 1, 5 (1980).
9. J. KOWARSKY in BIOLOGY AND CONSERVATION OF SEA TURTLES, K.A. BJORNDALE, ED. (Smithsonian Institution, Washington, D.C., 1982) p. 305.
10. E. BAXTER RILEY, AMONG PAPUAN HEADHUNTERS (J.B. Lippencott Co., Philadelphia 1925).
11. ANON, Construction and installing instructions for the trawling efficiency device. NMFS, P.O. Drawer 1207, Pascagoula, Mississippi 39567, USA.
12. C.J. PARMENTER, J.C.U.N.Q. Res. Monog. 1, 32 (1980).