

## **TURTLE FARMING AND CONSERVATION OF GREEN TURTLE (*CHELONIA MYDAS*)**

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### **INTRODUCTION**

A controversy exists concerning the pros and cons of turtle farming, Cherfas (1979, 1980), Pickett and Townson (1980), Townson (1980) and differing views concerning utilisation of marine turtles (see, for instance, the Marine Turtle Newsletter No. 14 (1979)).

The purpose of this article is to try objectively to assess the implication of commercial sea turtle farming activities to conservation of the green turtle. Such an assessment might also assist in deciding on the desirability of other reptile farming ventures.

### **THE PRESENT SITUATION**

Certain forces in the name of conservation have been promoting a negative approach to turtle farming and a number of thinly disguised attacks have been launched on turtle farming (see Pickett and Townson 1980 for details). The IUCN Marine Turtle Newsletter has, however, recently taken a very positive approach to the whole question of sea turtle utilization (Issue No. 13, November 1979), a view which has also been developed by Bustard (1980) who stated,

"The international fraternity's 'protect everything' philosophy does *real* conservation — which surely includes sustained yield utilization — as opposed to mere preservation, a great disservice in that it makes the countries in the developing world feel that total protection alone represents advanced thinking. This results in blanket conservation laws being brought in — never mind that they may not be enforced — which prevent the operation of conservation through good utilization schemes which would substantially benefit the population. I have been preaching conservation through utilization since the IUCN Marine Turtle Group was formed. IUCN Groups which wish to advance their animals must be pragmatists, have access to good scientific data and contain within their midst people with extensive experience of the sheer enormity of problems in the developing world, especially the enormous pressure on all resources especially land — as a result of huge human population growth."

### **THE POPULATION ECOLOGY OF THE GREEN SEA TURTLE**

#### **A BRIEF SYNOPSIS**

What follows is a very brief account. For details the reader is referred to Carr (1967) and Bustard (1972, 1973, 1974).

1. Sea turtles are very fecund animals and the female green turtle lays a number of clutches of eggs in a breeding year at intervals of approximately 14 days. The mean clutch size is 110 eggs. The number of clutches is commonly four to five and may exceed eight. Hence potential productivity is enormous. Given individuals do not nest annually, but after several years at sea — two or three years in the Costa Rican population study by Carr & Carr (1970) and four to five years in the Great Barrier Reef populations studied by Bustard (1972). The nesting typically occurs at very high density on restricted nesting beaches, often small islands. Egg destruction by subsequent nesting turtles (due to physical limitations of space available for nesting on the beaches) may play an important role in population regulation, and is responsible for large-scale egg losses (Bustard & Tognetti, 1969).
2. Both the eggs and the newly hatched turtles have many enemies and losses at both stages of the life history are very high. It is unlikely that more than 1% of the eggs produce adult turtles in nature and the percentage survival may be lower.  
*Factors which reduce these losses would greatly assist recruitment (see below).*

3. Green turtles take a number of years to reach sexual maturity. This age is not known with certainty for any population and may be longer than the average of about five years suggested by Carr (1967) for Caribbean population and between four and six years suggested for Asian populations (Hendrickson, 1958).

### **TURTLE CONSERVATION USING POPULATION ECOLOGY PARAMETERS**

It follows from the above that any factors which would reduce the massive loss of eggs and hatchlings would potentiate population growth. Eggs can best be saved by protecting them from predators. This would involve transport of large numbers of eggs to hatcheries (Bustard, 1972). However, on small islands egg predators may be absent or unimportant obviating the need for hatcheries.

Equally, if not more important, is the protection of the newly hatched turtles. The only effective way to do this, apart from the natural approach of 'flooding' the area with hatchlings, is to keep the hatchlings in pens until they outgrow at least most of their predators. There are disadvantages to this, however. It is expensive, losses are likely to be high unless the rearing station is well operated, and there is the fear that it may interfere with the natural homing instinct of the turtles.

The normal European turtle fishery is clearly wasteful and doomed to destroy the nesting turtle population in anything but the short-term. This was obvious to the early turtle workers such as Hornell (1927) and Moorhouse (1933). It is based on slaughter of female turtles only — turned on the beach as they come ashore at the start of the nesting season to lay their eggs. Hence not only are the breeding females lost, but so is the egg production resulting from several years feeding at sea. Native methods using capture at sea and especially the use of decoys (which capture only the promiscuous male turtles) are much less harmful.

If adequate protection in captivity were given to the eggs and hatchlings, and if it were demonstrated that after release such juveniles homed to the island of their birth, populations would greatly increase and then it would be possible to set quotas for the taking of adult turtles of both sexes. Such quotas would be very much larger than would be possible in a natural (unassisted) population. Now it may be that it is desirable on aesthetic or other grounds to completely stop culling of wild turtles. However, as a turtle population ecologist, I certainly cannot say that such a drastic step is necessary for the future survival of sea turtles. In a scientifically-managed scheme, annual quotas could be set on a sustained yield basis and, by definition, the crop would be available indefinitely.

### **POACHING**

Poaching can be controlled, given the political will. This is much more easily achieved if there is an alternative to poaching such as management and culling of the wild population, or farming. There can, in my opinion, be no case for saying that sea turtle management or turtle farms will increase demand and lead to enhanced poaching (see also Pickett and Townson, 1980). If there were enough farms, the total demand could be met by farmed stock as occurs nowadays with certain fur-bearing animals, such as mink and chinchilla.

### **WHAT NEEDS TO BE DONE**

1. Develop sufficient turtle farms under adequate scientific supervision to meet the demand for turtle products.

Conservation effort, instead of being directed at decrying the remarkable achievements of the Cayman Turtle Farm should endeavour to provide scientific management to a crop of similar enterprises. It should be noted that even if these farms need access to wild-laid eggs for several years, this need not prove a conservation problem (see below). Hopefully, many of these farms can be sited in areas where they will assist local employment opportunities and be locally owned (the huge Thai crocodile farm provides an outstanding example of this).

2. **Guarantee access for their products to the major North American and European markets**

Cayman Turtle Farm suffered greatly from denial of access of its products to the potentially very lucrative North American market under, in my view, wrongly placed pressure from conservationists. Clearly turtle farms on the required scale will not be developed on the basis of a gamble. It will be essential that decisions to enable them to operate commercially in the years ahead are taken now if viable farming units are to be developed.

Chabreck (1973) pin-pointed these problems as they have effected alligator farming:

"A major obstacle which has plagued the alligator farm industry in recent years has been the lack of legal security. A strong well-planned programme against the use of alligator skins has placed the future of alligator farms in jeopardy. Although the programme was aimed primarily at the use of skins from wild alligators, the threat that it could eventually influence the marketing of the farm-reared animals has made many farmers reluctant to put large capital investments into the operation."

3. **Management (sustained yield utilization) of existing large sea turtle populations**

Quite apart from actual farming of sea turtles, there is no reason why existing populations should not be cropped under scientific management on a sustained yield basis. Indeed such an approach — putting a commercial value on the population — may be the best way to ensure the future protection of the population and its rookery areas, since protection costs money. As pointed out by Hendrickson (1958) the "cheapest" stage in the life history in ecological terms is the eggs, sizeable numbers of which could be harvested with no effect on the population, especially if the remainder of the eggs are effectively protected. Bustard and Tognetti (1969) have taken this further and looked at egg losses at the rookeries caused by the nesting turtles themselves. I have also developed this work subsequently (Bustard, unpubl.) and know personally of a number of rookeries where most of the early-laid eggs could be removed with no effect on the population as they will be destroyed anyway by subsequently nesting turtles. Following the approach of Hendrickson (1958) these eggs would be used for food. If instead, they (or part of them) were used for farming purposes the total production could be enormous.

### **THE CAYMAN TURTLE FARM**

A pioneer green sea turtle farm was initiated by Mariculture Limited on Grand Cayman Island in 1968. A recent account of the subsequent Cayman Turtle Farm Ltd., has been given by Townson (1980). Pickett and Townson (1980) discuss certain problems facing this farm at the present time. It seems strange that a farming venture which has done so much over more than a decade to pioneer turtle farming at a practical level and has succeeded in breeding the green turtle in captivity (Simon, Ulrich and Parkes, 1975) should be under concerted attacks from certain quarters. Conservationists should be assisting development of this and similar turtle farming ventures. Part of the problem lies in the past. The Survival Services Commission of IUCN (The International Union for the Conservation of Nature and Natural Resources) set up a Marine Turtle Specialist Group, the first meeting of which was held in Morges, Switzerland in March 1969. Turtle farming was discussed, but no representative of Mariculture Limited had been invited to attend the meeting. The attitude of most Group members towards turtle farming was ambivalent. The lack of invitation was remedied at the next (1971) meeting of the Group but a very similar ambivalent attitude prevailed.

What is needed now is a firm commitment on the behalf of sea turtle scientists to the concept of turtle farming and *management* of sea turtle resources.

## OTHER CONSIDERATIONS

It requires to be stated repeatedly that not only is turtle farming (in the IUCN sense of producing all the farm products from eggs laid by captive breeding herd) a perfectly legitimate enterprise, but that so also is exploiting natural populations provided this is done on a sustained yield basis. It is perfectly *legitimate* conservation and it is regrettable that people who believe in scientific conservation should find that they have their backs to the wall and that the completely unscientific preservationist attitude should prevail. Perhaps IUCN has been half-hearted in promoting the concept of sustained yield utilization, partly no doubt, as a result of the preservationist attitude held by many of the supporters of its fund raising body, the World Wildlife Fund.

I agree with Pickett and Townson (1980) that there is no evidence to suggest that turtle farming would provide a demand for vital products which the farms could not meet. Instead, I feel that the presence of farms would provide the required product legitimately, thus making it easier, especially in countries actively farming turtles to:

- a) crack down on poaching of the wild populations, and
- b) to protect natural rookery areas from all other forms of disturbances, including development.

It is on these two aspects that the future of sea turtle species ultimately depends. Politically, it is always easier to close illicit operations when there is a legitimate alternative.

One should not be against a commercial enterprise just because it is commercial — a view commonly found among conservation-orientated scientists. For instance, Ehrenfeld (1974) wrote:

“Commercial mariculture of sea turtles is occasionally acceptable, but only when the operations are small and under government supervision, and when the markets are relatively local. The turtle ranches established in Queensland, Australia by Dr Robert Bustard (Bustard, 1972) are an excellent example: they serve the dual function of interesting the native population in turtle conservation and reducing the local hunting pressure on wild stocks (because the hunters are involved in the ranching). In this case the advantages appear to outweigh the usual/negative side effects of turtle mariculture, but periodic re-evaluation will be advisable.”

I would wish to differ with three statements in the above quotation:—

1. I would *not* accept that the enterprises should necessarily be small — the most viable ones may be large — especially if they are to have available to them the best scientific advice.
2. I would *not* accept that utilization should necessarily be local. This smacks of the non-commercialism espoused by Carr (1972).
3. I would *not* accept that there are usually negative side effects to turtle farming.

Hirth (1971) writing in an FAO publication wisely stated:

“initial attempts at turtle aquaculture should be on a small scale and should be conducted only if scientific expertise is available.”

I cannot totally accept the view expressed by Carr (1972):

“the only effort to be encouraged should be a non-profit government-sponsored campaign in which many small, widespread, purely experimental projects simultaneously attack the problem of nutrition, disease control, and captive breeding on procedure and results.”

This is because we all know that non-profit, government-sponsored schemes are often abject failures! I can see no reason why we should be against *commercial* motives and using these to get work done which would not be done, or cannot be done, on a sufficiently large scale as a research project. I have throughout my professional career

worked very closely with governments and carried out large-scale research projects in which a future potential profit was a strong or motivating force in government making the necessary research funds available. The onus then rests on the scientist to ensure that the best scientific advice is proffered so that the necessary safeguards are built into the system.

If I may end on a philosophical note it would be to say too many quasi-scientists have climbed on to the conservation band-wagon, and that unfortunately a sizeable proportion of both these and the remainder are anti-profit and anti-business – a strange approach when it is business (industry) which ultimately provides the funds which allows research scientists to continue to carry out their (often esoteric) research!

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#### REFERENCES

- Bustard, H.R. (1972) *Sea Turtles: their natural history and conservation*. Collins, London & Sydney.
- Bustard, H.R. (1973) *Kay's Turtles*. Collins, London & Sydney.
- Bustard, H.R. (1974) Barrier Reef Sea Turtle Populations. pps. 227-234 *In Proc. of the second International Coral Reef Symposium. I. Brisbane, Great Barrier Reef Committee.*
- Bustard, H.R. (1980) Should Sea Turtles be Exploited? *Marine Turtle Newsletter* No.15:3-5.
- Bustard, H.R. and Tognetti, K.P. (1969) Green Sea Turtles: a discreet simulation of density-dependent population regulation. *Science* 163: 939-941.
- Carr, A. (1967) *So eccellente a fishe: a natural history of sea turtles*. Natural History Press, New York.
- Carr, A. and Carr, M.H. (1970) Modulated Reproduction Periodicity in *Chelonia*. *Ecology* 51: 335-337.
- Carr, A. (1972) *Great reptiles, great enigmas*. Audobon 74: 24.
- Chabreck, R.H. (1973) Current Trends in Alligator Farming in the South-Eastern United States *In 'Crocodiles' Proceedings Second Working Meeting Crocodile Specialists, Ndumu and Lake St Lucia, Zululand, 20-27 March 1973. IUCN Publications. New Series, Supplementary Paper No. 41: 63-65.*
- Cherfas, J. (1979) The song of the turtle. *New Scientist* 84 No. 1185.
- Cherfas, J. (1980) Still no ban on Green Turtle imports. *New Scientist*.
- Ehrenfeld, D.W. (1974) Conserving edible sea turtles – Can Mariculture help? *American Scientist* 62(1): 23-31.
- Hendrickson, J.R. (1958) The Green Sea Turtle, *Chelonia mydas* (linn.) in Malaya and Sarawak. *Proc. Zool. Soc. London* 130: 455-535.
- Hirth, H. (1971) Synopsis of Biological Data on the Green Turtle *Chelonia mydas* (linnaeus) 1758. Rome: *FAO Fisheries Synopsis* No. 85.
- Hornell, J. (1927) *The Turtle Fisheries of the Seychelle Islands*. HMSO. London.
- Moorhouse, F.W. (1933) Notes on the Green Turtle (*Chelonia mydas*) Reports Great Barrier Reef Committee 4 (1): 1-22.
- Pickett, J. & Townson, S. (1980) Political Problems for the Cayman Turtle Farm: which way conservation? *Bull. Brit. Herpetol. Soc.* 1: 18-20.
- Simon, H., Ulrich, G.F. and Parkes, A.S. (1975) The Green Sea Turtle (*Chelonia mydas*); mating, nesting and hatching on a farm. *J. Zool., Lond.* 117: 411-423.
- Townson, S. (1980) Observations and notes on the captive breeding of the Green Sea Turtle (*Chelonia mydas*) on Grand Cayman, British West Indies. *Bull. Brit. Herpetol. Soc.* 1: 11-17.