SPC/Fisheries 10/WP.11
2 March 1978
ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

TENTH REGIONAL TECHNICAL MEETING ON FISHERIES
(Noumea, New Caledonia, 13 - 17 March 1978)

REPORT ON TURTLE CULTURE TRIALS IN TORRES STRAIT FEBRUARY - JULY 1976

by

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SUMMARY

A small turtle culture research station was set up on an island in Torres Strait, Northern Australia. Hatchling green turtles (Chelonia mydas) were kept for approximately five months under a variety of conditions during which time their survival and weight changes were documented. Culture conditions deliberately varied included stocking density, degree of physical crowding, and daily water turnover rates. Attempts were made to maintain food in excess at all times except overnight. There was evidence that poor water quality, rather than the degree of physical crowding, was the major adverse influence on the culture of these turtles over a wide range of stocking densities.

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INTRODUCTION:

Since the early part of this decade investigations have been carried out into the feasibility of setting up a turtle culture industry in the Torres Strait region by the Australian Government through its agency Applied Ecology Pty. Ltd. The aim of such development would be to provide much needed employment opportunities for people of the area. Alongside investigations into techniques of turtle culture have been studies of the wild turtle populations in order to properly assess the environmental impact of any future culture proposals.

In 1975 and 1976 I was employed by Applied Ecology Pty. Ltd. to study the feasibility of turtle culture in Torres Strait. To gain a realistic impression of the types of problems which could be encountered in the region the site for the experimental culture project was deliberately chosen to be Yorke Island ($9^{o}45'$ S, $143^{o}24'$ E), a small and remote coral cay. Several factors placed constraints upon the type of methods we used. Firstly, as the ultimate aim of the project was to provide employment opportunities the methods were designed to be as labour-intensive as possible without conflicting unduly with the life style to which local people employed on the project were accustomed. Secondly, due to the remoteness of the site, the level of technology used was limited. Delays and considerable expenses in supplying and servicing various pieces of equipment such as pumps and freezers were normal.

The culture trials were conducted between February and July 1976. The work was aimed at obtaining baseline information regarding the relation of the growth and survival of young green turtles to environmental factors such as water turnover rates and stocking densities, and the food requirements of these turtles. Further details of these trials can be obtained from Kowarsky (1977).

METHODS:

Hatchling green turtles were obtained either from collection and artificial incubation of eggs or by collection of newly emerged hatchlings from a natural nesting site. Locally caught fish were skinned, filletted and diced into small cubes and stored in a freezer. This was the food fed to turtles throughout the trial period except for two days when the fish supply failed and canned dog food was used.

Experiment 1:

Turtles were mass reared from 5 to 164 days of age in a 3.1m diameter plastic lined pool. Water changes were effected by transferring turtles by scoop net from one such pool to another freshly filled pool. The number of water changes daily increased from approximately 2 at the start of the experiment to 6 by the end. After each water change except the final one for the day turtles were fed to excess. The amount of food ingested at each feed was estimated. During this experiment some of the turtles were kept in floating mesh enclosures within the pool to investigate the effects of crowding without, ideally, concomitant changes in water quality. At the start of the trial period the stocking density was approximately 32 cc/grm turtle; by the end of the period it was 47 cc/grm turtle. The available volume of water to turtles outside enclosures ranged from 119 to 76 cc/grm turtle; the comparable figures for turtles inside enclosures were 17 to 6 cc/grm turtle. The available surface area of pool for turtles outside enclosures ranged from 2 to 1.5 cm^2/grm turtle, while inside enclosures the available surface area ranged from 0.7 to 0.4cm^2/grm turtle.

Experiment 2:

This experiment consisted of keeping turtles in 40 litre plastic tanks at three different initial stocking densities with two different water change schedules (3 water changes daily vs 4 water changes daily). At the start of the 113 day trial stocking densities ranged from 455 to 18 cc/grm turtle; at the end of the period they ranged from 241 to 9 cc/grm turtle. Available surface area ranged from $40cm^2$/grm turtle to $0.4cm^2$/grm turtle. All turtles were fed to excess four times per day.

RESULTS:

Survival of turtles in Experiment 1 was approximately 70%. Turtles confined to enclosures survived equally well to those outside enclosures. Some mortality was associated with lesions which covered the eyes and skin. Many of the turtles which died without severe lesions were found to have foreign pieces of material such as Styrofoam, flakes of paint and strands of nylon rope apparently stuck in the gut or cloaca. At 5 months of age turtles kept outside enclosures were of average weight approximately 350 grms; the turtles in one of the enclosures achieved similar average weight, but those in other enclosures were of 312 grm average weight at 5 months of age. Estimates of conversion efficiency ranged from factors of 1.7 to 7.1 with a trend of increasing values with time. The factor calculated for the whole period during which monitoring of food ingested took place was 4.8.

In general terms the pattern of survival of turtles in Experiment 2 was similar to that of Experiment 1 turtles. It was apparent however, that at the two higher stocking densities the survival of turtles given four water changes daily was superior to those given three water changes daily. Maximum deterioration of water quality after the final meal of the day took place within 2 hours of that meal; this finding supported the idea that turtles exhibited a gastro-colic reflex.

Because turtles which died were on average lighter than the average live weight of turtles at the time, it was difficult to draw any conclusions about real growth under different treatments in this experiment.

CONCLUSIONS:

There was evidence that poor water quality, rather than the degree of physical crowding, was the major adverse influence on turtles. To improve the conditions of culture, strategies should be developed to maintain water quality at levels not exerting harmful effects (for example, in Experiment 2 at the lowest stocking density it would be reasonable to conclude that water quality deterioration was not a significant factor, as no difference in survival between those turtles given three water changes daily and those given four water changes daily was found, nor were the latter turtles on average heavier than those given three water changes daily). Within a given range of stocking densities a given volume of water could be better used by keeping turtles in crowded conditions and changing the water often than by keeping the turtles in relatively uncrowded conditions and changing the water infrequently.

Kowarsky, J. 1977. Culture trials of young green turtles, Chelonia mydas, in Torres Strait, Northern Australia. Aquaculture 11 : 197-215