

Marketing patterns of green and hawksbill turtles in Port Moresby, Papua New Guinea

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*Of the six species of marine turtle in Papua New Guinea, the green turtle *Chelonia mydas* and the hawksbill turtle *Eretmochelys imbricata* are the most common and the most utilized in the Port Moresby region. This paper describes a study carried out in 1989, which monitored the trade in green turtles in the country's main market and the sale of tortoiseshell in a major shopping centre. The price of turtle meat was higher than that of some common reef fish, but cost less when fish was abundant. The commercial trade in tortoiseshell appeared to be negligible. As the urban population increases it is likely that demand for turtle meat will also increase. If this food resource is to be managed sustainably the size of the turtle population needs to be determined. The University of Papua New Guinea is supporting marine turtle field studies and a sea turtle education programme, but more needs to be done to ensure the survival of PNG's marine turtles.*

Papua New Guinea (PNG) has many natural attributes including six species of marine turtles in its waters. The green turtle is the most abundant sea turtle in PNG and is the most heavily utilized for food. The hawksbill turtle is also widespread throughout the country and is eaten locally. Hawksbill shell (tortoiseshell) is used in traditional ways and some tortoiseshell artefacts are sold in urban centres. The flesh of the leatherback turtle *Dermochelys coriacea* is only sometimes eaten in PNG; its eggs are preferred and are sold in local markets. These three turtles are listed as globally endangered species in the *IUCN Red Data Book* (Groombridge, 1982). However, Groombridge and Luxmoore (1989) have suggested that it may be more prudent to categorize each breeding population or regional population of marine turtles separately, because populations may be endangered in some areas but not in others. Thus scientific research is needed to determine the population parameters of sea turtles in PNG. Previous studies indicate that the numbers of green, hawksbill and leatherback turtles are decreasing in many areas of PNG (Pritchard, 1979; Spring, 1982b, c; Lockhart, 1989). Little is known about the populations of the flatback *Natator depressa*,

loggerhead *Caretta caretta* and olive ridley *Lepidochelys olivacea* turtles in PNG, but they are probably less abundant than the other three species.

Port Moresby is the national capital and largest city (population c. 152,000), with a rapidly increasing population. All six species of marine turtles have been recorded from the general area of Port Moresby, but the green and hawksbill turtles are by far the most common. The main purposes of this study were to describe some marketing patterns of green and hawksbill turtles in Port Moresby over one year, and to relate this information to the conservation of the species. The sale of green turtles was monitored in Koki Market, the main outlet for green turtles, while the sale of tortoiseshell was monitored chiefly in Boroko, a major shopping centre in Port Moresby.

Methods and background

Koki Market extended over 1 ha and supported about 400 vendors on a typical day. Fish was the most abundant meat in the market, followed by green turtle. Molluscs and crustaceans were less common. The red meat of

the turtle was cut into small pieces and strung together, sometimes with a few pieces of green fat and intestine. Sellers did not weigh the meat, but were adept in arranging the meat so that each string weighed about 1 kg. Vendors usually charged the same price per string at any given time and there was no bargaining.

The market was inspected on 38 days from February 1989 to January 1990. Surveys were made in every month of the year, on all days of the week and at various times of the day, but 59 per cent of the surveys were made in mid-morning on Sunday. The prices of some fish and crabs were sampled four times at approximately 3-month intervals. Researchers used a spring balance to record weights to the nearest 5 g. Weights of turtle meat equate with edible meat, while weights of fish and crabs were total wet weights (i.e. not dressed out). Standard carapace lengths were obtained over-the-curve to the nearest 0.5 cm.

Tortoiseshell (Motu = *gebore*) products were checked in Boroko. Sidewalk vendors and major shops were surveyed on 36 days over the same time period. The major supermarket in the Waigani district of Port Moresby was checked weekly for tortoiseshell sales.

The field data were collected by the first author, while the co-author was involved in the planning of the surveys and in the analysis and interpretation of the marketing data.

Results

Based on 42 samples over the course of a year, the average price of green turtle meat was \$US4.20 per kg (range \$US1.74–7.80). All prices are in 1989 \$US. The average cost of turtle meat was \$US1.20–1.60 per kg more expensive than the average cost of some popular coral reef and coastal fish including coral trout *Variola albimarginata*, red snapper *Lutjanus gibbus*, squirrelfish *Sargocentron spiniferum* and longtom *Tylosurus* sp. The mean cost of turtle meat was about the same as the mean cost (\$US4.12 per kg) of mud crab *Scylla serrata*.

The cost of turtle meat was significantly less at times when other animal protein was abundant (i.e. when 30 or more sellers offered other

meat, mostly fish) than at times when other meat was not abundant. A front or rear flipper of a green turtle cost \$US1.19. One kilogramme of green turtle fat cost \$US10.50, but it was rarely sold this way. Turtle vendors were selling meat at different prices on only two occasions: on 14 May the prices were \$US2.38 and \$US1.78 per kg and on 26 October the prices were \$US2.97 and \$US2.38 per kg. On both days fish was abundant.

Although not statistically significant, turtle meat was more expensive on Sundays and at times when the meat market was crowded (i.e. more than 30 buyers in the meat market). The price of turtle meat sometimes fluctuated during the morning. For example, on 28 May the price of meat dropped from \$US5.23 per kg at 08.10 to \$US3.90 per kg at 10.20 and then to \$US2.61 per kg at 11.00. During this time the number of turtle vendors, number of buyers, and amount of fish increased.

Live green turtles of different sizes were sometimes sold in the market, and there was a strong association between size and cost (Figure 1).

The number of turtle vendors ranged from one to eight. There was no statistically significant relationship between the cost of turtle meat and the number of turtle vendors. Seventy-eight per cent of the turtle vendors were women and most of these were family members of the turtle fishermen.

The green turtles sold in Koki Market were similar in colour to the *C. mydas* type turtles of the south-west Pacific Ocean and the Indian Ocean (Hirth, 1971). None had the black colouration or the marked indentation of the shell over the hind flippers, which are typical of some *C. m. agassizi* populations. Only 20 per cent of the turtles had barnacles on the carapace or plastron and none showed any signs of injury.

A female leatherback with a carapace length of 147.5 cm was caught in the sea off Port Moresby on 18 April. The fisherman wanted \$US200 for it and said that some people living in the city eat the meat. This species is much more common off the northern coast of PNG where its eggs are eaten much more frequently than the meat.

Hawksbill eggs were being sold on 23 and 26 October. Ten shelled or 15 shell-less eggs cost £1.19. Green turtle eggs were not seen in the market. No live hawksbills, hawksbill meat or tortoiseshell were seen on any of the market surveys.

The number of tortoiseshell vendors on the streets of Boroko ranged from one to six. All were women and each had about 15 items for sale. The average cost of a pair of tortoiseshell earrings, bracelet and comb were, respectively, \$US6.00, \$US9.00 and \$US9.00. Prices were similar at different times of the day and different days of the week throughout the year. Prices depended mainly upon size of the item. Unworked carapace scutes cost between \$US3.00 and \$US4.00 each, an unworked juvenile carapace cost about \$US10.00 and a polished juvenile shell cost about \$US30.00, but these items were rarely seen. All tortoiseshell vendors charged similar prices but it was possible to bargain a little. Most turtle vendors also sold a variety of seashells and these ranged in price from \$US1 to \$US2 for a medium-size cone *Conus* sp. or spider *Lambis* sp. shell to \$US30.00 for a large Pacific triton *Charonia tritonis*. Black coral earrings were about the same price as tortoiseshell earrings.

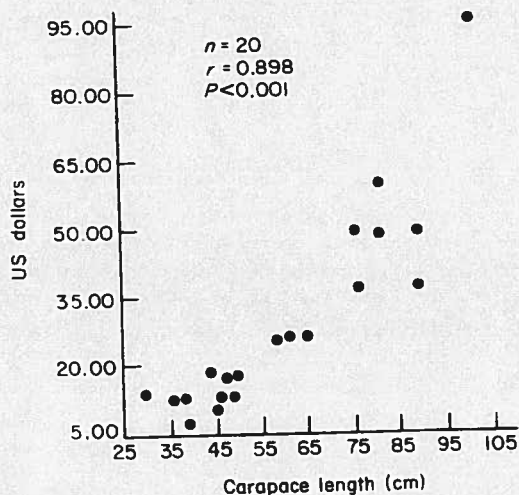


Figure 1. Association between carapace lengths of green turtles and their cost in \$US. Large individuals were females, others were unidentified sex. Individuals were caught in 10 different months in 1989 and were sold by different vendors.

The cost of tortoiseshell items in three jewellery stores and in one hotel was two to three times higher than similar items on the street. In the shops, price was related to workmanship as well as to size and thickness. The colour of the tortoiseshell did not appear to affect the price.

Weekly observations were made in the major supermarket in the Waigani section of Port Moresby. Thirteen of 16 pairs of earrings, at \$US5.00 per pair were sold in 12 months. Two bracelets, at \$US10.00 each, were not sold. Based upon observations and interviews, it appeared that the commercial sale of tortoiseshell products in the Port Moresby area in 1989 was desultory and minimal.

Discussion

The green turtle fishery in the Port Moresby area is based on simple, labour-intensive methods of capture. Most of the green turtles sold in Koki Market and at other smaller markets were caught in the vicinity of Fisherman's Island (= Daugo Is.). The turtles were captured on their feeding pastures by netting or harpooning. Turtles and turtle meat were sold directly to the public in the market on a daily basis. There was no middle-man. In spite of turtle meat being more expensive than whole fish, it was readily sold.

The population of PNG is approximately 3.6 million and at the present rate of increase the population will double in 27 years. Immigration to coastal cities, like Port Moresby, is significant. Such demographic trends will create more demands for marine food resources. In order to manage properly the green turtle resource, it is necessary to determine the size of the turtle population in PNG and then to regulate market quotas accordingly. Tagging studies would help elucidate the extent to which southern PNG and northern Australia share the same turtle resource. In this regard, comprehensive marine turtle field studies and a sea turtle education programme have recently been supported by the University of PNG in Port Moresby. The field studies have emphasized the training of Papua New Guineans in popu-

lation assessment, tagging and management options. The education workshops at turtle nesting beaches and in urban centres have focused on the value of long-range conservation of marine turtles. Scientists have also discussed sea turtle conservation programmes on television and radio and in the press. People at all levels appear interested in learning about the stewardship of their marine turtles. Wildlife Management Areas, where traditional landowners control the utilization of natural resources, is a viable conservation strategy and should be encouraged (Kwapena, 1982; Spring, 1982a, b, c; Eaton, 1988).

Although the commercial sale of tortoiseshell artefacts in the Port Moresby area appeared minimal, this situation could change. As more people become involved in the cash-economy system of Port Moresby, some discretionary income may be spent on items like tortoiseshell jewellery. Further, as the international tourist industry is developed in PNG, tourists may buy hawksbill products. An active conservation education programme would help alleviate some of these potential pressures.

Pernetta and Hill (1981) and Spring (1982b, c) describe some of the former and current traditional uses of tortoiseshell in PNG. Pritchard (1979) was of the opinion that tortoiseshell was currently little utilized in PNG, but that a potential threat to the hawksbill population existed in the form of tortoiseshell export. PNG is a signatory to CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and records indicate that export of turtle products is minimal (Groombridge and Luxmoore, 1989).

Acknowledgments

Drs John Smith and Jeff Jensen gave constructive comments on an earlier version of this paper and Ms Maurine Vaughan provided her customary editorial expertise. We thank an anonymous reviewer for valuable suggestions.

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