

THE TURTLE INDUSTRY OF BALI

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INTRODUCTION

The Hindus of the Indonesian island of Bali are traditional eaters of turtle meat, and such meat is eaten on ceremonial and religious occasions. In this they differ from the bulk of Indonesians who regard turtle flesh as unclean (but consume turtle eggs in large numbers). Bali has therefore been a focus of trade in adult turtles, particularly the green turtle *Chelonia mydas* L., for centuries, indeed it is probably the largest single point market in the world (IUCN/WWF, 1984). On a recent visit to the island (in January 1988) I was able to make some assessment of the current extent of exploitation and conservation, with the help of a Bahasa-speaking friend. In large measure the information given here is not new, but unfortunately investigators of the trade have not published their findings. Instead, they have limited themselves to reports circulated within the professional conservation community (e.g. IUCN/WWF, 1984; Schulz 1984, 1987).

CAPTURE AND TRANSPORT

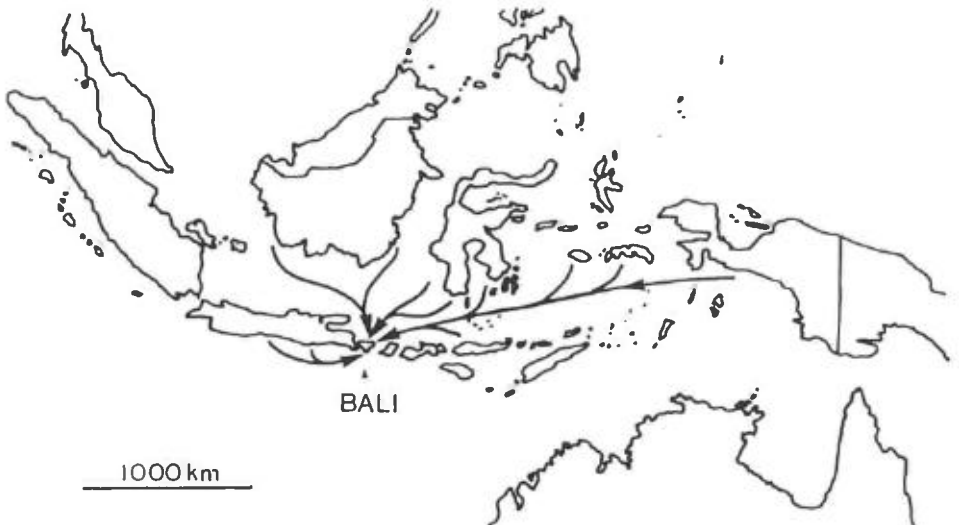


Figure 1. Map of Indonesia; arrows show turtle trade routes to Bali

Table 1. Areas supplying turtles to Bali (in approximate descending order of importance)

1. Maluku Islands

2. S. Sulawesi
3. S.E. Sulawesi
4. S. & E. coasts of Kalimantan
5. S. coast of Irian Jaya
6. S. coast of Central Java
7. S. coast of E. Java

Few turtles are found on or near Bali itself, indeed Sumertha Nuitja (1974) reported that Balinese populations were seriously depleted by 1950 and IUCN/WWF (1984) present good evidence of local overfishing around Bali. However, the values of the animals is such that fishermen scour a large proportion of the coast of Indonesia to supply the trade (Fig. 1, Table 1). Some turtles are taken on nesting beaches, but most are caught 10-20km offshore from small boats using trammel nets made of thick (3mm) monofilament, and having a coarse mesh (10-15cm). Their subsequent fate is rather variable. Sometimes fishermen take their catch directly to Bali, but more often the turtles are accumulated in holding pens looked after by local intermediaries. A typical pen (on eastern Lombok) is shown in Fig. 2. About 7m long, 5m wide and 1.5m high, it was sited at the mouth of a small stream and was constructed of bamboo and palm. Trees provided some shade, but the roof ensured a cool interior. Such a pen would hold up to 50 adult green turtles. If the animals were kept in the pen for more than a day or two, the villagers fed them upon green sea weed.



Figure 2. Village turtle holding pen on east coast of Lombok.

Transport to Bali is invariably by prahus (basically sailing vessels, 10-20m long, which nowadays have auxiliary inboard motors) which still dominate Indonesian inter-island trade as their shallow draught allows them to operate off beaches as well as harbours (Fig. 3). Some travel as much as 2500km to deliver turtles to Bali, and each prahu carries 30-50 turtles.



Figure 3. Transport prahu.

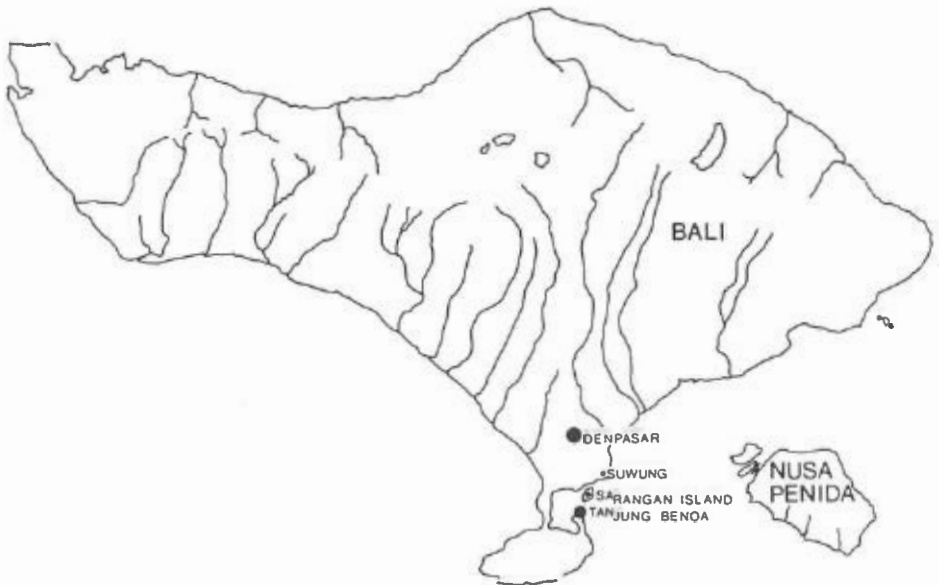


Figure 4. Map of Bali.

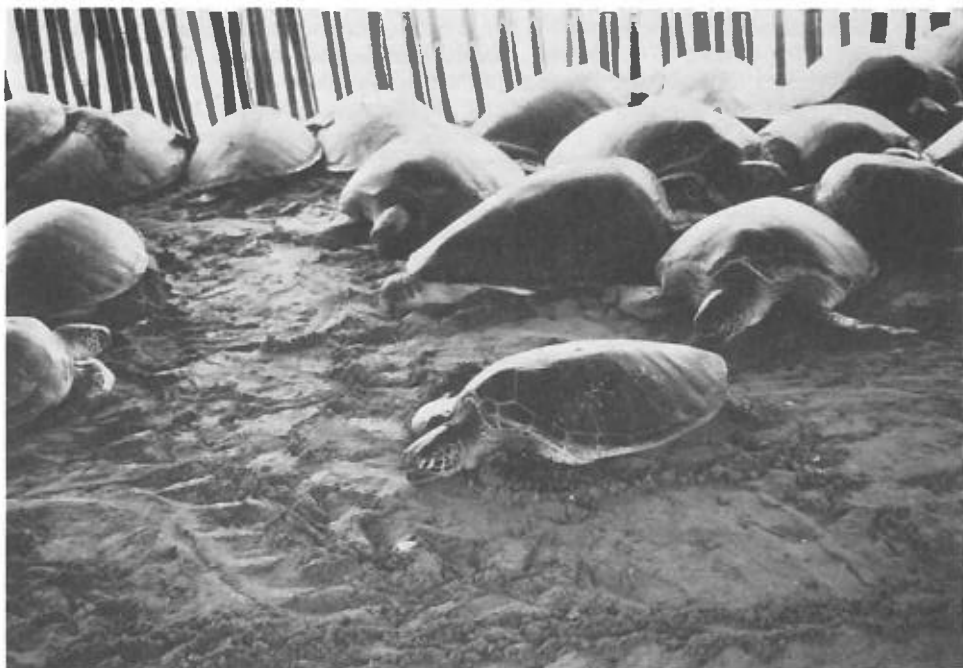


Figure 5. Inside a turtle pen at Tanjung Bena.

MARKETING

Most turtles taken to Bali (95% according to IUCN/WWF, 1984) are brought to a single village, Tanjung Bena, near the southern tip of Bali (Fig. 4). The village has several large turtle pens on the foreshore, flushed and cleaned by tidal action. Stoutly constructed of bamboo with a high roof (4-5m), they are cool and dark inside. The pens (Fig. 5), roughly 10m square, are continuous with one another, stretching for about 80m. On the day I visited the village around 400 green turtles were present. About 2/3 were large adults (predominantly females) with shell lengths of 80cm or more, the rest were sizeable subadults (above 50cm shell length). In conversation with Mr. Ashar, a merchant reputed to control 75% of the Bali trade, I established that the animals remained in the pens for 3-6 days, during which period they were not fed. They generally appeared healthy, and each pen featured a small blackboard on which was chalked the number of animals remaining in the pen, the level of mortality during holding (very low) and the date of purchase from the fishermen. The total number of turtles being handled by the trade is difficult to assess. Polunin and Sumertha Nuijta (1982) reported that more than 20,000 turtles were sold on Bali each year during the mid 1970s (IUCN/WWF (1984) reported a peak of 30,121 turtles landed in 1978), and if it is assumed that some 400 turtles pass through the pens of Tanjung Bena every 6 days then a figure of around 24,000 would still be true today. If accurate, this latter total would suggest no significant decline in catches over the past 4 years since IUCN/WWF (1984) recorded a catch of about 9,500 between April and July in 1984. Everyone concerned in the operation indicated that landings at Tanjung Bena were similar to those in previous years, so on balance it seems sensible to work from the throughput figures given above. With a few smaller operations elsewhere on the island, together with the scope for direct sales by fishermen, it seems probable that the whole Bali turtle trade still approaches 30,000 animals annually. Only a small percentage (perhaps 2%) is collected around Bali and its small neighbour, Nusa Penida.

Nothing appears to be wasted at Tanjung Bena; a small stone pen was filled with the maggot-ridden carapaces of large green turtles, which had presumably died en route to the village or shortly after. Cleaned of adhering flesh, they would be polished and varnished for the tourist curio trade.

Many turtles are sold directly from Tanjung Benoa to consumers, but some pass through another trader's hand at Suwung, where a few pens are sited at the margin of a mangrove swamp. Containing around 50 large adults on the occasion of my visit, Suwung is nearer and more convenient to the capital Denpasar than Tanjung Benoa (Fig. 4). Trade was brisk, the seller (Mr. Pan Pasir) disposing of a couple of large females during our brief conversation. Mr. Pasir's pens could hold perhaps 150-200 animals, and he feeds the animals each day on green sea weed. His turtles were eating algae readily during my visit; it is probable that this makes up the bulk of their natural diet as sea grass beds are rather patchy in Indonesia.

Up to the time of sale the turtles are handled reasonably carefully (IUCN/WWF (1984) reported that mortality in transit from collection zones was normally below 3% except on the longest voyages from Irian Jaya and Maluku) and exhibit few signs of damage. When a sale is agreed the position changes somewhat; holes are bored in the turtle's foreflippers which are lashed together in front of the head with raffia. Partly this is to prevent flapping of the flippers, but mainly to allow the animals to be slung from bamboo poles and carried along the narrow alleyways of Tanjung Benoa to waiting pickup trucks (Fig. 6).



Figure 6. Subadult turtles being carried to a purchaser's truck.

CONSUMPTION

Although turtle meat can be purchased in Balinese restaurants, mainly as a novelty dish at the tourist traps of Kuta Beach, it seems certain that the bulk of consumption is by private individuals or families in the Badung regency of Bali who butcher turtles themselves or purchase meat from slaughterers (in Tanjung Benoa and Denpasar). The turtles are either barbecued, or the flesh is pounded with spices and then fried to form a dish known locally as "abon".

There is no specific importation of turtle eggs to Bali, but a high proportion of the turtles butchered are females containing eggs. Generally these eggs are not eaten by the turtles' Hindu purchasers, but are sold to local Moslems.

ECONOMICS OF TRADE

As a rough guide, fishermen receive £20-£25 for each turtle they catch, so a prahu loaded with 50 turtles has a cargo value of £1000-£1250. The amount of money demanded by local intermediaries who control small holding pens in remote areas is difficult to estimate; a fisherman on the Alas Strait, regarded as a rather soft-hearted individual, took only £1-£2 per turtle. The Balinese middlemen take a large profit (especially those who own fishing boats too), since turtles sell to the consumer for £40-£50 apiece. Assuming a total yearly sale of 25,000-30,000 turtles, the wholesale/retail turtle meat trade is worth some £1-£1.5 million per annum, with a proportion being dispersed to fishing villages in all parts of Indonesia (except Sumatra), some as much as 2500km away. Restaurant profit margins on Bali undoubtedly add an unknown sum, as does the sale of the clutches of eggs collected post mortem (Suwelo *et al* (1982) reported that the eggs attracted higher prices than chicken eggs). IUCN/WWFA (1984) reported that some raw turtle meat is exported to Java and frozen flesh is exported further afield.

Much economic activity is also generated by the trade in non-edible parts of turtles; large numbers of immature animals are being gutted, dried, stuffed and varnished as tourist curios (selling on Bali for £5-£10 each, but also being exported to Japan). Carapaces of adults may sell for as much as £50. (IUCN/WWF (1984) reported that the trade in non-edible parts exceeded the value of the meat trade, at least as far as small turtles are concerned). I also saw prahus unloading sacks of sea weed to be fed to turtles.

The sums of money involved in the trade have to be considered in an Indonesian context. To a westerner a value of £20 per turtle to a fisherman, or £50 to a consumer may seem unexceptional, and sailing 2500km across oceanic waters in a small vessel a dangerous exercise to set against a £1000 profit. However, most Indonesians have to work extremely hard to earn £300 in a year, and this may have to cover the needs of a large family. By catching and selling 15-20 turtles, a fisherman can earn as much money as an experienced teacher or civil servant takes home in a year. Turtles form a highly prized (and priced) product when related to average national income!

"TURTLE VILLAGE" - SARANGAN ISLAND

The turtle pens at Tanjung Benoa are off the tourist track; visitors to Bali are directed instead to Sarangan Island where an unusual mixture of attempted conservation and exploitation of green turtles takes place. For information about this operation I am indebted to a fieldworker in the village (Mr. I. Made Madu) who has been trained by the Conservation Group of the Indonesian Government.

The island, reached either by sea from the beaches of the package tour hotels, or by dugout canoe through a mangrove swamp, is low lying. It has a muddy shore on the landward side and a sandy beach plus reef on the seaward, eastern shore. The island's village is heavily dependent on the tourist trade, but there is some fishing and crop growing. In the centre of the village stands a large concrete and bamboo pen, scoured by the tide. Here, visitors are invited to be photographed with adult and juvenile green turtles, after a small entry fee is levied. Notices announce that a conservation programme is in operation. A nearby shop sells turtle curios (mainly green turtles, but I saw one or two juvenile hawksbill turtles, *Eretmochelys imbricata*), including the polished carapaces of some large adults. Numerous sea shells, including those of *Nautilus* were also on offer. Dotted around the village are stone or bamboo pens containing green turtles of various sizes.

The basis of the village operation lies in the collection of about 1000 turtle eggs each year from a beach on the south coast of Central Java. The eggs are transferred to Sarangan Island and incubated in wire-protected artificial nests in the sand of the eastern beach. Hatching success, about 70%, is quite high, and half of the hatchlings (some 350 animals) are taken out beyond the reef and released as a conservation measure. This release has now been done annually for some 5 years.

The remaining hatchlings are reared together in concrete tanks for about 6 months. At this stage they are distributed amongst families in the village that have pens on the foreshore. Throughout, the hatchlings and juveniles are fed mainly upon sea weed, with occasional fish/shellfish supplementation. Mortality is low during the 6 months of communal rearing, but

rises sharply afterwards. Most of the deaths are probably attributable to a low protein diet; the villagers know that young green turtles should be fed regularly on fish or molluscs (they are encouraged to do so by the Conservation Group), but cannot afford the financial/food loss involved. The turtles are held in the pens indefinitely. Few are eaten by the villagers, and some have survived for several years to reach shell lengths of 60cm or more. However, most die and are prepared as curios; I saw three being brought to the village shop during my visit. Effectively, therefore, the operation is a small ranching programme aimed at the tourist trade, and is almost certainly supplemented by additional small turtles caught at sea rather than being reared (the village has been a focus of small turtle slaughter and stuffing for many years - IUCN/WWF (1984) - the families' stone pens are obviously much older than the "conservation" programme!). The villagers believe their hatchling release programme to be effective; there is no appreciation of the probability of failed beach imprinting in these animals. Even the "conservation" programme may itself be in decline; Schulz (1987) reported that 5000 eggs were imported from Java in 1986 (not the 1000 described by Mr. Made Matu for 1987/88). Certainly the wire-protected nests present in January 1988 represented no more than 1000 eggs.

DISCUSSION

Worldwide, the total population of adult green turtles is probably above 400,000, causing Mrosovsky (1983) to doubt the species' "endangered" status. However, it is generally agreed that *Chelonia mydas* is a 'species complex' of discrete populations, largely or entirely isolated genetically from one another, and that almost all populations are in decline (IUCN, 1982). Polunin and Sumertha Nuitja (1982) presented egg production data which indicated that at least 25,000 females nested annually in western Indonesia during the late 1970s, but that falling egg yields already suggested a general decline in numbers; they also reported an increased demand for adults. The size of the turtle trade of Bali (and its high proportion of capture of females) is such that the equivalent of about 70% of this number are being taken annually, usually *before* they have a chance to lay their last egg clutch (and this takes no account of the large numbers of small turtles killed for the curio trade). IUCN/WWF (1984) pointed out that many of the "Indonesian" green turtles killed on Bali may equally be regarded as "Australian" or "Malaysian", since the trade takes animals which feed in Indonesian waters but nest elsewhere. Their report indicated that the Bali trade was not only grossly overexploiting Indonesian green turtle populations (i.e. populations which nest on the Indonesian coast), but was also depleting the populations of neighbouring countries. The report (written in mid 1984) stressed that the turtle predicament in Indonesia was "grave" and recommended a number of immediate steps to be taken. These included the following: that capture and sale of turtles less than 60cm or above 85cm curved carapace length should be banned, that the sale of turtle meat in all public eating places be prohibited, that turtles should not be collected in pens before transshipment or sale. From my observations and those of Schulz (1987) it is quite clear that *none* of these critical recommendations has been implemented in the past 4 years, and that the trade is virtually unaltered despite the introduction (in 1984) by Prof. Emil Salim (the Indonesian Minister of the Environment) of a widely supported, comprehensive Wildlife Protection Act. Enforcing such legislation is difficult in a country where the bulk of the population is poor and strong cultural or religious traditions exist. Environmental concern is increasing amongst the Balinese, especially the young, and some Hindus have responded by substituting pork for turtle meat in their rituals (apparently the idea that turtle meat is *essential* to religious ritual is false; turtle meat has been used because it has generally been slightly cheaper than pork). The Sarangan Island "conservation" operation, though futile because of the tiny numbers of hatchlings released and the likelihood that their beach imprinting is faulty, also demonstrates concern. However, set against these positive signs are the pressures of a rising Balinese population, which is generally more prosperous (because of tourism) than most other parts of the Indonesian archipelago. The continued demand for turtle meat in tourist restaurants is particularly disturbing.

How important biologically is the drain on Indonesian and neighbouring turtle populations? Coming to grips with the population dynamics of sea turtles, particularly the migratory *Chelonia mydas* is extremely difficult, not least because estimates of age of sexual maturity have been revised from the 4-6 years accepted in the 1950s to current estimates ranging from 15-50 years. In the case of the Indonesian populations little or no tagging is being carried out, so information

about survival of adult females or recruitment to the nesting stock is not available. Only recently have age estimates for sea turtles been validated; it is probable that adult green turtles live well beyond the age of 50 years, with a proportion of individuals living much longer, perhaps exceeding a century. If it is assumed that most animals have two decades of reproductively active life, and that females nest in alternate years, laying perhaps 500 eggs per nesting season, then a female may lay about 5000 eggs during her life. Very high natural mortality, especially caused by predation on eggs and hatchlings (which probably kills more than 95% of individuals in the first year of life), offsets most of this fecundity, but in an undisturbed population the adult animals have a low vulnerability to predation. High fecundity in sea turtles in general has led several scientists to stress the wastefulness of killing adult animals (on economic as well as energetic and conservation grounds), and suggest that taking eggs alone is a less undesirable form of exploitation (e.g. Hendrickson, 1958; Mrosovsky, 1983). If it is assumed that each female killed on Bali had the potential of laying eggs for only 5 further seasons, then the killing wastes 2500 eggs, or perhaps 44 million eggs per year for the whole Balinese catch (taking an estimate of 25,000 animals fished per year and assuming about 70% to be female - IUCN/WWF (1984)). Whether this lost productivity is viewed as a food source for man, or as the raw material for future turtle populations, it is clear that the Bali turtle trade is enormously wasteful.

From a conservation point of view, the trade may be even more damaging than these figures suggest. Any effects of exploitation of adult turtles will presumably take 20-50 years before they are fully expressed in the form of reduced recruitment to the breeding stock; the trade is currently killing adults which probably hatched between the late 1930s and the late 1960s - before the great expansion of the trade since 1969. Conservation measures have an equal time lag for effectiveness.

Although no precise estimate of the total population of adult green turtles for the whole of the Indonesian archipelago is available, it is unlikely to exceed 120,000-150,000. This estimate stems from the finding of Schulz that about 30,000 females nest annually in Indonesia (in scattered fashion; there are no major nesting beaches according to IUCN, 1982) and assumes a) that females nest in alternate years, and b) that there are equal numbers of males and females. Such a number would be made up of several year classes (how many is obscure; anything between 10 and 20 is fairly likely). The current Bali turtle industry is removing a high proportion of this number (20-25%) from waters around the archipelago *each year*, and it is obvious that the greatest catches are from areas far away from Bali (Table 1), a classic sign of overfishing, and probably indicating a heavy toll of turtles which nest outside Indonesia. In the late 1970s Sumbawa and Flores (islands fairly close to Bali) provided a high proportion of the catch - they are of much less importance now. By the time landings at Bali start to fall it will almost certainly be too late to prevent a population crash - or a spread of the trade to an even larger part of Asia.

Unfortunately the Balinese turtle industry encapsulates most of the difficulties met in attempting to conserve wildlife in the Third World. Relatively balanced cultural exploitation has been distorted by rising human populations, the introduction of a cash economy and (especially) tourism, combined with the motorization of transport (in this case prahus) which lengthens viable supply lines. CITES legislation, designed to inhibit trade in endangered species between nations, is obviously powerless to control a large country's unpoliced internal markets (though much non-edible turtle material is exported from Indonesia, especially to Japan, but also by tourists from many countries including, unfortunately, U.K. citizens who do not know/care that they may not legally import such material). The positive forces of conservation are handicapped by inadequate funds and the slowness of information transfer from the predominantly western scientific literature to workers in the field. However, the rapacious level of turtle exploitation on Bali is quite unacceptable; the conservation measures taken are miserably inadequate.

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