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Subsistence Hunting of Leatherback Turtles, *Dermochelys coriacea*, in the Kai Islands, Indonesia

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ABSTRACT. – **The subsistence hunting of the leatherback sea turtle (*Dermochelys coriacea*) in the Kai Islands, Indonesia, was studied during October – November 1994. This traditional fishery has been part of Kai culture for centuries and encompasses ancient beliefs and rituals of *adat* which are equated with the will of the ancestors. Peoples of eight villages hunt leatherbacks in the open sea using traditional dugout sailboats and harpoons during the oceanic calm period of October to February. Leatherback hunts were observed and interviews were conducted with village chiefs, elders, and fishermen from ten villages in the Kai Islands. Capture numbers, locations, methods, and traditional beliefs and rituals associated with hunting leatherbacks are described. The loss of traditional restraints on hunting is the greatest threat to this population of leatherbacks. In addition to being hunted for ritual purposes as in past generations, leatherbacks are currently also taken regularly for sustenance.**

KEY WORDS. – **Reptilia; Testudines; Dermochelyidae; *Dermochelys coriacea*; sea turtle; conservation; fishery; subsistence hunting; traditional beliefs; Kai Islands; Indonesia**

Leatherback turtles (*Dermochelys coriacea*) have a circumglobal distribution and are pelagic, approaching coastal waters to nest on dynamic beaches adjacent to deep water. The routes taken by leatherbacks after nesting are largely unknown. Pritchard (1982) suggested they disperse in search of Scyphomedusae, a main prey item along with tunicates and other epipelagic invertebrates. High concentrations of Scyphomedusae have been shown to have an important influence on leatherback distribution and may account for concentrations of sightings and tag recoveries in the Pacific (Balazs, 1982; Suarez and Starbird, 1995), North America (Lazell, 1980; Eisenberg and Frazier, 1983; Starbird et al., 1993) and along the west coast of South America (Frazier and Brito Montero, 1990).

Leatherback populations in many areas throughout the world are threatened by poaching of nesting females, human encroachment on nesting beaches, incidental drowning of adults in fishing gear, and nest loss due to beach erosion, poaching by humans, and predation by animals. For these and other reasons the leatherback is classified as an endangered species by the World Conservation Union (Groombridge, 1982) and by U.S. Fish and Wildlife Service. Little is known of the status and ecology of the nesting leatherback populations of the Western Pacific region. Low density and scattered nesting occurs in Papua New Guinea, Solomon Islands, Fiji, Thailand, Malaysia, and Australia (Limpus et al., 1984; Hirth et al., 1993). In Indonesia leatherbacks nest in low density along western Sumatra, with an estimated 200 nesting annually, and in southeastern Java, with about 50 nesting annually (Polunin and Nuitja, 1982). The largest leatherback rookery in the Indo-Pacific and possibly the third largest in the world, lies on the north Vogelkop coast of Irian Jaya, where 3356 nesting females were recorded between June and September of 1993 (Bakarbessy, 1993).

Leatherbacks of the Indo-Pacific face threats typical of other nesting leatherback populations, especially the harvest of eggs for local consumption and commercial sale, as well as the take of nesting females for meat and oil. The number of nesting females in the Terengganu, Malaysia, leatherback population has declined by as much as 98% in recent decades due to generations of intensive egg harvest (Salleh et al., 1987; Chan and Liew, 1996). In Indonesia over 80% of leatherback nests laid on the north Vogelkop coast of Irian Jaya are lost each nesting season due to poaching by local inhabitants, predation by wild pigs, and beach erosion (Bhaskar, 1985; Bakarbessy, 1993; Starbird and Suarez, 1994). Nests from these beaches were commercially harvested for sale in the markets in Sorong until 1993, when the beaches first received protection by the Forestry Department (PHPA) of the Indonesian government (J. Bakarbessy, *pers. comm.*). Nesting leatherbacks are not killed along this coast, but in Manus, Papua New Guinea, every nesting female found is killed by local people (Spring, 1982). In the Kai Islands, approximately 1000 km by sea from the Irian Jaya nesting beaches, adult leatherbacks are hunted and captured at sea (Fig. 1) (Compost, 1980; Suarez and Starbird, 1994). A visit to the Kai Islands in October – November 1994 provided insight into the traditional leatherback sea turtle hunting practices of the Kai peoples, and these findings are summarized in this paper.

STUDY AREA AND METHODS

The Kai Islands are located southwest of New Guinea in the Maluku Province of Indonesia (5°43'S, 132°50'E). The archipelago consists of two large and many small coralline islands, encompassing an area of approximately 900 sq. km. Islands with freshwater are inhabited, with village populations ranging from 50–850. The study area encompassed

Figure 1. A leatherback hunted and captured at sea by Ohoidertutu villagers, Kai Kecil, Indonesia.

eight coastal villages in the southwestern Kai Islands (total population about 4000). Five of these villages are on Kai Kecil (Ohoidertutu, Ohoidertom, Madwaer, Somlain, Ohoiren) and three (Ur, Warbal, Tanimbar) are on adjacent islands of Ur, Warbal, and Tanimbar Kai (Fig. 2). The original inhabitants of Kai were Papuan in origin, but now most are descendants of the Javanese who have immigrated from south central Indonesia. Melanesian peoples first described by Wallace in 1869 also still inhabit this area.

A diversity of marine life inhabits the grass beds, coral reefs, and deep waters (200–3000 m) of this area, including five species of sea turtles. Green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles feed and nest in the archipelago. Olive ridleys (*Lepidochelys olivacea*) and loggerheads (*Caretta caretta*) are encountered with less frequency both in the open sea and near the islands. Numbers of all sea turtles have been reduced in recent decades due to capture with harpoons and hooks and incidental capture in nets. Leatherbacks frequent the waters southwest of Kai Kecil and feed on Scyphomedusae, which inhabit Kai waters seasonally.

Historically renowned for its natural beauty and diversity (Wallace, 1869), the biological richness of both terrestrial and marine systems of this archipelago have been greatly diminished in recent decades as a result of intensive logging by foreign timber companies, with no profit to local peoples (Programme Lingkunkan Maluku, *pers. comm.*, 1994). Local population growth has resulted in intensified demands for natural resources. Many of the islands have been deforested, and Kai peoples currently subsist primarily on marine resources and agriculture in the absence of forest resources such as birds, deer, and pigs. Fish and marine turtles are the main sources of animal protein for Kai

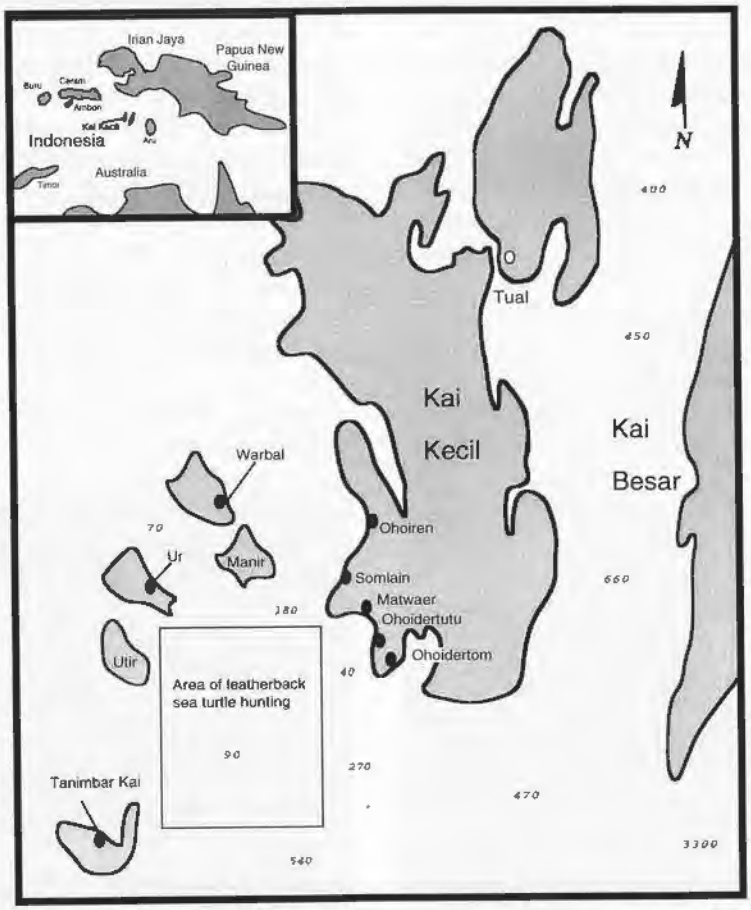

Figure 2. Location of traditional leatherback fishery in the Kai Islands, Indonesia. Depth is in meters. Map is not to scale.

Figure 3. Leatherback caught by traditional harpoon in Kai waters.

villagers throughout the year and manioc (cassava) is the staple food crop. Hard-shelled sea turtles (Cheloniidae) are utilized as a means of sustenance, for traditional feasts, and to generate extra income for those who hunt turtles and sell them in the market in Tual, the commercial center in the islands. Leatherbacks have been traditionally hunted in these waters for centuries but their meat is not sold or traded.

In an effort to describe leatherback hunting in Kai, we observed hunts at sea and interviewed village chiefs, teachers, fishermen, and elders. Interviews were standardized to document hunting season, location, and methods, villages whose inhabitants hunt turtles, number of leatherbacks taken per village, traditional beliefs associated with the hunt, and local knowledge of sea turtle ecology and distribution. We exchanged information about local natural history and sea turtle ecology and conservation with village chiefs and fishermen during informal meetings and discussions. Causes for the local decline of sea turtle populations and the need to protect sea turtles in foraging and nesting grounds were discussed.

An environmental education program depicting the ecology and conservation of the Kai marine environment was initiated in the secondary school of Ohoidertutu village. Objectives of this program were to expose youngsters of this village to a conservation ethic and foster an understanding of the biology and endangered status of sea turtles, especially leatherbacks, among them. Photographs, posters, literature, and marine animal skeletons and sea turtle carapaces were used as educational tools.

RESULTS AND DISCUSSION

Leatherback turtles, locally known as *tabob* or *bulu*, frequent Kai waters and feed on abundant Scyphomedusae while there (Starbird and Suarez, *pers. obs.*, 1994). Peoples of Kai traditionally hunt leatherbacks at sea, approximately 5–10 km southwest of Kai Kecil during the oceanic calm period of October to January. Some hunting occurs in February to March if sea conditions permit. Eight villages on Kai Kecil and adjacent islands of Ur, Warbal, and Tanimbar Kai are the only villages which hold the rights to hunt leatherbacks in this area (Ohoidertutu, Ohoidertom, Warbal, Ur, Tanimbar Kai, Somlain, Ohoiren, and Madwaer). This traditional management of hunting has existed in the region for many generations and enables these villages to maintain control of the exploitation of leatherbacks, providing there is respect for traditional authority between villages.

Local Knowledge of Leatherback Turtle Ecology and Distribution. — Leatherbacks are found in association with and feed on Scyphomedusae in the waters surrounding Kai, based on interviews with villagers who observed leatherbacks feeding on jellyfish or observed stomach contents. All those interviewed believed the leatherbacks in Kai waters have come from Irian Jaya (western New Guinea). This inference is based upon the Tabi-Tabii legend which describes how two brothers brought six leatherbacks to Kai on their emigration from New Guinea many generations ago. According to the legend, the leatherbacks were kept in a pond just north of Ohoidertutu village and were raised for meat until they escaped into the sea around Kai. Peoples of Kai claim the leatherbacks they hunt today are descendants of the escaped turtles. No one interviewed was familiar with the nesting beaches of the north Vogelkop coast of Irian Jaya and few had ever witnessed a leatherback nesting, although historically they are remembered to have nested in low numbers in this area.

Figure 4. Leatherback clubbed during hunt, Kai Islands.

Figure 5. Leatherback pulled into traditional boat, Kai Islands.

Traditional Beliefs, Rituals, and Methods Associated with the Hunt. — Traditional beliefs and rituals, known as *adat*, are associated with leatherback hunting and are equated with the will of the ancestors. According to *adat*, villagers should hunt leatherbacks only for ritual and subsistence purposes and it is forbidden to sell or trade leatherback meat. Violation of *adat* may incur the wrath of ancestral spirits. Unlike hard-shelled sea turtle species whose numbers have noticeably declined in recent decades, all interviewed believed leatherback populations have not declined nor will ever "finish" because *adat* will protect them. Other *adat* beliefs include: no food or water can be brought aboard during a hunt; the harpoon must not touch the water before a leatherback is speared; a hunter holding the harpoon must remove his hat before harpooning a leatherback; if a man's wife is pregnant he cannot harpoon the turtle (traditionally he could not participate in the hunt); the first on board to see a leatherback during the hunt receives its head (purportedly containing the best meat).

Kai peoples make offerings to their ancestors and deity prior to the leatherback hunt, and these include: a 100 Rupiah coin, rice liquor, lime, sirih leaves, areca palm nuts, and tobacco. The offerings are usually made in a private ceremony by a village chief or an elder. Eight to ten men then sail a traditional dugout boat to an area approximately 5–10 km offshore. Chanting is believed to attract leatherbacks to the boat and occurs throughout the hunt until a turtle is sighted. In a chant hunters express their respect for the leatherback and their need for meat. Once a turtle is sighted, sails are dropped and all men on board row towards it. A man on the bow harpoons the turtle through the carapace or neck with a detachable spear tip (Fig. 3). After the turtle tires from struggling it is pulled to the boat with the rope attached to the harpoon point and clubbed over the head (Fig. 4). Several men jump in the water and push the turtle over the gunwale of the boat. If it is a large leatherback, the boat may be partially submerged allowing the animal to float over the gunwale (Fig. 5). Hunting techniques do not differ between villages.

Hunting Season, Location, and Number of Leatherbacks Taken Per Village. — Twenty-three leatherbacks were taken by Kai peoples during the study; 19 were harpooned and 4 incidentally captured in nets. The 4 leatherbacks caught in nets were discarded into the ocean because the fishermen who captured them do not themselves eat meat for religious reasons and *adat* forbids the trade of leatherback meat. Six males and 17 female leatherbacks were captured during the study, 5 females captured during November carried undeveloped eggs with approximate diameter of 30 mm. Average curved carapace length was 154 cm ($n = 22$; range 145–173 cm). Carapace length was measured by stretching a flexible tape from the nuchal notch to the posterior tip of the carapace.

The number of leatherback turtles captured during the study period is lower than the annual take of leatherbacks estimated from Kai villager interviews. This may be attributed to a village project which Ohoidertutu village was involved in during our study. This village is estimated to hunt the most leatherback turtles in a season,but during this project villagers were busy three to four days of the week building a new church which they hoped to have built by December. Interviews with Ohoidertutu villagers suggested this activity replaced two to three hunting and fishing days a week. Also, a number of hunts may have gone unrecorded because often times the leatherback is taken to a beach away from the village to be butchered, as observed during this study.

Figure 6. Butchered leatherback meat in traditional dugout sail boat, Kai Islands.

The number of leatherbacks taken per village varies with the proximity of each village to the hunting area, number of hunting boats a village owns, the number of fishermen in a village, and proximity of a village to coral reefs which are inhabited by other sea turtles and marine animals. Ohoidertutu, Warbal, and Tanimbar Kai villages are the most active leatherback hunting villages of the eight in our study area. Over 60% of the men in Somlain village live away for most of the year to work in the mines of Irian Jaya, and this village has large poultry coops and relies less than other villages on the sea for meat. The villages of Ohoiren and Madwaer are small, have few hunting boats, and are situated next to Muslim villages which do not eat meat and do not approve of the strong smell of leatherback meat. Warbal, Ur, and Tanimbar Kai are near coral reefs and seem to rely more on the harvest of other sea turtle species, such as olive ridley, hawksbill, and green turtles. These villages catch leatherbacks incidentally in gill nets more than by hunting. Ohoidertutu takes about 80% of the leath-

erbacks harvested in the study area and villagers estimate this take to be about 70 animals in a season. This village is the closest to the hunting area and is located in an area of strong winds and currents. Fishermen and turtle hunters of Ohoidertutu have strong boats and appropriate hunting skills for the open water.

Environmental Education. — Understanding the biology of an endangered species and developing legislation and reserves for its protection are critical towards its conservation, but in remote areas such as Kai, the success of a program may be ultimately determined by the attitudes and actions of the peoples inhabiting the area. This has special merit in Indonesia where laws favoring the conservation of species and land are few and there is no enforcement of existing laws. Environmental education and public awareness efforts create an appreciation of natural areas and wildlife among local peoples and encourage a deeper understanding of the contemporary dangers facing their marine resources, especially sea turtles.

Children and adults alike were eager to learn about local natural areas and wildlife during the education workshops. These efforts were an important component of our project, as the effectiveness of conservation efforts in a remote area such as this is often determined by perspectives of the environment shared among local peoples. Hands-on education opportunities during turtle butchering and tidepooling during low tides allowed for informal discussions regarding sea turtle biology and folklore with locals with whom we may not have otherwise interacted.

CONCERNS

It is of concern that today many of the ancient *adat* beliefs and rituals associated with leatherback hunting no longer persist within villages of Kai, even in the most remote areas of this archipelago. This fishery has no cash importance in Kai, but leatherbacks are now regularly hunted for food, having been hunted only for ritual ceremonies by past generations. All village chiefs interviewed mentioned the following additional losses of traditional leatherback hunting *adat* beliefs among Kai peoples: leatherback meat is now traded among villagers and between villages, though forbidden in the past; newcomers to a village can now hunt turtles, leatherback meat is now spiced though this was not allowed in the past, and leatherback meat is no longer shared by an entire village. Historically, the hunt was a community event, but because villages have grown so large and some ritual associated with the hunt has been lost through the generations, leatherbacks are currently taken to isolated beaches for butchering and their meat is shared only among hunters' families (Starbird and Suarez, *pers. obs.*, 1994; Pius Teniwut, Ohoidertutu Chief, *pers. comm.*, 1994).

This shift in attitudes and perceptions of leatherback hunting is especially obvious among the younger generations who tend to hunt more indiscriminately and without as much regard for tradition. What began centuries ago as a highly ritualized and perhaps sustainable practice may be negatively affecting the status of the leatherback population in this area, especially in light of current threats to leatherbacks throughout the Indo-Pacific region. Most people interviewed mentioned that people from Ohoidertutu village had harpooned as many as 13 leatherbacks in one day. Traditional use of this species is not a safeguard against its extinction, especially in Kai, given continued unplanned harvest of the leatherbacks due to the high population growth rate in Kai villages and increased need for meat among Kai Islanders. Problems such as these require a range of solutions, with an underlying need for community awareness and involvement to prevent the further breakdown of cultural values, as has occurred in other sea turtle hunting societies which have undergone rapid change in the modern era (Nietschmann, 1982). Community support is integral to successful implementation of conservation initiatives in a remote area such as Kai (Pritchard, 1994).

RECOMMENDATIONS

Research. — Before the traditional ways of Kai peoples undergo further change it is important to understand their traditional beliefs and rituals and further document the take of adult leatherbacks which come to feed in Kai waters. Plans for conserving sea turtles in the Kai Islands should address and integrate the needs and traditional values of Kai communities. Further research of the pelagic habits of the leatherback in this area should be addressed. Telemetry and tagging studies would aid in determining the nesting populations to which adult females captured in Kai waters belong. Compost (1980) documented the existence of another leatherback fishery in the southern Aru Islands, Indonesia (east of Kai), in which as many as 30 leatherbacks were taken annually. This fishery should be further documented.

Alternate Food Sources. — Eliminating leatherback hunting is not recommended in Kai as it encompasses traditional beliefs and rituals integral to local culture. There is, however, potential to reduce the number of leatherbacks harvested as well as the take of other sea turtle species by encouraging the cultivation and husbandry of alternative and sustainable food sources. Village chiefs interviewed believe alternate food sources, such as wing beans and other legumes, amaranth and other grains, and chickens would alleviate the need for sea turtle meat. Somlain village has a large poultry coop and does not depend on sea turtle meat for sustenance. By providing communities in Kai with poultry and seed stock and enhancing local agricultural and husbandry skills through training, the need to hunt leatherbacks could be reduced. Integrating an alternative food sources program into existing community infrastructure by planting a community garden with the local schools, village chiefs, elders, and fishermen would promote participation in and local support for such a program.

Education and Fishery Management. — Sustainable use of natural resources requires taking careful measures to protect and enhance resource viability. Sea turtles take many years to reach reproductive maturity, so long-term projects

and programs are essential to their management. Kai peoples should address the need for management of their leatherback fishery at group meetings of local leaders and hunters, and determine quotas for the take of leatherbacks, as well as other sea turtle species, with the assistance of input from biologists. Developing community awareness of sea turtle utilization in Kai is the start. Through education Kai peoples must gain an understanding of general biological processes which will help them to make informed choices regarding their traditional harvest of leatherbacks and the capture of other sea turtle species. Only through such self-regulating means as planning resource management strategies and developing an alternative food sources program will Kai peoples modify their hunting and fishing behavior so that fewer turtles are taken annually. This may ensure sustainability of their traditional leatherback fishery and also alleviate the stress on populations of other sea turtles.

Conservation initiatives on Kai should continue to foster an understanding of the local marine environment among Kai peoples, as this is integral in the conservation and sustainable use of such resources (Pritchard, 1994). Integrating a conservation ethic into the existing community infrastructure in Kai is essential in the preservation of marine turtles in this area. Support for such a conservation ethic will be stimulated by environmental education programs. Key target groups should continue to be school groups, teachers, village leaders, elders, and fishermen. Through such community participation, such a conservation program will be most likely to survive and flourish in the future.

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