MARINE MAMMALS OF BORNEO: A PRELIMINARY CHECKLIST

by

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ABSTRACT

The island of Borneo includes the Malaysian states of Sabah and Sarawak, the Indonesian state of Kalimantan, and the islamic sultanate of Negara Brunei Darussalam. Although there has been little work done on marine mammals in this area since the 1950's, a number of species have been recorded from the island, mostly from strandings and opportunistic sightings. Of these, 16 have been confirmed based on reliable records.

Three brief research visits to Sabah and Sarawak have shown that the poorly-known Irrawaddy dolphin is common in several estuaries along the north coast of Borneo. Preliminary work found an average group size of 4.4 ± 2.19 S.D. (n=28). Seven individuals were photo-identified. In addition, evidence of coastal populations of Indo-Pacific hump-backed dolphins, finless porpoises, and dugongs was gathered. More work on all these species is planned to assess populations, identify threats, and ensure the animals are effectively conserved.

INTRODUCTION

In 1950, C.A. Gibson-Hill wrote, "There are still extremely few records of cetaceans from the coast of Sarawak, and several of the limited few have not been published. To the best of my knowledge there are no established records from Brunei and North Borneo (now Sabah)" (Gibson-Hill 1950, p. 288). Although the cetaceans of northern Borneo have not received much directed study since then, our knowledge is much improved since Gibson-Hill made his comments. However, many of the available records remain unpublished or are hidden in obscure references. In order to rectify this situation as best as we can, we provide here an annotated checklist to the marine mammals (including the dugong) of the island of Borneo. It reviews all records known to us, published and unpublished, and presents a number of new records obtained by us on three recent trips to the area. These new records add ecological and morphometric data for Irrawaddy dolphins (*Orcaella brevirostris*), finless porpoises (*Neophoceana phocaenoides*) and

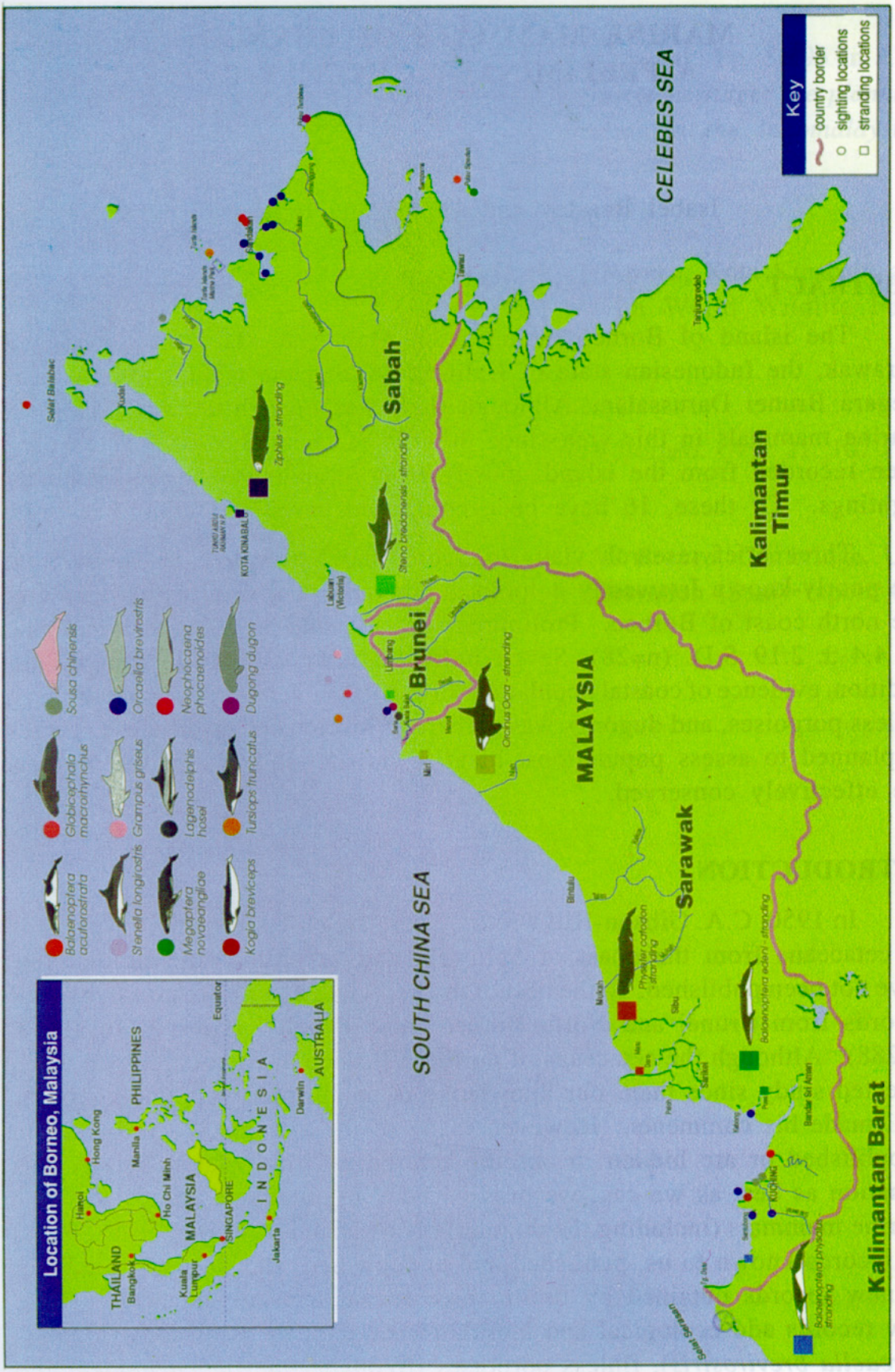

Fig. 1: Location map of Northern Borneo, showing confirmed records of marine mammal sightings and strandings.

Indo-Pacific hump-backed dolphins (*Sousa chinensis*) and provide the first records for one species, the sperm whale (*Physeter macrocephalus*), and one beaked whale genus, *Mesoplodon.*

STUDY AREA

The island of Borneo includes the Malaysian states of Sabah and Sarawak, with the islamic sultanate of Negara Brunei Darussalam between the two. The larger southern part of the island is the Indonesian state of Kalimantan (Fig. 1). Borneo covers an area of 700,000 square kilometers. It is the third largest island in the world, stretching from about 4° south of the equator to 7° north. The climate is tropical and the region is characterised by dense jungle with many large river systems throughout. The coastal waters of Sarawak are relatively shallow and are surrounded by the South China Sea. The waters off Brunei and western Sabah, are somewhat deeper, although a shallow shelf extends some distance from the coast. The Sulu Sea, between north-eastern Sabah and the Philippines, is quite deep, although shallow shelves exist between Sabah and two Philippine islands – Palawan and Mindanao. The Celebes Sea, between eastern Sabah and the Indonesian island of Sulawesi, is deep, and there is a very narrow shelf off the coast of Sabah, near the south-eastern border with Kalimantan.

METHODS AND MATERIALS

Two brief research visits were made to Sabah in May 1996 and April 1997, and one brief visit to Sarawak in June 1997. During May 2 to 5, 1996, the second author participated in the Joint Malaysia/Philippines Marine Mammal Training Workshop, which was held in Sandakan, Sabah. The workshop consisted of two practice survey days on May 4 and 5. Both were full days of survey into Sandakan Bay and the waters northeast of the bay. Approximately 70 km of survey effort were conducted during these two surveys (Dolar *et al.* in press).

A further trip to Sandakan was undertaken during April 1997 by the first author. A total of 316 km of survey effort were conducted during six days of preliminary surveys. Fourteen kilometers of survey were conducted around Sandakan Harbour and nearby Berhala Island on April 6. One hundred, twenty seven kilometers of the eastern coastal waters, Mumyung and Kinabatangan river systems were surveyed on April 7, 16 and 17. Eighty eight kilometers of survey were conducted out to nearby Selingan Island (oceanic waters) on April 18 and 19, and 48 kilometers of survey were conducted in Sandakan Harbour on April 20. Photographs were taken of the dorsal, ventral and lateral aspects of a dolphin skull on Selingan Island, Sandakan, for later identification.

During June, 1997, three days of marine mammal surveys were conducted around Kuching, Sarawak. A total of fifteen hours of survey were conducted. Six hours of survey were undertaken on 5 June in the waters of the Santubong branch of the Sarawak River and offshore to the Satang Islands. On 6 June, 5.5 hours were spent searching the waters of the Sarawak River and offshore to the end of Cape Sipang. On 9 June, 3.5 hours were again spent surveying the waters of the Sarawak River and offshore to the Satang Islands.

During the sighting surveys, one to two observers searched for marine mammals from 5-7 meter vessels. Survey effort was relatively informal, however, the survey areas were designed to cover all representative habitats of cetaceans and sirenians. All marine mammals encountered were recorded and position – using a handheld Global Positioning System (GPS), time, group size, Beaufort state and behaviour were noted.

In addition to sighting surveys, marine mammal skeletal material at the Sarawak Museum was examined, measured and photographed by the second author. Specimens were measured using vernier and dial calipers. A full inventory of specimens examined at the museum is available on request from the authors.

SPECIES CHECKLIST

Blue whale *(Balaenoptera musculus)*

Payne *et al.* (1985) reported unconfirmed sightings of blue whales north of Sabah. The mounted balaenopterid skeleton at the Sarawak Museum (see below) is listed as this species, but it is actually referable to either *B. edeni* or *B. borealis.*

Fin whale *(Balaenoptera physalus)*

An 18-m whale stranded in Lundu, Sarawak, has been reported to be of this species, although a small blue whale is not out of the question (Banks 1931; Gibson-Hill 1950). In addition, there are several unconfirmed stranding reports for Sarawak (Payne *et al.* 1985).

Bryde's whale *(Balaenoptera edeni)*

The Bryde's whale is the most common balaenopterid in most tropical regions. Although they can not be identified to species, two strandings of balaenopterids in Sarawak in the 1890's may have been of this species (Medway 1977). The complete, mounted skeleton of a whale stranded at

Pusa, Sarawak, in January 1909 is on display at the Sarawak Museum (SMZ 70.13; Plate XXV). This specimen is listed as *B. musculus*, and has been reported in the literature as *B. borealis* (Gibson-Hill 1950; Medway 1977; Payne *et al.* 1985). However, after examining the specimen, which is about 9 m long, we feel that it is an example of *B. edeni.* The baleen plates are dark gray with light, moderately coarse fringes. There were two additional reported strandings of this species on the Sarawak coast in 1956 and 1957 (Harrisson and Jamuh 1958; Payne *et al.* 1958). Five sightings have been reported from Brunei, some in which the diagnostic three head ridges of this species have been observed (Elkin 1992).

Minke whale *(Balaenoptera acutorostrata)*

There is a skeleton of this species in the British Museum of Natural History from northern Borneo (Leatherwood 1986). This is the only minke whale record for Borneo.

Humpback whale *(Megaptera novaeangliae)*

Slijper *et al.* (1964) reported an unconfirmed humpback whale sighting off the north coast of Borneo, and one sighting record off Sarawak was mentioned by Payne *et al.* (1985). There are also unconfirmed sighting reports off Sipidan Island, Sabah (Corkeron 1995).

Sperm whale *(Physeter macrocephalus)*

Kayan charms in the Sarawak Museum contain teeth that have been reported to have come from sperm whales, thereby implying the existence of this species in Sarawak (Banks 1931; Gibson-Hill 1950). However, in actuality, these teeth appear to have come from a large delphinid, such as the short-finned pilot whale or false killer whale (Corkeron 1995). The first confirmed record of a sperm whale in Borneo is that of a live-stranded individual at Matu-Daro, near Kuching, Sarawak, in early October 1995 (C. Leh, pers. comm.; Sarawak Tribune, 3 October 1995). The whale subsequently died; the skull was buried in the area, and will be placed in the Sarawak Museum collection upon unearthing (C. Leh, pers. comm.).

Pygmy sperm whale *(Kogia breviceps)*

The only record appears to be the stranding on 19 February 1958 of a pregnant female pygmy sperm whale at Buntal, Sarawak (Harrisson and Jamuh 1958). The skull of this specimen is still in the Sarawak Musuem (Plate XXVI).

Beaked whales *(Ziphiidae)*

At least three species of beaked whales can be expected from Bornean waters: Cuvier's beaked whale *(Ziphius cavirostris),* Blainville's beaked whale *(Mesoplodon densirostris),* and the ginkgo-toothed beaked whale *(Mesoplodon ginkgodens).* The only record of a beaked whale anywhere in Borneo appears to be the recent stranding in Kota Kinabalu, Sabah, of an unidentified ziphiid. The animal stranded on 10 April 1997 and was about 5 m long (Dailey Express, 12 April 1997; Borneo Mail, 12 April 1997). Officials from the Sabah Parks Department have been asked to obtain photographs for species identification.

Killer whale *(Orcinus orca)*

There is a complete, mounted skeleton of a killer whale that was stranded at Miri, Sarawak, in May 1912 on display at the Sarawak Museum (Gibson-Hill 1950). This specimen, with a total length of about 7 m, has the catalog number SMZ 0614/1 (Plate XXVII). This remains the only confirmed record of this species for Borneo, although there are unconfirmed reports of killer whale sightings off Sipadan Island, Sabah (Corkeron 1995).

Short-finned pilot whale *(Globicephala macrorhynchus)*

Elkin (1992) reported one confirmed and one tentative sighting, and one stranding record of this species for the coast of Brunei. Payne *et al.* (1985) mentioned a mass stranding near Kota Kinabalu, Sabah, as well as several sightings off Sarawak, but these records have apparently not been reported in the primary literature. Leatherwood *et al.* (1991) reported on a sighting off the east coast of Kalimantan, and there are several possible sightings of this species off Sipadan Island (Corkeron 1995).

Risso's dolphin *(Grampus griseus)*

Payne *et al.* (1985) and Harrison (1974) reported many sight records from Sarawak and a skull of Risso's dolphin in the Sarawak Museum. There was no indication of how the sightings were identified, and in a recent visit to the Sarawak Museum, one of us (TAJ) could not locate the above-mentioned skull. This skull has apparently been transferred to the Field Museum, Chicago, Illinois, USA, where it has been given the number FMNH 99609. The only other reliable record for Borneo appears to be a sighting from Brunei reported by Elkin (1992).

Bottlenose dolphin *(Tursiops truncatus)*

Payne *et al* (1985) reported sighting records off Sarawak, but these are considered to be unconfirmed, as the authors gave no supporting details. There are 29 sight records from off the coast of Brunei, and photographs in Elkin (1992) show characteristics of *aduncus*-type bottlenose dolphins, which may be reclassified in the near future as a separate species (Curry 1997). A skull at the Marine Turtle Conservation Facility on Gulisan Island, Sabah, apparently came from a bottlenose dolphin stranded there in July 1995 (Dolar *et al.* in press.). There are unconfirmed reports from Sipadan Island, Sabah, of what sound like bottlenose dolphins (Corkeron 1995).

Fraser's dolphin *(Lagenodelphis hosei)*

The only record of Fraser's dolphin for Borneo is that of the type specimen, which was collected before May 1895 on a beach near the Lutong River, Sarawak (Fraser 1956). The specimen is now held in the British Museum of Natural History, with the catalog number BM 1895.5.9.1.

Long-beaked common dolphin *(Delphinus capensis)*

There are many reports in the literature of common dolphins off the northern coast of Borneo (Gibson-Hill 1950; Payne *et al.* 1985), but we consider all of these to be questionable, as they either do not contain supporting details or the details suggest misidentification of other similar-appearing species. There appear to be no reliable records of common dolphins for the north coast of Borneo, but there is a specimen in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM 49977), which apparently came from near Pontianak, west Kalimantan (van Bree and Gallagher 1978). Van Bree and Gallagher (1978) referred this specimen to the nominal species, *Delphinus tropicalis*, a very long-beaked type of common dolphin and, in fact, any valid records of common dolphins from Borneo will probably be of this type.

Spinner dolphin *(Stenella longirostris)*

There are several confirmed records of the spinner dolphin from Brunei, including that of a stranded individual found at Panaga, in March 1989 and another at an unreported location in Brunei (Elkin 1992). Elkin (1992) also reported five sightings of this species off the Brunei coast.

Rough-toothed dolphin *(Steno bredanensis)*

There are only two records of this species from Borneo. The first is an alcohol specimen in the National Museum of Natural History, Leiden (Weber 1923). The second one is a skull in the British Museum of Natural History (BM 1992.97), which was found beach-cast in Brunei in 1989. Although the skull was listed as a specimen of *Sousa chinensis,* examination by the second author showed it to be in fact *Steno bredanensis* (TAJ, unpubl. data).

Indo-Pacific hump-backed dolphin (Sousa chinensis)

In 1901, R. Lydekker described a new species of dolphin, the Borneo white dolphin, *Sotalia borneensis*, from a specimen captured in September 1900 at Cape Sipang, near the mouth of the Sarawak River (Lydekker 1901). The type specimen is now in the British Museum (BM 1901.2.16.1), along with another skull from Borneo (BM 1914.1.14.1 – originally from the Sarawak Museum). The species *Sotalia borneensis* is now considered to be synonymous with *Sousa chinensis* (Ross *et al.* 1994). A number of additional specimens have been collected and there are currently four skulls of this species in the Sarawak Museum (SMZ 711 from Kuala Ranjup, an unnumbered skull from Sematan, and two other unnumbered skulls from unknown localities) (Plate XXVIII). There is also a stuffed skin on display in the new building of the Sarawak Museum – probably the one taken at Santubong in 1913, which was mentioned by Gibson-Hill (1950). An osteological specimen from northern Borneo was mentioned by Weber (1923).

The first report of *Sousa* in Sabah was in the appendix to Gibson-Hill's (1950) paper; Mr. J.A. Tubb (p. 296) stated that it "does definitely occur in the Sandakan area." Although no recent specimens appear to have been collected, there are reports of what can only be hump-backed dolphins from the areas around Sandakan, Sabah, and Kuching, Sarawak (Banks 1931; Fraser 1956; Harrisson 1959; field notes of authors). Mörzer-Bruyns (1971) reported seeing hump-backed dolphins 20-25 miles (32-40 km) up the Rajang River, in Sarawak. Dolar *et al.* (in press) sighted one group of this species at Jambongan, off the northern coast of Sabah in May 1996 (Plate XXIX and Plate XXX).

Suwelo (1988) reported records from the east coast of Kalimantan, but these are considered unconfirmed, as no details were reported. The only records of hump-backed dolphins for Brunei are three sightings reported by Elkin (1992).

Irrawaddy dolphin *(Orcaella brevirostris)*

There are a number of reports of Irrawaddy dolphins from throughout northern Borneo and Kalimantan, Indonesia. Banks (1931) reported possessing the skin and skeleton of an Irrawaddy dolphin retrieved from Buntal, Sarawak. He also noted they are commonly seen in estuaries of the Sarawak River. Currently three skulls of this species (dated 1949, 24/4/57 and 11/6/64) and a stuffed skin are housed in the Sarawak Museum. The first confirmed sightings were made by Gibson-Hill (1950) at the mouth of the Brunei River and the lower waters of the Santubong branch of the Sarawak River. Elkin (1992) noted a group of five Irrawaddy dolphins, which were sighted in Brunei and sightings were also reported near Muara Island off Brunei by Weber (1923). Mörzer-Bruyns (1966) reported sightings from the Rajang River on the west coast of Borneo. J.A. Tubb first reported *Orcaella* to possibly occur in Sandakan Harbour, Sabah (Gibson-Hill 1950) and confirmed sightings were made near there in 1996 (Dolar *et al.* in press). Recent visits to both Sandakan, Sabah, and Kuching, Sarawak, by the authors, have confirmed the continued occurrence of *Orcaella* in these areas. There is a well-known population in the Mahakam River and associated lakes, Kalimantan, and several individuals have been captured from this population and taken to the Jaya Ancol Aquarium, Jakarta (Tas'an *et al.* 1980; Tas'an and Leatherwood 1984; Payne *et al.* 1985). This is one of only a handful of known riverine populations of the species.

During the three trips by the authors, 28 groups of *Orcaella* were sighted. Nine groups were sighted near Kuching (Plate XXXI) and 19 groups near Sandakan (Plate XXXII). Groups ranged from one to ten individuals, and average group size was 4.4 ± s.d. 2.19 (n=28). Seven *Orcaella* were identified individually from photographs taken during the surveys. Most groups were relatively elusive, and respired noisily while at the surface. No spyhopping, jumping or other active behaviour was observed during sightings in Sandakan, April 1997, however, three occurrences of groups socialising and spyhopping were observed during sightings in Sandakan, May 1996, and Kuching, June 1997.

Threats from bycatch and habitat loss through logging and palm oil plantations are evident throughout Borneo. Intensive gillnetting and trawling were observed in rivers near both Kuching and Sandakan. It is currently unknown what effect these potential threats are having on populations of *Orcaella* throughout Borneo.

Finless porpoise *(Neophocaena phocaenoides)*

Weber (1923) stated that finless porpoises were common in rivers of Borneo. There are four finless porpoise skulls and one stuffed skin (TL = 111 cm) in the Sarawak Museum (one skull has a catalog number, SMZ 71-18, the others are un-numbered) (Plate XXXIII). The first records of this species for Sabah were two sightings made by the first author just east of Sandakan in April 1997. Both sightings were brief, but the absence of a dorsal fin, small size and rounded forehead distinguished them as *Neophocaena* (which the authors have observed many times before in Hong Kong). Both sightings were made to the northeast of Sandakan Harbour, approximately one kilometer from the coast, in relatively turbid water. Best estimates of group size were one to two animals. This species was reported to be common in estuaries of northern Sarawak, and previously also in southern Sarawak; however, one wonders whether there may have been some confusion with Irrawaddy dolphins (Medway 1977; Payne *et al.* 1985). Banks (1931) stated that this is the most common species in Borneo. There are one stranding and two sighting records from Brunei (Elkin 1992). Duckworth (1995) reported recent sightings from Similajau National Park in Sarawak. There is also a skeleton of a finless porpoise from an unspecified locality in Borneo in the collection of the Zoological Museum of the Academy of Sciences, Moscow (Tomilin 1957).

Dugong *(Dugong dugon)*

Only a few confirmed sighting records of dugongs have been reported for Borneo. These include two aerial and one boat-based observation, all close to Muara breakwater, Brunei (Elkin 1992). Banks (1931) noted they were commonly believed to occur in Tanjong Datu, Sarawak, where they were hunted and harpooned. He believed they were not common in all the coastal parts of Sarawak; however, they may occur at Kedurong Pt and Limbang and Lawas District to the north. Recent reports by a fisherman indicate dugongs may have been found in northeastern Borneo, near Tambisan Island (Dolar *et al.* in press). The stuffed skin of a dugong discovered in Sabah, is housed at the Sarawak Museum (Plate XXXIV), and another stuffed skin of unknown origin is housed in the Kota Kinabalu Museum. Tas'an *et al.* (1979) reported sightings from the east, south and west coasts of Kalimantan.

DISCUSSION

There have, to date, been no comprehensive studies undertaken on marine mammals (including the dugong) which frequent the waters of Borneo,

and few confirmed sighting records or specimens are available. However, there appear to be many small porpoises and dolphins which inhabit both coastal and oceanic waters and several species of large whales are likely to pass through Bornean waters, at least occasionally (Payne *et al.* 1985). Presently, 16 marine mammals have been confirmed from Bornean waters (three others have been reported, but not confirmed) (Table 1). Many species are, however, known only from a few sightings or specimens recovered from strandings which occurred throughout the area. There are 11 other species of cetaceans which are likely to occur in the area, but have not yet been recorded. This may result from a lack of dedicated surveys for cetaceans in Borneo and the absence of an adequate stranding network. Species which could be expected as a result of their presence in surrounding waters and known distribution, include the dwarf sperm whale *(Kogia simus)*, Cuvier's beaked whale *(Ziphius cavirostris)*, several species of *Mesoplodon*, false killer whale *(Pseudorca crassidens)*, pygmy killer whale *(Feresa attenuata)*, melon-headed whale *(Peponocephala electra)*, pantropical spotted dolphin *(Stenella attenuata)*, and striped dolphin *(Stenella coeruleoalba)*. Two other baleen whales, the northern right whale *(Eubalaena glacialis)* and sei whale *(Balaenoptera borealis)* may also occur in Borneo, at least as strays.

The most common coastal species, at least near river mouths, appears to be *Orcaella brevirostris*, based on the sightings made during field trips to the area. No Indo-Pacific hump-backed dolphins were sighted during visits to Kuching or the most recent trip to Sandakan; however, observations by Dolar *et al.* (in press) of Indo-Pacific hump-backed dolphins around Jambongan Island, Sabah, and finless porpoises near Sandakan Harbour (author's observ.) indicate that these species may also be common in some coastal waters surrounding Borneo.

There have been no studies of population/stock structure of Bornean Irrawaddy dolphins, nor of any other marine mammal species from this area. Irrawaddy dolphins appear to be largely restricted in their distribution to rivers and areas of coastline near river mouths. The possibility of multiple stocks of Irrawaddy dolphins in Borneo seems high. Interestingly, Irrawaddy dolphins from the Mahakam River area appear to be very light, almost white, in color, while those observed along the north coast of Borneo have been consistently dark gray. The section of coastline along the east coast of Borneo between these areas has a narrow continental shelf, and it is possible that these groups have been separated for a long period of time and are taxonomically distinct. The animals in the Mahakam River of Kalimantan are one of only three known populations of Irrawaddy dolphins that occur

Table 1. Species of Marine Mammals Known and Expected to Occur in Borneo

Species	Occurrence			Sub Areas			
	Confirmed Records	Unconfirmed Records	Unrecorded but Expected	Sarawak	Brunei	Sabah	Kalimantan
Eubalaena glacialis			X **				
Balaenoptera musculus		X			?		
Balaenoptera physalus		X		?			
Balaenoptera borealis			X **	?			
Balaenoptera edeni	X			S *	O		
Balaenoptera acutorostrata	X					S	
Megaptera novaeangliae		X		?		?	
Physeter macrocephalus	X			S			
Kogia breviceps	X			S			
Kogia simus			X				
Ziphius cavirostris			X				
Mesoplodon densirostris			X				
Mesoplodon ginkgodens			X				
Mesoplodon sp.			X			S	
Orcinus orca	X			S		?	
Globicephala macrorhynchus	X			?	O	?	
Pseudorca crassidens			X				
Feresa attenuata			X				
Peponocephala electra			X				
Lagenodelphis hosei	X			S			
Grampus griseus	X			S	O		
Tursiops truncatus	X			?	O	S ?	
Delphinus capensis	X			?		?	
Stenella longirostris	X				S O		
Stenella attenuata			X				
Stenella coeruleoalba			X				
Steno bredanesis	X				S		
Sousa chinensis	X			S O	O	O P	
Orcaella brevirostris	X			S O	O	S O P	S O
Neophocaena phocaenoides	X			S O	S O P	O	
Dugong dugon	X			? S	O	S O	O

S = specimen record
O = sighting record
P = photo
? = unconfirmed
* = originally identified as *Balaenoptera musculus* and *Balaenoptera borealis*
** = Expected only as strays

hundreds of kilometers up rivers (the others being in the Irrawaddy River of Burma [Myanmar], and the Mekong River of Vietnam, Laos, and Cambodia). The exact relationships between marine and riverine populations of Irrawaddy dolphins remain unknown, and it appears possible that they have diverged at the specific or subspecific level. This should be examined through future morphometric and molecular studies.

Interestingly, despite having been originally described as a separate species, *Sotalia borneensis*, the external appearance and ecology of hump-backed dolphins from Borneo have not been well-documented. They have commonly been regarded as conspecific with hump-backed dolphins from the rest of the Indo-Pacific, largely as a result of lack of alternative information. Examination of drawings and photographs suggest that these animals are distinct from those along the coast of southern China, and the Bornean animals may be very similar to those from the Gulf of Thailand and Vietnam (Smith *et al.* 1995). This species shows tremendous amounts of geographic variation across its range, but taxonomic revisions still suffer from a lack of data from throughout most of southeast Asia (Ross *et al.* 1994). Attempts to obtain morphological and molecular data on this species from Borneo will significantly aid in such work, currently underway.

Fishermen interviewed during field visits showed no animosity towards dolphins. Some trawl fishermen were observed throwing fish to *Orcaella* after they had pulled in their catch and at least two groups of *Orcaella* were associated with boats when first sighted. We found no evidence of direct exploitation of whales, dolphins or porpoises during our trips. However, Dolar *et al.* (in press) noted that near Tambisan Island (located on the north east tip of Borneo) dugongs caught in fish corrals were sold live to a Chinese merchant. There have been no sightings of dugongs from Sarawak or Sabah and reports of dugongs at Tambisan Island, which is a relatively remote area, may represent one of the last remaining viable populations of dugongs in Borneo. Most people in northern Borneo are Islamic, and thus probably do not eat marine mammal meat.

Based on interviews and observations by the authors, incidental dolphin catches appear to occur throughout Borneo by gillnetters and the larger single trawlers. Incidental catches were reported to take place in the Kinabatangan River and near its mouth, where *Orcaella* following shrimp trawlers had apparently been caught (Dolar *et al.* in press). A fishermen interviewed by the first author, three kilometers northeast of Sandakan, down the Bugan River, disclosed that he had caught two dolphins in as many years. The carcasses were apparently thrown back into the river. At this river mouth,

the first author observed extensive gillnetting by approximately 25 fishermen, where nets were stretched across almost the entire width of the river in several locations. A group of *Orcaella* was sighted 50 meters down the river behind these nets, but was elusive and lost soon after being sighted. Fishermen also reported that other offshore dolphin species, which were tentatively identified as bottlenose dolphins, follow their trawlers regularly while they are fishing, but according to the fishermen interviewed, no oceanic dolphins have ever been caught in nets. The extent of such gillnetting and its effect on marine mammal populations in the area is currently unknown, however, in other areas, such as the Mekong River, gillnetting is apparently a major threat to cetacean populations (Smith *et al.* 1995; Stacey 1996).

We are particularly concerned about the conservation status of several coastal species in Borneo. In particular, the conservation status of Irrawaddy dolphins in the Mahakam River system of Kalimantan should be investigated as a matter of priority. Recent evidence suggests that live captures, incidental kills, habitat loss, and hunting may have reduced its numbers considerably. If this is found to be true, a conservation action plan for this population should be developed urgently. Also, the reports of a small population of dugongs along the northeastern coast of Borneo should be investigated fully, and considering the serious threats facing this species throughout Southeast Asia, a major effort by the appropriate governments to conserve any remaining dugongs in Borneo should be made.

The marine mammals of Borneo are diverse, and there are several areas where indepth long-term studies of coastal species may be feasible. With cooperation from local authorities, the Ocean Park Conservation Foundation has plans to continue our studies of Bornean marine mammals, with particular emphasis on coastal populations of Irrawaddy dolphins, hump-backed dolphins, finless porpoises, and dugongs in Sabah, Sarawak and Brunei.

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Plate XXV: Mounted skeleton of a Bryde's whale (SMZ 70.13), which was stranded at Pusa, Sarawak.

Plate XXVI: Skull of a pygmy sperm whale, which was stranded at Buntal, Sarawak (SMZ unnumbered).

Plate XXVII: Mounted skeleton of a killer whale (SMZ 0614/1), which was stranded at Miri, Sarawak.

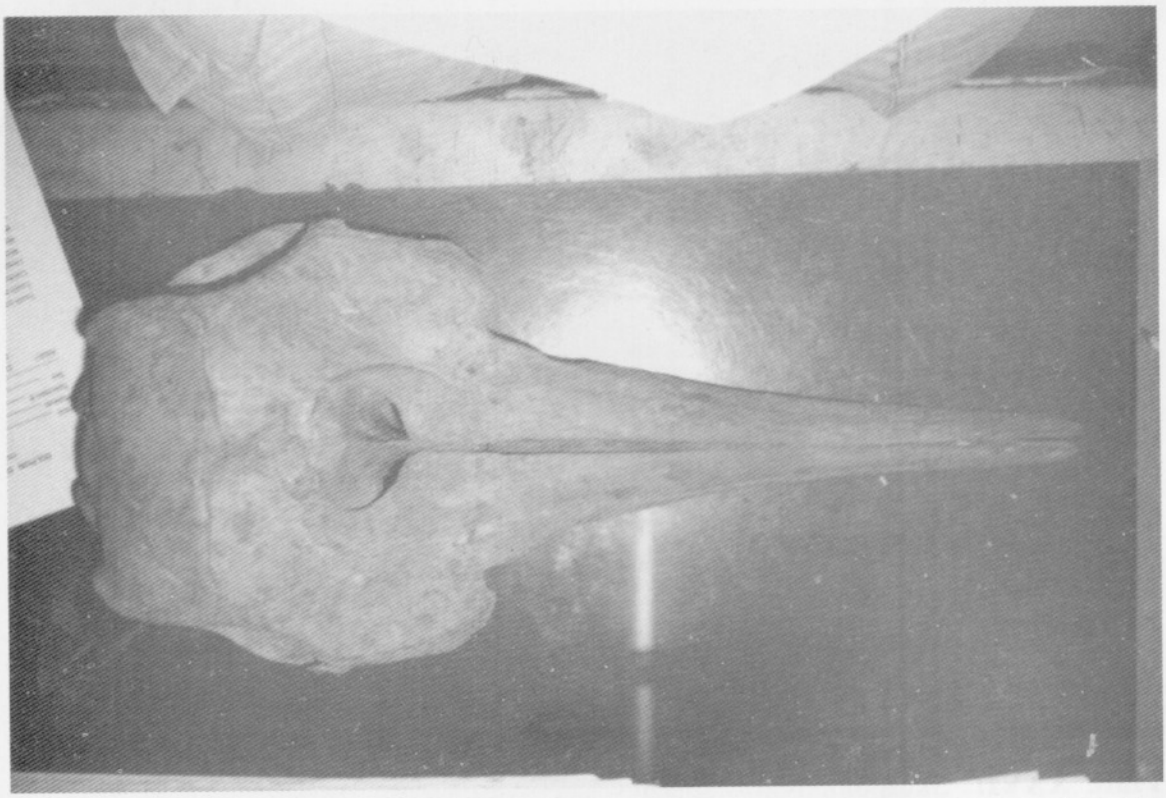

Plate XXVIII: Skull of an Indo-Pacific hump-backed dolphin (SMZ unnumbered).

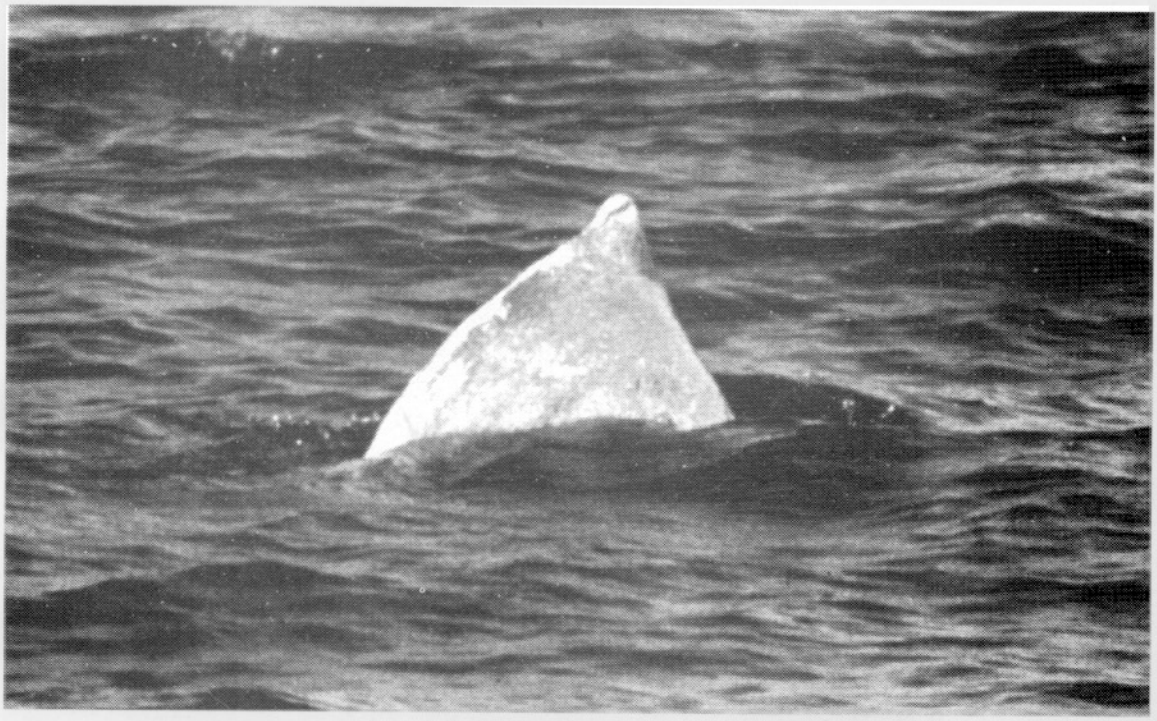

Plate XXIX: View of an Indo-Pacific hump-backed dolphin sighted at Jambongan, off the northern coast of Sabah. (Photo: M.L.L. Dolar)

Plate XXX: View of an Indo-Pacific hump-backed dolphin also sighted at Jambongan, Sabah. (Photo: M.L.L. Dolar)

Plate XXXI: Irrawaddy dolphins sighted in the Santubong Branch of the Sarawak River, Sarawak.

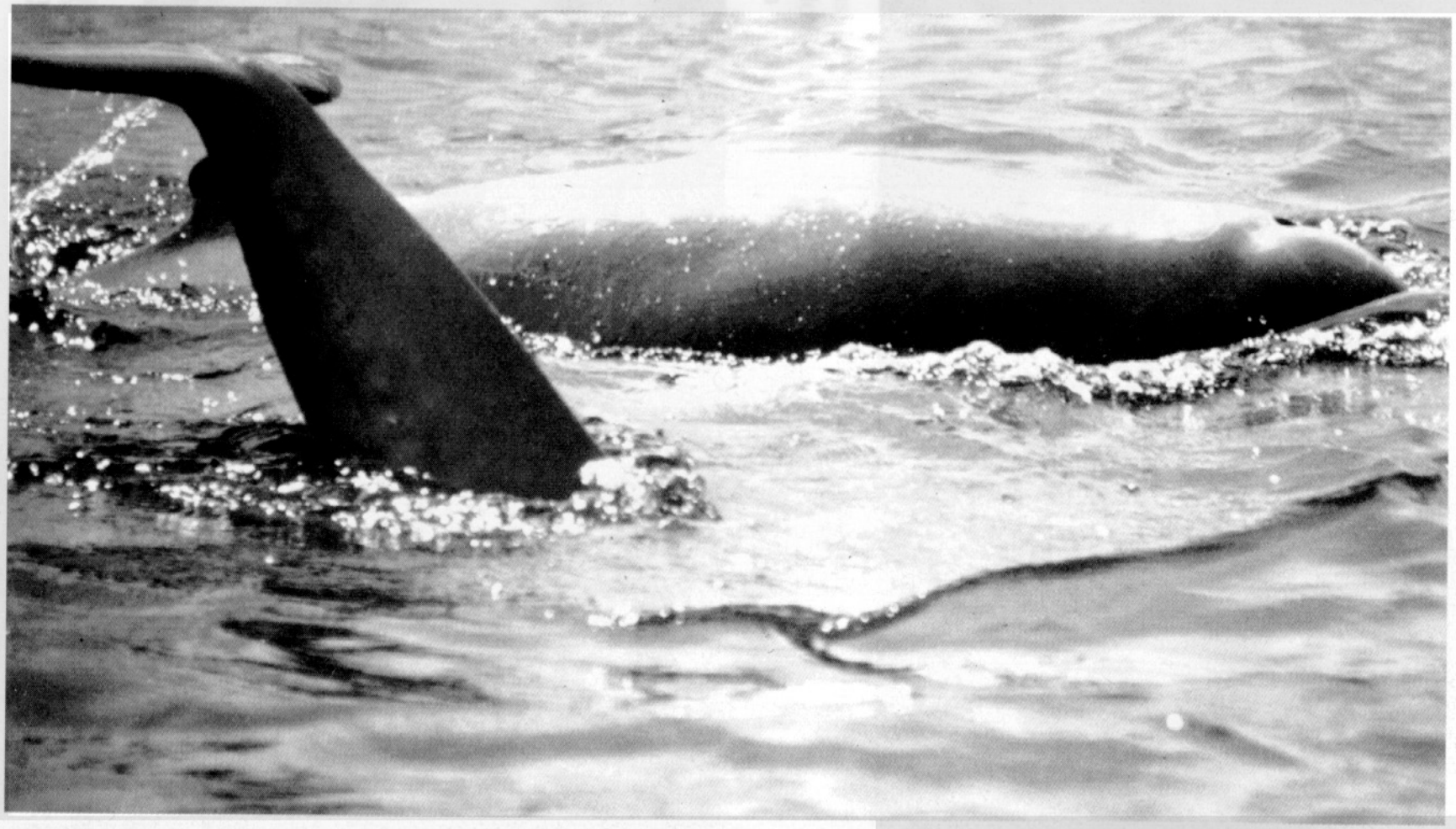

Plate XXXII: Irrawaddy dolphins sighted in Sandakan Harbour, Sabah.

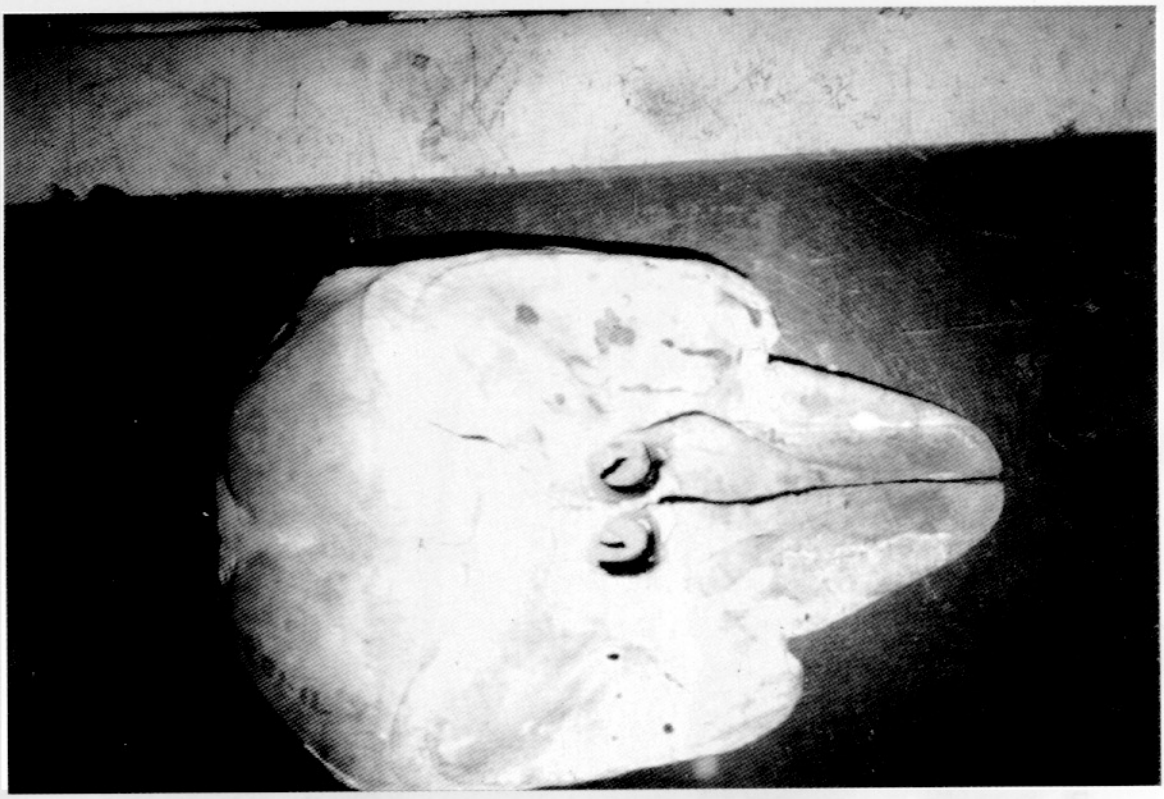

Plate XXXIII: Skull of a finless porpoise (SMZ 71-18).

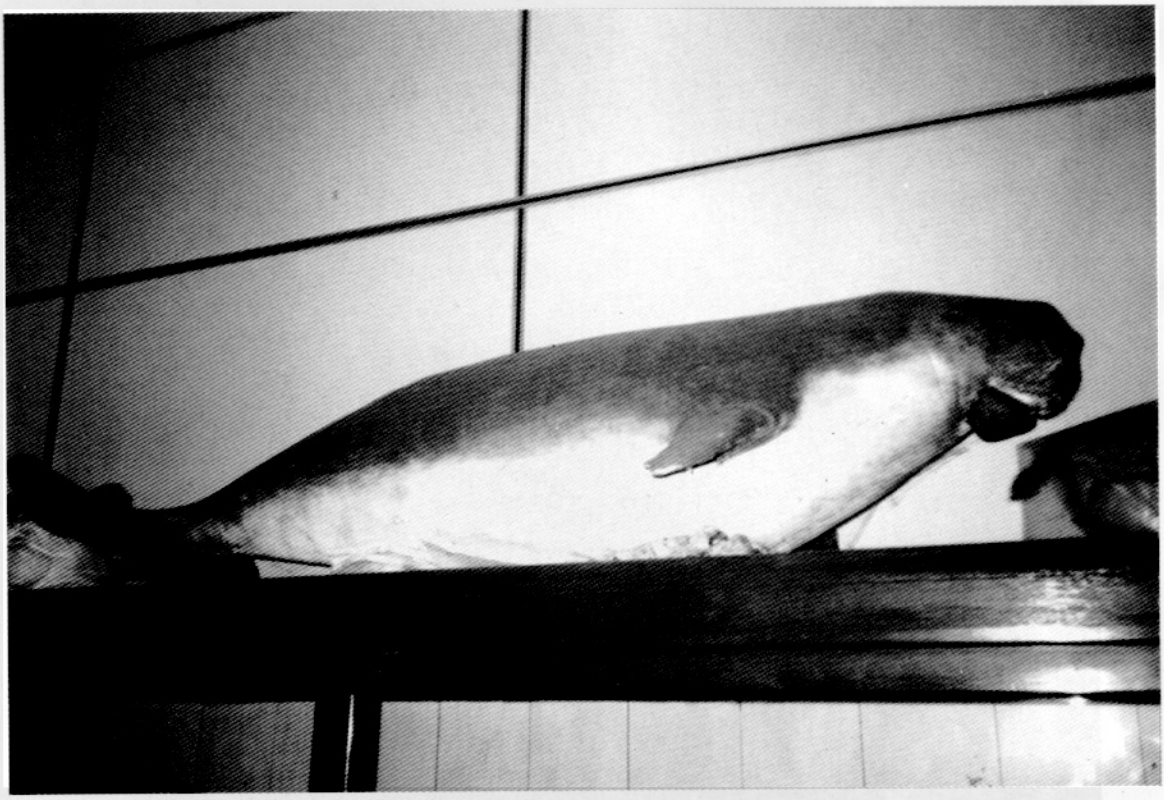

Plate XXXIV: Stuffed skin of a dugong discovered in Sabah (SMZ unnumbered).