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MARINE MAMMALS OF VIETNAM: A PRELIMINARY CHECKLIST

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Abstract

During March and April of 1995, we collected information on the occurrence and distribution of marine mammals along the coast of Vietnam. We found very few mammals during 95 hours of sighting surveys, but documented many species from bones stored at "Whale temples". Sixteen species of Cetaceans (one baleen whale and 15 toothed whales, dolphins and porpoises), and one species of sirenian (the dugong) have now been confirmed to occur in Vietnam. The reason for paucity of sightings is unknown, but we strongly recommend that further survey work and research on levels of cetacean bycatch in fishing nets be conducted.

INTRODUCTION

There has been very little research on the marine mammals of Indochina, here defined as consisting of Vietnam, Laos and Cambodia (for a review and summary of cetacean work in the entire southeast Asia/Indo-Malay region, see Perrin 1994; Perrin et al. 1995). Essentially the only directed research conducted in Indochina has been two studies of Irrawaddy dolphin (*Orcaella brevirostris*) in the Mekong River of Cambodia,

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Laos and Vietnam (Lloze 1973; Baird et al. 1994). There have been no directed studies of marine cetaceans along Vietnam's 3260 km of coastline and, in addition to the Irrawaddy dolphin, only three species have been reported from opportunistic reports of strandings : the blue whale (*Balaenoptera musculus*) (Gruvel 1925), the pygmy sperm whale (*Kogia breviceps*) (Serene 1934), and the bottlenose dolphin (*Tursiops truncatus*) (Zhou Kaiya and Qian Weijuan 1985). The finless porpoise (*Neophocaena phocaenoides*) is known from Vietnam, based on photos of skulls published by Kemf (1993). In addition, a single sirenian, the dugong (*Dugong dugon*), has been recorded several times from Vietnamese waters (Tran Ngoc Loi 1962; van Bree and Duguy 1977).

There is growing interest in status of wildlife in the southeast Asia, in part, due to the rapid economic development and concomitant environmental problems of nations within the region. Wildlife conservation concerns in the region were addressed at the 1993 meeting of the Scientific Council on Migratory Species of Wild Animals (Bonn Convention) (see Perrin et al. 1995). In particular, the marine mammal fauna of this part of the world has become of focal interest in recent years (see Intentional Whaling Commission 1994).

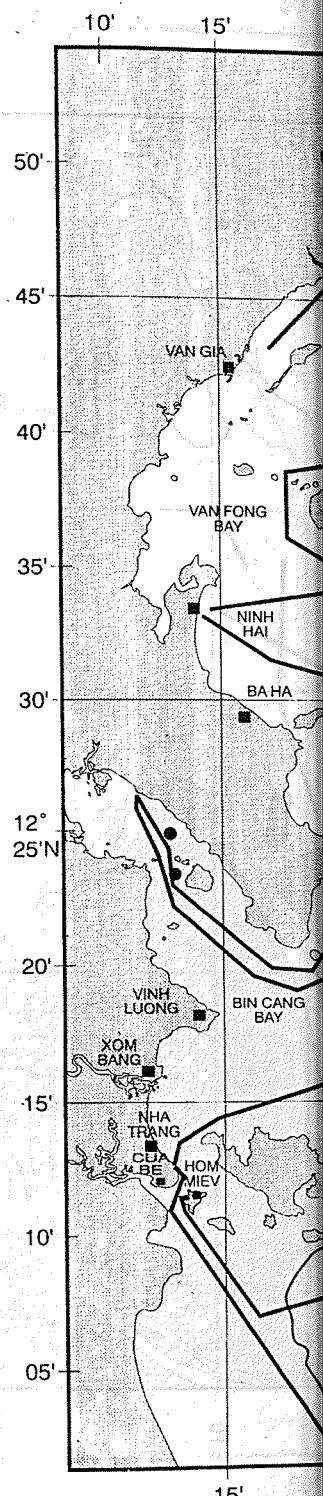
In March and April 1995, we conducted a reconnaissance visit, the first of its kind in Vietnam, to gather information on marine mammals. We present our findings here in the form of a checklist and attempt to summarize what is currently known about marine mammals in Vietnam.

STUDY AREA

Most of the coastline of Indochina belongs to Vietnam. This large country (329.566 km^2) is essentially a narrow strip of land extending along the western edge of the South China Sea. The region is largely tropical, and is characterized by a relatively broad continental shelf. The shelf is narrowest in south-central Vietnam, where it encroaches to within about 30-40 km of the shore, but in most of the rest of the country it is much wider. There are several groups of offshore islands, most of them located in shallow waters of the south-central part of the country, near Nhatrang, and in and around Halong Bay in the far north.

MATERIALS AND METHODS

A preliminary sighting survey of marine mammals in Vietnam was conducted during March and April 1995. We surveyed a total 913 km of trackline during 94.6 hours of search effort in coastal and offshore waters, including 498 km of trackline in south-central Vietnam, between Hon Noi and Vung Ro Bay, from 3–10 March and 12 April (fig. 1); 151 km of trackline in and around the Mekong River Delta, from 16–17 March (fig. 2); 134 km of tracline on the southeast side and offshore of the southern tip of Phu Quoc Island, near the Cambodian border, from 20–21 March (fig. 3); and 130 km of trackline between Do son and Hon Gia, including Halong Bay, in the far north, from 2–8 April (fig. 4). The survey covered a variety of continental shelf habitats, including river mouths, shallow bays, inland channels, exposed coasts, waters immediately around offshore islands, and offshore waters to a depth of about 180 m. In addition, we spent 5 hours searching for dolphins in the Han River, just upstream of Danang.



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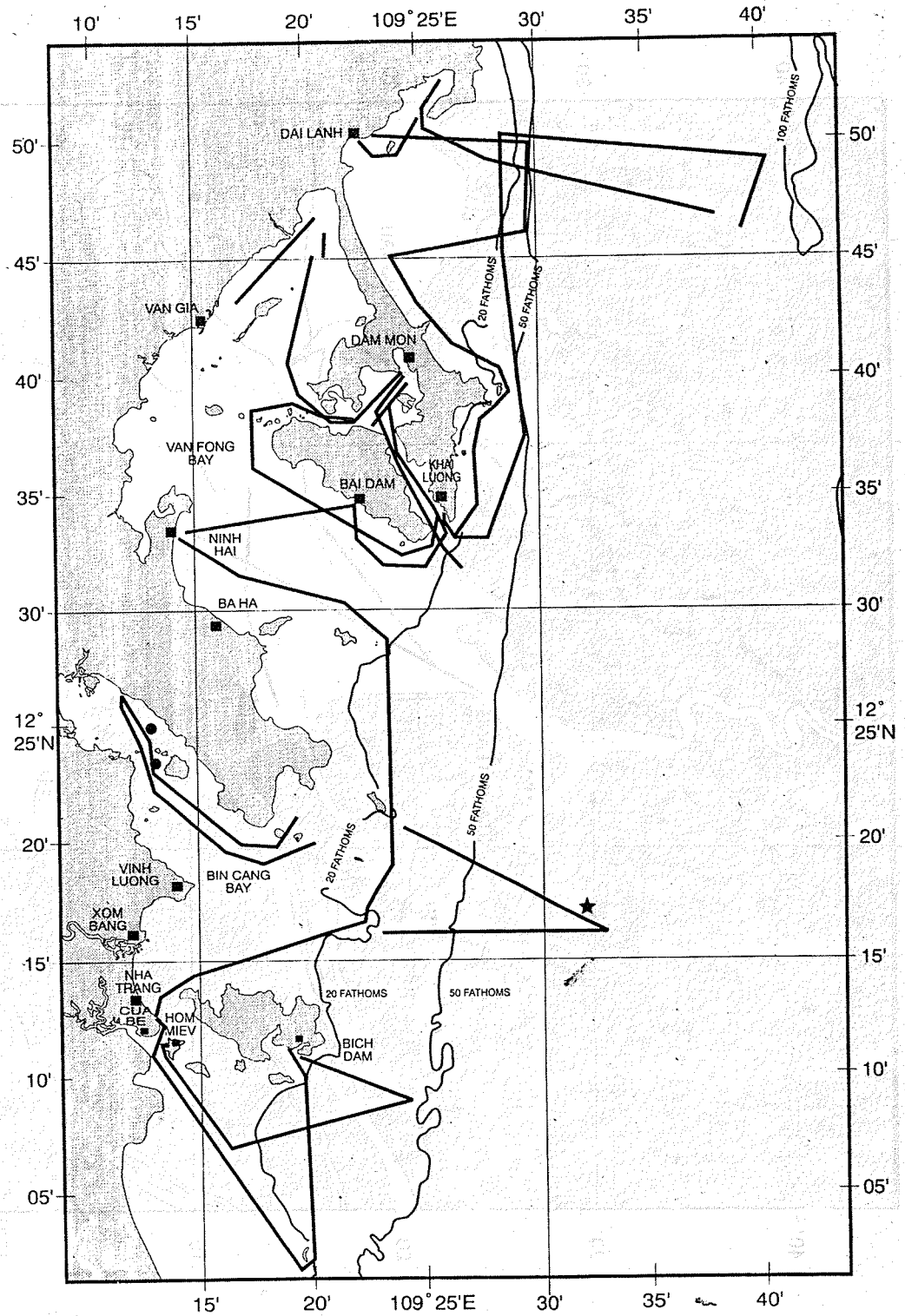


Fig. 1. South-central Vietnam, showing tracklines surveyed, and positions of whale temples (*squares*). Indo-Pacific humpbacked dolphin sightings (*circle*), and sightings of an undentified small whale (*star*).

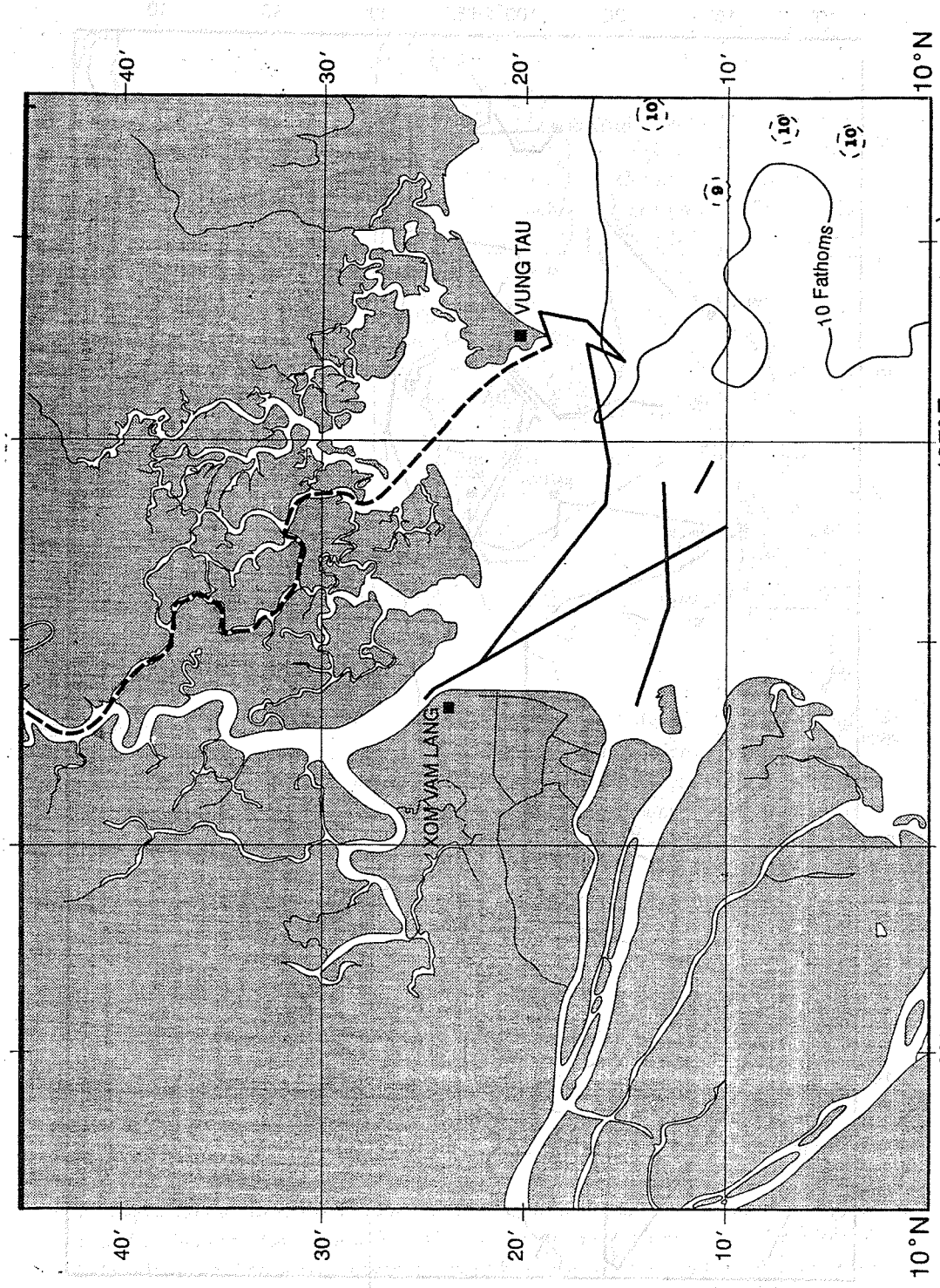
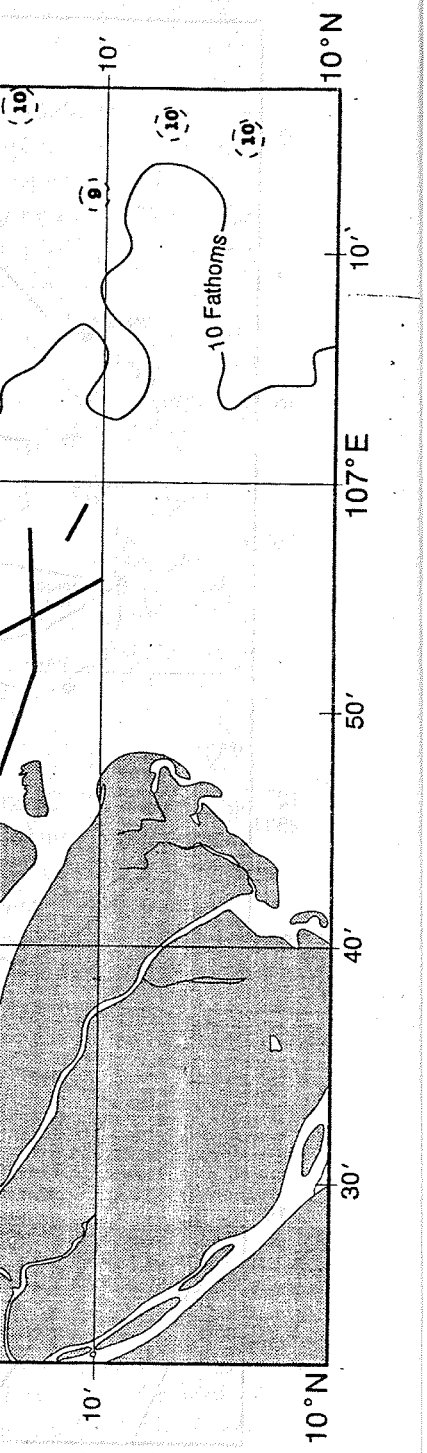


Fig. 2. The Mekong River Delta, showing tracklines surveyed, and positions of whale temples (*squares*).



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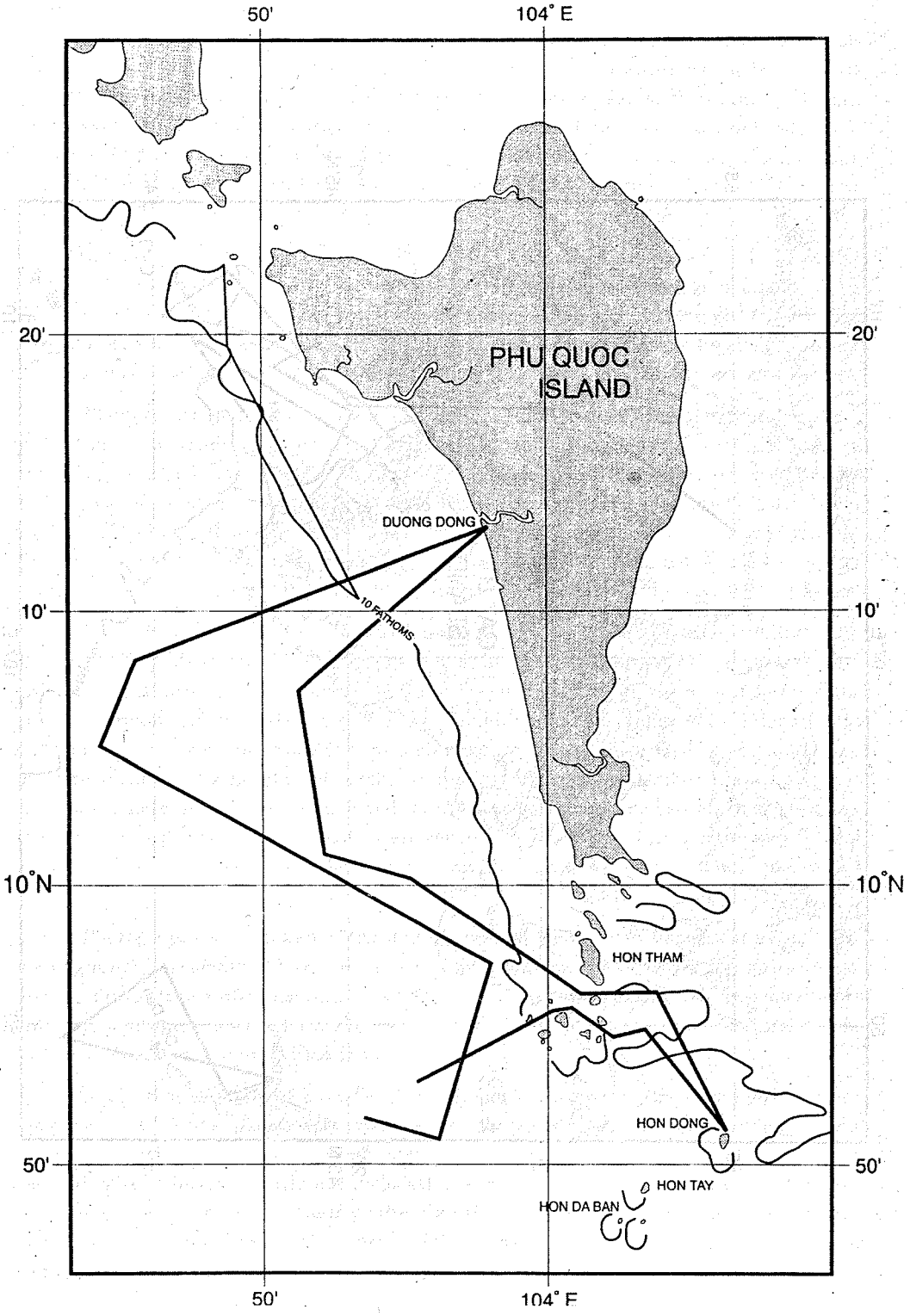

Fig. 3. Phu Quoc Island, showing tracklines surveyed, and positions of whale temples (*squares*).

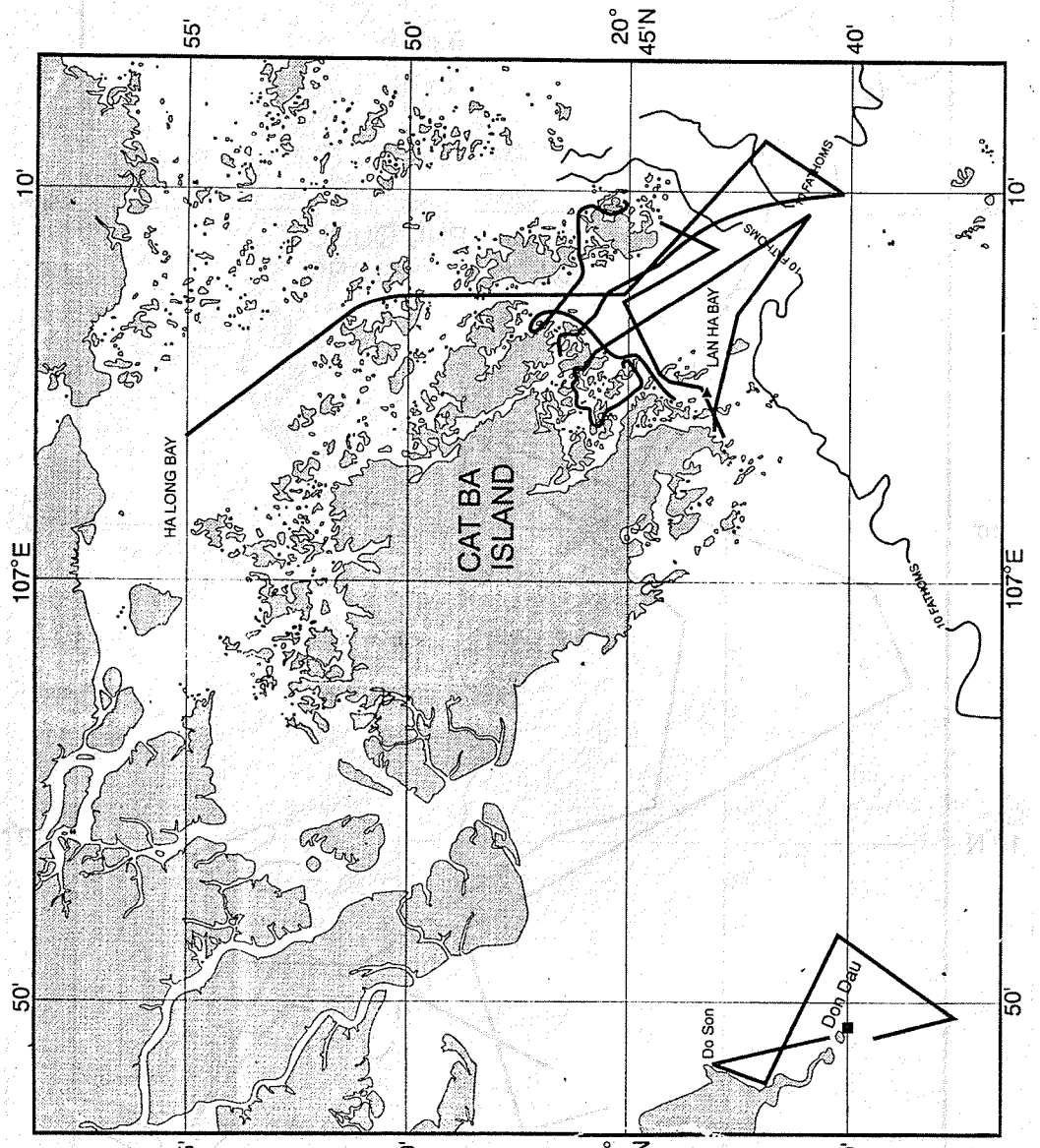

Fig. 4. Ha Long Bay, showing tracklines surveyed, and positions of whale temples (squares), and sighting of an unidentified delphinid (triangle).

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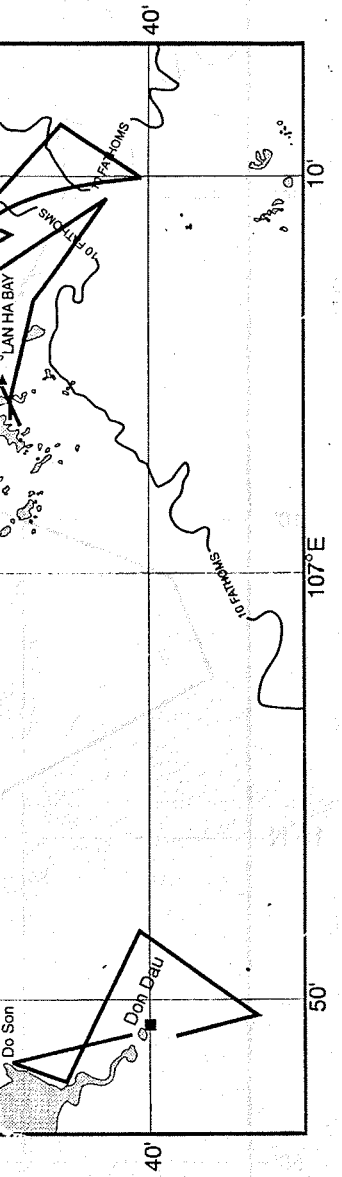

itions of whale temples

Two to three observers searched for marine mammals from 10–15 m vessels, with the aid of 7 × 35 and 10 × 70 binoculars. We followed tracklines designed to cover all representative habitats and recorded our position, using a Global Positioning System (GPS), every 15–20 minutes, at course changes, and at the location of cetacean sightings. Sighting conditions, including Beaufort sea state and presence or absence of fog and/or rain, were also recorded each time a position was taken. A summary of search effort and sighting conditions is given in Table 1.

In addition to sighting surveys, we examined marine mammals specimens at the Institute of Oceanography in Nhatrang (ION), Hai Phong Branch of Institute of Oceanography (HIO), Research Institute of Marine Products in Hai Phong (RIMP), Museum of Quang Ninh Province (MQNP), YenHung District Museum (YHDM), and at "whale temples" located in many fishing villages (see Kemf 1993 and Discussion below).

Skeletal materials at whale temples were examined, measured and photographed, when time and handling constraints allowed. At some temples, we were not able to handle specimens because of the concerns of temple keepers or the fragility of damaged or decomposed skulls. Since we did not have access to calipers, we measured condylobasal length (CBL) of skulls with a plastic tape measure or along the edge of a field journal (and later converted the measurements to centimeters). Measurements taken in this manner are not as accurate as more standardized measuring techniques using calipers.

Tooth counts were taken from both sides of the upper jaw and when available the lower jaw. The lower mandibles were matched for size with the upper jaws to ensure a greater probability that they were from the same specimen. If the tip of rostrum or lower jaw was broken off, we estimated the number of teeth and used a + to indicate that additional teeth were not based on an actual count. If the broken off portion was too large to estimate the number of teeth, we used a + without a number to indicate that there were more teeth than the reported count but too much uncertainly about the number to include an estimate. Tooth counts were coded UR, UL, LR and LL for the upper right mandible, upper left mandible, lower right mandible, and lower left mandible, respectively.

Photographs were taken of the dorsal, ventral, and lateral aspects of most skulls we examined, especially when we were not able to realiably identify the specimen to species during the initial examination. Photographs, tooth counts, and measurements from these specimens were later shown to colleagues specializing in these animal groups to clarify questionable identifications.

Even with the help of knowledgable colleagues, we were unable to identify some specimens to species. These specimens were identified to the lowest taxonomic group possible, or to a group of several similar species. Questionable or species group identifications were generally not included in species accounts (unless they represented a possible new record for Vietnam or the identification was considered highly probable). All provisional identifications are clearly labeled as such. A full inventory of specimens examined at the whale temples is available upon request from the authors.

SPECIES ACCOUNTS

Order Cetacea

Suborder Mysticeti

Family Balaenopteridae

Bluewhale *Balaenoptera musculus*

Gruvel (1925) mentions a blue whale stranded at Poulo Condor (Con dao Islands) on 16 September 1907. This must be a misidentificaiton, however, because the length of the specimen is reported as 5.4 m, which is too small, even for a newborn blue whale. The correct identity of the specimen remains unknown to us.

Bryde's whale Balaenoptera edeni

A skull from the whale temple at Dai Lanh (DL4; fig. 5) is probably from a Bryde's whale. The specific location of the stranding is not known, but it was reported to have occurred about 40 years ago. We expect that the Bryde's whale, which is primarily a tropical/ subtropical species, will turn-out to be the most common species of baleen whale in Vietnamese waters.

Minke whale *Balaenoptera acutorostrata*

Bones from the postcranial skeleton of a baleen whale at Bich dam (Hon Lon) (BD 1) were extremely small. If they were from any other balaenopterid species, they would have to be from a newborn animal, and would thus be only partially calcified, therefore would have decomposed quickly after death. The bones we examined at the Bich Dam temple appeared to be (and were reported to be) very old, but were hard to the touch.

Humpback whale *Megaptera novaeangliae*

Two or three humpback whale records were documented for Vietnam. One was from a specimen stored at HIO. The skeleton was in the process of being moved when we visited the Institute, so a detailed examination could not be made. We were, however, able to identify this specimen as a humpback whale from the absence of an acromial process on the scapula (this feature is present in all other members of the family Balaenopteridae).

In addition, we obtained photographs of a humpback whale skull from the northern coast of Vietnam. In the photograph (fig. 5), the whale can be identified as a humpback from the gentle U-shaped curve of the anterior margin of the squamosal (in all other balaenopterids it has a shape V-shaped curve). It is possible that this is the specimen at HIO, but we are not able to confirm this.

The other record, from a skeleton found in the Nam Ha Province, is based upon photos in a newspaper article entitled, "Details for identifying the Big Animal in Hai Hau (Nam ha)" (Bao Khoa hoc va Doi song – Science and Living Newspaper, 16 February 1995, p. 4). In the article, the whale is identified as a probable fin whale *Balaenoptera physalus*, with one local scientist identifying it at belonging to the genus *Physeter* (of which the only species is the sperm whale, *P. macrocephalus*). However, photos in the article allow the skull to be identified as that of a humpback whale, from the broad rostrum and U-shaped margin of the squamosal.

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(2) Hai Chu (HC 5);
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(3) Cua Be (CB 12);
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False killer whale

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Skulls of false killer

Suborder Odontoceti

Family Physeteridae

Pygmy sperm whale *Kogia breviceps*

Serene (1934) reported the stranding of a pygmy sperm whale 2 km south of Nhatrang on 19 May 1934. However, because the two species of *Kogia* were not properly distinguished until 1966 (Handley 1966), this specimen might have been a dwarf sperm whale (*K. simus*). The reported length of 3.1 m indicates *K. breviceps* but the number of teeth (7–8 pairs) is more in consistent with *K. simus*. Because of this conflicting information, we conservatively log this as only identifiable to the genus *Kogia*.

Skulls of *K. breviceps* were identified at three temples:

(1) Van Gia (VG3; fig 6); tooth counts 12 (LR) and 10+ (LL), no teeth in upper jaw; CBL 48 cm.

(2) Hai Chu (HC 5); lower jaw unavailable for tooth counts; no teeth in upper jaw; CBL 41 cm.

(3) Cua Be (CB 12); lower jaw unavailable for tooth counts, no teeth in upper jaw; CBL 41+1 cm.

Dwarf sperm whale *Kogia simus*

Skulls of *K. simus* were identified at two temples; and damaged skull (CB 8) at third temple was tentatively identified as *K. breviceps*.

(1) Dam Mon (DM 4; Fig 6); lower jaw unavailable for tooth counts, no teeth in upper jaw.

(2) Ninh Chu (NC 10); tooth counts 11 (LR) and 11 (LL), no teeth in upper jaw.

(3) Cua Be (CB 8); lower jaw unavailable for tooth counts, no teeth in upper jaw; skull too soft to handle; identification tentative.

Family Ziphiidae

Cuvier's beaked whale *Ziphius cavirostris*

A small whale we observed on 3 March 1995 at 12°18'N, 109°33'E may have been a Cuvier's beaked whale, judging from its size and surfacing profile; during the single surfacing that we saw, we were not able to observe any of the species' diagnostic characteristics.

Family Delphinidae

Short-finned pilot whale *Globicephala macrorhynchus*

A skull of short-finned pilot whale was identified at the Dam mon whale temple (DM 9; fig. 7); tooth counts 7 + 2 (UR), 6 + 3 (UL); CBL 65 cm.

False killer whale *Pseudorca crassidens*

The ION has the stuffed skin of a false killer whale on display (fig. 8). It is labelled "Ca Ong Chuong *Pseudorca crassidens* (Owen)". The stuffed specimen had a total length of 263 cm, and tooth counts were 7 + 2 (UR), 8 + 1 (UL), 9 (LR) and 9 (LL).

Skulls of false killer whales were also identified at five different temples:

(1) Nhatrang (NT 1); specimen stranded about 1983; tooth counts 9 (UR) and 9 (UL), teeth extensively worn; CBL 70–75 cm.

(2) Dam Mon (DM 3); tooth counts 8 (UR), 8 (UL); CBL 57 cm.

(3) Khai Luong (KL 5); tooth counts 9 (UR), 9 (UL); CBL 48 cm.

(4) Van Gia (VG 2); CBL 55 cm

(5) Vinh Luong (VL 6); tooth counts 8+1 (LR), 9 (LL)

In addition, at the Khai Luong whale temple, we examined a mandible and partial cranium of a small whale (KL 12) that was provisionally identified as *P. crassidens*. Lower tooth counts were 9–10.

We also examined a photograph in the newspaper Lao Dong (27 July 1993, article entitled " Killing a Dolphin in Halong Tourist area") of a specimen that appears to be either a false killer whale or a melon-headed whale. If the reported length of 4.2 m is correct, it was certainly a false killer whale.

Pygmy killer whale *Feresa attenuata*

A skull of a pygmy killer whale was identified at the Dam Mon temple (DM 5; fig. 7); tooth counts 11 (UR), 10 + 1 (UL), 13 (LL), and 12 (LR); teeth restricted to anterior two-thirds rostrum; CBL 33 cm.

A very small, incomplete skull (KL 13) at the Khai Luong whale temple was suspected to be that of a young pygmy killer whale, although this could not be confirmed.

Melon-headed whale *Peponocephala electra*

Skulls of melon-headed whales were identified at two temples:

(1) Dam Mon (DM 1; fig. &) upper tooth count approximately 25; antorbital notches very deep; approximate CBL 45 cm (skull damaged).

(2) Hai Chu (HC 2); tooth counts 22 + 2-3 (UR), 23 + 3-4 (UL), 23 (LR), 22 (LL); deep antorbital notches; CBL 45 cm.

Risso's dolphin *Grampus griseus*

Skulls of Risso's dolphin were examined at two temples:

(1) Ninh Chu (NC 8; Fig. 9a); tooth counts (UR) and (UL) absent; 3 (LR), 3 (LL); CBL 47.5cm.

(2) Hon Mieu (HM4); tooth counts (UR) and (UL) absent; 4 (LR), 4 (LL).

Rough-toothed dolphin *Steno bredanensis*

Skulls of rough toothed dolphins were identified at three temples:

(1) Dam Mon (DM 6; fig. 10); tooth counts 22 (UR), 22 (UL), CBL 49 cm.

(2) Dai Lanh (DL 3); tooth counts 27 (UR), 28 (UL), 28 (LR), 26 (LL),

(3) Ninh Chu (Phan rang) (NC 5); tooth counts 22+1? (UR), 22+1 (UL), 24 (LR); 23 (LL), CBL 21 cm.

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(6) Van Gia (VG 9); t

(7) Van Gia (VG 9); t

(8) Van Gia (VG 9); t

(9) Vinh luong (VL 10
(LR); CBL 48 cm.

(10) Hai Chu (HC 3);
CBL 49 cm.

(11) Cua Be (CB 4); j

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23 (LR). The total length of
was 11.5 cm.

Indo-Pacific humpbacked dolphin *Sousa chinensis*

There is a skeleton of a humpbacked dolphin from Tonkin (northern Vietnam) in the Museum National d'Histoire Naturelle, Paris, France. The specimen is cataloged with the number 1987-656 (D. Robineau, pers. comm.).

Indo-Pacific humpbacked dolphins were identified twice during our sighting surveys, both times inside the Bay of Binh cang north of Nhatrang. The first sighting occurred on 3 March at 12°24'N, 109°13'E, and consisted of three animals. The second sighting was on 4 March at 12°26'N, 109°12'E. A single animal was in the vicinity of a small fishing boat using a gillnet, and the fishermen told us that the dolphin was attempting to take fish from the net.

In addition to the sightings, we positively identified 11 skulls of this species at five whale temples:

(1) Van Gia (VG 4; Fig. 10); tooth counts 32+1 (UR), 29+2 (UL), 34 (LR), 31 (LL).

(2) Van Gia (VG 5); tooth counts 30+3 (UR), 31+3 (UL), 28+3 (LR), 30 (LL).

(3) Van Gia (VG 7); tooth count 29+3 (UL).

(4) Van Gia (VG 8); no data collected.

(5) Van Gia (VG 9); no data collected.

(6) Van Gia (VG 9); tooth count 36 (UL).

(7) Van Gia (VG 9); tooth count 34+3 (UL).

(8) Van Gia (VG 9); tooth counts 35 (UR), 34 (UL).

(9) Vinh luong (VL 10); tooth counts 32+3-6 (UR), 33+ (UL), 32+1-2 (LL), 32+1-2 (LR); CBL 48 cm.

(10) Hai Chu (HC 3); tooth counts 34+1 (UR), 34+1 (UL), 32+1 (LL), 30+2-3 (LR); CBL 49 cm.

(11) Cua Be (CB 4); juvenile specimen, no data collected.

(12) Ninh Hai (Hon Khoi) (NH 1); tooth count 53 + 1 - 3 (UR), 34 + 3 - 4 (UL) and 33 + 1 - 3 (LL), CBL 50 cm

We examined two additional skulls at Van Gia and Bich Dam temples (VG 14 and BD 2, respectively) that were damaged; these were tentatively identified *S. chinensis*.

Bottlenose dolphin *Tursiops truncatus*

Zhou Kaiya and Qian Weijuan (1985) reported two records (one consisting of three specimens) of bottlenose dolphins (reported as *T. aduncus*) in the central Gulf of Tonkin (Gulf of Beibuwan), between the northern Vietnamese coast and Hainam island.

A stuffed bottlenose dolphin specimen displayed at RIMP was reported stranded in Halong Bay several years before. Tooth counts were 24 (UR), 24 (UL), 23+1 (LL), and 23 (LR). The total length of the specimen was approximately 180 cm. The beak length was 11.5 cm.

In addition, skulls of bottlenose dolphins were identified at five temples:

(1) Dam Mon (DM2; Fig. 9b); tooth counts 24 (UR), 25 (UL), CBL 48 cm.

(2) Hai Chu (HC 1); tooth counts 23+1-2 (UR), 20+1-3 (UL), CBL 48 cm.

(3) Hon Mieu (HM 1); tooth counts 20+3-4 (UR), 23+1 (UL), CBL 48 + 1 cm.

(4) Xom Bong (XM 5); tooth counts 23+1-2 (UR), 22+2-3 (UL), 21+2-3 (LR), 21+2-3 (LL); CBL 51+0.5 cm.

(5) Vung Tau (VT 2) tooth counts 20+1 (UR), 19+2-3 (UL).

With the exception of XB 5, all the specimens examined were judged to be from the *aduncus*- type, which is characteristically coastal form of *Tursiops* (see Ross, 1977, Ross and Cockcroft, 1990). Specimen XB 5 may be an offshore form of *Tursiops*, judging from its large size and very wide rostrum.

Pantropical spotted dolphin *Stenella attenuata*

Skulls of pantropical spotted dolphins were identified at three temples:

(1) Khai Luong (KL 1); tooth counts: 35 (UR), 35 (UL), 31+ (LR); 34+ (LL), CBL 43 cm.

(2) Khai Luong (KL 8); tooth counts: 34+1 or 2 (UR).

(3) Khai Luong (KL 6); no data collected.

(4) Dai Lanh (DL 6; fig. 11b); tooth counts: 35 (UR), 34 (UL).

(5) Vinh Luong (VL 5); tooth counts 35+2 (UR), 35+2 (UL), 35+2 (UL), 37+2-2 (LR); 34+2-3 (LL), CBL 39.4 cm.

Spinner dolphin *Stenella longirostris*

A long-snouted dolphin that stranded about 50 years ago near Nha Trang is on display as a stuffed specimen at the Oceanographic Museum in Nha Trang. It is labelled "Prodelphinus malayanus Lesson", and is either a specimen of *Stenella longirostris* or *Delphinus capensis*. Because of the closed position of the mouth, it was impossible to tell if this specimen possessed the deep palatal grooves characteristic of *Delphinus spp*. Measurements of the stuff skin are as follows: total length 132 cm, beak length 16.8 cm, dorsal fin height 9.3 cm, and anterior flipper length 20.3 cm.

Skulls of five spinner dolphins were examined at four temples:

(1) Khai Luong (KL 9;fig. 11); tooth counts 43+8-9 (UR), 44+8 (UL), CBL 42 cm.

(2) Khai Luong (KL 10), tooth counts: 51+1 (UR), 51 (UL), CBL approximately 41 cm.

(3) Hai Chu (HC 6); tooth counts: 38+5-6 (UR), 41+2-3 (UL), 40 (LR); 41 (LL), CBL 37 cm.

(4) Hon Mieu (HM 3); tooth counts: 38 (UR), 46 (UL), CBL 35+1.5 cm.

(5) Ninh Chu (NC 6); tooth counts: 46+1-2 (UR), 48 (UL), 45 (LR); 47 (LL), CBL 39 cm.

Based on the size
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(5) Van Gia (VG 1

(6) Dai Lanh (DL

(7) Hai Chu (HC 4

(8) Bich Dam (Hon
CBL 49+ 0.5 cm.

(9) Bich Dam (BD

(10) Bich Dam (BD

(11) Bich Dam (BD

(12) Hon Mieu (HM

(13) Xom Bong (XB

(14) Xom Bong (XB

(15) Cua Be (CB 13
(LL), CBL 50+1 cm.

(16) Cua Be (CB 14
CBL 49+1.

Another specimen
stuffed and painted skin
"Prodelphinus malayanus
carcass, but was identified
following measurements
rostrum length, 142 mm, d

In addition, anothe
account above) may be of t
longirostris, because the
absence of palatal grooves

entified at five temples:

R), 25 (UL), CBL 48 cm.

+1-3 (UL), CBL 48 cm.

23+1 (UL), CBL 48 + 1 cm.

2+2-3 (UL), 21+2-3 (LR), 21+2-3

2-3 (UL).

amined were judged to be from
m of *Tursiops* (see Ross, 1977,
shore form of *Tursiops*, judging

ella attenuata

ified at three temples:

(UL), 31+ (LR); 34+ (LL), CBL

R).

R), 34 (UL).

35+2 (UL), 35+2 (UL), 37+2-2

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ears ago near Nha Trang is on
um in Nha Trang. It is labelled
nen of *Stenella longirostris* or
e mouth, it was impossible to
haracteristic of *Delphinus spp.*
1 132 cm, beak length 16.8 cm,
cm.

four temples:

(UR), 44+8 (UL), CBL 42 cm.

51 (UL), CBL approximately

1+2-3 (UL), 40 (LR); 41 (LL),

L), CBL 35+1.5 cm.

8 (UL), 45 (LR); 47 (LL), CBL

Based on the sized of several these skulls (e.g. KL9, KL 10, and NC 5), the specimens were not of the dwarf form, described from the Gulf of Thailand by Perrin et al. (1989), but rather of the pantropical subspecies, *S. Longirostris* (see Perrin 1990). However, it is possible that the smaller skulls may have been of the dwarf form. Alternatively, they may have been of young specimens of *S.l.longirostris*. More work with large sample sizes is needed to confirm whether or not the dwarf form occurs along the coats of Vietnam.

Long-beaked common dolphin *Delphinus capensis*

Skulls of common dolphins were identified at eight temples:

(1) Khai Luong (KL 2); tooth counts 63 (UR), 60+ (UL), CBL 52 cm.

(2) Khai Luong (KL 3); skull damaged; no data collected

(3) Khai Luong (KL 4); skull damaged; no data collected

(4) Kha Luong (KL 11); skull damaged; no data collected

(5) Van Gia (VG 10); tooth counts: 53+4 (UL), skull damaged.

(6) Dai Lanh (DL 7); tooth counts: 53+3 (UR), 57+2 (UL), 56 (LR); 56 (LL).

(7) Hai Chu (HC 4); tooth counts 53(UL), 54 (UL), CBL 50 cm.

(8) Bich Dam (Hon Lon/Hon Tre) (BD 2); tooth counts: 65+2-3 (UR), 52+ (UL), CBL 49+ 0.5 cm.

(9) Bich Dam (BD 3); skull damaged, no data collected.

(10) Bich Dam (BD 4); tooth counts: 61+1-3 (UR), 62+2-3 (UL), CBL 51+1 cm.

(11) Bich Dam (BD 6); skull damaged, no data collected.

(12) Hon Mieu (HM 2); no data collected.

(13) Xom Bong (XB 2); no data collected.

(14) Xom Bong (XB 7); no data collected.

(15) Cua Be (CB 13); tooth counts 52+5-7(UL), 54+2-3 (LR); 51+2-4 (LR); 51+2-4 (LL), CBL 50+1 cm.

(16) Cua Be (CB 14); skull damaged; tooth counts: 51+ (UR), 51+(UL), 60+(LR); CBL 49+1.

Another specimen of this species stranded near Nhatrang about 3 years ago. The stuffed and painted skin, and is now on display at the ION, where it is labelled "Prodelphinus malayanus Less". It is not recognizable as a *Delphinus* from the stuffed carcass, but was identified from photographs of the fresh carcass (Fig. 12). We took the following measurements from the stuffed display specimen: total length, 1200 mm, rostrum length, 142 mm, dorsal fin height, 104 mm, and anterior flipper length, 206 mm.

In addition, another stuffed specimen at the ION (described in spinner dolphin account above) may be of this species. It was not possible to distinguish it from *Stenella longirostris*, because the color pattern has been completely lost, and the presence or absence of palatal grooves could not be confirmed.

All of the *Delphinus* skulls that were intact appeared to be of long-beaked species (*D.capensis*) or the extremely long-beaked variety (*tropialis*-type) described by van Bree and Gallager (1978). According to Heyning and Perrin (1994), this type is likely to be either a geographical form of *D. Capensis*, or a valid species (*Delphinus tropicalis*), but this decision must await further taxonomic study.

Irrawaddy dolphin *Orcaella brevirostris*

Lloze (1973) reported at least four records of Irrawaddy dolphins near the mouth of Mekong River of Vietnam, and from the Isles de Pirates, off southwest Vietnam. We did not find any specimens or obtain any other data on this species.

Family Phocoenidae

Finless porpoise *Neophocaena phocaenoides*

Photographs published in the article by Kemf (1993), show two skulls of finless porpoises being prepared for deposit into the whale temple in Vung Tau. This is the only published indication that this species occurs in Vietnam; however, we identified more than 46 skulls of finless porpoises at seven temples:

(1) Nhatrang (NT 2); collected from stranding in about 1985.

(2) Nhatrang (NT 3); collected from stranding in about 1985.

(3) Van Gia (VG 6); CBL 24 cm.

(4) Van Gia (VG 12); no data collected.

(5) Van Gia (VG 15); no data collected.

(6) Dai Lanh (DL 1); no data collected.

(7) Dai Lanh (DL 2); no data collected.

(8) Dai Lanh (DL 5); no data collected.

(9) Bich Dam (BD 1); no data collected.

(10) Bich Dam (BD 3); no data collected.

(11) Vinh Luong (VL 2); no data collected.

(12) Vinh Luong (VL 3); no data collected.

(13) Vinh Luong (VL 7); no data collected.

(14) Vinh Luong (VL 8); no data collected.

(15) Vinh Luong (VL 9); no data collected.

(16) Cua Be (CB 5); no data collected.

In addition, over 30 *Neophocoena* skulls were observed in a glass case at the temple in Vung Tau. The skulls were not available for handling, but were easily identified as finless porpoises, by their small size and prominent bosses located just anterior to the nares.

In addition, we examined photographs of a finless porpoise (Fig. 13) at the Xom Vam Lang temple near the mouth of the Mekong River. The photographs were of a fresh

specimen that was reported
visit in mid-March 1995.

Order Sirenia

Family D
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A dugong was caught
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We identified dugon

(1) Van Gia (VG 1; F

(2) Khai Luong (KL

(3) Ba Ha 1 (Ninh T

(4) Cua Be (CB 15);

(5) Ninh Hai (Hon F

DISCUSSION

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specimen that was reportedly caught in a fisherman's net several months before our visit in mid-March 1995.

Order Sirenia

Family Dugonidae

Dugong *Dugong dugon*

A dugong was caught in a fishing net about 20 km south of Nhatrang in July 1960 (Tran Ngoc Loi 1962). Van Bree and Duguy (1977) published information on seven dugong specimens from the Condao islands, housed in the Museum of Bordeaux, France. An additional dugong specimen (#1907-303) from Tonkin (Hacoi) is housed at the Museum National d'Histoire Naturelle (D. Robineau, pers. comm.).

We identified dugong skulls at five temples:

(1) Van Gia (VG 1; Fig. 14); no data collected.

(2) Khai Luong (KL 7); no data collected.

(3) Ba Ha 1 (Ninh Thuy) (BH 3); no data collected.

(4) Cua Be (CB 15); no data collected.

(5) Ninh Hai (Hon Khoi) (NH 2; Fig. 14); no data collected.

DISCUSSION

Of the 30 species of cetaceans previously recorded in the Southeast Asia/Indo-Malay region (see Perrin 1994, Perrin et al. 1995), 16 have now been confirmed in Vietnam, most for the first time as a result of this study (Table 2). Examination of two mysticete specimens and a sighting of an odontocete suggests that three additional species can be added. This study indicates that, at least historically, the coastline of Vietnam, has provided habitat for a diversity of cetacean fauna, as well as for dugongs.

During a total of 913 km of survey effort, we only had four cetacean sightings, two of humpbacked dolphins, one of an unidentified small whale (probably Cuvier's beaked whale), and one of an unidentified delphinid. We are unable to account for the virtual absence of cetacean sightings, despite extensive search effort in a variety of different locations and representative habitats. The results of our surveys are consistent with the report of a similar absence of cetacean sightings made during four days of casual searching effort, conducted as a part of an ecotourism cruise from Ho Chi Minh City to Haiphong on the passenger ship Caladonia Star in June 1993 (W. T. Evertt, pers. comm.).

The paucity of sightings may be partially accounted for by the migratory habits of some dolphin species. We may simply have conducted our search during the wrong time of year. For example, fishermen all along the coast suggested that we come back in the summer when dolphins were more abundant. This explanation would not, however, account for the absence of species known from other areas of their distribution to be more sedentary (e.g. bottlenose, humpbacked, and irrawaddy dolphins and finless porpoises). Other explanations for the low number of sightings may be that dolphins living along the coast of Vietnam have been subjected to high mortality from accidental entanglement in fishing nets, or that there has been a depletion in their food base that has reduced dolphin survival or reproduction.

Fishermen reported that they sometimes accidentally catch dolphins in gillnets, although not often. They consistently reported releasing animals that were alive when found. In practice, dolphins (as air breathing mammals) die fairly quickly from suffocation when they are caught in gillnets and prevented from reaching the surface for air. With the large number of gillnets being used along the coast of Vietnam, even a low by catch rate of dolphins could result in a significant conservation problem. One Vietnamese fisher reported that, while working as a translator for a large Chinese gillnetter, he witnessed 14–15 dolphins come up dead in the net during a single two-week trip off the coast of Thanh Hoa Province (net position: 20°20' N, 106°40'E). From photographs, he identified the dolphins as pygmy killer or melon headed whales, and Risso's dolphins. He stated that the Chinese fishermen sold the meat at the market in Cat Ba for USD 5/kg. Apparently the meat of pygmy killer/melon headed whales has a strong taste, and there fore does not demand a very high price (these animals were eaten by the Chinese fishermen).

We speculate that a loss of the dolphins' food base from overfishing could prevent the animals from obtaining sufficient nutrition for survival or successful reproduction. This problem would presumably most seriously affect the more sedentary coastal species, which may not be able to migrate to more productive waters.

Fisheries in Vietnam are extensive and appear to be expanding in recent years, the catch of fish and shellfish along the south-central coast of Vietnam (Phu Yen Province to Binh Thuan Province) was about 160,000 to 200,000 tons/year (Nguyen Huu Phung et al. 1994). While surveying offshore of Dai Lanh (see Fig. 1), we counted 80–100 active fishing boats in view in a single scan. On another occasion, as we entered the Mekong River Delta (Fig. 22), we observed several dozen stow nets, each one stretching 200–400 m. Further into the delta, we observed over 10 rows of gill nets, laid out so that they stretched across nearly the entire channel, with only small openings to permit vessel traffic. At one point, we counted 60 gillnet vessels tending 4–5 nets each.

We found no evidence of direct exploitation of cetaceans in Vietnam. Such small cetacean fisheries are known to occur in other parts of Asia, including the Philippines (Dolar et al. 1964), Sri Lanka (Leatherwood and Reeves 1989), and Indonesia (Barnes 1991). In fact, several older fishermen expressed concern and revulsion about stories of fishermen from other countries hunting and eating the meat of whales and dolphins. Reports of dolphin meat occasionally being sold in the market in Cat ba, and of the exploitation of small cetaceans by Vietnamese hunters from inland areas, may be reason for concern. The newspaper article entitled "Killing of a dolphin in Halong Tourist Area" (Lao Dong 27 July 1993) reported that a dolphin weighing 300 kg with a length of 4.2 m was shot and brought to the beach by a hunter, who stated that the meat could be sold for 200,000 VD (approximately 20 USD). The article also stated that local fishermen never catch dolphins, because the animals sometimes help boats when there is an accident and that seamen like to watch them as they frolic alongside vessels.

Whale temples have proven to be a highly valuable source of information on marine mammals of Vietnam. In fact, the concept of a marine mammal stranding network may have been invented by those who first conceived and developed such temple, whale worship has apparently been in practice since at least the 1700s (see Kemf 1993).

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At least one temple in Hong Kong, Tai Do on Lantau Island, also has whale bones incorporated into its altar displays. Serene (1934) mentioned that he was not able to acquire the *Kogia* specimen that he reported on because it was being prepared for worship. Museums and research institutions in Vietnam have also found it difficult, if not impossible, to acquire cetacean skeletons for display, as stranded specimens are zealously guarded by local fishermen and temple keepers. A newspaper article entitled "Dolphin Found on the Beach of Quang Tri Province" (*Lao Dong*, 16 March 1995) related how when a large dolphin was found on the beach, the fishermen refused to sell the meat and , instead, buried it at the village whale temple according to their local tradition.

When Vietnamese fishermen find the body of a dead cetacean, they generally bury the animal near the temple of their home village if it is small enough to transport. If it is too large to transport, they bury it in the location where it stranded. Cetaceans that are incidentally caught during fishing operations, and bones that come up the net while bottom trawling, are also taken to whale temples. After the carcass has been buried for three years and the flesh cleaned from the bones by insects and microorganisms, the fishermen dig up the skeleton in a special ceremony and deposit the bones at the local whale temple for worship (see description of a "whale wake" in Kemf 1993).

Vietnamese fishermen worship cetaceans because they believe the animals will aid them when in distress at sea. In nearly every village we visited, we heard stories of cetaceans pushing people and vessels ashore after their boat had sunk or been blown out to sea in a storm. In addition to the skeletal materials of cetaceans, we also found bones of dugongs and leatherback turtles (*Dermochelys coriacea*) and bills of sawfish (*Pritis sp*) at the whale temples. We were also told by some fishermen that they even buried giant squid near the temples.

Although in the past, all large sea creatures were apparently worshipped, people at some temples now only worship what they consider to be whales (i.f. cetaceans without a beak). Some fishermen include cetaceans with beaks in this category, but only those that do not travel in large groups and that swim with characteristic "sine-wave" leaps. In practice, the definition of what is considered a whale varies among temples and is not always clear. In some cases, we were told by fishermen that they only worshipped "whales", but when we examined specimens at the whale temple, we found mostly long-snouted delphinids (we were told that these were old specimens). One man explained that fishermen in his village included dolphins, not because they worshipped them, but only to be respectful of their intelligence and their families. Other fishermen said that they worshipped whales, but did not like dolphins, because of their habit of stealing fish from their nets (they said sometimes beat, but never kill, the dolphins).

During our second sighting of Indo-pacific humpbacked dolphins, we observed a single animals surfacing near a gillnet tended by local fishermen. The boat was circling around the net, and a fisher was beating the water with a long bamboo pole, in part to drive fish into the net, but also (as he later explained) to scare the dolphin away from the net. We watched him pull up the net and reset it approximately one km away, the dolphin followed the boat to the new location. The fishermen later complained that it was difficult to feed his family when dolphins frequently took a large proportion of his catch.

Although it is difficult to determine exactly when dolphins began to fall out of favor at many of the temples, the timing seems to be roughly about the time of the introduction of plastic monofilament gillnets in the early 1960s. We suggest that, until then, there was little direct competition between Vietnamese fishermen and dolphins for food. Gillnet fisheries, however, may have provided an easily accessible, although potentially deadly, source of food that put the dolphins in direct competition with local fishermen. A decreasing food base resulting in reduced foraging oppotunities, could have led dolphins to become more dependent on easily accessible fish from gillnets. In addition, the probable increase in the bycatch rate of dolphins, once gillnets came into common use, may have resulted in a conflict with the traditional venerated status of dolphins.

Although some fishermen still worship dugongs and claim that they do not hunt living animals on the rare occasions when they see them, others readily admit that they hunt dugongs for their meat, which fetches a high price in local markets. Fishermen told us that dugongs are now very rare in the area of south-central Vietnam. Bones of dugongs that we examined at some of the temples were sometimes mistaken by fishermen as coming from cetaceans.

Several residents of Nhatrang reported that, some years ago, a group of Russian entrepreneurs brought three Black sea bottlenose dolphins to Nhatrang and kept them in a netted-off area of the bay near the Cau Da peninsula. The Russians charged admission and offered dolphins shows to locals and tourists. We were also told that occasionally escaped from their pens, and had to be recaptured. The dolphins apparently performed until they died, from eating plastic trash blown into the bay.

Researchers at the ION also told us that 2–3 years ago three scientists from the Academy of Science of USSR, Far East Branch, attempted to obtain dolphin specimens from the waters offshore of Nhatrang and Vung Tau for their Museum. From what we were told, they were unsuccessful in their efforts. Our attempts to obtain information to corroborate these stories from our Russian colleagues have not been successful and we have no other details on these incidents at present.

We hope that this first attempt to assess the distribution of marine mammals in Vietnam will encourage other, more extensive, research projects on these animals along the entire Vietnamese coast. One of us (MA), has plans to begin a long-term project in Vietnam, similar to that recently completed in Thailand (see Andersen and Kinze 1993). Another one of us (DTH) has submitted a proposal to monitor bycatch levels of dolphins in gillnet fisheries along the south-central coast. Once these and other projects are completed, we hope it will be possible to present a more complete and detailed picture of marine mammals in Vietnam, and to fill-in the gaps in our knowledge that we have identified in this preliminary checklist.

ACKNOWLEDGMENTS

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Table 2. *Species of*

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Balaenoptera borealis
Balaenoptera edeni
Balaenoptera acutorostrata
Megaptera novaeangliae
Physeter macrocephalus
Kogia breviceps
Kogia simus
Ziphius cavirostris
Hyperoodon sp.
Mesoplodon densirostris
Mesoplodon ginkgodens

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Oceanography was invaluable in conducting the surveys. Dr. Nguyen Nhat Thi of the Marine Natural Museum at the Hai Phong Branch of Institute of Oceanography, Tran Trong Ha from the Museum of Quang Ninh Province and Dr. Bui Dinh Chung of the Research Institute of Marine Products provided important information on museum specimens. We thank Vinh An for assistance in arranging permission to conduct the surveys and for help with searching for animals. D. Robineau provided information on specimens in French Museums, and W.F. Heyning confirmed species identifications. We also thank the crews of our numerous surveys vessel for their unfailing hard work and assistance in conducting the surveys. We appreciate the cooperation of fishermen and whale temple keepers of Vietnam with our requests to exhume the skeletons of marine mammals stored at the whale temples and for their practice of whale worship, which is an inspiration to marine enthusiasts.

Table 1. *Summary of the number of hours of survey effort conducted in different areas in good and poor conditions.*

Area	Sighting conditions		
	Good[1]	Poor[2]	Total
South-central coast (Nhatrang area)	25:36	23:25	49:01
Mekong River Delta	0	13:18	13:18
Around Phu Quoc Island	1:34	11:56	13:30
Cat Ba Island/Halong Bay area	7:31	11:18	18:49
Total	34:41	59:57	94:38

1. Good sighting conditions are defined as clear weather, with Beauforts of 1-2.
2. Poor sighting conditions are defined as significant fog or rain, or Beauforts of 3+ (or both).

Table 2. *Species of marine mammals known or expected to occur in Vietnam.*

Species	Recorded			Not Recorded But Expected[2]
	Confirmed[1] 1	Tentative[2] 1	Source(s)	
Balaenoptera musculus			Gruvel (1925)[3]	
Balaenoptera physalus				x
Balaenoptera borealis				x
Balaenoptera edeni		S	This paper	
Balaenoptera acutorostrata		S	This paper	
Megaptera novaeangliae	S		This paper	
Physeter macrocephalus				x
Kogia breviceps	L, S		Serene (1934)[4]	
			This paper	
Kogia simus	S		This paper	
Ziphius cavirostris		O	This paper	
Hyperoodon sp.				x
Mesoplodon densirostris				x
Mesoplodon ginkgodens				x

Species	Recorded			Not Recorded But Expected[2]
	Confirmed[1] 1	Tentative[2] 1	Source(s)	
Orcinus orca				x
Globicephala macrorhyncus	S		This paper	
Pseudorca crassidens	S		This paper	
Feresa attentuata	S		This paper	
Peponocephala electra	S		This paper	
Grampus griseus	S		This paper	
Steno bredanensis	S		This paper	
Sousa chinensis	S, O		This paper	
Tursiops truncatus	L, S		Zhou Kaiya & Qian Wenjuan (1985); this paper	
Stenella attenuata	S		This paper	
Stenella longirostris	S		This paper	
Stenella coeruleoalba				x
Delphinus delphis				x
Delphinus capensis	S		This paper	
Lagenodelphis hosei				x
Orcaella brevirostris	L		Lloze (1973)	
Neophocaena phocaenoides	L, S		Kemf (1993); this paper	
Dugong dugon	L, S		Tran Ngoc Loi (1962); Van Bree & Duguy (1977); this paper	

[1] L = litterature record, S = previously-unpublished specimen record, and O = previously-unpublished sighting record.

[2] Species not recorded, but expected to occur in Vietnam are based on species known from the Southeast Asia/Indo-Malay region (see Perrin et al., 1995).

[3] The litterature report of the blue Whale in Vietnam is apparently erroneous.

[4] The litterature report of the pygmy sperm whale in Vietnam is questionable.

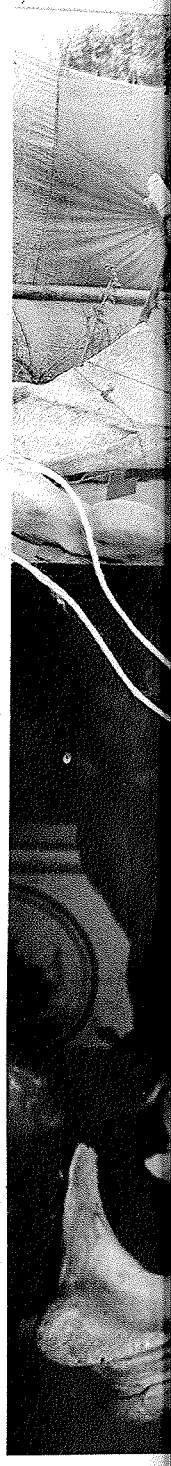

Fig. 5. Skulls of baleen whales and probable Bryde's

Source(s)	Not Recorded But Expected[2]
	x
This paper	
This paper	
This paper	
This paper	
This paper	
This paper	
This paper	
Zhou Kaiya & Qian Wenjuan (1985); this paper	
This paper	
This paper	
	x
	x
This paper	
	x
Lloze (1973)	
Kemf (1993); this paper	
Tran Ngoc Loi (1962); Van Bree & Duguy (1977); this paper	

imen record, and O = previously-un-

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s apparently erroneous.
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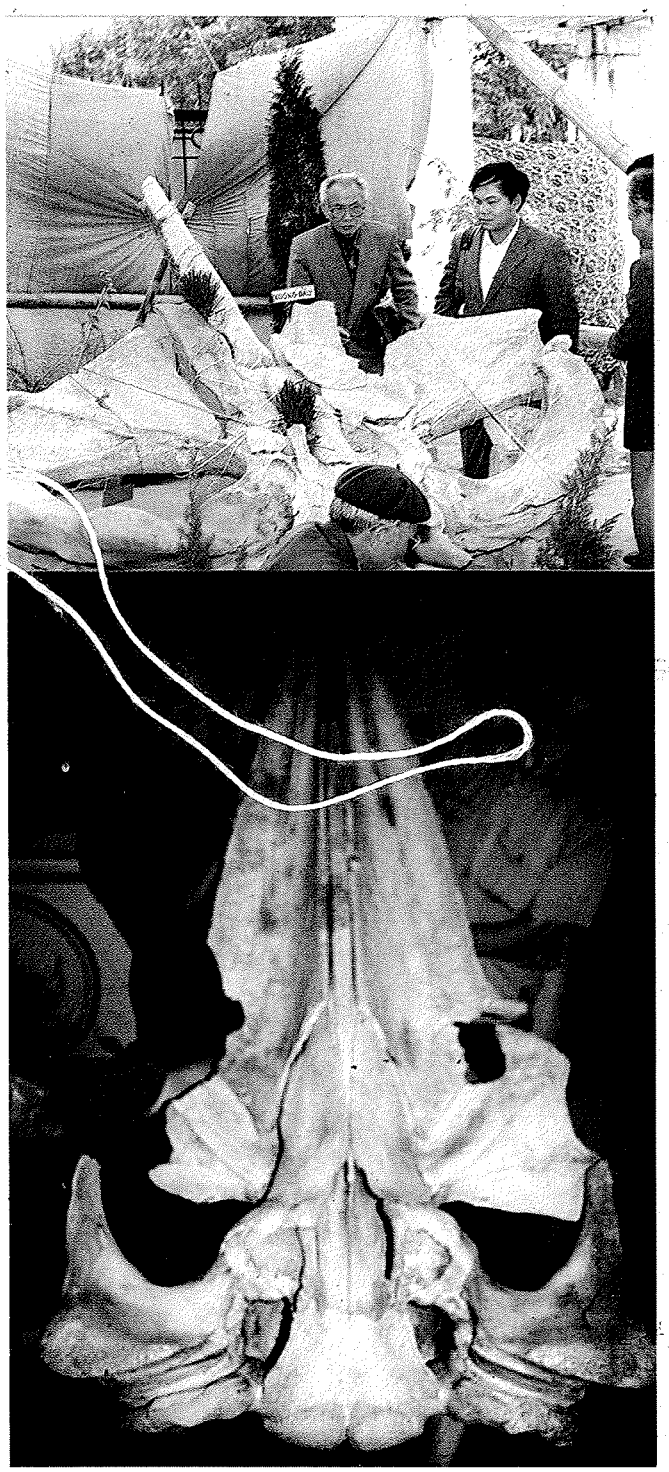


Fig. 5. Skulls of baleen whales from Vietnam: humpback whale from the north coast (*top*); and probable Bryde's whale (DL4) from Dai Lanh whale temple (*bottom*)

Fig. 6. Skulls of *Kogia spp.*, pygmy sperm whale (VG3) from Van Gia whale temple (*bottom*); and a dwarf sperm whale (DM4) from Dam Mon whale temple (*top*).

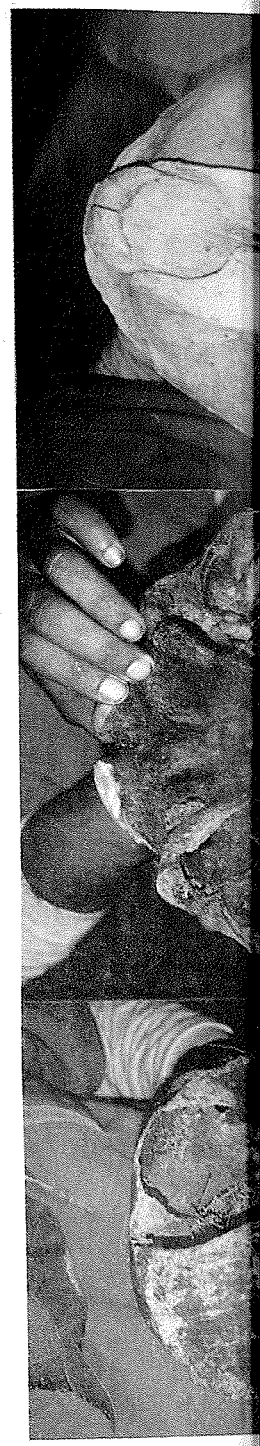
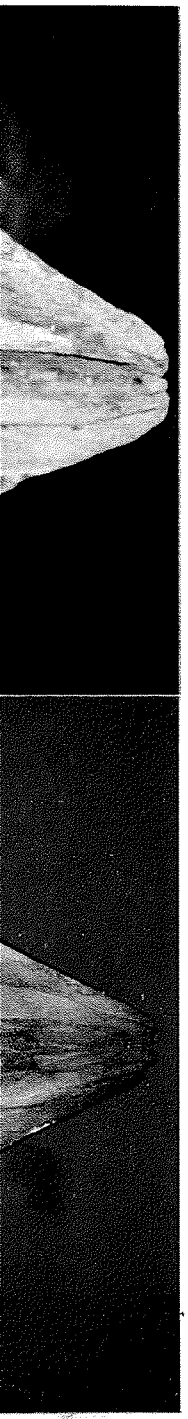


Fig. 7. Skulls of blackfish fr
pygmy killer w



Van Gia whale temple (*bottom*);
whale temple (*top*).

Fig. 7. Skulls of blackfish from Dam Mon whale temple: melon-headed whale (DM1) (*bottom*); pygmy killer whale (DM5) (*center*), short-finned whale (DM9) (*top*).

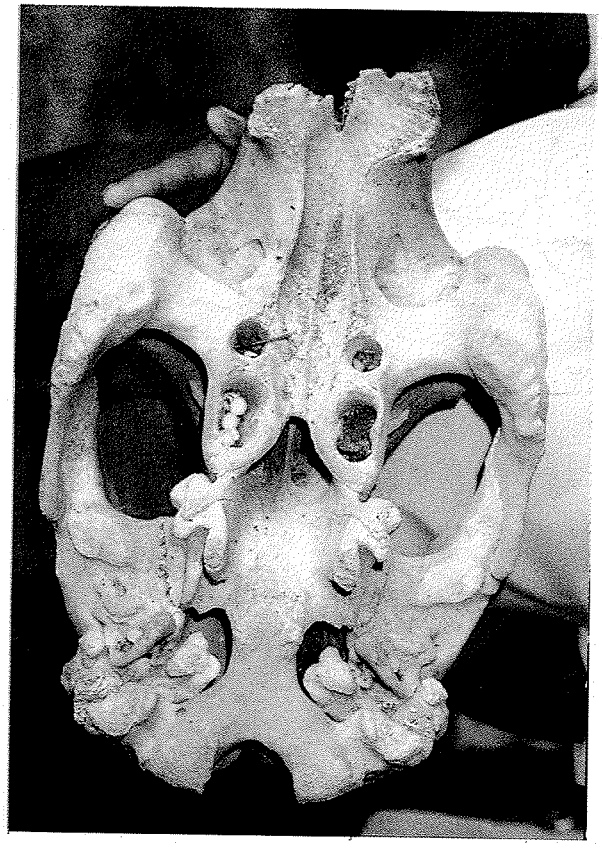


Fig. 14. Skull of a dugong (NH2) from Ninh Hai (Hon Khoi) temple

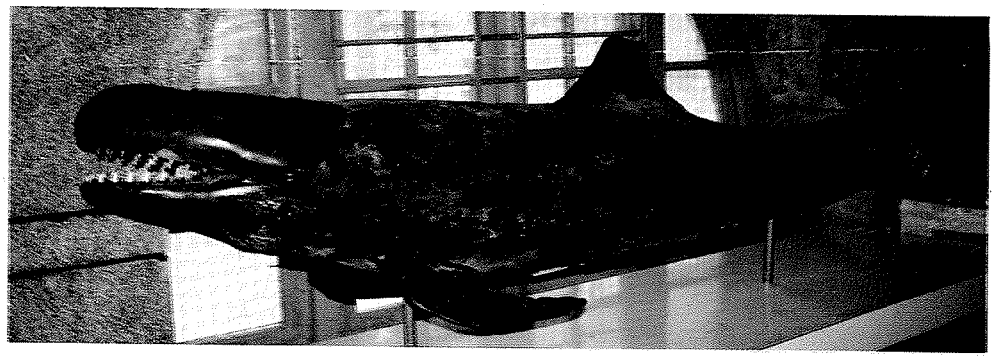
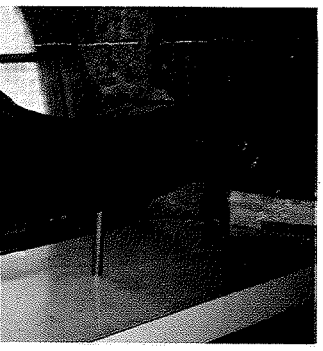


Fig. 8. Stuffed specimen of a false killer whale at the Oceanographic Museum in Nhatrang.

Fig. 9. Skulls of a
and a bottle

Hon Khoi) temple



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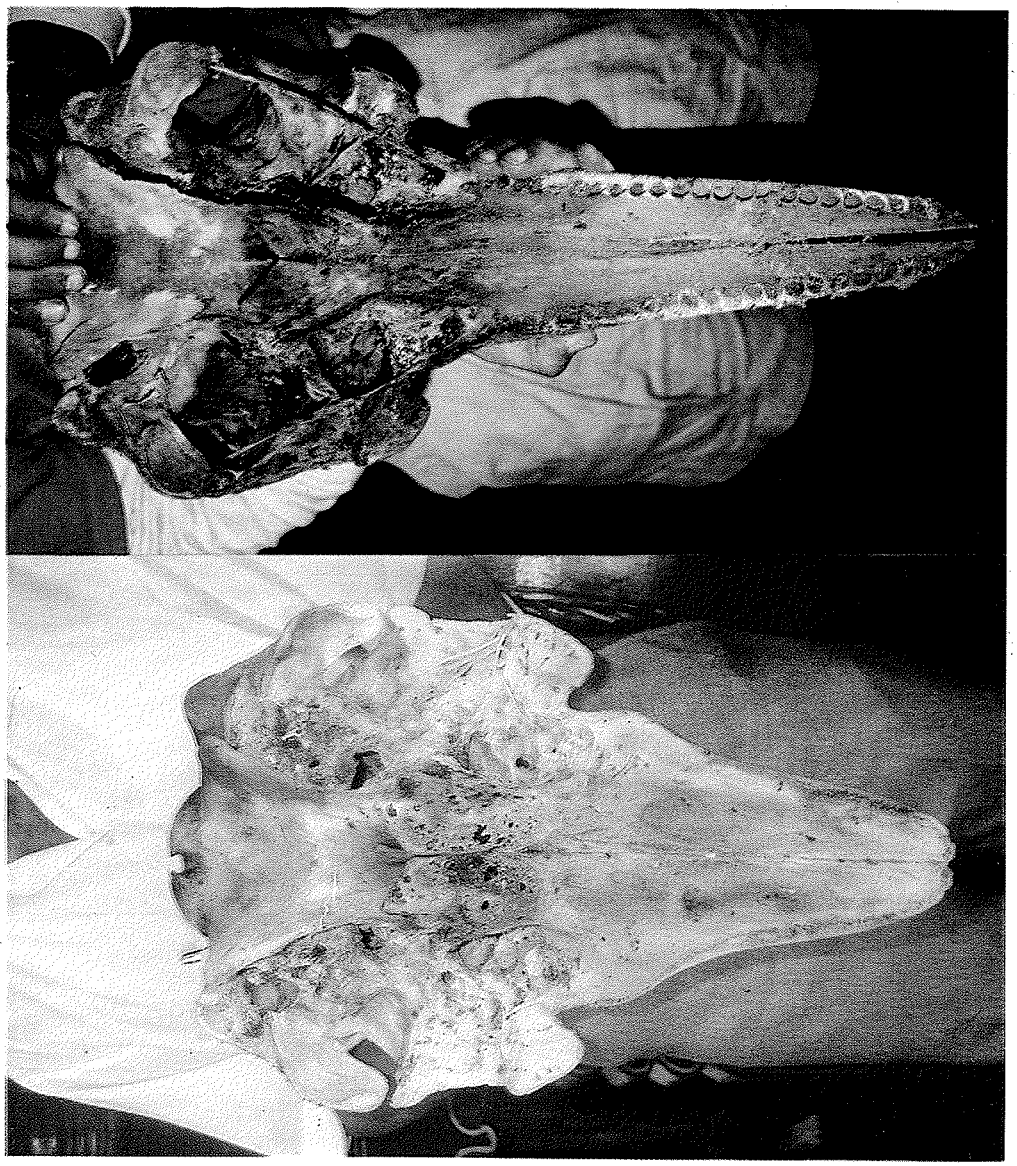


Fig. 9. Skulls of a Risso's dolphin (NC8) from Ninh Chu whale temple (*bottom*); and a bottlenose dolphin (DM2) from Dam Mon whale temple (*top*).

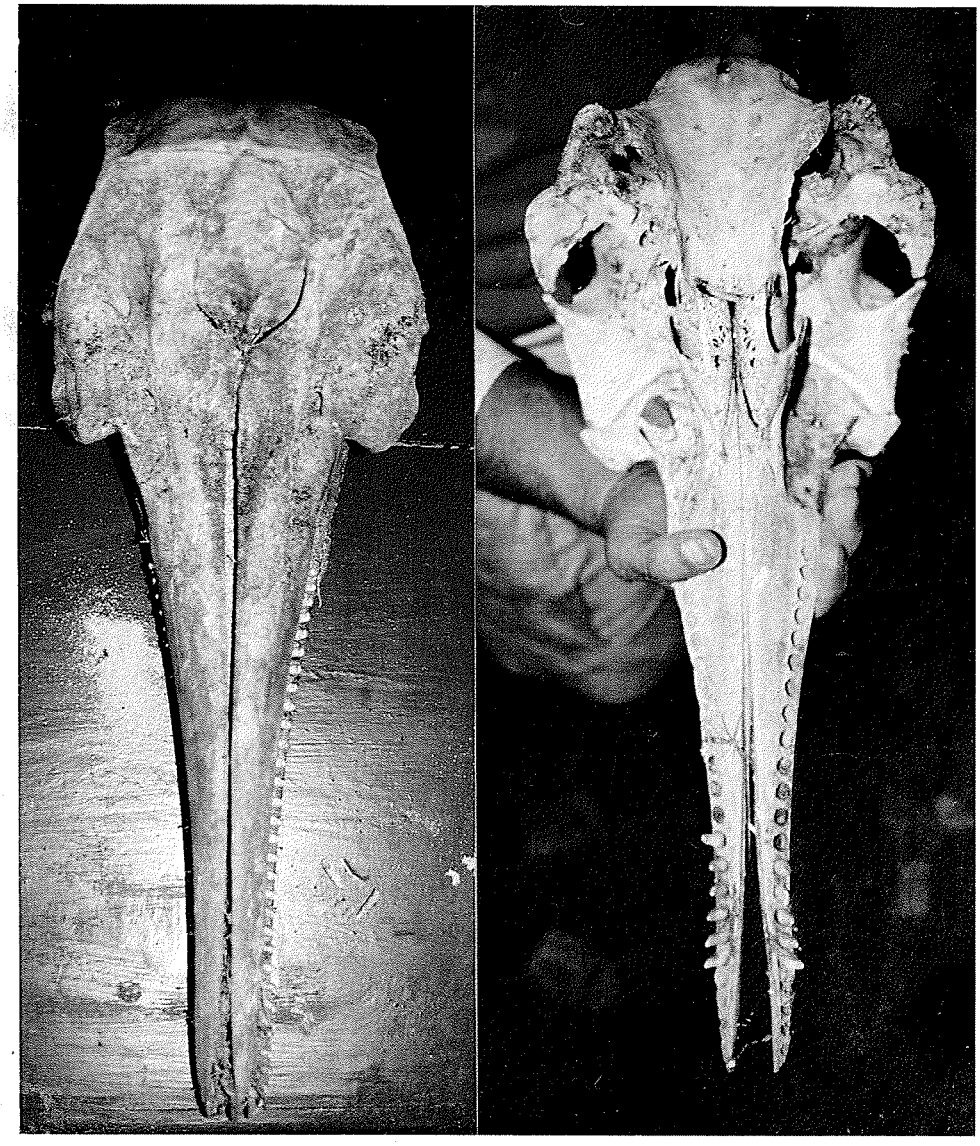
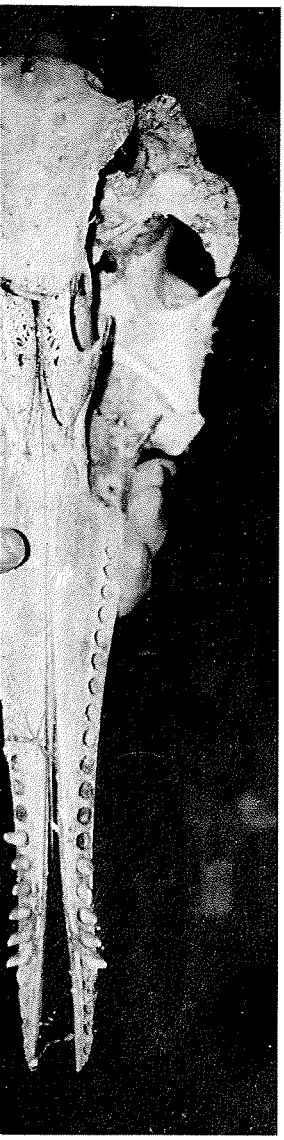


Fig. 10. Skulls of an Indo-pacific humpbacked dolphin (VG4) from Van Gia whale temple (*left*); and a rough-toothed dolphin (DM8) from Dam Mon whale temple (*right*).

Fig. 11. Skulls of *Stenella*
a



Van Gia whale temple (*left*);
le temple (*right*).

Fig. 11. Skulls of *Stenella spp.* From Khai Luong whale temple: a spinner dolphin (KL9) (*left*); and a pantropical spotted dolphin (KL1) (*right*).

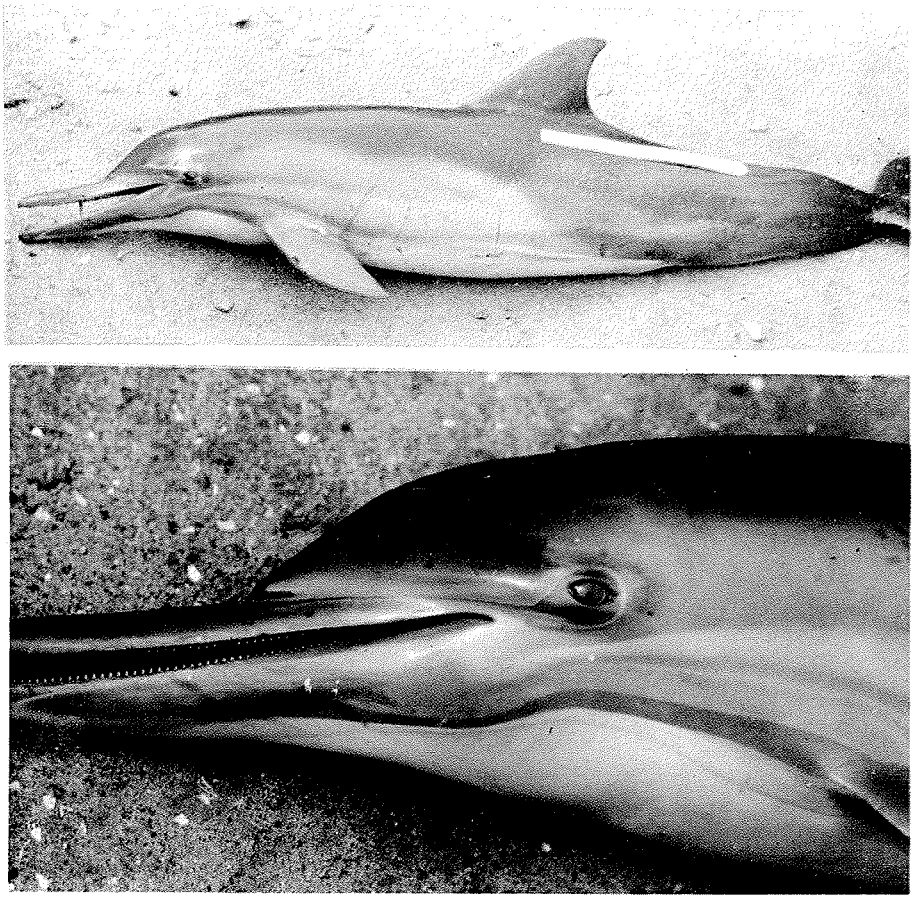


Fig. 12. Long-beaked common dolphin stranded in Nhatrang, stuffed specimen now on display at the Institute of Oceanography in Nhatrang.

Fig. 13. Finless porpoise caught in fishing net near the Mekong River Delta.

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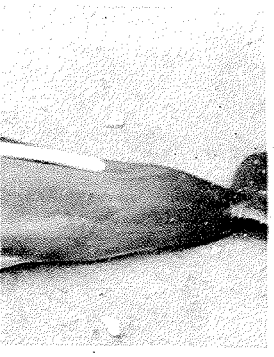

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