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Stranding record activities at the Institute of Cetacean Research

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ABSTRACT

The Institute of Cetacean Research (ICR) has been engaged in collecting and analyzing cetacean stranding records along the coast of Japan for a number of years. Stranding records are reported to the ICR voluntarily by the general public as well as staff from local governments, universities, aquariums and museums. In this document, the stranding record activities of the ICR are described briefly. A total of 4,275 individual records involving toothed and baleen whales were made during 1996–2015. Of these, 297 related to baleen whale species and 3,943 to toothed whale species. In 35 cases the species could not be determined due to insufficient morphological information or evidence from genetic analysis. When possible, samples and data have been collected from stranded cetaceans and used in different studies.

INTRODUCTION

Cetaceans can become stranded along the coast line due to a variety of reasons. They can be stranded alive or found dead after drifting to the shore. A mass stranding is defined as two or more individuals (excluding parent-calf pairs) stranded in the same location at the same time (Geraci and Lounsbury, 2005). This kind of stranding is common in a few species of toothed whales that strand in groups of 15 to 100 or more (Geraci and Lounsbury, 2005). There are records of at least 19 species of toothed whales and four species of baleen whales related to mass stranding events (Martin *et al.*, 1990). While mass stranding is generally rare in baleen whales, one exception is the mass stranding of sei whales that occurred in the Chilean Central Patagonia region in early 2015 (Häussermann *et al.*, 2017).

As a review study by Sergeant (1982) shows, there are a variety of possible reasons for stranding. Cetaceans can drift to the shore as a result of natural death. In many cases, calves separate from their parents and become stranded. In other cases, animals can be stranded due to weakness or diseases. Some of the diseases are caused by virus (Hinshaw *et al.*, 1986; Groch *et al.*, 2020), bacteria (Guzmán-Verri *et al.*, 2012), or parasite infections (Bowater *et al.*, 2003). In addition, whales may become lost due to the influence of wind, tide, or ocean currents and become beached or drift into harbors. In some cases, whales have been stranded because of man-made causes, such as entanglement or ship strike. The mass stranding of beaked whales has been related to mid-frequency active sonar (Piantadosi and Thalmann, 2004; Bernaldo de Quirós *et al.*, 2019). Further, some mass stranding events have been related to the geomagnetic field.

Cetacean stranding provides biologists with a wide range of information. This includes genetic samples for addressing taxonomic questions (Wada *et al.*, 2003; Yamada *et al.*, 2019; Rosel *et al.*, 2021), and biological samples for pathological (Hinshaw *et al.*, 1986; Bowater *et al.*, 2003; Guzmán-Verri *et al.*, 2012) and environmental pollutant studies (Law *et al.*, 2012; Bowater *et al.*, 2003; Garcia-Cegarra *et al.*, 2021). Also, data and samples have been used in population studies (Peltier *et al.*, 2012; 2013). Necropsies provide information to ascertain possible causes of death. A recent study based on stranding investigated microplastics ingestion (Burkhardt-Holm and N'Guyen, 2019). Analyses of stranding data allow the assessment of the impact of human activities on cetaceans (e.g., fishing gear entanglement, ship strikes, etc.).

In this document, the stranding record activities of the Institute of Cetacean Research (ICR) are described briefly.

STRANDING RECORD HELD AT THE ICR

Network

ICR has been collecting whale stranding records along the coast of Japan for a number of years. Stranding events can be reported by volunteers from the general public, local governments, universities, aquariums and museums. There is an established protocol and as well as a data sheet form available for providing stranding information to the ICR.

Protocol for data recording and species identification

The objective of this protocol is to facilitate and standardize the collection of data and samples from stranded animals. Such samples and data can be useful in understanding the reasons for the stranding as well as being useful in different research activities. The data sheet in Appendix 1 is a key part of the protocol, and show the basic items on data and samples to be collected. This form should be completed for each stranding event. Collection of samples are avoided when animals are found alive or when there are any safety concerns (Ishikawa and Ogino, 2001).

The collection of genetic samples is important because subsequent genetic analyses allow the confirmation of the species identity of the stranded animal. Furthermore, such genetic samples can be added to a larger collection of samples at the ICR, contributing to other studies a such as taxonomy and stock structure of the species involved.

Database

The basic information of stranding events recorded in the form in Appendix 1 is stored electronically in an Excel file. When the exact location in terms of latitude and longitude is not provided, geographic coordinates are assigned using geocoding from the address submitted. Only the cases where the species identity has been confirmed are added to the Excel file. The Excel file is updated annually and is upload to the ICR site https://www.icrwhale.org/zasho2.html (accessed 2021-09-30).

Sample storage

Samples for genetics analysis are kept in 99% ethanol in a sealed bottle that is pre-labeled and stored at room temperature (Figure 1). Other types of samples are kept in a frozen state.

NUMBER OF STRANDING EVENTS

Between 1996 and 2015 a total of 4,275 cetacean individuals were recorded in the ICR database related to stranding events (Table 1). Most of the cases corresponded to toothed whales.

EXAMPLES OF STRANDING RECORDS

The first example is on a large baleen whale found stranded on 1 April 2003 at Hitachi City, on the Pacific coast of Ibaraki prefecture, Japan (36°39'N, 140°42'E). Local authorities towed the carcass (via sea) to a sandy shore area within the Kawajiri Harbor, where the whale was buried. Prior to burial, however, biological research was conducted by staff of the Ibaraki Prefectural Oarai Aquarium, Ibaraki Nature Museum, National Museum

Figure 1. Storage samples for genetics analysis.

Table 1
Number of stranded cetaceans recorded in the ICR database during 1996–2015.

Suborder	Family	Events	Individuals	Genetic samples (percentage of individuals)
Mysticeti (Baleen whales)	Balaenidae	7	7	6 (85.7)
	Balaenopteridae	264	264	115 (43.6)
	Eschrichtiidae	4	4	2 (50.0)
	Unknown [1)]	22	22	6 (27.3)
Odontoceti (Toothed whales)	Delphinidae	577	1,357	86 (6.3)
	Kogiidae	143	156	24 (15.4)
	Phocoenidae	1,763	1,777	161 (9.1)
	Physeteridae	123	139	27 (19.4)
	Ziphiidae	259	265	75 (28.3)
	Unknown [1)]	235	249	15 (6.0)
Unknown [1)]		35	35	1 (2.9)

[1)] The cetacean could not be identified to the family level because extreme decomposition and/or lack of genetic samples.

of Nature Science and ICR. The procedure followed the protocol and the Stranding Recording Form (Appendix 1) was used to take photographs and collect biological tissue samples (Figure 2).

The whale was morphologically identified as a male North Pacific right whale with a body length of 12.95 m and body weight of approximately 33,000 kg. Three years after its burial, the carcass was cleaned, and the skeleton, together with relevant information, were displayed for educational purpose at the Ibaraki Prefectural Oarai Aquarium in January 2006.

The second example is that of a whale found stranded on 14 May 2015 in a decomposed state in the city of Takahagi (Figure 3). Ibaraki Prefectural Oarai Aquarium investigated the carcass and completed the sheet in Appendix 1, which was sent to ICR together with a skin sample for genetic analysis. The length of the whale was 4.6 m. Due to the advanced state of decomposition, only subsequent mitochondrial DNA (mtDNA) analyses were able to identify the animal as a North Pacific common minke whale.

Genetic analyses on stock structure have been conducted based on genetic samples from stranded whales. For example, Pastene *et al.* (in review) used mtDNA analyses for investigating the stock structure of western and eastern North Pacific right whales. The western samples included a number of stranded whales along the Japanese coast. Results of the analyses were consistent with the hypothesis that separate populations inhabit the eastern and western North Pacific Ocean respectively.

As shown in these cases, genetic samples from stranded animals make valuable contributions to the genetic analyses for species identification/confirmation, and to studies on stock structure.

Figure 2. Investigation of a stranded North Pacific right whale.

Figure 3. A stranded baleen whale. Subsequent genetic analyses identified the animal as a North Pacific common minke whale.

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Appendix 1.

Stranding Reporting Form

* This form is designed to record one whale per sheet.
To record multiple individuals at the same time, please use separate sheets.

OBSERVER NAME _____

AFFILIATION _____

ADDRESS _____ TEL _____

STRANDING TYPE 1. Beached / Drifting at sea 2. Bycatch 3. Entering river or harbor _____
* Please fill in the applicable number.

COMMON NAME _____ No. of Whales _____

_____
* If you have determined the species, please describe the distinctive features.

SEX 1. Male 2. Female 3. Unknown _____
* Please fill in the applicable number.

DATE Year _____ Month _____ Day _____ Hour _____
1.Sighting 2. Observation _____
1. Alive 2. Dead 3. Unknown _____
* Please fill in the applicable number.

LOCATION _____

STRANDING SITUATION _____
* Please provide any additional information on the situation when the animal was found.
In case of death, please describe the condition of the corpse.

ANIMAL INFORMATION
Body length (Measurement 1 on the reverse side. Measurement method used) _____
Body weight (Measurement method used) _____
External features _____
1. Body color 2. Baleen plate/ tooth 3. Snout (Shape of the tip of the head) 4. Dorsal fin
5. Notch of flukes (Presence / Absence of the notch; reverse side of the page)
6. Throat / Ventral grooves (reverse side of the page) 7. Color pattern of flipper 8. Other features

PHOTOGRAPHS TAKEN
1. Full body 2. Head 3. External genital organs 4. Other _____
* Please fill in the applicable number. If possible, attach any photographs.

SAMPLES COLLECTED _____ * Yes / No

Detail (Organ / Storage / Owner) _____

REMARKS _____

CARCASS DISPOSAL _____

MORPHOLOGICAL MEASUREMENTS

* Please use this side as an aid when the observer makes measurements.

The ownership of the measurement data belongs to the measurer and the Institute of Cetacean Research. If the data recorded by the Institute of Cetacean Research are used by other researchers, the consent of the measurer must also be obtained.

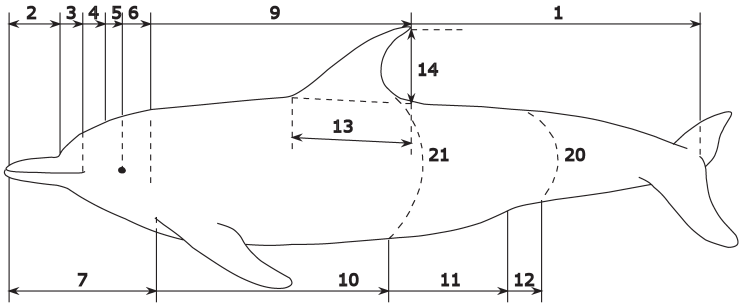
1. Tip of snout – Notch of flukes _____
2. – Base of beak _____
3. – Angle of gape _____
4. – Blowhole _____
5. – Center of eye _____
6. – Center of ear _____
7. – Base of flipper _____
8. – End of ventral grooves _____
9. – Posterior tips of dorsal fin _____
10. – Umbilicus _____
11. – Center of reproductive aperture _____
12. Tip of snout – Notch of flukes _____
13. Dorsal fin, length of base _____
14. Dorsal fin, vertical height _____
15. Flipper, boundary length of lower border _____
16. Flipper, boundary length of posterior _____
17. Flipper, maximum width _____
18. Width of flukes _____
19. Flukes, width at insertion _____
20. Girth of buttock, half _____
21. Girth of abdomen, half _____
22. Baleen plate / Tooth, maximum height _____
23. Baleen plate / Tooth, maximum width _____

* Please indicate all length measurements in centimeters. Please measure parallel to the body axis.

24. # Tooth Upper left _____ Upper right _____ Lower left _____ Lower right _____
25. Body weight _____

* Be aware of the possibility of an impacted tooth.

Toothed whales, dolphins, and porpoises



Baleen whales