

**Summarized Results
of Two Necropsy Sessions
of Harbor Porpoise
Phocoena phocoena
Incidentally Taken During
Commercial Fishing Operations
in the Gulf of Maine**

by

John R. Nicolas

NOAA/National Marine Fisheries Service
Northeast Fisheries Science Center
Conservation and Utilization Division
Woods Hole, MA 02543-1097

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Table of Contents

Introduction	1
Specimen Materials	1
Necropsy Protocols	1
Results	1
Discussion	2
Acknowledgments	2
Literature Cited	2
Appendix: Necropsy protocols	7

List of Tables

Table 1. Locations and tag numbers of necropsy specimens	2
Table 2. Sex, total length, and weight of necropsy sepcimens by tag number	2
Table 3. Sample summary table, 1992	3
Table 4. Sample summary table, 1993	4
Table 5. Collaborating researchers, institutions, and research projects	5

List of Figures

Figure 1. Necropsy specimen locations from the Gulf of Maine	6
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INTRODUCTION

Twenty-five harbor porpoise *Phocoena phocoena* were necropsied during two sessions at the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts in two sessions held in 1992 and 1993. The first session was March 10-13, 1992 and the second January 12-15, 1993. Several scientists representing a broad spectrum of research interests, both national and international, took part in these sessions. In addition to samples collected by researchers attending these sessions, many samples were taken to support ongoing research projects.

The subject animals were all incidentally caught during sink gillnet fishing operations in the Gulf of Maine (NEFSC 1992). Most of the animals were taken between October and April of both years. The animals were of excellent specimen quality, thus maximizing sample collection. The goal of the necropsy sessions was to collect biological samples sufficient to support present and future research pursuing a better understanding of the biological parameters of the species. A summary of the biological samples collected, and the research they will support, are reported herein.

SPECIMEN MATERIALS

Harbor porpoise incidentally killed in the sink gillnet fishery in the Gulf of Maine are handled with extreme care to ensure optimum specimen quality. Immediately after an animal is landed it is placed in an insulated, leakproof bag and packed in ice. Once the carcass has reached port it is transported to one of three chest freezers located at or near various key ports. The carcass is then relocated to NEFSC, Woods Hole to await necropsy. Prior to necropsy whole specimens were stored frozen at -20°F.

Samples from each specimen were collected to satisfy at least eight general categories: biochemistry, genetics, histopathology, life history, parasitology, physiology, systematics, and toxicology. Samples collected for these categories were either frozen at -20°F or preserved in alcohol, buffered formalin, or DMSO.

NECROPSY PROTOCOLS

An external inspection of each animal was made to determine sex, general condition, and nutritional state. Following external examina-

tion, each animal was photographed, the total weight and blubber weight were recorded, and various body measurements were taken. Internal organs were inspected to document the presence of lesions and/or parasites.

Tissue samples were collected from five major organs: heart, liver, kidney, brain, and gonads. Skin and blubber samples were removed, stomachs frozen, and teeth were extracted. The skulls and the post-cranial complex of mature animals were refrozen and will be archived at the Smithsonian Institution.

Necropsy protocols from the University of Guelph, James Madison University, and the Woods Hole Oceanographic Institution (Appendix) were used during both sessions. In addition, samples were collected to support other researchers' projects.

RESULTS

Twenty-five carcasses from the central Gulf of Maine were necropsied (Table 1). The sex, length, and total weight of the carcasses is shown

Table 1. Locations and tag numbers of necropsy specimens

Tag Number	Latitude	Longitude
0026	42°- 57'	70°- 02'
1617	43°- 07'	70°- 02'
0256	42°- 50'	70°- 18'
0325	43°- 29'	69°- 38'
0265	43°- 30'	69°- 38'
0263	43°- 31'	69°- 38'
1614	42°- 53'	70°- 09'
0465	42°- 54'	70°- 23'
0140	*	*
0460	43°- 08'	70°- 03'
0148	42°- 52'	70°- 41'
0211	42°- 40'	67°- 56'
0474	43°- 13'	70°- 11'
0478	42°- 25'	70°- 49'
0471	42°- 58'	70°- 22'
0010	42°- 53'	70°- 31'
0048	43°- 01'	70°- 02'
0492	42°- 52'	70°- 29'
0050	43°- 02'	70°- 23'
0053	43°- 07'	70°- 20'
0367	43°- 00'	70°- 25'
0339	39°- 47'	71°- 53'
0372	43°- 02'	70°- 23'
0047	43°- 04'	70°- 20'
0141	*	*

* No field data available

Table 2. Sex, total length, and weight of necropsy specimens by tag number

Tag Number	Sex	Total Length (cm)	Total Weight (kg)
0026	M	121	34.3
1617	F	122	35.3
0256	M	142	42.3
0325	M	144	45.7
0265	M	119	33.2
0263	F	152	64.7
1614	F	146	56.7
0465	M	138	43.6
*0140	F	163	82.0
0460	M	137	53.0
0148	F	150	64.9
0211	F	126	31.75
0474	F	128	32.97
0478	F	119	29.9
*0471	F	158	64.8
*0010	F	150	55.0
0048	M	124	37.3
*0492	F	156	66.8
0050	F	154	59.5
0053	M	151	47.2
*0367	F	140	51.4
0339	F	113	28.0
0372	M	141	44.4
0047	M	126	35.2
0141	M	142	50.5

* Fetus present

in Table 2. Fifty-six percent (n=14) were female. Females ranged in length from 113 to 163 cm, with an average length of 141.2 cm (sd=16.40). The weight of the females ranged from 28.0 to 82.0 kg, with average weight of 51.7 kg (sd=17.12). Males were somewhat smaller and lighter. The lengths ranged from 119 to 151 cm, with average length of 135.0 cm (sd=10.66); and weights ranged from 33.2 to 53.0 kg, with an average weight of 42.4 kg (sd=6.67).

Fourteen animals had been incidentally killed in 1992, and eleven in 1993. From those specimens, approximately 600 soft tissues, 82 hard parts, 25 stomachs, and three fetuses were collected. Specific tissues taken from each specimen are listed in Tables 3 and 4.

Samples from harbor porpoise were collected for twelve research groups in the United States, five in Canada, and one each in England and Sweden (Table 5). A standard reference of both hard and soft tissues is archived at the Northeast Fisheries Science Center in Woods Hole, Massachusetts.

DISCUSSION

Sampling the bycatch of cetaceans taken during commercial fishing operations provides an opportunity to obtain unique biological specimens that are important in several areas of pure and applied research. Access to samples has been facilitated by the presence of sea-going technicians aboard domestic fishing vessels. The cooperation of fishermen working with these technicians has allowed a large fraction of the harbor porpoise observed killed to be sampled. The accumulation of large numbers of specimens for individual necropsy sessions has encouraged researchers with a wide range of research skills to work together to make optimal use of the available material. The samples collected are contributing to advances in the understanding of the biology of harbor porpoises in New England waters, and of the species more generally.

ACKNOWLEDGEMENTS

Many thanks to the session participants, Dr. Ramona Haebler (USEPA, Narragansett R.I.), Dr. Darlene Ketten (Harvard Medical School, Boston Mass.), Ms. Heather Koopman and Andrew Westgate (University of Guelph, Ontario, Canada), Mr. William McLellen (James Madison University, Harrisonburg, Vir.), Mr. Charles Potter and Dr. Sentiel Rommel (National Museum of Natural History, Washington D.C.), Mr. David Potter (NOAA/NEFSC Woods Hole, Mass.), and Dr. Andrew Read (Woods Hole Oceanographic Institution, Woods Hole, Mass.). In addition to the session participants, I wish to offer thanks to all of the sea-going observers for the collection of the specimens used during the sessions and to the captains and crews of the many fishing vessels for their generous assistance. Also a special thanks to Janeen Cox of the NEFSC for her Word Perfect wizardry, and Todd McConchie for his assistance with data entry.

LITERATURE CITED

NEFSC [Northeast Fisheries Science Center]. 1992. Harbor porpoise in North America: status and research needs. Woods Hole, Mass: NOAA/NMFS/NEFSC. *Center Ref. Doc. 92-06*. Available from: NEFSC, 166 Water Street, Woods Hole, MA 02543.

Table 3. Sample summary table 1992

Tag# ¹	Photo ²	Morphs/ ³ Measure	Blub ⁴ Mass	Blub ⁵	Musc ⁶ Froz	Musc ⁷ DMSO	Teeth	Gonads	Stom ⁸	Skull	Post ⁹ Cran	Dorsal Fin	Heart	Liver	Brain	Kidney	Other
0211	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	DAP
0474	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No
0478	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
0471	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	DAP
0010	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
0048	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
0492	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	DAP
0050	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
0053	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	DAP
0367	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No
0339	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No
0372	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	DAP
0047	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No
0141	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No

- ¹ Tag # = Tail tag number
² Photo = Photograph
³ Morphs/measure = Morphometric measurements
⁴ Blub Mass = Blubber mass (kg)
⁵ Blub = Blubber sample
⁶ Musc Froz = Muscle frozen
⁷ Musc DMSO = Muscle DMSO preserved
⁸ Stom = Stomach
⁹ Post cran = Post cranial

Table 4. Sample summary table 1992

Tag# ¹	Photo ²	Morphs/ ³ Measure	Blub ⁴ Mass	Blub ⁵	Musc ⁶ Froz	Musc ⁷ DMSO	Teeth	Gonads	Stom ⁸	Skull	Post ⁹ Cran	Dorsal Fin	Heart	Liver	Brain	Kidney	Other
0026	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Melon ¹⁰
1617	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Melon
0256	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Melon
0325	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI ¹¹	No	Yes	Yes	Yes	Yes	Yes	Melon
0265	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	No	Yes	Yes	Yes	Yes	Yes	Melon
0263	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	SI	Yes	Yes	Yes	Yes	Yes	DAP ¹²
1614	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	SI	Yes	Yes	Yes	Yes	Yes	DAP
0465	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	SI	Yes	Yes	Yes	Yes	Yes	DAP
0140	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	SI	Yes	Yes	Yes	Yes	Yes	Fetus
0460	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SI	SI	Yes	Yes	Yes	Yes	Yes	Fetus
0148	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	None

- ¹ Tag # = Tail tag number
² Photo = Photograph
³ Morphs/measure = Morphometric measurements
⁴ Blub Mass = Blubber mass (kg)
⁵ Blub = Blubber sample
⁶ Musc Froz = Muscle frozen
⁷ Musc DMSO = Muscle DMSO preserved
⁸ Stom = Stomach
⁹ Post cran = Post cranial
¹⁰ Melon = Melon bones
¹¹ SI = Smithsonian Institution
¹² DAP = D. Ann Pabst

Table 5. Collaborating researchers, institutions, and research projects where data collected will be used

Researcher	Institution	Research Project
Joseph Adelstein	Cape Cod Research, Falmouth, MA	Hydrodynamic properties of skin and blubber
Per Berggren	University of Stockholm, Sweden	Organic chlorine in blubber
John Jahoda	Bridgewater State College, Bridgewater, MA	Skull for display
Andrew Dizon	Southwest Fisheries Science Center, La Jolla, CA	Tissue Banking
David Johnston	University of Guelph, Ontario, Canada	Heavy Metal Analysis
Ramona Haebler	EPA, Narragansett, RI	Contaminant loading of internal organs
Usha Varanasi	National Marine Mammal Laboratory, Seattle, WA	Chemical contaminants in tissues
Darlene R. Ketten	Harvard Medical School, Boston, MA	Physiology of the inner ear
Heather Koopman	University of Guelph, Ontario, Canada	Biochemical composition and structure of blubber
Jon Lien	Memorial University of St. John's, Newfoundland	Stable isotopes
Christina Lockyer	Sea Mammal Research Unit, Cambridge, UK	Age comparison of Northwest and Northeast Atlantic <i>Phocoena</i>
John Nicolas	NMFS/NEFSC/Woods Hole, MA	Sample archival
Ann Pabst, Bill McLellen	James Madison University, Harrisonburg, VA	Dorsal fin anatomy and temperature regulation/muscle development
Charley Potter	Smithsonian Institution, Washington, D.C.	Archival of <i>Phocoena</i> skeletons/ systematics
Andrew Read	WHOI, Woods Hole, MA	Life history analysis of <i>Phocoena</i> in the Northwest Atlantic
Sentiel Rommel	Smithsonian Institution, Washington, DC	Thermal regulation
John Wang	University of Guelph, Ontario, Canada	Genetic analysis
Andrew Westgate	University of Guelph, Ontario, Canada	Organic contaminant levels in blubber
Stephen Wise	NIST, Washington, D.C.	Tissue banking

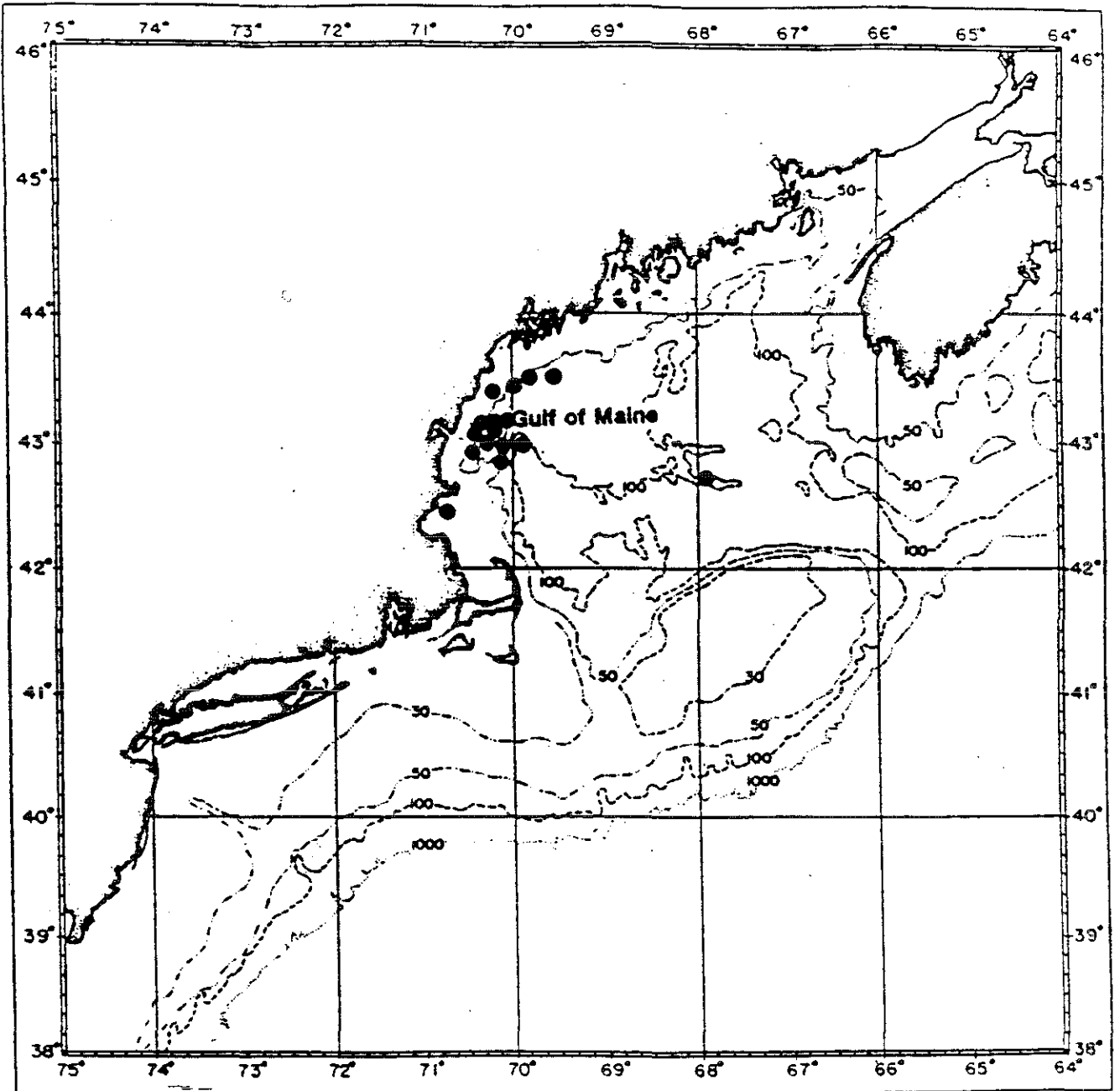


Figure 1. Necropsy specimen locations from the Gulf of Maine.

APPENDIX

NECROPSY PROTOCOLS

**James Madison University - Mr. William McLellen
University of Guelph - Ms. Heather Koopman
Woods Hole Oceanographic Institution - Dr. Andrew Read**

MR. WILLIAM MCLELLEN
James Madison University

NECROPSY PROTOCOL

PHOCOENA MASS DISSECTION

Field Number	_____	Total Length	_____
Total Weight	_____	Sex & Age estimate	_____
Left Flipper	_____	Right Flipper	_____
Fluke lobes	_____	Dorsal Fin	_____
Left Blubber	_____	Right Blubber	_____
Left Panniculus	_____	Right Panniculus	_____
Left Iliocostalis	_____	Right Iliocostalis	_____
Left Epaxial	_____	Right Epaxial	_____
Left Mammary	_____	Right Mammary	_____
Left Scalenes	_____	Right Scalenes	_____
Left Sternomastoid	_____	Right Sternomastoid	_____
Left Sternohyoid	_____	Right Sternohyoid	_____
Left Sternothyroid	_____	Right Sternothyroid	_____
Left Shoulder (comp)	_____	Right Shoulder (comp)	_____
Left Shoulder muscle	_____	Right Shoulder muscle	_____
Left Scapula	_____	Right Scapula	_____
Left Ribs w/ muscle	_____	Right Ribs w/ muscle	_____
Left Intercostals	_____	Right Intercostals	_____
Left Ribs	_____	Right Ribs	_____
Left Rectus abdominus	_____	Right Rectus abdominus	_____
Left Ischiocaudalis	_____	Right Ischiocaudalis	_____
Left Hypaxial	_____	Right Hypaxial	_____

PHOCOENA MASS DISSECTION

Left Kidney	_____	Right Kidney	_____
Left Adrenal	_____	Right Adrenal	_____
Left Ovary	_____	Right Ovary	_____
Left Testis	_____	Right Testis	_____
Left Gonad dimensions	_____	Right Gonad dimensions	_____
Left Epididymus	_____	Right Epididymus	_____
Sperm present?	_____	Bladder full/empty	_____
Male repro-tract	_____	Uterus	_____
Left Lung	_____	Right Lung	_____
Heart	_____	Thymus	_____
Intestine	_____	Thyroid	_____
Liver	_____	Dorsal Aorta & Rete	_____
Diaphragm	_____		
Pancreas	_____		
Mesenteric lymph-node	_____		
Spleen	_____		
Esophagus	_____		
Stomach full	_____	Stomach empty	_____
Fore Stomach	_____	Main Stomach	_____
Pyloric Stomach	_____	Duodenum	_____
Stomach volume	_____		
Stomach contents:			

PHOCOENA MASS DISSECTION

Head Intact	_____		
Ventral Blubber	_____	Dorsal Blubber	_____
Ventral Misc.	_____	Dorsal Misc.	_____
Brain	_____	Trachea	_____
Skull weight	_____	Hyoids	_____
Vertebral Column	_____	Pelvics	_____
Sternum	_____	Ribs #Double/#Single	_____
Vertebral count	<u>cervical</u>	<u>thoracic</u>	<u>lumbar</u> <u>caudal</u>

PARASITES

Crassicauda:

Monorhynchus:

Phyllobothrium:

Anterior

Posterior



Campulla:

Stenurus:

Nasitrema:

Lung worm:

COMMENTS:

MS. HEATHER KOOPMAN
University of Guelph

NECROPSY PROTOCOL

Protocol for Analysis of Harbour Porpoise (Phocoena phocoena) Blubber

Heather Koopman, Dept. of Zoology, University of Guelph

The objective of this project is to examine the distribution and chemical composition of lipid in the harbour porpoise.

Blubber Thickness

*This is the most important part of the protocol, and also the most time-consuming.

Blubber thickness is measured in mm in situ, excluding skin, in 49 locations on one side of the body (preferably the right). First, a cut is made on the dorsal midline of the animal from the blowhole to the flukes. A ventral midline cut is then made from the posterior edge of the jaw to the flukes. All cuts made on the animal should go through the skin, blubber and nuchal (sub dermal) fat, but not the underlying musculature.

The total length of the animal is then divided by 8 (= x cm). Seven half-girth cuts (dorsal to ventral) are then made on the right side of the animal every x cm.

Each of these dorso-ventral cuts (i.e. half-girths) must then be divided to make seven measurements. Each cut is measured and divided by 6 (= y cm). Take blubber measurements at the following places on each cut: at the top (on the dorsal ridge), at y cm, at $2y$ cm, at $3y$ cm, at $4y$ cm, at $5y$ cm and at the bottom (ventral midline).

The diagram (Fig. 1) makes this a lot easier to visualize.

* make all cuts before measuring to ensure even strain/shrinkage on the tissue.

* please note any damage on the animal that would affect the thickness measurements.

Additional blubber thicknesses

(These are also important. If time is limited, however, do only these measurements instead of the above)

Half girth cuts are made on one side of the animal at (I) the posterior insertion of the flipper, (II) just anterior to the dorsal fin, and (III) at the anus. Blubber thickness is measured in mm, excluding skin at three points on each cut: dorsal, lateral and ventral. The ventral (III) measurement is usually not taken.

Again, see diagram (Fig. 2).

Blubber Samples (10)

These are taken at precise locations along cuts made for blubber thickness. Blubber samples should include skin (still attached) and be about 10 x 10 cm. The blubber should be placed in a plastic bag clearly labelled with i) animal number and ii) position of sample on body, and frozen at - 20 °C.

Samples are taken at the eight sites of blubber thickness measurement described in "additional blubber thicknesses" (see Fig. 2), just posterior to the first half-girth cut (on the head) and just anterior to the last half-girth cut (on the caudal peduncle) described in the main blubber thickness measurement section (Fig. 1). A visual representation of all ten sampling locations is given in Fig. 3.

Other Tissue Samples

If possible, the following tissues (in order of importance) can also be collected, stored in appropriately labelled bags and frozen:

- *nuchal fat* - the soft fat layer beneath the blubber layer, generally found around the head and ribs, can be gently separated from the underlying connective tissue and muscle with a scalpel. The fat can be completely removed from one side of the animal above the rib line, weighed, and maximum thickness measured.

- *fat surrounding the organs* - this can be removed from the organs and frozen.

- *foetus* - the foetus can be removed from the uterus its membranes and frozen whole.

- *epaxial muscle, liver, heart, kidney* - these tissues can be sampled (pieces of about 10 x 6 x 6 cm are best) and frozen.

- *bones (4)* - the fifth rib, scapula, one lumbar vertebra and one caudal vertebra.

These can be frozen.

Please ship tissues (frozen) to:

Heather Koopman
272B Axelrod Building
Department of Zoology
University of Guelph
Guelph, Ontario
N1G 2W1

Please contact me prior to shipping:

Phone 1-519-824-4120 ext. 8386 Fax 1-519-767-1656

Figure 1. Cuts for blubber thickness measurements of harbour porpoise (Phocoena phocoena).

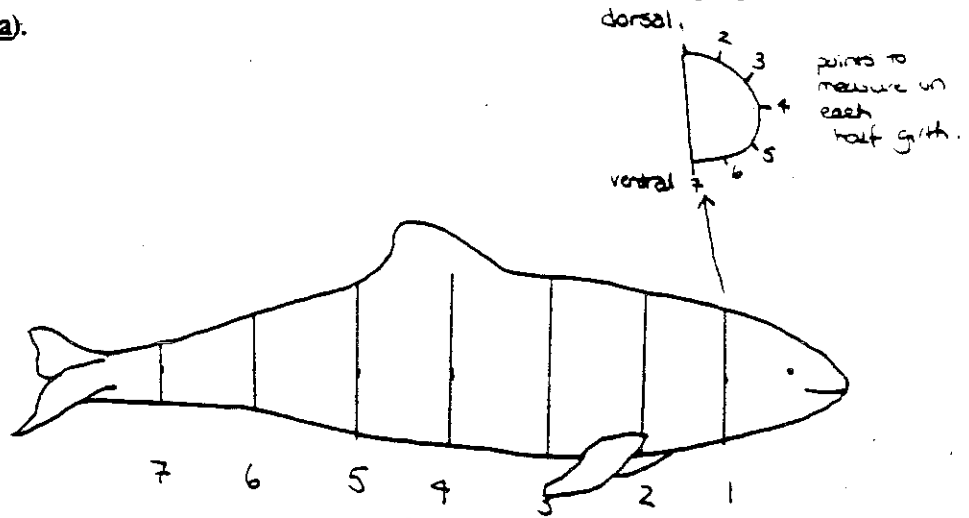


Figure 2. Cuts for additional blubber thickness measurements of harbour porpoise.

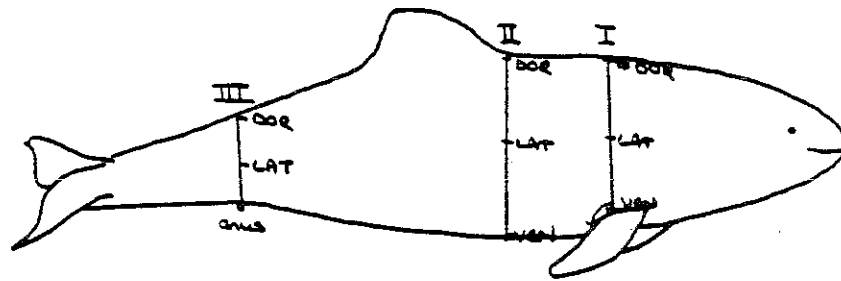
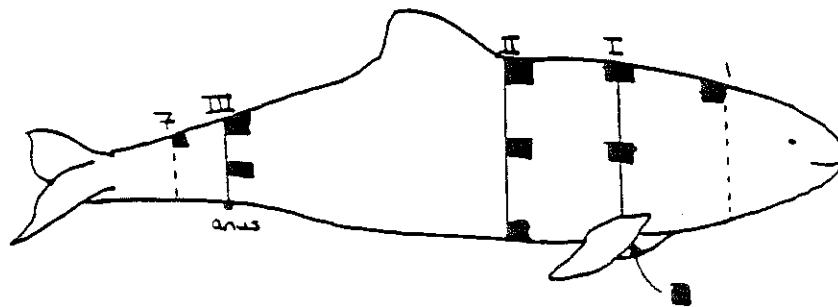


Figure 3. Sites of blubber sampling on harbour porpoise.



DR. ANDREW READ
Woods Hole Oceanographic Institution

NECROPSY PROTOCOL

CETACEAN SPECIMEN RECORD

SPECIES _____ SEX _____ LENGTH _____

LOCATION _____

CONDITION _____

CAUSE OF DEATH _____

COMMENTS _____

FIELD NO. _____

CATALOG NO. _____

PHOTO NOS. _____

OBSERVERS _____

CAPTURE DATE _____

NECROPSY DATE _____

Tooth Wear _____

Tooth Counts UL _____ UR _____ LL _____ LR _____

BLUBBER THICKNESS cm

I-DOR	.
I-LAT	.
I-VEN	.

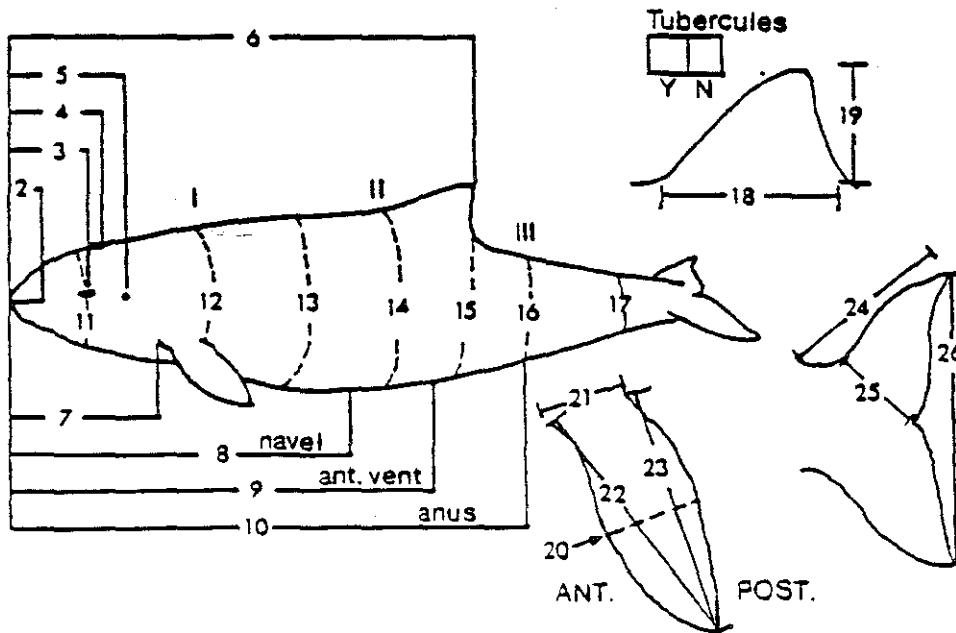
II-DOR	.
II-LAT	.
II-VEN	.

III-DOR	.
III-LAT	.

BODY WT. _____

BLUBB. WT. _____

MEASUREMENTS STRAIGHT LINE & AXIAL



LEFT SIDE:

2	.
3	.
4	.
5	.
6	.
7	.
8	.
9	.
10	.
11	.
12	.
13	.
14	.
15	.
16	.
17	.
18	.
19	.
20	.
21	.
22	.
23	.
24	.
25	.
26	.

REPRODUCTIVE TISSUES

FIELD NO. _____

Gonad Dimensions L x W x D Left _____ Right _____
 Lactating _____ Mammary Gland Colour _____ L x W x D _____
 Pregnant _____ Foetus Length _____ Weight _____ Sex _____
 C. Lutea _____ C. Albicantia _____ Uterine Diam. L. _____ R. _____
 Sperm in Epididymus _____ Testis Wt. L. _____ R. _____
 Comments _____

STOMACH CONTENTS

	Full Wt.	Empty Wt.	Contents
FORE	_____	_____	_____
MAIN	_____	_____	_____
PYLORIC	_____	_____	_____

Comments _____

ORGAN WEIGHTS:(g)

Heart	_____	L. Kidney	_____	Stomachs	_____
L. Lung	_____	R. Kidney	_____	Skeleton	_____
R. Lung	_____	Pancreas	_____	Brain	_____
Liver	_____	L. Adrenal	_____	Intestines	_____
Spleen	_____	R. Adrenal	_____	Muscle	_____

PARASITES & PATHOLOGY

Stomach _____
 Intestine _____
 Kidney _____
 Pancreas _____
 Mammary _____
 Liver _____
 Lungs _____
 Heart _____
 Brain _____
 Sinuses _____
 Other _____

SPECIMEN CHECKLIST

Teeth	_____	Gonads	_____	Parasites	_____	Brain	_____
Skull	_____	Mammary	_____	Blubber	_____	Stom. Cont.	_____
				Muscle	_____	Liver	_____