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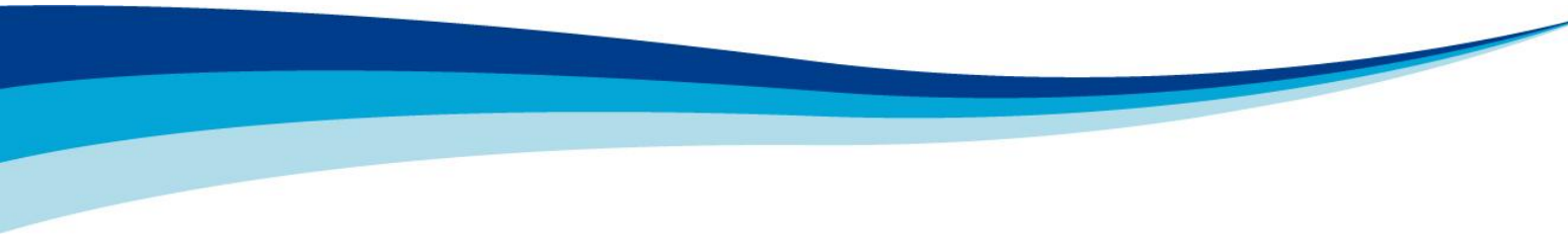
THE HARBOUR PORPOISES *(PHOCOENA PHOCOENA)* OF SKJÁLFANDI BAY

– size, gender and diet



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THE HARBOUR PORPOISES (PHOCOENA PHOCOENA) OF SKJÁLFANDI BAY - SIZE, GENDER AND DIET

This thesis was written to acquire more information about the harbour porpoises (*Phocoena phocoena L.)* of Skjálfandi Bay and of whole Iceland. Not much is known about the harbour porpoises in Iceland because it is very challenging to study them in the wild due to their small size and shy behavior. The baleen whales and bigger toothed whales are very important for tourism and it is also much easier to study them in the wild because of their bigger size and curious behaviour. Therefore, much more is known about them than their smaller cousins, the porpoises. This is the case also at Skjálfandi Bay in Húsavík where whale watching tourism is constantly increasing while professional fishing continues to stay viable.

Every year thousands of harbour porpoises are drown in fishing nets all over their distribution area. The harbour porpoises also drown in fishing nets in Iceland and Skjálfandi Bay. This is unfortunate but at the same time gives a great chance to study these animals and gain more knowledge about the species. The harbour porpoises dissected in this study were by-caught in lump sucker (*Cyclopterus lumpus*) gillnets by professional fishermen at Skjálfandi Bay during spring 2011 and 2012.

There were 23 carcasses from 2011 and five from 2012. This thesis studies the general condition of the animals and the consistence of their diet at the time of death by looking at their stomach contents, total length and weight, gender and stage of maturity. The sample consisted of both females and males as well as immature and mature animals.

In the stomachs there were otoliths of nine different fish species. In 2011 most of the otoliths in the stomachs were from capelin (*Mallotus villosus*) but in 2012 the greatest number of otoliths was of Atlantic cod (*Gadus morhua*). In addition, there were a lot of capelin eggs and small unidentified crustaceans in the stomachs.

It is difficult to draw valid conclusions because of the limited sample size, annual differences, missing information and sometimes inadequate measurements. It is possible to say though, judging by the results, that in the spring time during these two years the porpoises in Skjálfandi Bay used mostly capelin and in 2012 also Atlantic cod and small crustaceans as their prey.

KEYWORDS:

harbour porpoise, capelin, atlantic cod, whales, Skjálfandi Bay, Iceland

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SKJÁLFANDIN LAHDEN PYÖRIÄISET (PHOCOENA PHOCOENA) - KOKO, SUKUPUOLI JA RAVINTO

Työ lähti liikkeelle tarpeesta saada enemmän tietoa Skjálfandin lahden ja samalla koko Islannin pyöriäisistä (*Phocoena phocoena L.*). Islannin pyöriäisistä ei tiedetä paljoa, sillä niiden elävänä tutkiminen on haasteellista eläinten pienen koon ja aran luonteen takia. Suuremmat valaat ovat tärkeitä turismille ja niitä on paljon helpompi tarkkailla luonnossa, joten niistä tiedetään paljon enemmän, kuin pienistä serkuistaan pyöriäisistä. Näin on myös Skjálfandin lahdella Húsavíkissa, jossa valassafariturismi ovat jatkuvassa kasvussa.

Tuhansia pyöriäisiä hukkuu vuosittain kalastajien verkkoihin joka puolella niiden levinneisyysaluetta, myös Islannissa ja Skjálfandin lahdella. Tämä on valitettavaa, mutta antaa myös mahdollisuuden tutkia näitä eläimiä ja saada lisää tietämystä lajista. Tässä opinnäytetyössä on käytetty aineistona Húsavíkin ammattikalastajien rasvakalapyynnin (*Cyclopterus lumpus*) yhteydessä verkkoihin vuosina 2011 ja 2012 kuolleiden pyöriäisten ruumiinavaustuloksia.

Ruhoja saatiin 23 vuonna 2011 ja viisi vuonna 2012. Työssäni halusin selvittää pyöriäisten sukupuolijakaumaa ja sukukypsyysastetta verrattuna kokonaispituuteen ja -painoon sekä ravinnon koostumusta.

Mahoista löytyi yhdeksän eri kalalajin otoliitteja, joista suurin osa vuonna 2012 oli villakuoretta (*Mallotus villosus*) ja vuonna 2011 turskaa (*Gadus morhua*). Lisäksi löytyi suuri määrä villakuoreen munia ja jonkin verran pieniä äyriäisiä.

Pätevien johtopäätöksien tekeminen on hankalaa aineiston pienuuden, vuosien erilaisuuden sekä puutteellisten tietojen ja mittausten johdosta. Tulosten perusteella voidaan kuitenkin todeta, että kyseisinä vuosina kevätaikana Skjálfandin lahden pyöriäset käyttivät ravinnokseen enimmäkseen villakuoretta ja keväällä 2012 myös turskaa sekä jossain määrin pieniä äyriäisiä.

ASIASANAT:

pyöriäinen, villakuore, turska, valaat, Skjálfandin lahti, Islanti

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1 INTRODUCTION

This thesis was written to do more research on harbour porpoises in Iceland and in Skjálfandi Bay especially. The bay is situated in the northeastern corner of Iceland and is famous for its magnificent whale abundance during the summer season. Whale watching industry has been benefitting of the whale abundancy and hundreds of thousands of visitors have come to the small town of Húsavík, situated right by the bay, to participate in a whale watching safari. At the same time the small porpoises have been left to the shadow of their larger cousins. Not much is known about the Skjálfandi porpoises except for the fact that every year many of them are by-caught by local fishermen. By-catching means that fisheries unintentionally catch fish or other animals that they do not aim to catch.

The study was launched by the University of Iceland Húsavík research station. There is already a lot of research about the larger whales and but none on the harbour porpoises. They are very hard to observe in the wild because they are much shyer than the larger whales and so small that it is hard to spot them in the wavy ocean from a boat. Some of the research methods used with larger whale species, are not applicable to porpoises.

In January 2011 the process started by a meeting with the curator of the Húsavík Whale museum, Hermann Báðarson, and the local fishermen about the project. The fishermen were very interested in participating and the possibility to learn more about these animals. Both of the local whale watching companies also practice professional fishing and they were naturally interested in learning about all the whale species in the bay since their livelihood depends on them. It was agreed that during the lump sucker (*Cyclopterus lumpus*) season 2011, ten fishing vessels from Húsavík would collect and deliver all their by-caught porpoises to the research station for further investigations. After the 2011 season it was decided that the project would continue in the following year.

The purpose of this thesis is to present the method the porpoises were dissected, their diet at the time of death, gender distribution and stage of maturity in comparison with the length and weight.

Picture 1. Some of the 2011 by-caught harbour porpoises.

2 THE HARBOUR PORPOISE

2.1 The biology of the harbour porpoise

The harbour porpoise (*Phocoena phocoena*) is a marine mammal belonging to the order Cetacea, which consists of whales, dolphins and porpoises. They are part of a suborder Odontoceti, also known as toothed whales. There are six different porpoise species in the world which are the harbour porpoise, the spectacled porpoise (*Phocoena dioptrica*), the burmeister's porpoise (*Phocoena spinipinnis*), the vaquita (*Phocoena sinus*), the finless porpoise (*Neophocaena phocaenoides*) and the dall's porpoise (*Phocoenoides dalli*). (Carwardine, 1995)

It is estimated that there are at least 700 000 harbour porpoises in the world (Hammond *et al*, 2008.) but some sources suggest much higher numbers. In an Icelandic study in 2003, based on surveys conducted in 1987, it was estimated that there are about 27 000 harbour porpoises in Iceland. (Stenson, 2003) This survey does not give very accurate information about the current situation in Iceland because the information is relatively old and it does not include coastal waters where the porpoises mostly are. However, it is very difficult to estimate the exact number of harbour porpoises anywhere in the world because there is no way of accurately covering their entire range. According to the IUNC Red List of Threatened Species the harbour porpoise is of least concern. (Hammond *et al*, 2008)

Harbour porpoises are robust little whales with almost no beak but rather a snout. Their body shape helps them prevent heat loss in their cold environment. The colouring is different shades of grey and becomes much lighter under the body. They can grow up to two meters of length and weigh up to 70 kg but most of them are smaller than this. The females grow somewhat larger than males. (Jefferson et al. 1993) In the wild they can reach the maximum age of about twenty years but an average life span of 8-10 years is more common. They have a very fast and short life cycle compared to the

larger whales. (Hohn & Read, 1995) Harbour porpoises normally become sexually mature at the age of three and females can have calves every year after that. They are one of the only cetaceans that can lactate and be pregnant at the same time. (Gaskin, 1984)

2.2 Distribution and ecology

The harbour porpoises inhabit the whole range of the northern hemisphere (Johnston *et al*. 2005) and the world population divides into three different main populations: the Atlantic, the Pacific and the Black Sea population. These populations are reproductively separate from each other. (Bjorge & Tolley, 2009) There are also subpopulations within the main three world populations but their structure and number is not fully known. The porpoises mostly stay in relatively shallow coastal waters, bays, river estuaries and fjords and rarely swim very far from their region. There is some winter migration from the coast towards deeper waters.

Harbour porpoises live alone or in small groups of less than ten animals but occasionally form larger temporary groups. As all cetaceans, also porpoises have complex social relationships between each other. (Clapham *et all*. 2002)

Small fish, cephalopods and crustaceans form the main part of the diet of harbour porpoises. Their diet can vary tremendously between different areas and seasons. (Jefferson et al. 1993) The prey is located and hunted with the help of echolocation, also called biosonar. They rarely dive deeper than 200 meters and commonly forage closer to the surface. They also practice bottom foraging in shallow waters with less than 200 meters. (Bjorge & Tolley, 2009)

Unlike larger cetaceans porpoises need a rather stable food source all year round. This is because of their small size and the inability to store a lot of energy to their bodies (Santos & Pierce, 2003). For example, humpback whales travel to breed from Skálfandi Bay to the Caribbean and the females do not eat anything during their six-month stay there. Only when the calf is large enough to endure the migration back to the north the female starts to eat again and

restores her bodily energy resources. (Martin *et al*, 1984) On the other hand, the northern Icelandic waters are full of food because of the mixing of cold Polar and warm Atlantic ocean currents. This mixing lifts nutrients to the water column which enables huge plankton growth in the spring time which then benefits fish species and other prey the whales also eat.

3 MATERIAL AND METHODS

The porpoises used in this thesis were dead by-caught animals from lump sucker gillnets and they were given to scientific research by the local fishermen in Húsavík, Iceland.

3.1 Gender distribution, maturity, length and weight

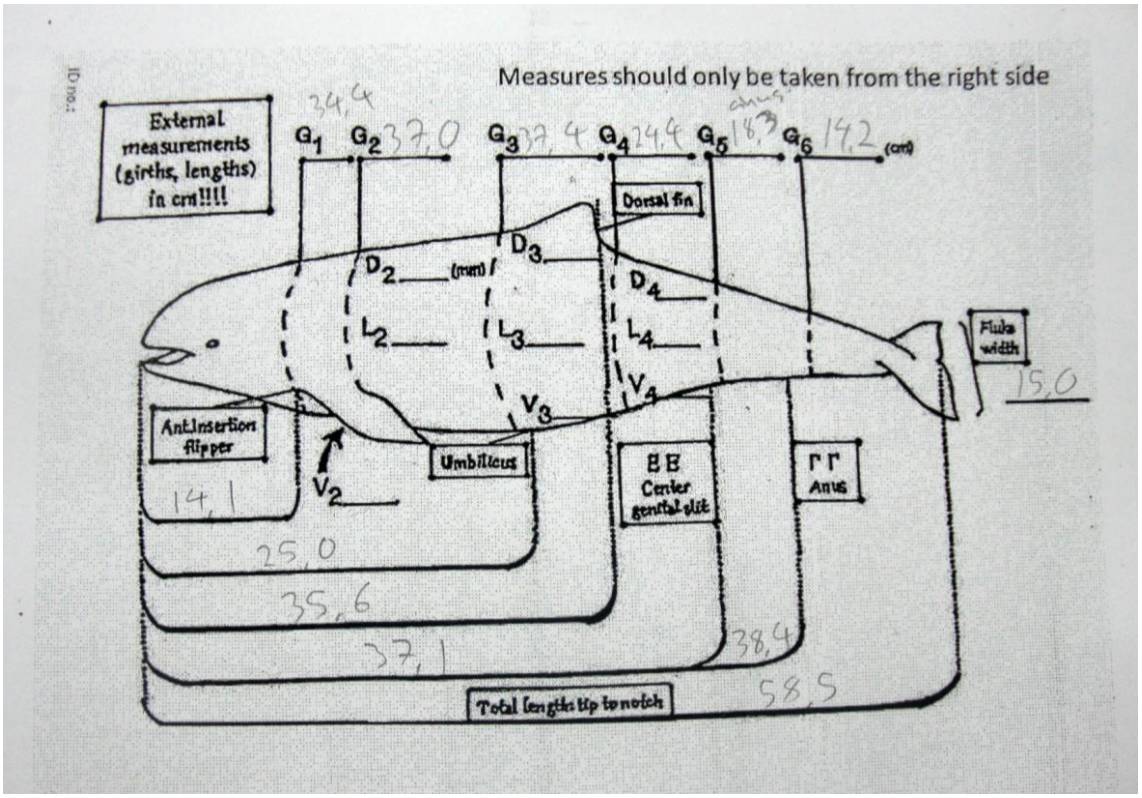
3.1.1 Maturity and gender

The sex of a harbor porpoise is relatively easy to determine. The length between the genital slit and the anal slit is much longer in a male than it is in a female where it looks like they are almost joined together. The female also has two nipple holes around its genital slit. The gender of the animal was determined externally before dissecting. The porpoises were also divided into four different maturity groups: immature, mature, pregnant and lactating. Maturity was determined by looking at the gonad size, general size and whether females were pregnant or lactating.

3.1.2 Total length

All the external length measurements, excluding girth measurements, were acquired by using a wooden foldable measuring stick. The girth lengths were measured with a flexible measuring tape.

In addition to the total length and fluke width, the animal was measured from snout to the front of the flippers, behind the dorsal fin, the umbilicus, the genital slit and the anal slit. The girth of the animal (G1 - G6) was measured in front of and behind the flipper, in front of and behind the dorsal fin, at the genital slit and at the point where the blubber in the tail ends. (Picture 2)



Picture 2. Part of a dissection form. This form is from a fetus dissection.

3.1.3 Total weight

Before being dissected the animals were weighed by using a standard bathroom scale with an accuracy of one hundred grams. Two timber boards were used on the scale to prevent the tail and head from touching the ground. In 2012 there was no scale to weigh the whole animals.

3.2 Dissection

The porpoises were dissected during a time period from July to August in 2011 and in July 2012 in the Húsavík Whale museum. The dissections were conducted partly by student groups participating in a field course *Studying marine mammals in the wild* at the University of Iceland both in 2011 and 2012 and partly by volunteers of the Húsavík whale museum. In addition, the dissections were organized and supervised by the personnel from the University of Iceland Húsavík whale research station.

The dissection space was a cellar under the whale museum where there were two tables to enable two dissection teams to work simultaneously. (Picture 3) During the process and based on previous experience it was concluded that it is most effective to have a dissection team of three people working on one porpoise at a time. One person is a "clean hands" person who writes measurements down, bags the samples in bags and other containers and labels them. It is most efficient to label and prepare the sample bags beforehand to prevent confusion, time loss and the sampling equipment from becoming bloody. The two other members of the team share the dissecting work by, for example one cutting out samples and looking for parasites while the other one strips the carcass of blubber and muscle tissue.

Picture 3. The dissection space in the basement of the Húsavík whale museum. (Picture: Maria Lund Paulsen)

3.3 Dissection equipment

The dissection equipment consisted of dissection tables, filleting knives, different sized tweezers, a measuring stick and tape, scissors and two scales. One scale was for weighing large items such as the whole porpoises and the other one with higher accuracy for weighing tissue samples and organs. (Picture 4)

Picture 4. Dissection equipment and the front page of the dissection form.

The equipment was always kept clean and dry between dissections to prevent maggots, smell, mold and bacteria spreading in the dissection room. Therefore, running water, good floor drainage, dishwashing equipment and drying towels were needed to keep everything hygienic. It was also very important to wear gloves and aprons, not to make cuts to your own skin and avoid unnecessary

skin contact with the carcass because porpoises can carry cetacean bacteria *Brucella ceti* which can cause very severe infections to people. (Barley *et al.* 2008)

For tissue samples different sized re-closeable plastic bags were used which were labeled both on the outside and inside. All together at least 18 bags were needed for each animal including the possible parasite jars. The inside label was special paper which could endure moisture, blood, ethanol and freezing without the writing disappearing. The outside sticker was a normal sticker label to help identify the right sample bag. Afterwards the samples were frozen. Stomach contents were also frozen but they were separated into bags of small and large items. All the tissue samples were weighed and some of them also measured for length etc. Parasite samples were preserved in small glass jars filled with ethanol or frozen in a plastic jar if the sample was very large. Parasite jars were also labeled inside and outside with the same materials as the sample bags.

3.3.1 Preparations

The animals were kept frozen in the museum freezing room from where they were carried to the dissection space to thaw for four days before the dissection. When a carcass was ready to be dissected it was first weighed and then lifted to the dissection table. Before the dissection itself the label attached by the fishermen with a rope to the tail of the animal was checked first. Sadly the label was often missing or so badly damaged that part or any of the information written on it could not be used. Usually the label contained information about the type of the fishery, which in this case was always lump sucker, location of the net where the animal was found, the date of death and the name of the fishing vessel which caught the animal. All this information was written down on a six page form that was filled in for each animal.

The next step was to check the outside of the animal for any scarring, wounds, net cuts and everything out of the ordinary. All markings and cuts were drawn accurately with explanations into the pictures of both sides of the animal on the

first page of the dissection form. The animal's external measurements were also taken and they are explained above as well as the gender identification. At the same time the sex of the animal and the position of dorsal fin knobs were checked and whether it had tongue fringes or not.

The tongue fringes or marginal lingual papillae are situated on the outer edge of a porpoise's tongue and their purpose is believed to be to help a calf suck and direct the mother's milk into its mouth and not let it escape to the surrounding water. They are the longest on a new-born animal and disappear slowly as the animal matures. (Dubbeldam & Kastelein, 1990) (Picture 5)

Picture 5. The tongue fringes of a fetus harbour porpoise.

The dorsal fin knobs are little knobs on either the leading or trading edge of the dorsal fin. They are easily felt by sliding a finger on the edge but their purpose is not fully understood. On the specimens the knobs were always on the leading edge.

3.3.2 Cutting

The cutting began by making six vertical cuts on the right side of the animal, through the blubber and leaf fat layers all the way to the beginning of the muscle tissue but no further. The cuts ran down from the top of the animal to the stomach. The correct cutting lines are in front of and behind the flipper, in front of and behind the dorsal fin and through the center of the genital slit. Then the blubber thickness was measured on three different vertical lines and three different lateral lines in nine places all together: D2 - D4, L2 - L4, V2 - V4. (Picture 6) The thickness of the leaf fat was also measured in the thickest place if it was present.

Picture 6. Blubber thickness measurement from a fetus harbour porpoise.

After the vertical blubber cuts and measurements, blubber and skin samples were taken from the D3 spot. Two samples from blubber, muscle and liver were taken and the other one was always wrapped in aluminum foil before bagging so it could be used later to search for toxins. Then the blubber was cut out of the entire body and while one person was doing that the other took a muscle sample also from D3 and started to open the organ cavity.

The organs were all weighed and a sample piece was taken from all of them except for pancreas. The pancreas should have been sampled as well but it was forgotten from the sample list. From both lungs lung fat thickness was measures which is a general condition marker. It is believed that the more there is lung fat, the better the condition of the animal is. The stomach was weighed when it was still full and after the contents were removed and sampled the stomach was weighed again to obtain the weight of the contents.

All the organs were searched for parasites by first feeling them with hands in search of hard calcified parasite cocoons and then by cutting the organs open and looking for them. The porpoise body protects itself against some parasites by forming hard calcium cocoons around them preventing them from moving and spreading. Some parasites were also found roaming freely in the organ cavities. (Picture 7)

Picture 7. Lung parasite in a harbour porpoise lung. (Picture: Elise Biersma)

If the animal was a pregnant female, the fetus was taken and frozen as well. One of the three fetuses was also dissected. After the organ cavity was empty it was easy to find the pelvic bones to take samples.

After all the organs were removed and all the samples taken there was only the carcass left. All blubber and muscle tissue was cut out from the bones and put into separate containers as well as the bones. The head was removed from the carcass and weighed separately from the rest of the bones to obtain the skull weight. The blow hole was searched for parasites but none was found. When the whole carcass was completed and divided into the right containers, the containers were weighed separately to obtain the total muscle, blubber and skeleton weight. After the dissections were completed the meat and bones were burnt.

3.4 Stomach contents

The full stomachs were cut open and rinsed with water over two sieves. The sieve sizes were different which enabled taking large and small items as separate samples. During the field course there was not very much time so only subsamples of the small item samples were taken for the course group project. The subsamples were studied with a microscope in a laboratory in the North East Iceland Nature Center in Húsavík. The rest of the stomachs were studied in a laboratory at the University of Akureyri during February and March 2012 and in the North East Iceland Nature Center in Húsavík during July 2012.

Since the stomach contents were divided into large and small items it was easy to study them. The large items consisted mostly of well-preserved fish skeletons. All heads and head bones were picked out and counted. This was done to have an idea of how many fish there were in the stomach. Many of the heads still had the otoliths intact inside and they were collected as well as loose otoliths. (Picture 8)

Picture 8. Capelin skulls and skull bones and an otolith extracted from a skull.

Most of the otoliths were found within the small item samples together with millions of capelin *(Mallotus villosus)* eggs. (Picture 9) The otoliths from the stomachs were identified by using a microscope and different otolith identification keys (Brodeur, 1979. Lidster *et al*, 1994. Nyberg *et al*. 2000). Some of the eggs were preserved in ethanol as well.

Picture 9. Capelin roe from a harbour porpoise stomach.

Capelins in Iceland have one main spawning area on the southern coast but they also have smaller secondary spawning areas in the fjords of the north coast. They migrate to the spawning areas in early spring and this is why many of the porpoises had their stomachs full of capelin and capelin eggs. (Vilhjálmsson, 1998)

4 RESULTS AND DISCUSSION

The total of 28 animals were received, 23 in 2011 and five in 2012. There were 15 females and 13 males, of which 19 were immature animals and nine mature or pregnant animals. (Chart 1.) Some of the carcasses were already cut by the fishermen and therefore, could not be used for all the measurements. Those animals are not included in the 28 animals used in this study.

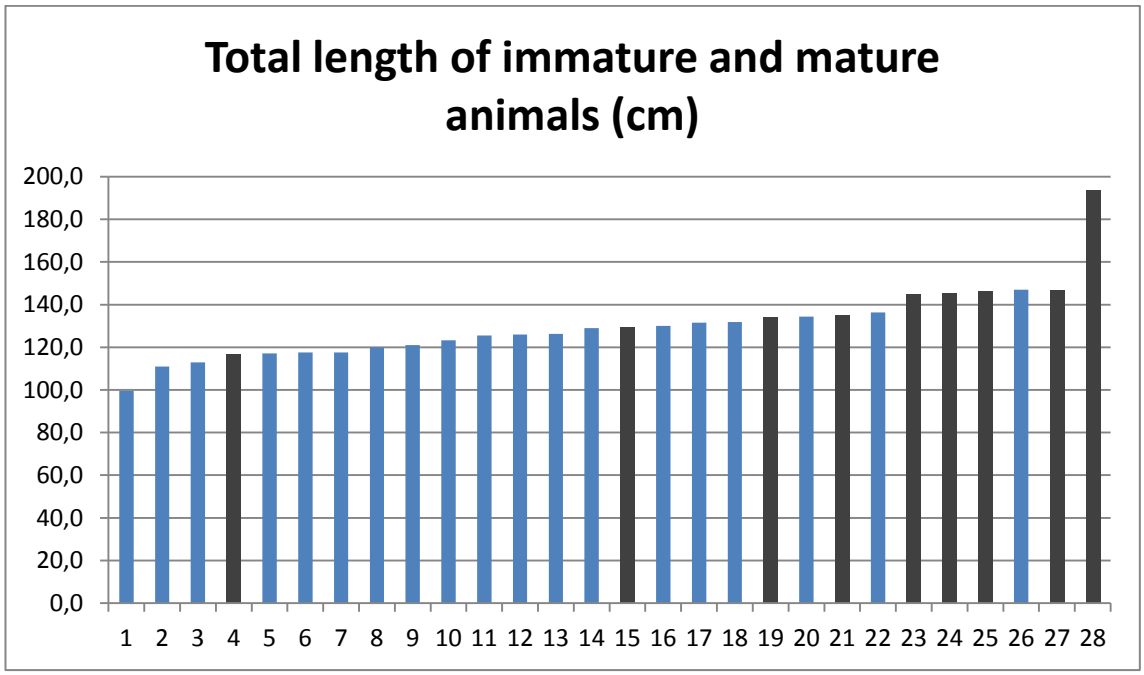


Chart 1. The total length and the maturity stage of all 28 porpoises. Dark columns represent mature animals and light columns represent juveniles.

4.1 Maturity and gender

It is more common that immature young porpoises get by-caught in fishing nets rather than older adults. (Lockyer et all, 2001) The adults might have previous entanglement experiences and therefore know better to stay away from the nets. The fish in the nets is also easy prey for young animals learning to hunt by themselves. In the data the immature animals represented the highest proportion as expected. In 2012 there were no mature animals at all but on the other hand, the number of animals caught was much smaller than the year before so it might be a mere coincidence. The reason why there were so few

animals caught in 2012 compared to 2011 is that there was only one fishing vessel delivering porpoises that year.

Together in 2011 and 2012 there were 19 immature animals and nine mature ones, including pregnant females. None of the pregnant females were found to be lactating. The immature animal gender distribution was nine females and ten males but in mature animals it was six females and three males totalling to 15 females and 13 males. (Tables 1 and 2)

In 2011 there were 23 animals. 11 of them were females and 12 males. Of the 11 females five were immature, six were mature and four of the mature females were also pregnant. The males were nine immature ones and three mature ones. In 2012 there were only five animals to sample and measure, five immature females and one immature male. (Tables 1 and 2)

Table 1. The number of females in both years and the stage of maturity.

Gender + maturity/year	2011	2012	2011 + 2012
Females in total	**11**	**4**	**15**
Immature	5	4	**9**
Mature	2	0	**2**
Pregnant	4	0	**4**

Table 2. The number of males in both years and the stage of maturity.

Gender + maturity/year	2011	2012	2011 + 2012
Males in total	**12**	**1**	**13**
Immature	9	1	**10**
Mature	3	0	**3**

4.2 Length

The total length was measured from all 28 animals. It is again difficult to make comparisons with the two years because in 2012 there were so few animals and they were all immature. But in total some differences can be seen between maturity stages and gender. Immature harbour porpoises are naturally shorter than mature animals and this is easily seen in the results as well. The average

immature animal body length in both sexes is slightly under 125 cm. There is, however, no significant difference in the average length between genders among the immature group. This is normal for harbour porpoises since both sexes grow at a similar pace until maturity.

Studies have shown that it is common for harbour porpoise females to reach greater length than males. In the world the average length for adult harbour porpoise males is 145 cm and 160 cm for females. In the Black sea population the animals are a lot smaller but still the females are in average ten centimeters longer than males. (Bjorge & Tolley, 2009. Gol'din, 2004) In the results it is also possible to see a difference between mature gender groups. The mature and pregnant females have an average length of 146.5 cm and the mature males 138.2 cm. The longest porpoise in this study was a pregnant female with 193.7 cm and the shortest one was an immature male with 99.5 cm.

The average length and standard deviation of each maturity and gender group can be seen in the table below. The longest porpoise was a pregnant female with 193.7 cm and the shortest one was an immature male with 99.5 cm. (Table 3)

Table 3. The average length in cm/gender and the maturity stage of all 28 animals.

Gender + maturity/year	2011	2012	2011+2012
Females in total	**137** (n=11, SD=22,2)	**122,5** (n=4, SD=6,2)	**133,2** (n=15, SD=20,1)
Immature	**125,7** (n=5, SD=9,3)	**122,5** (n=4, SD=6,2)	**124,3** (n=9, SD=7,8)
Mature	**138** (n=2, SD=12,0)	**0**	**138** (n=2, SD=12,0)
Mature + pregnant	**146,5** (n=6, SD=26,0)	**0**	**146,5** (n=6, SD=26,0)
Pregnant	**150,7** (n=4, SD=31,8)	**0**	**150,7** (n=4, SD=31,8)
Females + males in total	**127,8** (n=23, SD=18,5)	**123,8** (n=5, SD=6,1)	**127** (n=28, SD=17,2)
Immature females + males	**124,2** (n=14, SD=12,0)	**123,8** (n=5, SD=6,1)	**124,1** (n=19, SD=10,6)
Mature females + males	**143,7** (n=9, SD=21,2)	**0**	**143,7** (n=9, SD=21,2)
Males in total	**127** (n=12, SD=13,8)	**129** (n=1)	**127,2** (n=13, SD=13,2)
Immature	**123,3** (n=9, SD=13,8)	**129** (n=1)	**123,9** (n=10, SD=13,1)
Mature	**138,2** (n=3, SD=6,1)	**0**	**138,2** (n=3, SD=6,1)

4.3 Weight

Since there was no scale in use in 2012 it is impossible to compare the average weights from the two years. In addition, many of the porpoises were cut by the fishermen before weighing and therefore could not be used for average weight calculations. The fishermen sometimes take the outer files for food for themselves, hence the cutting.

Even though the animals that could be used to calculate the average weight were so few, it is possible to see that the weights are normal as the immature animals weigh on average less than the mature ones, females are heavier than males and pregnant females are heavier than the other mature females.

The average weight of all the porpoises, excluding the four pregnant females, was 37 kg. The immature animals from both sexes weighed on average less than the mature ones and the average weight of the mature females was about ten kilograms higher than that of the males. The pregnant females were about nine kilograms heavier on average than other mature females. (Table 4) The heaviest animal was the longest pregnant female weighing 63.2 kg and the lightest one was also the shortest animal weighing only 21.7 kg.

Table 4. The average weight in kg/gender and the maturity stage of 23 animals caught in 2011.

Gender + maturity/year	2011
Females in total	**39,1** (n=7, SD=7,3)
Immature	**35,4** (n=5, SD=4,1)
Mature	**48,2** (n=2, SD=3,8)
Pregnant (excluded in other weight calculations)	**57,1** (n=4, SD=4,3)
Females + males in total	**37** (n=19, SD=8,7)
Immature females + males	**35,2** (n=14, SD=6,9)
Mature females + males	**42** (n=5, SD=11,8)
Males in total	**35,7** (n=12, SD=9,5)
Immature	**35** (n=9, SD=8,3)
Mature	**37,8** (n=3, SD=14,3)

4.4 Sources of error in dissection

The dissection was conducted by many different people, most of whom had no previous experience in porpoise dissection. Furthermore, in a large group with little experience, mistakes tend to happen. This became clear during the dissections and while going through the dissection forms. Some measurements were missing, some organs had been thrown away before taking a sample and some handwriting was nearly impossible to interpret.

Due to perhaps badly given instructions to the fishermen or their unwillingness to follow them, some of the porpoises were not in a very good condition. Some of them were missing part of a tail or some muscle tissue from the back. The lack of body parts or muscles obviously affects many measurements and for example, total length, body weight and girth measurements might not be accurate with these cut individuals. The cut ones were left out from the measurements where they would show inaccurate results.

The skeleton and muscle weights are not totally accurate because it was impossible to obtain all the muscle of the bones without boiling them, which was not done.

4.5 Stomach contents

There were two stomachs out of 28 with no otoliths and stomachs full of small crustaceans generally had little to none otoliths in them. Of all otoliths found, 95 % were capelin otoliths. (Chart 2)

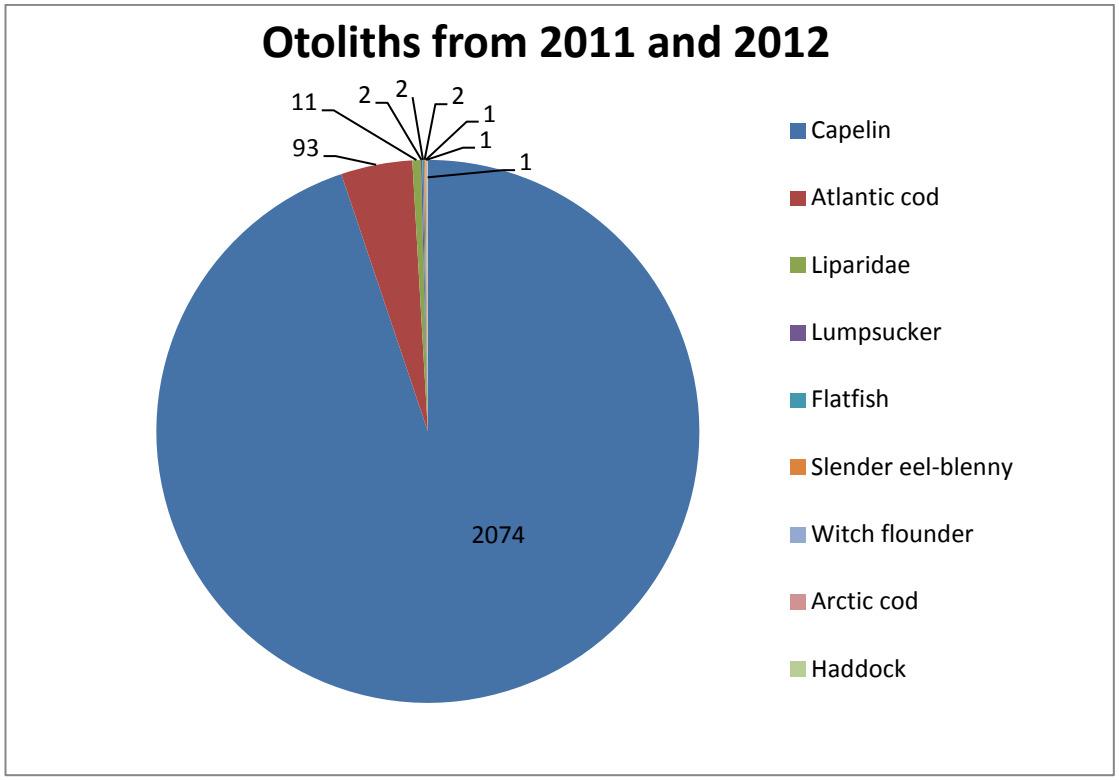


Chart 2. The number of otoliths of different species from 28 harbour porpoise stomachs.

There is, however, a difference between the two years. In 2011 the capelin (*Mallotus villosus)* otoliths were nearly 100% of all otoliths whereas in 2012 they were only 22%. In 2011 there were also no Atlantic cod (*Gadus morhua)* otoliths but in 2012 they were 70% of all otoliths found. (Chart 3 and 4) (Picture 10)

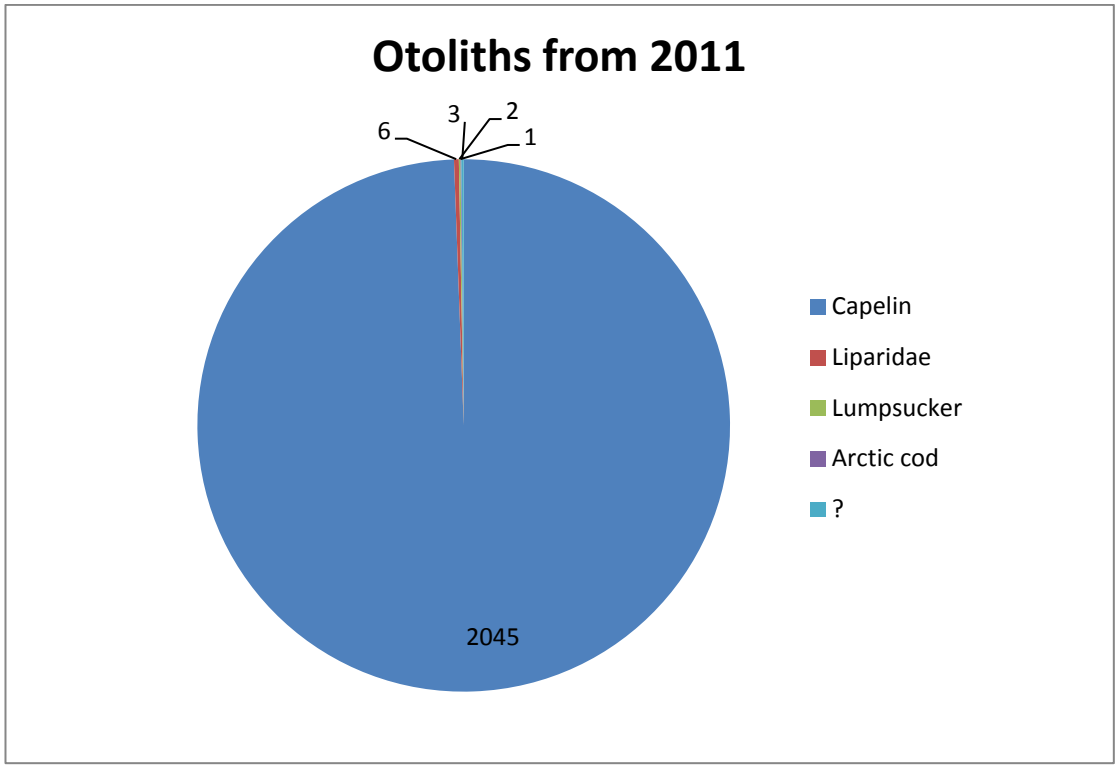


Chart 3. The number of otoliths of different species from 23 harbour porpoise stomachs.

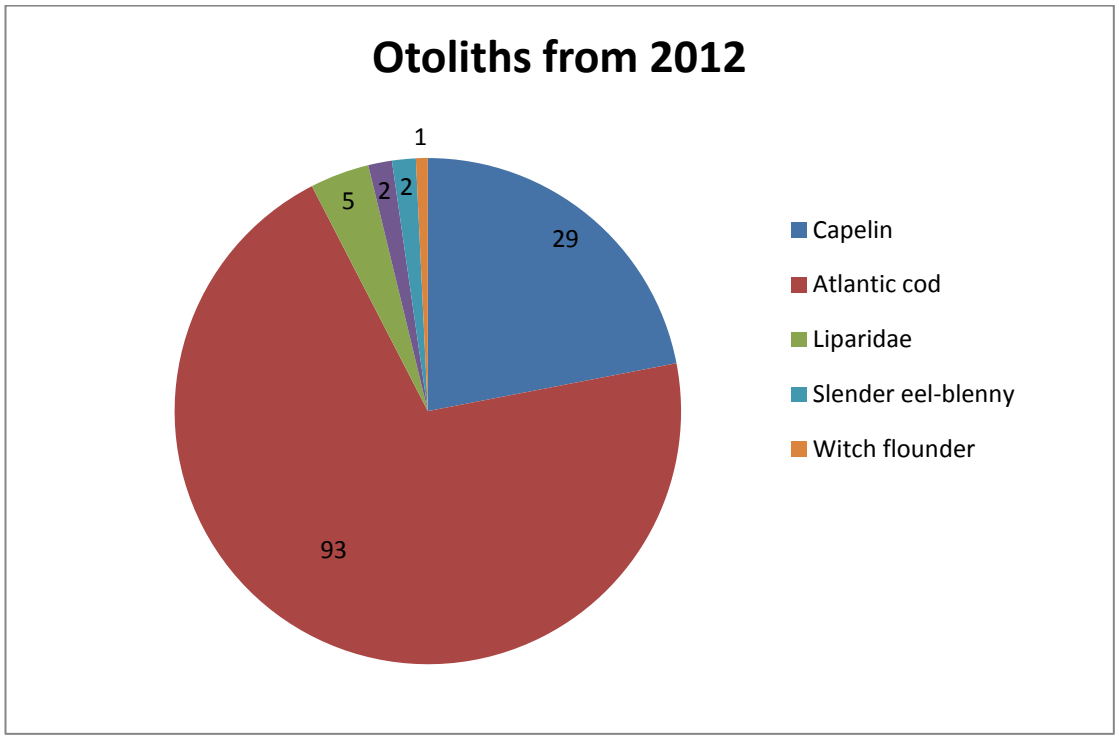


Chart 4. The number of otoliths of different species from five harbour porpoise stomachs.

Three otoliths were unidentified. Altogether there were otoliths of nine different species. Also there were much more crustaceans in the stomachs in 2012. Some stomachs contained almost entirely small crustaceans. Many of the capelin otoliths were very degraded which had to be considered while identifying the species. (Picture 10)

Picture 10. Up: different stages of degradation in capelin otoliths. Below: Atlantic cod otoliths.

It is quite difficult to make comparisons with other literature since the porpoises were caught within two months in the spring time and this time period does not overlap much with other studies about porpoises in other regions. There was, though, a study conducted in North-East Atlantic French coast with 29 stomach samples collected between the years 1988 and 2003. (Spitz et all, 2006) The sample animals were from both sexes and included mature as well as immature animals. The main difference is that all the animals were stranded animals whereas the ones in this study were all by-caught. (Spitz et all, 2006) This naturally makes it more difficult to compare the results.

The average stomach content weight in this study was 435 g with a range of 19 g to 1910 g. The weight was acquired from the difference between full and empty stomach weight. There were also completely empty stomachs and some that lacked either or both the full and empty weights. (Chart 5) In the comparison study the stomach content weight was 182 ± 227g ranging from 6 g to 839 g. The number of different fish species in Skjálfandi stomachs was nine and in the comparison study it was 13. Capelin was clearly the main species in the Skjálfandi stomachs with total occurrence of 95 % but in the comparison study there was no single significantly big prey fish species, blue whiting *(Micromesistius poutassou)* having the biggest occurrence of 39 %. (Spitz et all, 2006)

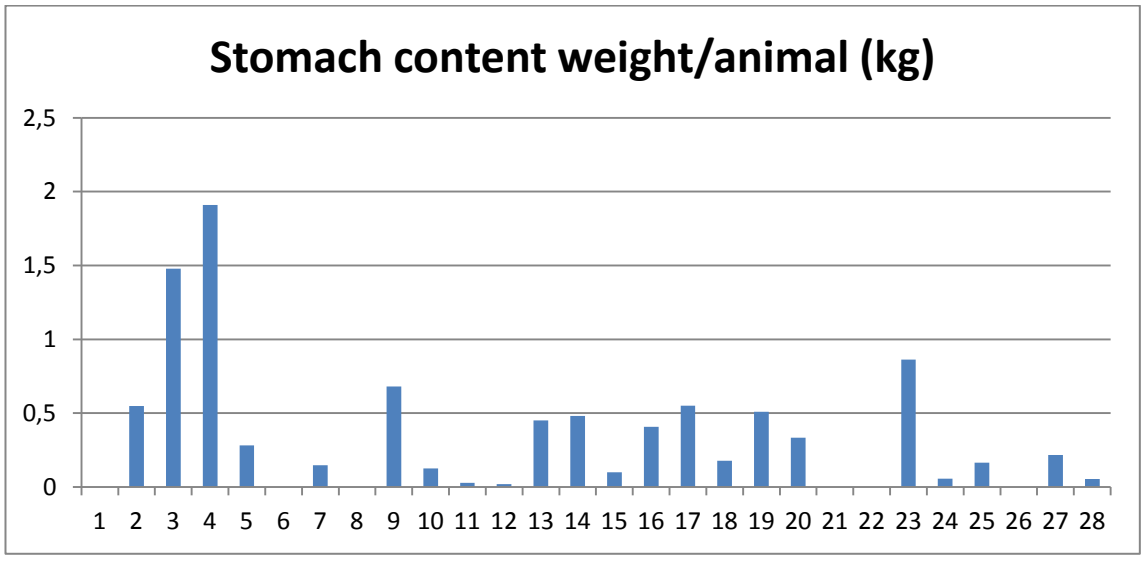


Chart 5. The stomach content weight from 28 harbour porpoises.

In another study from Bay of Fundy and Gulf of Maine it was stated that 80% of harbour porpoise prey was Atlantic herring (*Clupea harengus). (*Read, 2001) There were no herrings in the current samples but most likely it is one of the harbour porpoise prey items in Skjálfandi as well.

4.6 Conclusions

The main and largest part of this thesis was to dissect the by-caught harbour porpoises, demonstrate how it was done and analyze the stomach contents. The stomach contents could have been analyzed more thoroughly since only the number of otoliths/ species/ animals was determined.

All in all, a lot of information was gathered from the porpoises by dissecting, measuring, sampling and identifying what they had eaten but so far only some of it has been used. For example, a large part of the dissection data was not used in this specific study but can well be used in the future. Just by using the porpoise teeth for age determination and comparing the age to size etc. would give a lot of interesting new information. Also the otoliths and other stomach content samples can be further studied to determine, for example, the age and size of the prey fish.

What is the outcome of this thesis? The acquired results and data create a good basic foundation for further studies on this subject. The porpoises in Skjálfandi Bay have not been studied before and therefore any new information we can have from them is very welcome. This thesis gives the reader a basic understanding of a species living in a specific area, based on a limited sample that was collected during a short period of time. Hopefully there will be other studies conducted later which will concentrate more deeply on narrower subjects based on the data.

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Appendix 1. Porpoise dissection data.

Porpoise	Locality	Condition	Necropsy	Death	Cause of death	Fishery	Longitude	Latitude	Vessel	Gender	Maturity	Tonguefringes (mm)	Knobs
1	Skjálfandi	fresh	29.6.2011	12.4.2011	bycatch/drowning	Lumpsucker	66'11,3	17'15;8	Galti	M	Immature	1	Leading
2	Skjálfandi	fresh	30.6.2011		bycatch/drowning	Lumpsucker				F	Immature	2	Leading
3	Skjálfandi	fresh	2.7.2011	25.3.2011	bycatch/drowning	Lumpsucker	17'23"	66'06"	Von?	M	Mature		Leading
4	Skjálfandi	fresh	2.7.2011		bycatch/drowning	Lumpsucker				M	Immature		Leading
5	Skjálfandi	fresh	2.7.2011	18.3.2011	bycatch/drowning	Lumpsucker	17'14"3	66'11"6	Sigrún I	M	Immature	3	Leading
6	Skjálfandi	fresh	3.7.2011	29.3.2011	bycatch/drowning	Lumpsucker	66'13	17'12	Galti	F	Immature	1,5	Leading
7	Skjálfandi	fresh	3.7.2011	17.3.2011	bycatch/drowning	Lumpsucker				F	Immature		Leading
8	Skjálfandi	fresh	3.7.2011	18.3.2011	bycatch/drowning	Lumpsucker	66'11,6	17'14,3	Sigrún I	M	Immature		Leading
9	Skjálfandi	fresh	4.7.2011		bycatch/drowning	Lumpsucker				F	Immature	1	Leading
10	Skjálfandi	fresh	4.7.2011		bycatch/drowning	Lumpsucker				M	Immature	1,5	Leading
11	Skjálfandi	fresh	4.7.2011		bycatch/drowning	Lumpsucker				F	Mature	0,5	Leading
12	Skjálfandi	fresh	5.7.2011	21.3.2011	bycatch/drowning	Lumpsucker	17'19,3	66'11,8		M	Mature		Leading
13	Skjálfandi	fresh	5.7.2011		bycatch/drowning	Lumpsucker				M	Immature		Leading
14	Skjálfandi	fresh	5.7.2011	17.3.2011	bycatch/drowning	Lumpsucker			Galti	F	Mature+pregnant		Leading
15	Skjálfandi	fresh	5.7.2011		bycatch/drowning	Lumpsucker				F	Mature+pregnant		Leading
16	Skjálfandi	fresh	5.7.2011		bycatch/drowning	Lumpsucker				F	Mature		Leading
17	Skjálfandi	fresh	5.7.2011		bycatch/drowning	Lumpsucker				F	Mature+pregnant		Leading
18	Skjálfandi	cut	25.7.2011	27.3.2011	bycatch/drowning	Lumpsucker	66'06	17'23"20	Von?	M	Mature	1	Leading
19	Skjálfandi	fresh	25.7.2011	27.3.2011	bycatch/drowning	Lumpsucker				M	Immature		Leading
20	Skjálfandi	cut	25.7.2011		bycatch/drowning	Lumpsucker				F	Mature+pregnant	1	Leading
21	Skjálfandi	cut	25.7.2011	28.3.2011	bycatch/drowning	Lumpsucker	66'05	17'45		M	Immature	1	Leading
22	Skjálfandi	cut	25.7.2011	28.3.2011	bycatch/drowning	Lumpsucker	66'05	17'45		F	Immature		Leading
23	Skjálfandi	cut	25.7.2011	28.3.2011	bycatch/drowning	Lumpsucker	66'04"6	17'43"4		M	Mature	1	Leading
24	Skjálfandi	cut	25.6.2012		bycatch/drowning	Lumpsucker				F	Immature	1	Leading
25	Skjálfandi	cut	25.6.2012		bycatch/drowning	Lumpsucker				F	Immature	1,5	Leading
26	Skjálfandi	fresh	26.6.2012	12.4.2012	bycatch/drowning	Lumpsucker				M	Immature	2	Leading
27	Skjálfandi	fresh	27.6.2012		bycatch/drowning	Lumpsucker				F	Immature		Leading
28	Skjálfandi	fresh	27.6.2012		bycatch/drowning	Lumpsucker				F	Immature	3	Leading
14 fetus	Skjálfandi	fresh	26.7.2011	17.3.2011	mother bycaught	Lumpsucker				F	Fetus	3	

porpoise	L,total (cm)	L,flipper (cm)	L,umbilicus (cm)	L,dorsalfinback (cm)	L,genital (cm)	L,anus (cm)	L,fluke (cm)	G1 (cm)	G2 (cm)	G3 (cm)	G4 (cm)	G5 (cm)	G6 (cm)	D2 (mm)	D3 (mm)	D4 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	V2 (mm)	V3 (mm)	V4 (mm)	L,Leaf fat(cm)
1	123,3	23,0	39,5	60,7	68,0	83,2	29,7	71,9	78,8	85,6	69,4	50,3	31,3	21	25	23	27	27	23	29	25	18	
2	111,0	22,8	48,7	64,8	73,5	77,5	25,0	69,7	76,5	81,5	63,3	49,6	21,8	27	28	27	24	23	25	29	30	26	0,9
3	135,2	30,8	60,3	85,8	69,7	102,6	31,9	77,5	91,0	102,8	83,5	56,5	27,2	24	33	27	27	24	23	23	24	12	1,0
4	99,5	24,0	43,4	58,8	51,3	66,9	22,5	68,6	71,8	76,4	51,2	36,8	17,5	27	28	28	30	27	25	30	27	14	1,0
5	117,5	23,5	48,5	68,5	57,0	82,5	26,0	73,3	82,5	87,5	70,0	46,5	25,0	26	31	30	24	25	29	29	24	24	0,5
6	125,9	25,8	51,7	73,1	82,6	85,9	27,9	73,0	82,6	88,6	86,4	53,3	30,9	25	29	26	24	25	22	34	20	20	0,5
7	125,5	28,0	53,0	72,0	82,0	86,9	27,2	72,7	83,0	87,8	73,9	52,8	25,7	24	23	17	26	27	23	31	24	21	0,4
8	134,4	25,0	56,0	71,0	66,5	94,1	31,5	75,0	83,2	92,5	72,0	45,3	25,8	21	29	21	24	22	19	28	25	14	1,2
9	136,3	25,7	55,6	76,7	88,5	94,7	28,6	73,3	81,6	88,0	68,8	57,1	26,0	21	20	22	20	20	20	22	22	20	
10	126,3	25,0	51,5	71,3	60,0	87,3	27,2	76,4	85,1	90,5	74,0	45,6	22,6	26	25	24	23	21	21	33	22	20	3,0
11	129,5	24,7	63,1	73,6	84,5	90,1	32,8	75,4	84,2	93,0	83,2	66,1	35,5	32	34	38	23	28	38	27	24	37	0,7
12	117,1	26,0	59,6	77,7	61,2	91,9	23,2	73,4	86,2	94,9	94,0	94,0	22,6	26	22	28	25	27	26	28	26	17	0,5
13	147,0	29,2	66,9	84,4	69,1	102,0	31,5	73,2	81,4	90,3	76,2	88,4	31,6	26	29	27	25	26	21	20	22	15	0,6
14	147,0	25,4	65,9	84,4	95,4	101,0	35,3	76,7	91,7	102,8	87,0	64,7	34,1	29	32	27	23	23	24	20	30	22	0,6
15	145,0	29,1	59,5	84,5	95,0	105,0	31,0	68,8	57,4	100,8	74,4	53,0	26,2	19	20	22	20	22	22	21	20	16	0,4
16	146,5	28,9	56,5	85,4	94,3	100,0	32,0	78,7	88,3	88,2	78,8	66,5	37,0	33	27	22	20	21	18	21	24	19	1,5
17	193,7	31,0	61,0	64,7	96,6	102,5	33,0	84,0	97,6	114,0	87,3	67,0	35,3	24	30	25	21	19	19	25	17	17	0,3
18	145,2	27,5	57,3		68,7	102,3	33,5																
19	131,8	25,8	46,3	76,5	61,3	91,5	31,7	69,2	77,0	86,9	74,4	47,0	28,1	21	21	19	21	18	18	20	18	17	2,0
20	117,0	30,2	57,2	82,5	96,0	101,0		79,0	90,8	109,6	87,2	71,1		27	26	30	26	26	27	25	22	15	0,4
21	112,9	25,0	44,7		53,9	76,8	26,3																
22	130,0	27,3	54,2	78,5	87,0	90,9								25	26	27	24	24	20	25	25	19	
23	134,2	27,0	50,0		60,0	91,0	31,6																
24	131,5	25,8	52,3		82,0	86,4	25,9										21	19	19				2
25	119,9	25,8	50,5		78,2	84,9	25,9													28	24		
26	129,0	28,0	56,5		63,0	89,5		70	80	87	73	49	21	22	26	26	24	25	20	25	24	15	0,8
27	117,5	22,0	47,1	70,5	77,6	82,0	24,6	80,8	76	80,2	68,5	53,4	23,5	32	31	41	29	27	27	28	23	23	0,7
28	121,0	23,5	53,3	74,4	78,4	85,0	26,5	72,8	84,2	91	67,1	58,5	23,4	27	30	32	33	36	44	43	36	32	2,5
14 fetus	58,5	14,1	25	35,6	37,1	38,4	15	34,4	37	37,4	24,4	18,3	14,2	7	7	10	10	10	11	8	11	10	0,1

porpoise	W,total (kg)	W,muscle (kg)	W,blubber (kg)	W,skull (kg)	W,skeleton (kg)	W,stomach full(kg)	W,stomach empty(kg)	W,intestines (kg)	L,intestines (m)	W,liver (g)	W,heart (g)	W,pancreas (g)	W,spleen (g)	N of spleens	W,kidney right(g)	W,kidney left(g)
1	32,0	8,7	11,6	1,6	4,4	6,500		1,620	14,14	711	194	7	9	3	920	103
2	28,6	5,4	10,9	2,3	3,9	0,978	0,430	1,511	13,15	731	148	3	12		113	106
3	54,1	15,2	16,2	3,3	5,8	2,185	0,708	1,389	15,16	1280	311	11	10	3	188	204
4	21,7	4,3	11,0	1,6	2,7	6,270	4,360	1,632	12,68	574	124	40	5	7	78	86
5	33,0	7,1	13,3	2,8	4,6	0,695	0,413	1,581	17,00	837	188		9	9	91	87
6	38,3	9,4	13,9	3,0	4,4		0,590	2,314	12,89	1018	994	7	5	10	121	118
7	35,1	9,9	12,9	2,4	4,7	0,663	0,517	1,650	13,46	1035	203	8	5	12	115	126
8	40,6	12,9	14,4	2,1	4,7		0,730	2,041	16,14	1062	258	8	6	7	131	138
9	39,0	10,8	12,7	3,0	4,9	1,353	0,672	2,271	18,40	996	281	14	9	5	130	131
10	39,1	9,7	14,4	3,4	4,7	0,671	0,545	1,155	14,26	998	232		13		130	138
11	45,5	10,6	19,2	3,4	5,3	0,538	0,511	1,522	13,00	979	203	12	7	7	108	107
12	43,4	11,4	16,0	3,4	5,3	0,525	0,506	1,595	13,30	995	239	12	1	2	149	138
13	45,0	12,4	15,3	3,3	6,1	1,311	0,860	1,760	14,12	1039	301	30	9	10	157	144
14	55,8	17,5	15,4	3,8	5,8	1,430	0,950	2,000	15,90	1800	313	18	14		165	180
15	53,4		17,7	3,8	4,0	0,821	0,722	1,716	15,00	1212	325	18	8		169	149
16	50,9	16,8	15,5	4,9	6,3	0,920	0,512	1,400	16,50	1115	322	7	16	4	220	207
17	63,2	17,9	18,4	4,3	6,9	1,345	0,795	1,256	16,00	1430	324	6			172	188
18	32,4	3,8	15,8	3,5	9,7	1,152	0,975	2,400	16,63	1327	283	14	7	2	145	172
19	37,3	10,1	10,8	3,3	5,2	1,200	0,691	1,721	18,15	1145	232		8	17	124	145
20	55,8	18,0	17,3	3,4	4,8	1,220	0,887	2,323	13,17	1369	292	9	17	8	163	177
21	23,1			2,1	4,6	1,921		1,160	10,70	760	156		8	5	105	101
22	36,2	9,5	12,7	3,6	4,8	1,128		2,140	15,61	985	242	9	11	8	172	164
23	27,0	14,9+blubber		2,6	4,8	1,459	0,596	1,905	14,36	1035	230		7	9	111	109
24						0,609	0,553	1,538	12,00	785	218	4	7	5	120	122
25						0,590	0,425	1,577	15,26	670	134	3	6	7	103	97
26							0,572	1,549	14,40	1000	275		3	7	130	141
27						0,580	0,363	1,636	12,60	708	161	43	4	2	112	89
28						0,416	0,362		14,83	726	201	43	11	6	89	99
14 fetus	3,6	0,53	1,3	0,697	0,7	0,019	0,019	0,09	4,8	84	26		21	2	16	20

porpoise	W,adrenal right(g)	W,adrenal left(g)	W,lung right(g)	W,lung left(g)	L,lungfat right(mm)	L,lungfat left(mm)	W,gonad right(g)	W,gonad left(g)	L,gonad right(mm)	L,gonad left(mm)	H,gonad right(mm)	H,gonad left(mm)	Widht,gonad right(mm)	Widht,gonad left(mm)
1	1	3	405	300			19	21	63	67	17	18	27	28
2			312	222	20	22	1	2						
3	8	9	547	468	3	2	185	183	142	146	32	29	64	67
4	3	2	144	137	20	20	14	14	65	62	12	14	22	23
5	6	4	328	271	24	22	14	17	60	60	15	15	25	30
6	1	1	359	441	2	2	3							
7	12	11	230	305	17	19	1	1						
8	3		396	386	32	30	72	75	109	96	27	28	47	53
9	5	5	429	331	40	20	1	3	22	24	8	6	11	17
10	8	4	373	341	26	26	26	28	69	72	28	30	23	23
11	3	1	408	350	30	34	1	1	23	20	7	6	12	13
12	7	7	310	388	30	38	148	153	145	147	21	28	87	88
13	7	6	395	375	25	25	128	118	125	120	30	28	60	57
14	11	11	555	453	2	2	12	10	51	18	10	9	36	24
15	6	4	390	406	28	30	1	8	39	40	10	25	2	25
16	8	8	465	462	33	25	2	7	31	28	8	5	15	13
17	9	9	566	535	23	26	5	7	29	39	5	12	19	26
18	5	5	530	430	18	20	216	231	156	165	20	24	97	90
19	3	9	333	290	20	19	129	106	125	117	21	60	60	61
20	10	9	497	513	32	26	9	1	35	22	19	6	27	13
21	2	2	262	282	20	20	31	35	70	70	21	21	35	33
22	4	3	435	406	22	20	1	1						
23	2	2	303	389	15	15	117	129	120	110	30	35	58	58
24	3	4	338	327	19	18	1	1	22	21	4	5	9	10
25	4	4	246	232	14	14	1	1	23	24	4	4	8	6
26	3	4	222	243	21	23	109	75	13	13	26	23	53	52
27	3	3	278	255	19	15	1	1	15	14	3	2	6	5
28	3	2	420	345	27	27	1	1	22	25	5	14	10	3
14 fetus	1	1	71	77	5	2	0,5	0,5						

Samples, sample weight(g) written down if taken. Blubber and muscle sample weight often divided to foil and no foil.

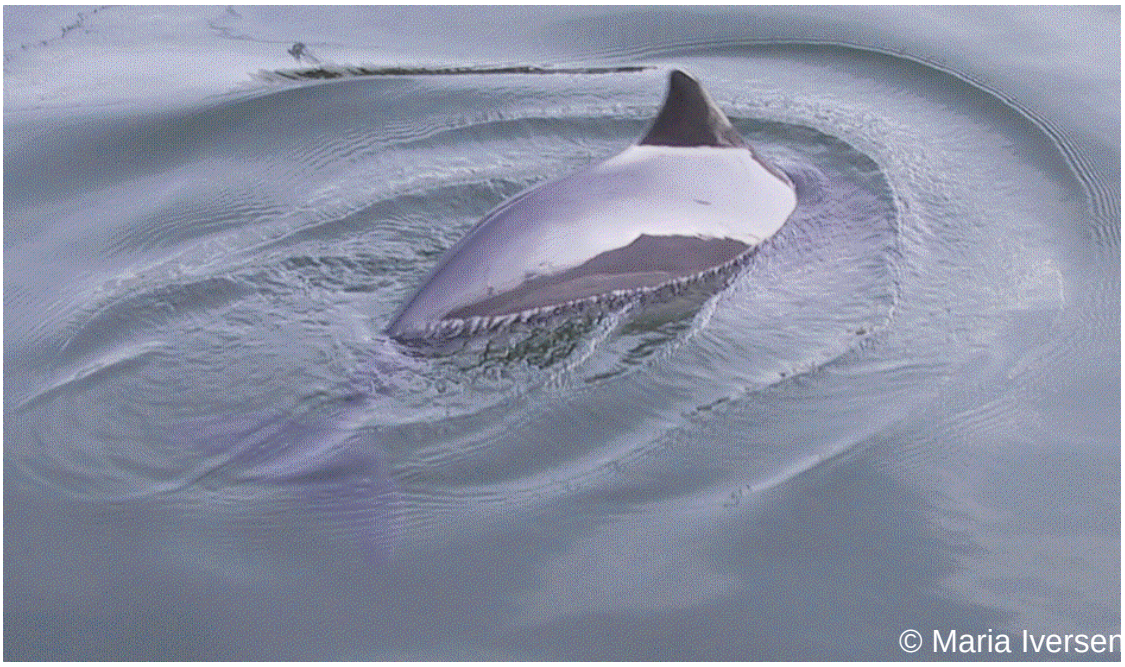
Parasite load

	teeth	pelvic bones	urine	blood	fetus	L,fetus (cm)	W,fetus (kg)	fetus sex	gonads	milk	stomach	blubber	blubber foil	muscle	muscle foil	skin	lung	liver	liver foil	heart	kidney	adrenals	spleen	ear	skin	lung	blow hole	intestine	stomach	liver	other	what?
1												62	X	39	X	9				X	X	X	X	0	0	1	0	0	0	0	0	
2									X		X	80	X	26	X	9	X	X	X	X	X		X	0	0	0	0	0	0	2	X	HEART
3		X							X		X	75	X	98	X	5	X	X	X	X	X	X	X	1	0	0	0	0	0	2	0	
4	X								X			97	X	120	X	X	X	X	X	X	X	X	X	0	0	0	0	0	0	0	0	
5	X	X							X		X	X	X	X	X	X	X	X	X	X	X	1	X	0	0	0	0	0	0	0	0	
6	X	X							1		X	X	X	X	X	X	X	X	X	X	X	X	X	0	0	1	0	0	0	3	0	
7	X	X							1		X	X	X	X	X	X	X	X	X	X	X	1	X	0	0	1	0	0	2	2	0	
8																								0	0	3	0	0	1	0	0	
9	X	X							X	X	X	X	X	X	X	X	X	Y	X	X	X	X	X	2	0	2	0	0	X	0	0	
10	X	X							X		X	X	X	X	X	X	X	X	X	X	X		X	0	0	1	0	0	0	3	0	
11																								0	0	0	0	0	0	0	0	
12	X	X							X			X	X	X	X	X	X	X	X	X	X	1	X	1	0	1	0	0	1	3	0	
13												144	X	83	X	6								0	0	0	0	0	0	1	0	
14	X	X			X	62,8	4,1	F	X		X	111	X	111	X	6	X	X	X	X	X	1	X	0	0	1	0	0	0	1	0	
15					X	50	1,977	M				66	X	101	X	4		25	X	43	22			0	0	2	0	0	0	3	0	
16	X	1	X						X		X	X	X	X	X	X	X		X	X	X	X	X	0	0	1	0	0	1	1	0	
17	X	1			X	65,7	4,2	M	X			X	X	X	X	X	X	X		X	X	X		0	0	1	0	0	0	0	0	
18	X	X							X			108	X	65	X	X	X	X	X	X	X	X	X	0	0	0	0	0	2	3	1	
19	X	X							X			85	X	103	X	X	X	X	X	X	X	X	X	1	0	1	0	0	0	0	1	BLUBBER
20	X	X			X	46	2,1	M	X			104	X	104	120	X	X	X	X	X	X	X	X	1	0	1	0	0	0	0	0	
21	X	X							X			62	X	69	X	X	X	X	X	X	X	X	X	0	0	0	0	0	0	1	0	
22	X	X							X			63	X	X	X	X	X	X	X	X	X	X	X	1	0	0	0	0	0	1	0	
23	X	X	X						X			37	20	X	X	7	X	X	X	X	X	X	X	2	0	1	0	0	0	2	0	
24	X	X	X	X					X			X	X	X	X	X	X	X	X	X	X	X	X	0	0	1	0	0	0	0	0	
25	X	X							X		X	X	X	X	X	X	X	X	X	X	X	X	X	0	0	1	0	0	0	1	0	
26	X	X	X	X								18	23	29	20	3		25	22		8		3	0	0	1	0	0	0	1	0	
27	X	X	X	X					X			X	X	X	X	X	X	X	X	X	X		X	0	0	1	0	0	0	2	0	
28		X		X					X			X	X	X	X	X	X	X	X	X	X	X	X	0	0	0	0	0	1	1	0	
14 f												X		X		X		X														

Appendix 2. Porpoise dissection form

Cetacean Dissection form
Húsavík Research Center (University of Iceland) & Húsavík Whale Museum

Maria Iversen



Contains a six-page dissection form,
Notes and figures for the use of the dissection form
An Excel folder set-up for filling in the data from the dissection forms

With inspiration from the dissection form from the Danish Institute of Fisheries Research

Cetacean Dissection form

Húsavík Research Center (University of Iceland) & Húsavík Whale Museum

ID No. Species:

Locality: Date of death:
Condition: Cause of death:
Date of Necropsy: If by-catch, in which fishery:
Photographs: Longitude: Latitude:

CHARACTERS:

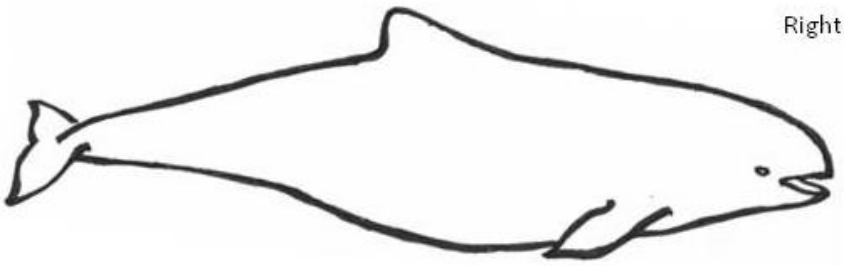
Sex
Male: Mature:_____ Immature:_____
Female: Mature:_____ Immature:_____Pregnant:_____Lactating: _____

Knobs on dorsal fin: Leading edge: Y / N Trading edge: Y / N

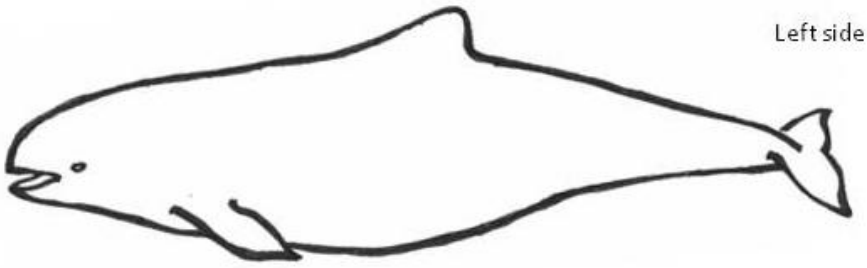
Tongue fringes: Y / N Length:_____mm

EXTERNAL APPERANCE:

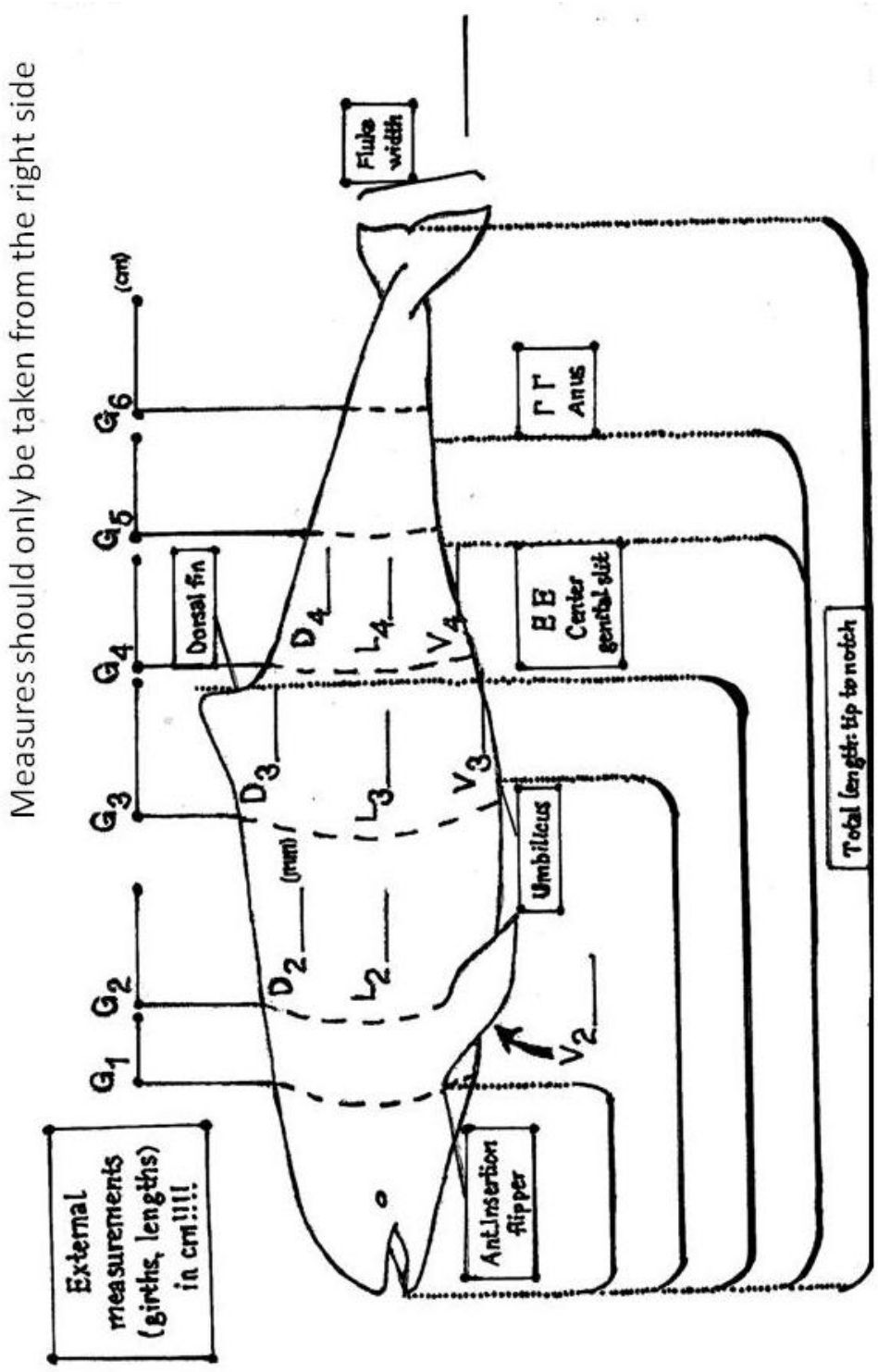
Right side



Left side



ID no.: 1


Measures should only be taken from the right side
External measurements (girths, lengths) in cm!!!!
Fluke width
Dorsal fin
Anus
Center genital slit
Umbilicus
Ant.insertion flipper
Total length: tip to notch
(cm)
(mm)
G1
G2
G3
G4
G5
G6
D2
D3
D4
L2
L3
L4
V2
V3
V4

ID no.:

2

EXTERNAL APPERANCE NOTES:

BODY CONDITION MEASURES:

See diagram page 2 for positions of sampling

Blubber thickness (mm): D_2 _____ D_3 _____ D_4 _____mm
L_2 _____ L_3 _____ L_4 _____mm
V_2 _____ V_3 _____ V_4 _____mm

Girth measures: G_1 _____ G_2 _____ G_3 _____ G_4 _____ G_5 _____ G_6 _____cm

_____

Leaf fat, if present: _____ cm

Length measures:

L_{total}: _____ cm L_{anus}: _____cm $L_{genital}$: _____ cm

$L_{umbillicus}$: _____cm $L_{flipper}$: _____cm

BODY CONDITION NOTES:

ID no.: 3

INTERNAL ORGAN NOTES:

MEASUREMENTS:

a. Body length: _____ cm

b. Body weight: _____ kg

d. Muscle weight: _____ kg

c. Blubber weight: _____ kg

e. Skull weight:_____ kg

f. Skeleton weight
(incl.flukes excl.skull) _____ kg

6. Stomach- Full: _____ kg
Stomach-empty: _____ kg

9. Intestines weigth: _____ kg
Intestines length: _____ m

3. Liver weight: _____ g

2. Heart weight: _____ g

5. Pancreas weight: _____ g

4. Spleen weight: _____ g

7. Kidney weigth: R_____ g L _____g

8. Adrenal weight: R_____ g L _____g

Lung weight: R_____ g L _____g
Lung-fat: R _____mm L _____mm

10. Gonad weight: R _____ g L _____g
Gonad length: R _____mm L _____mm
Gonad height: R _____mm L _____ mm
Gonad width: R _____mm L _____mm

ID no.:

4

REPRODUCTION:
External examination, should be fixed in formalin for further investigation

FEMALE

Sign of previous pregnancies (e.g. enlarged reproductive tract): Y / N

Right ovary: Nr. of Corpus luteum:_____ Nr. of Corpus albicans:_____

Left ovary: Nr. of Corpus luteum:_____ Nr. of Corpus albicans:_____

FOETUS

Foetus length:_____ cm Foetus weight:_____ kg

MALE

Presents of Sperm: Y / N - sample (if fresh:_____

PARASITE SAMPLES:

Ear: _____	Blowhole:_____	Liver: _____
Skin: _____	Intestine: _____	Other:_____
Lung: _____	Stomach: _____	

PARASITE LOAD (0-3):

Ear: _____	Blowhole:_____	Liver: _____
Skin: _____	Intestine: _____	Other:_____
Lung: _____	Stomach: _____	

GENERAL SAMPLES:

Teeth (min. 4): _____	Gonads(2): _____	Pelvic bones(2): _____
Skull: _____	Urine: _____	Blood (if fresh): _____
Fetus: _____	Milk: _____	Whole stomach: _____

TISSUE SAMPLES:

Blubber, D3: _____	Skin: _____	Kidney: _____
Blubber, D3 foil: _____	Lung: _____	Adrenals: _____
Muscle, D3: _____	Liver: _____	Liver foil: _____
Muscle, D3 foil: _____	Heart: _____	Spleen: _____
Other: _____		

ID no.: 5

REPRODUCTIVE NOTES:

SKELETON NOTES:

GENERAL NOTES:

ID no.: 6