COMPARISON OF MATURITY AND ACCUMULATION RATE OF CORPORA ALBICANTIA BETWEEN THE LEFT AND RIGHT OVARIES IN CETACEA

SEIJI OHSUMI

INTRODUCTION

On the activity of ovaries in animals, there are some species of which one side of the ovary is not functional, and there are other species of which both ovaries are functional. And the latter species are separated into two kinds, one is a animal of which both ovaries are active equally, the other one is a animal of which one ovary is more active than the other. Limiting to mammals, Orinithorhynchus paradoxus of Monotremata is functional in the left ovary only and the embryos are always found in the left uterus (Flynn & Hill, 1938). In some vespertilionid bats, only one ovary, usually the right, is functional; in others, both appear to be functional, but pregnancies are found only in the right horn of uterus (Asdell, 1946). In domestic cattle (Bos taurus), the right ovary tends to produce more ovulations than the left. A corpus luteum count showed 60.2% in the right ovary (Reece & Turner, 1938). According to Henning (1939), the right ovary-functions act more frequently than the left, since ovulations have been found in that ovary in 58.58±1.85% of cases. The other hand, in domestic pig (Sus scrofa), the left ovary appears to be slightly more active than the right. Warwick (1926) reported that 55.3% of ovulation were shed from the left ovary. The left ovary of horse (Equus caballus) functions more frequently than the right. In a series of 185 ovulations 61% were from the left (Andrews & McKenzie, 1941). But in many animal, there is practically little or no difference in the relative activity of the two ovaries (Guinea pig, Gavia porcellus; domestic rabbit, Oryctologus cuniculus; Woodchuck, Marmota monax; rat, Rattus rattus; Bengal rhesus monkey, Macaca mulatta etc.), according to a book by Asdell (1946).

Concerning the difference of ovulation or pregnancy between the left and right ovaries in CETACEA, Sleptsov (1940) reported that in only 17% of 635 pregnant dolphin and beluga embryos were found in he right horn of uterus. And Slijper (1958) described that ‘In all ODONTOCETES so far investigated, the fertilized ovum was almost invariably attached to the distended left horn of the uterus, while the smaller right horn was found to contain a part of the allantois. In MYSTICETES, on the other hand, the foetus may develope in eigher horn.’ In CETACEA, a ovum ovulated from one side of ovary, usually attached to the same side of horn of uterus (Slijper, 1949), therefore we can estimate by the horn in which foetus is, from which ovary ovulation occured. And fortunately in CETACEA, all ovulations are recorded permanently in the ovaries as corpora albicantia. So, we can determine the number of ovulation by the time of investigation by
counting corpora lutea and albicantia in each ovary. Laws (1961) reported that combining both corpora albicantia and corpora lutea, of 724 fin whale (Balaenoptera physalus) corpora, 52.4±3.72% were in right ovary and of 454 blue whale (Balaenoptera musculus) corpora, 52.4±4.68% were in right ovary, and he estimated possibility that there is a slight prevalence of right side in both species. Sergeant (1962) described that from the distribution of corpora lutea and albicantia in 42 ovary pairs of the pilot whale (Globicephala melaena) it was found that 70% of ovulations on average took place from the left ovary with wide individual variation in incidence of scars between two ovaries.

Reviewing the above reports, they seems to investigate the comparison of ovulation between the left and right ovaries including all age groups, and it seems that there is no report on the variation of accumulation rate of corpora in one side of ovary according to the increment of age. I studied the number of corpora lutea and albicantia between the left and right ovaries in 23 species of CETACEA, for the purpose of comparision of maturity and variation of corpora accumulation rate between the left and right ovaries. And then taxonomic consideration was given on the typing of relative corpora accumulation and interrelationship of the types.

I wish to express my sincere thanks to Dr. D. E. Sergeant of the Fisheries Research Board of Canada, Dr. M. Nakajima of the Enosima Marineland, Drs. M. Nishiwaki and T. Nemoto and Mr. T. Ichihara of our Institute, who kindly gave their valuable data for my study. Present paper would not be completed, if I didn't get their valuable materials. Especially Drs. Sergeant and Nishiwaki gave me many data and many suggestions. I am indebted to Professor H. Hosokawa of Department of Anatomy, School of Medicine, University of Tokyo, Assistant Professor T. Hibiya of Department of Fisheries, School of Agriculture, University of Tokyo and Dr. H. Omura, Director of our Institute for their helpful comment on my draft.

**MATERIAL**

Species, locality, number of samples, and investigator used in this study are shown in Table 1. To my regret, I collected the data on only 23 species, and they are not contained in all Genera of CETACEA.

Ovaries are convinced of the left and right, and number of corpora lutea and albicantia in each ovary are counted as accurate as possible. Mature ovary is defined as that in which more than one corpus luteum or albicans is accumulated, and I did not use an individual of which both ovaries are immature as the material for this paper.

As mentioned in above chapter, in CETACEA, corpus albicans is considered to be not absorbed. Therefore, the ovulations are recorded permanently as corpus albicans. Although there are individual variation in the ovulation rate, number of corpora albicantia is related to age in average. Then, the comparison of maturity and accumulation rate of corpora between the left and right ovaries are able to be examined by the comparison of number of corpora in the left or right ovary to the
total number of corpora in both ovaries.

Frequencies of number of corpora in the left ovary in each class of number of corpora in both ovaries are tabulated for eight species as shown in Appendix-Tables. Frequency of number of corpora in the right ovary is calculated easily from the table. From an Appendix-Table, a figure which shows a process of relative accumulation of corpora in the left and right ovaries is drawn for each species. On the species of which samples are small, individual data are plotted in the figure, and estimated mean curves of accumulation or corpora are drawn in the left and right ovary. Other species of which samples are collected more than 40, I calculated average number of corpora in the left or right ovary in adequate class of total number of corpora, and connected each average values by straight line.

**TABLE 1. LIST OF SPECIES AND NUMBER OF INDIVIDUALS EXAMINED IN THIS PAPER**

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality</th>
<th>No. of specimen</th>
<th>Investigator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balaenoptera musculus</td>
<td>N. Pacific</td>
<td>57</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>⌍physalus</td>
<td>N. Pacific</td>
<td>297</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>⌍edani</td>
<td>Japan</td>
<td>54</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>⌍boralis</td>
<td>Antarctic</td>
<td>80</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>⌍acutorostrata</td>
<td>Japan</td>
<td>2</td>
<td>T. ICHIHARA</td>
</tr>
<tr>
<td>Megaptera novaeangliae</td>
<td>N. P. and Ant.</td>
<td>100</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Eubalaena glacialis</td>
<td>N. P. and Ant.</td>
<td>3</td>
<td>T. NEMOTO and MATTHEWS (1938)</td>
</tr>
<tr>
<td>Physeter catodon</td>
<td>Japan</td>
<td>298</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Kogia sp.</td>
<td>Japan</td>
<td>1</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Berardius bairdii</td>
<td>Japan</td>
<td>13</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Ziphius cavirostris</td>
<td>Japan and N.P.</td>
<td>3</td>
<td>S. OHSUMI and KENYON (1961)</td>
</tr>
<tr>
<td>Delphinapterus leucas</td>
<td>Hudson Bay</td>
<td>16</td>
<td>D. E. SERGEANT</td>
</tr>
<tr>
<td>Phocoenoides dalli</td>
<td>Japan</td>
<td>5</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Grampus griseus</td>
<td>Japan</td>
<td>2</td>
<td>M. NAKAJIMA</td>
</tr>
<tr>
<td>Globicephala melasna</td>
<td>Newfoundland</td>
<td>173</td>
<td>D. E. SERGEANT</td>
</tr>
<tr>
<td>⌍scammoni</td>
<td>Japan</td>
<td>7</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Orcinus Orca</td>
<td>Japan</td>
<td>1</td>
<td>S. OHSUMI</td>
</tr>
<tr>
<td>Feresa attenuata</td>
<td>Japan</td>
<td>4</td>
<td>M. NISHIWAKI and S. OHSUMI</td>
</tr>
<tr>
<td>Lagenorhynchus obliversiens</td>
<td>Japan</td>
<td>1</td>
<td>M. NAKAJIMA</td>
</tr>
<tr>
<td>Tursiops truncatus*</td>
<td>Japan</td>
<td>26</td>
<td>M. NISHIWAKI, M. NAKAJIMA and S. OHSUMI</td>
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<tr>
<td>Delphinus delphis</td>
<td>Japan</td>
<td>6</td>
<td>M. NISHIWAKI, and M. NAKAJIMA</td>
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<tr>
<td>Stenella attenuata</td>
<td>Japan</td>
<td>3</td>
<td>M. NAKAJIMA</td>
</tr>
<tr>
<td>⌍caeruleoloba</td>
<td>Japan</td>
<td>333</td>
<td>M. NISHIWAKI and S. OHSUMI</td>
</tr>
</tbody>
</table>

* More taxonomic studies are needed on this species.

**RESULTS**

*Balaenoptera musculus*

Slijper (1949) reported 59% of pregnancies came from the left ovary in the blue whale, and Laws (1961) described that of 454 corpora, 52.4±4.86% were in right ovary. According to my material, total corpora in the left ovaries are 47.4% of total number of corpora in both ovaries.
As shown in Appendix-Table 1, each ovary attains to maturity by the time of two ovulations in each other side of ovary. And as shown in Fig. 1, accumulation rates of corpora are almost piled up each other in both sides of ovaries.

Considering above phenomenon, I conclude that in *Balaenoptera musculus* the left and right ovaries attain at maturity in the same time and ovulation occurs alternately from the left and right ovary in average.

*Balaenoptera physalus*

Many materials are obtained for this examination from the northern part of the North Pacific. In total individuals, 51.9\% of corpora accumulated in the left ovary. Slijper (1949) reported the percentage of existence of corpus luteum of pregnancy on 17, fin whales and the result was 65\% of fin whales the corpus luteum was in the right ovary. However, Laws (1961) describes that combining the corpora lutea and albicantia, of 724 fin whale corpora, 52.4±3.72\% were in the right ovary, and he states it seems possible that there is a slight prevalence of the right side in the fin and blue whale. My result is that the left side is slightly more, but it is included into the standard deviation by Laws (1961).

Appendix-Table 4 shows the distribution of number of corpora in the left ovary in each class of number of corpora in both ovaries. There is individual variation, for instance, in the 8 corpora class in both ovaries, the number of corpora in the left ovary distribute from 2 to 7, but the average is 4.6. That is to say, the average of corpora in the right ovary is 3.4. The left ovary attains to maturity by the time when the other side of ovary accumulated 4 corpora, on the other hand, right ovary attains to maturity by the time when 6 corpora accumulate in the left ovary.

As shown in Fig. 1, the maturity and the relative accumulation rate of corpora are almost the same between the left and right ovary in average.

*Balaenoptera edeni*

Materials were collected from Japanese coast. In total of 54 whales, 48.7\% of corpora accumulate in the left ovary. Each ovary attains to maturity by 3 corpora accumulate in each other side of ovary. And as shown in Fig. 1, the maturity and relative accumulation rate of corpora are seemed in average to be the same between the left and right ovary, although there is some individual variation.

*Balaenoptera borealis*

Materials were obtained from the Antarctic Areas IV, V, and VI. 49.7\% of corpora accumulate in the left ovary. The individual variation is seemed not to be so wide as *Balaenoptera physalus*. The left ovary attains to maturity by 5 corpora accumulate in the right ovary, on the other hand, the right ovary attains to maturity by 4 corpora accumulate in the left ovary. The average accumulation of corpora in each ovary is shown in Fig. 2, and maturity and corpora accumulation is almost the same each other between the left and right ovary.
Fig. 1. Relative accumulation of corpora lutea and albicantia in the left and right ovaries on *Balaenoptera musculus*, *B. physalus*, and *B. edeni*. Open circles and broken line: Average values in the right ovary. Closed circles and broad straight line: Average values in the left ovary. Thin line A: Ovulation occurs from one side only. Thin line B: Ovulation occurs equally from each ovary. Circles and curves: Law values and estimated average accumulation of corpora. (Explanations are same as above in the following Figures)
Fig. 2. Relative accumulation of corpora in the left and right ovaries on *Balaenoptera borealis, B. acutorostrata, Megaptera novaeangliae* and *Eubalaena glacialis*. Cross: Unknown which is the left or the right ovary.
Fig. 3. Relative accumulation of corpora in the left and right ovaries on *Physseter catodon*, *Kogia sp.*, *Berardius bairdii* and *Ziphius cavirostris*. 
Fig. 4. Relative accumulation of corpora in the left and right ovaries on *Delphinapterus leucus*, *Phocaenoides dalli*, *Grampus griseus* and *Globicephala melaena*.
Fig. 5. Relative accumulation of corpora in the left and right ovaries on *Globicephala scenmani*, *Orcinus orca*, *Feresa attenuata* and *Lagenorhynchus obliquidens*. 
Fig. 6. Relative accumulation of corpora in the left and right ovaries on *Tursiops truncatus*, *Stenella attenuata*, *S. caeruleoalba* and *Delphinus delphis.*
Balaenoptera acutorostrata

I have only two materials. But as shown in Fig. 2, the maturity and corpora accumulation is seemed to show the same type as the above species.

Megaptera novaeangliae

I used the ovaries materials from the Antarctic and the North Pacific. In the total of 100 individuals, 53.4% of corpora accumulate in the left ovary. The left ovary attaines to maturity by 5 corpora in the right ovary, and the right ovary attaines to maturity by 4 corpora in the left ovary. But in average, as shown in Fig. 2, the left and right ovaries are almost the same in the maturity and relative accumulation of corpora.

Eubalaena glacialis

By 1963, 11 right whales were killed by Japan in the North Pacific on the special permission of scientific research. Among them female whales are 4. The ovaries of one of the females were entirely immature and no follicle was seen on their surface (Omura, 1958). The ovaries of the second female are seemed to be prepuberal, because one follicle of which diameter is 3.8 cm is seen in the left ovary but there is not difference in the size between the both ovaries (Left: 30.0 x 12.0 cm, Right: 31.0 x 11.5 cm), and they are considered to be almost the same stage from the observation by naked eye. Other two females are both pregnant. One individual has only one corpus luteum in the right ovary and there is no corpus albicans in both ovaries. The other individual has one corpus luteum in the left ovary and two corpora albicantia in the right ovary.

Matthews (1938) reported that No. 1019 right whale in the southern hemisphere had one corpus luteum and 6 corpora albicantia in one side of ovary, and has 6 corpora albicantia in the other side of ovary.

Although I have small data on this species, and it is difficult to conclude, I estimate that maturity and relative corpora accumulation are the same in average between the both ovaries like the above 6 species.

Physeter catodon

Materials were obtained in the coast of Japan. In the total 298 whales, 51.6% of corpora accumulate in the left ovaries. From this point, we can estimate that ovulation occurs equally from both sides of ovaries. Appendix-Table 6 shows the distribution of corpora in the left ovary. Each ovary attains to maturity by 5 corpora accumulate in the other side of ovaries. Deviation of corpora is not so wide even in the old stages. As shown in Fig. 3, the maturity and relative accumulation rate of corpora is seemed to be equal in both side of ovaries like as MYSTACOCETI.

Kogia sp.

A Kogia was caught in a coast of Japan. Dr. M. Nakajima investigated and collected many materials on the species, but it is not yet identified. This individual has 6 corpora albicantia in the left ovary and 7 corpora albicantia in the right ovary.
I have only one material, but I estimate that this species will be the same tendency
as *Physeter catodon*.

**Berardius bairdii**

13 individuals were examined the corpora counts separating the left and right
ovaries. 47 corpora (47.5%) accumulated in the left ovary. Although the mate-
rials are not so many, we can estimate the maturity and relative accumulation
will be the same between the both ovaries.

**Ziphius cavirostris**

I have only two materials from the coast of Japan. And Kenyon (1961)
describes that one corpus albicans accumulated in each ovary of a female. Con-
sidering the above data and Fig. 3, I estimate that the tendency of maturity and
corpora accumulation will be the same as *Physeter*.

**Delphinapterus leucus**

In the total corpora, 68.9–70.8% of corpora accumulate in the left ovary, and
apparently the ovulations from the left ovary exceed those from the right side.

As shown in Fig. 4, there is an individual of which right ovary is still im-
mature when 5 corpora accumulate in the left ovary. On the contrary, there is an
individual of which left ovary is still immature when 3 corpora accumulate in the
right ovary. The right ovary in average attaines to maturity later than the left
ovary, but the deviation is not so much. Relative accumulation rate in the right
ovary is somewhat lower than that in the left ovary in younger stage, but the devia-
tion of corpora accumulation between the both ovaries seems to become shorter
gradually.

**Phocaenoides dalli**

There are 5 pairs of ovaries taken in the coast of Japan.

Unfortunately they are all relatively young stage (the oldest individual has
only 4 corpora in the both ovaries), and data are given from only 5 individuals.
Therefore, conclusion will be not introduced, but all corpora accumulate from the
left ovary. Right ovary is still immature, when 4 corpora accumulate in the left
ovary. And the size of ovary is smaller in the right ovary than in the left ovary.

**Grampus griseus**

One individual has one corpus albicans in the left ovary and one corp. luteum
and two corp. albicantia in the right ovary, whereas the other individual has one
corp. luteum and 7 corp. albicantia in the left ovary and one corp. albicans in the
right ovary. Then, 69.2% of corpora accumulate in the left ovary.

**Globicephala melaena**

In total corpora, 65.5% of corpora accumulate in the left ovary, therefore
ovulation occurs more frequently from the left ovary than from the right ovary.
Left ovary attaines to maturity by the time when 9 corpora accumulate in
the right ovary, on the contrary, there is an individual of which right ovary is immature when 9 corpora accumulate in the left ovary. As shown in Appendix-Table 7, there are many individuals of which left ovary is mature but the right ovary is still immature.

Fig. 5 shows the average corpora in the left and right ovaries in each total corpora class. From this figure relative corpora accumulation in the left ovary exceeds that in the right ovary.

Globicephala scammoni
I have only 7 data on the corpora count on this species. Considering Fig. 5, the relative accumulation curve is similar with that of Globicephala melaena. 58.9% of corpora accumulate in the left ovary.

Orcinusorca
I have only one corpora count on this species. One corpus luteum and 3 corpora albicantia accumulate in the left ovary and one corp. albicans exists in the right ovary. Assuming from only this specimen, this species is included into the similar type as Globicephala.

Feresa attenuata
There is an individual of which right ovary is still immature when 10 corpora accumulate in the left ovary. However, in total corpora, 82.6% of corpora accumulate in the left ovary. Although there are scanty of data, the relative corpora accumulation will be similar with that of Globicephala.

Lagenorhynchus obliquidens
I have only one material. This individual has two corpora albicantia in the left ovary, but the right ovary is still immature.

Tursiops truncatus
Zoological name of this species caught in the coast of Japan must be studied further, but I used it as T. truncatus according to Ogawa (1938).
82.8% of corpora accumulate in the left ovary, and all left ovaries are mature in the materials, but mature right ovary appears from the time when 3 corpora accumulate in the left ovary. And there is an individual of which right ovary is immature when 10 corpora accumulate in the left ovary. From Fig. 5, it will be assumed that the left ovary attaines at maturity first, and in younger stage ovulation occures in average from only the left ovary. Then, after attainment of later maturity of the right ovary, relative corpora accumulation rate of the right ovary will be larger than the left ovary.

Delphinus delphis
Of total individual, 88.5% corpora accumulate in the left ovary. In 5 individuals of total 11 corpora only the left ovaries are mature. The other in-
individual has 15 corpora albicantia in the left ovary and 6 corpora albicantia in
the right ovary. From Fig. 6, it will be considered that the right ovary attains to
maturity by the time when about 10 corpora accumulate in the left ovary, after then
relative accumulation rate will be more in the right ovary than in the left ovary.

*Stenella attenuata*

I have 3 corpora counts taken and kept in Japan. The data are scant and got
from young animals, but all corpora accumulate in only the left ovary.

*Stenella caeruleoalba*

As many as 333 materials are obtained from the coast of Japan as shown in
Appendix-Table 8.

There is no individual of which only left ovary is immature. On the other
hand, there are many individuals of which right ovary is still immature by the
time when 14 corpora accumulate in the left ovary. 93.4% of corpora accumulate
in the left ovary in total corpora.

In average, ovarian maturity occurs from the left ovary first, and until the
time when about 9 corpora accumulate in the left ovary, the right ovary is still
immature. But the right ovary is not immature for life. After the maturity of
the right ovary, relative corpora-accumulation rate becomes more in the right ovary
than in the left ovary.

**TYPES OF CORPORA ACCUMULATION IN BOTH SIDES OF OVARIES**

Considering the relative corpora-accumulation curves, we can classify them into
three kinds of types for 23 kinds of Cetacean species.

Type I: Left and right ovaries attain to maturity almost the same time in average,
and there is no difference in the relative accumulation rate of corpora between the
left and right ovary. Following 10 species are considered to be included into this
kind of type: *Balaenoptera musculus*, *B. physalus*, *B. edeni*, *B. borealis*, *B. acutorostrata*, *Magaptera novaeangliae*, *Eubalaena glacialis*, *Physeter catodon*, *Berardius bairdii*, and *Ziphius cavirostris*. I have only one *Kogia sp.* of which ovaries are examined. So, it is dangerous to conclude, but I consider that this species is also included in Type I.

Type II: Maturity of right ovary is attained somewhat later than the left. Relative
accumulation rate of corpora in the left ovary is more than that in the right during
young stage, but the difference between the left and right ovaries is not so much.
In older stage, relative accumulation rate of corpora in right ovary exceeds that
of the left ovary. Following 4 species are considered to be included into Type II: *Delphinapterus leucas*, *Globicephala melaelena*, *G. scammoni* and *Feresa attenuata*.

Owing to the deficiency of samples, I could not determine the type of corpora
accumulation for *Grampus griseus* and *Orcinus orca*. But I presumably consider they
are also included into this kind of type.

Type III: Remarkable difference of corpora-accumulation rate occurs between
the left and right ovaries. Left ovary attains to maturity earlier than the right.
And for relatively long time, ovulation occurs from only left ovary. But after
attainment of maturity of right ovary, the ovulation from right ovary becomes more frequently than the left. Following 5 species are considered to be included into this type: *Phocaenoides dalli, Tursiops truncatus, Delphinus delphis, Stenella attenuata* and *S. caeruleoalba*.

On *Lagenorhynchus obliquidens*, I have only one material, so I hesitate to conclude that this species is included in Type III, but I think it is possible.

![Fig. 7. Schematic figures of the three kinds of types of relative corpora accumulation in the left and right ovaries of cetacea.](image)

Number of corpora in both ovaries

- **Type I**: Broad solid line: Left ovary, Broad broken line: Right ovary, A-line: Ovulation occurs from only one side of ovaries, B-line: Both ovaries attain to sexual maturity in the same time and ovulation occurs equally from both sides of ovaries.

Table 2 shows the accumulation type and the per cent of number of ovulations (number of corpora lutea and albicantia) from the left ovaries to total ovulations from both ovaries for 23 species of *Cetacea* examined. As shown in the previous figures, such percents must be variable according to the variation of age distribution, especially in Types II and III. For instance, in *Stenella caeruleoalba*, if we collect only young animals, the percentage of ovulation in the left ovary is near 100%. On the contrary, if we collect only older animals, the percentage decreases remarkably. Therefore, I want to emphasize on this phenomenon. Previous workers reported percentage of the existence of fetuses in left or right uterine cornu (Sleptsov, 1940; Slijper, 1949 etc.) or percentage of number of corpora in left or right (Laws, 1961; Sergeant, 1962). But I think they did not consider the above phenomenon.

Nevertheless, as shown in Table 2, the percentages of total ovulation from left ovary to that from both ovaries are seemed to have relation with the types of corpora accumulation. That is to say, it is as a matter of course, the percentages of ovulation from left ovary are distributed between 45 and 55% in 11 species of Type I. They are 52.0% in average. In Type II, percentages of ovulation from the left ovary are distributed between 58 and 83% for 6 species. They are apparently separate from the values of Type I. And in average 65.9% of ovulations occurs from the left ovaries on the 6 species.

Type-III species have much percentage of ovulation from the left ovaries. The range of the ratios is between 82 and 100% and the average is calculated as 92.7% for the 6 species.
I consider that if we have only material on the distribution of corpora in left and right ovary or the percentage of foetal existence in the left or right uterine cornu on one species, we can estimate briefly in what kind of corpora-accumulation type the animal is classified.

### TABLE 2. TYPES OF CORPORA ACCUMULATION AND TOTAL NUMBER OF CORPORA

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of specimens</th>
<th>No. of Type</th>
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</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td><strong>Balaenoptera musculus</strong></td>
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<td>I</td>
<td>755</td>
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<td>——physalus</td>
<td>297</td>
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<td>1056</td>
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<tr>
<td><strong>Eubalaena glacialis</strong></td>
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<td>7-8</td>
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<td><strong>Physseter catodon</strong></td>
<td>298</td>
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<td>909</td>
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<td>47</td>
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<td>I</td>
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<td>16</td>
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<td>51</td>
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<tr>
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<td>III</td>
<td>10</td>
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<td>173</td>
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<td>607</td>
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<td><strong>Orcinus orca</strong></td>
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<td><strong>Feresa attenuata</strong></td>
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<td>26</td>
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<td>101</td>
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<tr>
<td><strong>Delphinus delphis</strong></td>
<td>6</td>
<td>III</td>
<td>46</td>
</tr>
<tr>
<td><strong>Stenella attenuata</strong></td>
<td>3</td>
<td>III</td>
<td>7</td>
</tr>
<tr>
<td>——caeruleolba</td>
<td>333</td>
<td>III</td>
<td>1750</td>
</tr>
</tbody>
</table>

* Per cent of number of corpora in the left ovary to total corpora in both ovaries.

### TAXONOMIC CONSIDERATION ON THE TYPES OF RELATIVE CORPORA ACCUMULATION IN CETACEA

In the previous chapter, I classified the relative corpora-accumulation curves into three kinds of types.

Among 23 species examined, there are only three genera in which more than two species are included (*Balaenoptera*, *Globicephala* and *Stenella*). But we can find that the species included in same genus show the same type of corpora accumulation. Then, I arrange genera of living CETACEA in Table 3. Types of corpora accumulation and the combination of genera by Flower & Lydekker (1891), Winge (1918), Fraser (1938), Simpson (1945) and Nishiwaki (1963, 1964) are also recorded in this table.

To my regret, I could not examine the types of corpora accumulation on all
<table>
<thead>
<tr>
<th>Genus</th>
<th>Type</th>
<th>Flower &amp; Lythgoe (1891)</th>
<th>Wing (1918)</th>
<th>Fraser (1938)</th>
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<th>National (1963-64)</th>
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<td></td>
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<td>Group A</td>
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<td>Globiceps</td>
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<td>I?</td>
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<td>Steno</td>
<td>II</td>
<td>Group B</td>
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<td></td>
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<tr>
<td>Steno</td>
<td>II</td>
<td>Delphinidae</td>
<td></td>
<td></td>
<td></td>
<td>Delphinidae</td>
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<tr>
<td>Stenella</td>
<td></td>
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<td></td>
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<tr>
<td>Sotalia</td>
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</tbody>
</table>
living genera. Especially there is no material on RHACHIANECTIDAE and PLATANISTIDAE. Now, three genera belonged to MYSTICETI are all included into Type I, and I guess all species of MYSTICETI has Type I corpora accumulation. In other words, we cannot divide MYSTICETI more than one group by only the corpora-accumulation curve.

On the contrary, ODONTOCETI are able to be divided at least three types by the corpora accumulation. Physeter, Kogia, Berardius and Ziphius are included into Type I. And Slijper (1958)'s discription must be added that in ODONTOCETI, there are some species of which foetus may develope in either horn. Åq the way, recently many authors use the same the classification as Fraser (1938), that is, Physeter and Kogia are classified into PHYSETERIDAE and Berardius, Hyperoodon, Ziphius, Tasmacetus and Mesoplodon are classified into another family of ZIPHIIDAE. But Flower & Lydekker (1891) and Winge (1918) recognized they are belonged to subfamily of PHYSETERIDAE. And Simpson (1945) established Superfamily PHYSETEROIDEA combining PHYSETERIDAE and ZIPHIIDAE. The phenomena in corpora accumulation will support the taxonomic interrelationship between PHYSETERIDAE and ZIPHIIDAE.

I cannot show the type of corpora accumulation for PLATANISTIDAE. Abel (1913) made special researches on the fossil CETACEA, and he tried to determine their position to recent forms. According his genealogical tree, PLATANISTIDAE is included into SQUALOCETI with PHYSETERIDAE and ZIPHIIDAE. But Slijper (1936) shows that from primitive SQUALODONTIDAE separate four branches of ODONTOCETI, and one of branches becomes to PLATANISTIDAE and PHYSETERIDAE. ZIPHIIDAE become from the second branch and DELPHINIDAE from the third branch. It is very interesting taxonomically that whether corpora accumulation shows Type I or the fourth type in PLATANISTIDAE.

Superfamily DELPHINOIDEA classified by Simpson (1945) and family DELPHINIDAE classified by Flower & Lydekker (1891), Winge (1918) and Fraser (1938) etc. does not show Type I. From this point of view, we will understand that so called DELPHINIDAE can be separated phylogenically from MYSTICETI and PHYSETEROIDEA.

However, there are at least two types of species in DELPHINOIDEA by the examination on the corpora accumulation rate. That is to say, Delphinapterus, Grampus, Globicephala, Orcinus, and Feresa show Type II, on the contrary, Phocoenoides, Lagenorhynchus Tursiops, Delphinus and Stenella are considered to be included into Type III. Flower & Lydekker (1891) separated DELPHINIDAE into Groups A and B. The species included in Group B show Type III, but in Group A there are two types of corpora accumulation. Winge (1918) describes that DELPHINIDAE is divided into five subfamily; MONODONTES, PHOCAENAE, GLOBICIPITES, LAGENORHYNCHI and DELPHINI, This classification is not contradictory to my result. Fraser (1938)'s classification of subfamily DELPHININAE which is widely used today is considered to be too large as Nishiwaki (1963) reported. Slijper (1936) and Simpson (1945) divided DELPHININAE by Fraser.
CORPORA ACCUMULATION IN CETACEA

(1938) into two families PHOCAENIDAE and DELPHINIDAE but their DELPHINIDAE must be divided at least two kinds from the viewpoint of my typing of corpora accumulation. Recently Nishiwaki (1963, 1964) compared body lengths, number of vertebrae, fused bone in cervical vertebrae, shape of skull, number maxillary teeth and length of rostrum for 12 genera of ODONTOCETI, and he separated living ODONTOSETI into 10 families as shown in Table 3. I have no data on the ovaries count for Orcaella, Noephocaena, Phocaena Pseudorca and Lissodelphis and I cannot conclude the typing of corpora accumualtion for Grampus. Excluding these 7 genera, the typing of corpora accumualtion agrees well with Nishiwaki's description. And on the standing point of only corpora accumulation, MONODONTIDAE and GLOBICEPHALIDAE is taxonomically near each other, because they show Type II of corpora accumulation, the other hand, PHOCAENIDAE (Phocaena) and DELPHINIDAE (Lagenorhynchus and Delphinus) show another type of corpora accumulation (Type III). They seem to be somewhat separated taxonomically from MONODONTIDAE and GLOBICEPHALIDAE. But, I consider that the difference between Type II and III is not so substantial as Type I. So, to my opinion, superfamily DELPHINOIDEA is needful for the classification of DELPHINIDAE-type species.

DISCUSSION

In DELPHINIDAE, especially Type III group, left ovary attaines at maturity first, and ovulations occure only from the left ovary in young generation, but after the right ovary attains at maturity, ovulations occure more frequently from the right ovary than from the left ovary. Such a phenomenon is interesting for the physiology of reproduction. The mechanism of control for maturity and ovulation in the each ovaries must be studied in future. As morphological approach, distribution of blood vessels and nerves, thickness of coatical layer of each ovary and their change according to age should be researched for the settlement of the mechanism.

It is notable that in the males both testes are almost equally mature and the difference of weight between both testes is very slight in the case of DELPHINIDAE so far as I investigated. Then, it is interesting why in the only females maturity and ovulations are different between each sides of ovaries. Ontogenical comparison is needful on the reproductive organs between both sexes for solution of this problem. The asymmetry of maturity and ovulation in DELPHINIDAE is considered to be related to the asymmetry of skull of ODONTOCETI, but PHYSETEROIDEA has same ovulatory pattern as MYSTICETI although the skull of it is asymmetry like DELPHINIDAE.

In the previous chapter I discussed the interrelationship between corpora-accumulation types and the taxomic position of CETACEA, and I found ovulatory pattern is related with the taxonomic status of the animals. Johnson & Ostenson (1959) describes that "modern taxonomic studies on specific and above must be based on more than simple morphologic comparison when complex relationships
are involved. Further research into their biologic nature is necessary". And they showed several taxonomic methods. As one of modern morphologic comparisons, they showed the genital tracts and foetal membranes reported by Mossman (1953). I believe in fact that the total biologic relationship and not any single taxonomic criterion is important as Johnson & Ostenson described. And the comparison of corpora-accumulation rate will be useful as one of the taxonomic criteria. For this purpose, we must gather more material on all species. Especially we have no or very small materials on PLATANISTIDAE and PHOCAENIDAE. I must say that comparison of corpora accumulation is only one method of taxonomical approaches and many other biological relationships are needful for the complete attainment to truth.

SUMMARY

1. Comparison of maturity and accumulation of corpora between the left and right ovaries is studied for 23 species of CETACEA.
2. Accumulation curves of CETACEA so far as investigated are classified into three kinds of types.
3. Type I: Maturity and ovulation occurs from both ovaries equally. Following species are considered to be included in this kind of type: *Balaenoptera musculus, B. physalus, B. edeni, B. borealis, B. acutorostrata, Megaptera novaeangliae, Eubalaena glacialis, Physeter catodon, Kogia sp, Berardius bairdii* and *Ziphius cavirostris*.
4. Type II: Corpora accumulation in the left ovary is rather more than the right in young stage. But the difference between both ovaries is not so much. Following species are considered to be included in Type II: *Delphinapterus leucas, Grampus griseus, Globicephala melaena, G. scammoni, Orcinus orca* and *Feresa attenuata*.
5. Type III: For relatively long time, ovulation occurs only from the left ovary, but after attainment of maturity of the right ovary, corpora accumulation of the right ovary becomes more frequently than the left. Following species are included into this type: *Phocaenoides dalli, Lagenorhynchus obliquidens, Tursiops truncatus, Delphinus delphis, Stenella attenuata*, and *S. caeruleoalba*.
6. As regards the percentage of distribution of corpora in the left ovary, range and average values of above three types are counted as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Range (%)</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>45–55</td>
<td>52.0</td>
</tr>
<tr>
<td>Type II</td>
<td>58–83</td>
<td>65.6</td>
</tr>
<tr>
<td>Type III</td>
<td>82–100</td>
<td>92.7</td>
</tr>
</tbody>
</table>
7. Corpora accumulation in MYSTICETI and PHYSETEROIDAE is classified into Type I. On the contrary, DEPHINIDAE *seusu lato* shows other types, and they should be separated into at least two classification by consideration of corpora-accumulation types.
REFERENCES


Adam and Charles Black, London.


Fraser, F. C. (1937). (See Norman, J. R. & Fraser, F. C.)


APPENDIX. RELATION OF THE NUMBER OF CORPORA BETWEEN THE
BOOTH OVARIIES AND THE LEFT OVARY

B: Number of corpora in the both ovaries.
L: Number of corpora in the left ovary.

**TABLE 1. BALAENOPTERA MUSCULUS**

| L \ B | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | Total |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|------|
| 0     | 2  | 2  |    |    |    |    |    |    |    |    |    |    | 4    |
| 1     | 5  | 1  | 2  | 3  |    |    |    |    |    |    |    |    | 12   |
| 2     | 1  | 1  | 7  | 2  | 1  | 1  | 2  | 1  |    |    |    |    | 16   |
| 3     |    | 1  | 2  |    | 1  | 2  | 2  |    |    |    |    |    | 8    |
| 4     |    |    | 3  | 1  | 2  |    |    |    |    | 2  |    |    | 8    |
| 5     |    |    |    |    | 1  | 2  |    |    |    |    |    |    | 3    |
| 6     |    |    |    |    |    |    |    | 1  |    |    |    |    | 1    |
| 7     |    |    |    |    |    |    |    |    |    |    | 1  |    | 2    |
| 8     |    |    |    |    |    |    |    |    |    |    |    | 1  |    |
| Total | 7  | 4  | 3  | 11 | 4  | 5  | 4  | 7  | 6  | 3  | 1  | 2  | 57   |

**TABLE 2. BALAENOPTERA EDENI**

| L \ B | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | Total |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|
| 0     | 2  | 1  | 2  |    |    |    |    |    |    |    |    |    |    | 6    |
| 1     | 3  | 6  | 5  | 1  | 1  |    |    |    |    |    |    |    |    | 16   |
| 2     | 1  |    | 3  | 1  | 1  |    |    |    |    |    |    |    |    | 7    |
| 3     |    | 1  | 4  | 1  |    | 1  |    |    |    | 1  |    |    |    |    | 10   |
| 4     |    |    |    | 1  | 1  |    |    |    |    |    |    |    |    | 4    |
| 5     |    |    |    |    | 1  |    |    |    |    |    |    |    |    | 2    |
| 6     |    |    |    |    |    |    |    | 1  |    |    | 1  |    |    | 4    |
| 7     |    |    |    |    |    |    |    |    |    |    |    | 1  |    | 3    |
| 8     |    |    |    |    |    |    |    |    |    |    |    |    | 1    | 2    |
| Total | 6  | 8  | 8  | 8  | 4  | 3  | 2  | 2  | 3  | 1  | 1  |    | 3    | 3    | 1    | 54   |

**TABLE 3. BALAENOPTERA BOREALIS**

| L \ B | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|
| 0     | 1  | 2  | 1  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 5    |
| 1     | 2  | 1  | 2  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 8    |
| 2     | 2  | 4  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 6    |
| 3     |    |    | 1  | 1  | 3  |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 13   |
| 4     |    |    |    | 1  | 1  | 3  | 5  | 3  |    |    |    |    |    |    |    |    |    |    |    | 15   |
| 5     |    |    |    | 1  | 2  | 2  |    |    |    |    |    |    |    |    |    |    |    |    |    | 8    |
| 6     |    |    |    |    | 2  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    | 10   |
| 7     |    |    |    |    |    | 2  |    |    |    |    |    |    |    |    |    |    |    |    |    | 3    |
| 8     |    |    |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    | 4    |
| 9     |    |    |    |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |    | 4    |
| 10    |    |    |    |    |    |    |    |    |    |    | 1  |    |    |    |    |    |    |    | 3    |
| 11    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 3    |
| 12    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 3    |
| Total | 3  | 5  | 8  | 2  | 6  |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 80   |
### TABLE 4. Balaenoptera physalus

| L\B | 1 | 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 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 40 | 47 | 69 | Total |
|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0   | 12| 8 | 1 |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 21 |
| 1   | 21| 24| 19| 7 | 5 | 2 | 1 | --| --| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 80 |
| 2   | 8 | 12| 15| 6  | 7 | 3 | 1 |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 52 |
| 3   | 6 | 8 | 9 | 5 | 2 | 2 | 5 | --| --| -- | 1  | -- | -- | -- | -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 40 |
| 4   | 2 | 3 | 3 | 9 | 3 | 4 | --| 1 | --| -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 27 |
| 5   | 2 | 2 | 5 | 3 | 1 | 4 | 3 | 2 |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 22 |
| 6   | 2 | 2 | 1 | 3 | --| 1 | -- | --| --| -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 7   | 1 | 1 | 1 | 2 | --| 1 | -- | --| --| -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 |
| 8   | 1 | 2 | 3 | 4 | --| --| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 |
| 9   | 1 | 1 | 3 | --| --| 1 | -- | --| --| -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 |
| 10  | 1 | 1 | 1 | 1 | --| --| -- | --| --| -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 |
| 11  | 1 | 1 | 1 | --| --| --| -- | --| --| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3 |
| 12  | 1 | 1 | 1 | --| --| --| -- | --| --| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4 |
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| 14  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1 |
| 15  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1 |
| 16  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1 |
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| 19  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1 |
| 20  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1 |

Total 33 40 38 32 25 17 17 14 14 3 11 11 9 5 4 2 4 3 2 -- 3 1 1 1 1 2 -- 1 1 1 1 1 297
### TABLE 5. MEGAPTERA NOVAEANGLIAE

| L\B | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | Total |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 0   | 9   | 2   | 1   | 1   |     |     |     |     |     |     |     |     | 13   |
| 1   | 13  | 11  | 5   | 3   | 1   |     |     |     |     |     |     |     | 33   |
| 2   | 7   | 7   | 2   | 4   | 1   | 1   |     |     |     |     |     |     | 22   |
| 3   | 2   | 5   | 3   | 4   | 2   | 1   |     |     |     |     |     |     | 17   |
| 4   | 2   | 3   | 2   |     |     |     |     |     |     |     |     |     | 7    |
| 5   | 2   | 2   |     |     |     |     |     |     |     |     |     |     | 6    |
| 6   |     |     |     |     |     |     |     |     |     | 1   | 1   |     | 1    |
| Total| 22  | 20  | 15  | 10  | 8   | 7   | 3   | 1   | 1   | 1   | 1   | 1    | 100  |

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### TABLE 7. GLOBICEPHALA MELAENA

| L\B | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | Total |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 0   | 3   | 1   | 1   | 2   |     |     |     |     |     |     |     |     |     |     | 8     |
| 1   | 20  | 6   | 2   | 3   |     |     |     |     |     |     |     |     |     |     | 33    |
| 2   | 5   | 17  | 3   | 3   |     |     |     |     |     |     |     |     |     |     | 26    |
| 3   | 10  | 4   | 7   | 2   | 2   |     |     |     |     |     |     |     |     |     | 28    |
| 4   |     |     | 6   | 3   | 2   | 3   |     |     |     |     |     |     |     |     | 17    |
| 5   |     |     | 6   | 6   | 6   | 3   | 3   |     |     |     |     |     |     |     | 27    |
| 6   |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 21    |
| 7   |     |     |     |     |     |     |     |     |     | 1   | 1   |     |     | 5     |
| 8   |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 3     |
| 9   |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 2     |
| 10  |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 2     |
| 11  |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1     |
| 12  |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1     |
| Total| 23  | 12  | 30  | 18  | 16  | 11  | 17  | 12  | 13  | 8   | 2   | 6   | 4   | 1    | 173   |
### TABLE 8. STENELLA CAERULEOALBA

| L.B | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | Total |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|
| 0   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 0    |
| 1   | 33 | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 34   |
| 2   | 38 |    |    | -  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    | 39   |
| 3   | 44 |    | 1  |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 46   |
| 4   | 38 |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    | 39   |
| 5   |    | 41 |    | 1  |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    | 43   |
| 6   |    | 24 |    | 2  | 3  | -  | 1  | -  |    |    |    |    |    |    |    |    |    |    |    | 31   |
| 7   |    |    | 19 | 1  |    | -  | -  | -  |    |    |    |    |    |    |    |    |    |    |    | 21   |
| 8   |    |    | 19 |    |    | -  | 2  | 1  |    |    |    |    |    |    |    |    |    |    |    | 22   |
| 9   |    |    |    |    |    | 14 | 1  |    | -  | -  |    |    |    |    |    |    |    |    |    |    | 17   |
| 10  |    |    |    |    |    |    | 10 | 2  | 1  |    | -  | 1  | 2  |    |    |    |    |    |    |    | 17   |
| 11  |    |    |    |    |    |    |    | 5  | 1  |    | -  |    |    |    |    |    |    |    |    |    | 9    |
| 12  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 4    |
| 13  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 6    |
| 14  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 3    |
| 15  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 16  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1  |
| Total| 33 | 39 | 44 | 40 | 43 | 25 | 22 | 23 | 14 | 12 | 9  | 8  | 4  | 4  | 4  | 3  | 2  | 2  | 1  | 1 | 333  |
EXPLANATION OF PLATE

Left side shows the left ovary and the right side shows right ovary in each figure. Numbers of corpora are shown as follows; a-b: a is the number of corpora lutea, and b is the number of corpora albicantia.

A: *Balaenoptera physalus*, L: 0–6, R: 0–9  (×0.17)
B: *Physeter catodon*, L: 0–3, R: 0–2  (×0.33)
C: *Kogia sp.*, L: 0–6, R: 0–7  (×1.1)
D: *Feresa attenuata*, L: 0–3, R: 0–1  (×1.1)
E: *Phocoenoides dalli*, L: 1–1, R: 0–0  (×1.3)
F: *Stenella caerulea*, L: 0–2, R: 0–0  (×1.4)