

On the pelvic girdle of cetaceans of the genus *Mesoplodon* Gervais, 1850

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Introduction

It has been claimed by SLIJPER in his very interesting text-book on cetaceans, "Walvissen" (1958, p. 67), that pelvic bones are absent in the female specimens of the pigmy sperm-whale and of the *Mesoplodon*¹, and that the absence of these bones represents an extreme stage in the reduction of the pelvic girdle in the cetaceans.

SLIJPER's contention on this absence of pelvic bones in the female *Mesoplodon* is very surprising, because one cannot find any information on this subject in classical text-books on cetaceans (VAN BENEDEN and GERVAIS 1868—1880; TOMILIN 1969), nor in studies on the skeletons of *Mesoplodon* (TRUE 1910; HARMER 1925; RAVEN 1937), nor in recent studies on *Mesoplodon* (those of NISHIWAKI and his collaborators), nor in SLIJPER's very extensive work on cetacean anatomy (1936), nor in any of his other studies. As E. J. SLIJPER does not give any reference to a source of information, it seems interesting to investigate where the information comes from and how the state of the pelvic girdle is in *Mesoplodon* of different sex, age and species.

The pelvic girdle in the Cetacean has already been a matter of much research. It consists of a pair of bilaterally situated bony structures, without any connection to the vertebral column. The most complete study on these structures is that of ABEL (1908): this author distinguishes several steps in the reduction, but does not seem to have known any case of a complete absence of this girdle. In most cetacean species this pelvic structures consist of only a single bone at either side, and this bone is considered by ABEL to be the remainder of the ileum (the cranial part) and the ischion (the caudal part), both in complete coalescence.

This opinion has been shared by VAN DEINSE (1931, pp. 195—241) in his investigation on 45 pelvic girdles of the harbour porpoise, *Phocoena phocoena* (Linnaeus, 1758). This author has also paid a peculiar attention to the differences between the girdles of male and female specimens and of different age. Although a lot of VAN DEINSE's contentions are subject to discussion, because of the illogical working method (see VAN BREE 1973), it is evident that in male specimens the pelvic bones are larger, longer, broader, thicker and especially heavier than those of female specimens of the same length.

This sexual difference in the pelvic bones may be seen in relation to the presence of the large crus penis and the well developed ischiocavernosus muscle of the male, both taking their origin on the rudimentary pelvic bone and needing a good base of fixation, while the corresponding structures in the female are but poorly developed. These anatomical features indicate that in male cetaceans the pelvic

¹ E. J. SLIJPER uses the respective dutch terms "Dwergpotvis" and "Spitssnuitdolfijn". But the latter term may cover in addition the peculiar species *Mesoplodon bidens* (Sowerby, 1804), encountered in the North Sea, as well as all other representatives of the genus *Mesoplodon* Gervais, 1850.

bones still have a functional role in the act of copulation, while in the female such a role is very limited.

In some species like the pigmy sperm-whale, *Kogia breviceps* (Blainville, 1838), the pelvic bones do not exist even in the male sex and are replaced by ligaments, as the investigations of SCHULTE and SMITH (1918, pp. 47–48) have shown. A similar absence has been described in the Ganges dolphin, *Susu gangetica* (Roxburgh, 1801), but VAN DEINSE (1931, p. 201) contests it.

Statements on the pelvic girdle in specimens of *Mesoplodon*

The problem now is whether in *Mesoplodon* a similar absence of the pelvic girdle happens to be the case. For verifying this absence museum skeletons are not a good source of information, because in many of them the pelvic bones are lacking, having been overlooked or lost during the preparation of the skeleton². Only the presence of such bones in the skeleton may yield as a positive information point. The present author has inspected 5 skeletons (3 females, 1 male and 1 of unknown sex) in the Brussels Museum (Institut Royal des Sciences naturelles de Belgique, — Koninklijk Belgisch Instituut voor Natuurwetenschappen) and 5 (4 females, 1 of unknown sex) in the Leyden Museum (Rijksmuseum voor Natuurlijke Historie, Leiden, Netherlands). Only in 1 of the 7 (or 9?) female skeletons pelvic bones (both being 74 mm long) are present, and this skeleton belongs to the species *Mesoplodon grayi* von Haast, 1876. The absence of pelvic bones in the 6 (or 8?) other female skeletons, all belonging to the species *Mesoplodon bidens* (Sowerby, 1804) may be significant, but remains inconclusive.

In the case of the male *Mesoplodon bidens* there is no doubt about the presence of pelvic bones, and the present author has seen their presence himself in a 4,6 m long male of this species, stranded on the Belgian coast in 1969 (DE SMET 1974). ABEL (1908) has described (pp. 179–180) and figured (fig. 51) all details of the male pelvic girdle; in his specimen (4,6 m long) they are a pair of slender bones, respectively 73 and 75 mm long. Several authors have cited their presence in other specimens.

Although they are present in the adult male specimens, they may remain for a long period in a cartilaginous state. In this respect an interesting observation has been made by the present author in a radiograph of a 40,5 cm male foetus of *Mesoplodon bidens*, found in a female of the Belgian coast. This foetus may have been some 6 months old, when one refers to the conjectures expressed by JONSGÅRD and HØIDAL (1957) on the growth of this species. Ossification has proceeded very well in the different parts of the skeleton of this foetus, but there was still no trace of it in the pelvic girdle.

Another interesting fact about these bones may be seen in the study of NISHIWAKI et al. (1972) on a male *Mesoplodon ginkgodens* (Nishiwaki and Kamyia 1958) of 477 cm, stranded at Ito (Japan). These authors have represented the pelvic

² As an example of this absence of pelvic bones, one may cite that in the 22 cetacean skeletons of an exhibition room of the Brussels Museum 14 of them do not have pelvic bones. — Even when the dissection of a specimen has been done by an experienced taxidermist under the guidance of an interested zoologist, there is no guarantee of conservation of these bones. The present author himself has had an unfortunate experience with a male *Mesoplodon bidens* of the Belgian coast in 1969: its pelvic bones had been lost although they had been transmitted to a skilled taxidermist, who was conscious of their value. In another case the pelvic bones of an harbour porpoise, *Phocoena phocoena*, were saved at the last moment.

girdle of this specimen (their fig. 9) without giving any description nor commentary on it. It is interesting to note that at the left side the pelvic bone consists of two pieces. This configuration gives the impression not to be the result of a transverse rupture of a single bone, but to be an entity of two separate bones, perhaps linked one to another by cartilage or by a ligament. It would be tempting to recognize in these two bones the ileum and the ischion, that ABEL has considered to be the components of the pelvic bone of most cetaceans.

It may not be excluded that at an older age these two bones would have formed a single one, like that of the right side. But it is also possible that this existence of two bones is the result of a pathological desossification. While in adult male specimens there does not seem to be any doubt as to the existence of pelvic bones, the problem remains for the female specimens of *Mesoplodon bidens*, because none of the inspected museum skeletons showed these bones and because nowhere in literature could a statement on their presence be found.³

For this reason the best conclusive information could be yielded by an examination of a fresh cadaver. However it occurs only very rarely that somebody has such an opportunity to do this because of the rareness of the species. Even when a stranding occurs, information may come too late. This occurred in October 1972, when an adult female *Mesoplodon bidens* of 4,75 m accompanied by a young female of 2,70 m was stranded on the Belgian coast. The next night the body of the adult female has been quickly dissected by unexperienced people, who payed no attention to the pelvic bones. The young female has lived three days in a delphinarium. Fortunately its lumber region has been inspected and two small pelvic bones, still in a cartilaginous state, were found.

If in a young female of *Mesoplodon bidens* of 2,70 m the pelvic bones are still in a cartilaginous state, it is quite possible that these bones remain cartilaginous during all life. This would explain their absence in the 6 skeletons of these species in the two Museums.

It is interesting to note here the observation of the Belgian biologist DUMORTIER, who gave in 1839 the first good description of *Mesoplodon bidens*. He studied a skeleton of a female that had stranded in 1835 in Ostend and had been prepared by a local taxidermist, PARET, being exhibited in the private collection of the latter. In DUMORTIER's study (p. 11) one can read: "Le squelette d'Ostende n'a présenté aucune trace de bassin; peut-être cet organe n'était-il pas encore ossifié." It cannot be excluded that DUMORTIER had been well informed by the taxidermist, who probably had some knowledge of cetacean anatomy, and who could have stated the absence of the bones. In any case, DUMORTIER's conjecture might be right. When later this skeleton came to the Brussels Museum, VAN BENEDEN has made a new description of it, but he has not paid any attention to the absence of the pelvic bones.

Did DUMORTIER's description give inspiration to SLIJPER for writing that the pelvic bones were absent in the female *Mesoplodon*? Or did SLIJPER observe it himself? Or did he know it from taxidermists or from his colleague VAN DEINSE? In any case a few laconical statements by VAN DEINSE touch on this problem. In 1946, when giving information on a female *Mesoplodon bidens* stranded in 1932 in the Netherlands and whose skeleton is in the Leyden Museum, VAN DEINSE stated briefly (p. 151) that in this animal (or in its skeleton in the museum?) no pelvic girdle had been

³ In his work on *Pseudorca crassidens* (Owen), SLIJPER (1939, p. 258) gives several informations on the pelvic bones of other cetaceans, and states the presence of a cranial processus on those of a female *Mesoplodon bidens* of the Leiden Museum (museum specimen n° 1638). It is this specimen that has been recognized later to be a *Mesoplodon grayi*.

found. On the same way he later (1948, p. 23) says of two female *Mesoplodon bidens*, both 5,3 m long, stranded in 1947 on the island of Texel (Netherlands) that the animals (or their skeletons?) had no remains of a pelvic girdle. In no case it is clear that VAN DEINSE had assisted at the dissection, nor whether he had been informed of statements made during the dissection, nor if he just observed the absence of the pelvic bones in the mounted skeletons.

A similar brief statement may be seen in the study of THORPE (1938) on a skeleton of a female *Mesoplodon mirus* (TRUE 1913) of 15 feet and 6 inches; after stating that the skeleton had been skullfully prepared (p. 354), the phrase (p. 362) "No pelvic bones were present" must merit attention.

In any case such a laconic negative saying provides more information than RAVEN'S study (1937) on the skeleton of a female *Mesoplodon europaeus* (GERVAIS 1855) of 4,67 m and a *Mesoplodon mirus* (TRUE 1913) of 4,87 m, where no phrase tells anything on the pelvic girdle.

Conclusions

Resuming the above statements one may say:

1. The reduced pelvic girdle of the cetaceans has still some role in the male specimens as a fixation base for some structures of the penis.
2. Absence of a pelvic girdle seems to be the case in a few cetacean species, e. g. *Kogia breviceps*.
3. In a 40,5 cm male foetus (probably being six months old) of *Mesoplodon bidens*, ossification was occurring in most parts of the skeleton, but not in the pelvic girdle.
4. In a young female *M. bidens*, 2,70 m long, the pelvic girdle was represented by two small cartilaginous pieces.
5. In adult females of *M. bidens* probably no ossified pelvic bones exist; in any case none of the museum skeletons inspected had a pelvic girdle and several brief references in literature make to believe that the girdle is truly absent.
6. In the adult females of *M. mirus* and *M. europaeus* a similar state may obtain but the information is too scanty.
7. In a museum skeleton of an adult female of *M. grayi* a pair of ossified bones is present as representatives of a pelvic girdle.
8. In an adult male of *M. ginkgodens*, stranded in 1971 in Japan, two separated bones represented the pelvic girdle at the left side and a single bone did so at the right side.
9. In adult males of *M. bidens* a pair of slender bones represents the pelvic girdle.

These facts give the impression that in the different species of the genus *Mesoplodon* the pelvic girdle is involved in a very special process of reduction. This process may be different from one species to another, but is much more pronounced in the female specimens than in the male ones.

A careful investigation of the ossification state of the pelvic girdle of any representative of this genus or of allied genera would allow to have some better insight in the state of the reduction than we have at present. Unfortunately all these species seem to be rare (MOORE 1968).

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Summary

The ossification of the reduced pelvic girdle in representatives of the cetacean genus *Mesoplodon* Gervais, 1850 begins late in foetal life in the male specimens and probably never occurs in the female specimens of a few species.

Zusammenfassung

Über den Beckengürtel bei Cetaceen der Gattung *Mesoplodon* Gervais, 1850

Die Verknöcherung des reduzierten Beckengürtels des Cetaceen-Genus *Mesoplodon* Gervais, 1850 fängt bei männlichen Individuen erst spät embryonal an und findet scheinbar niemals bei weiblichen Tieren statt. Das gilt jedoch nur bei bestimmten Arten.

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