

Miocene cetacean remains from mediterranean Spain

G. PILLERI*

RESUMEN

PILLERI, G. Restos de cetáceos miocénicos en la España mediterránea.

Contrariamente a lo que sucede con los Sirenia, los Cetacea fósiles son muy raros en el Mioceno (Burdigaliense superior) español. Este artículo describe el material que existe en los museos catalanes. Se ha podido identificar un Eurhinodelphido (*Eurhinodelphis* sp., cf. *E. sigmoideus* ?) y un diente de Delphinidae (*Champsodelphis* ?), además de restos postcraneales indeterminados de Odontoceto. Entre los Mysticetos existen fragmentos craneales y esqueléticos de *Cetotherium* sp.

Palabras clave: Cetacea, Mioceno superior de la España mediterránea, Revisión taxonómica.

ABSTRACT

In contrast to the Sirenia, fossil Cetacea are much rarer in the Spanish Miocene (upper Burdigalian). This paper discusses the material available in the Catalan museums. It was possible to identify one Euhinodelphide (*Eurhinodelphis* sp., cf. *E. sigmoideus*?) and a tooth of Delphinidae (*Champsodelphis*?), in addition to indeterminate postcranial Odontocete remains. For the Mysticeti, cranial and skeletal fragments of a *Cetotherium* sp. are present.

Key words: Cetacea, Upper Miocene of Mediterranean Spain, Taxonomic revision.

INTRODUCTION

«The remains of this order», wrote BATALLER (1956, p. 25), referring to the fossil cetacean remains in the whole of Spain «and particularly the whales, which are

* Brain Anatomy Institute. University of Berne. Untere Zollgasse 71. 3072 Ostermündingen. Switzerland

so abundant in the northern seas of the Atlantic Coast, both American and European, are non-existent in our country».*

In the course of my studies on the Sirenia of Catalonia, I found among the specimens of the Barcelona Geological Museum (MGB), the Geological Museum of the Barcelona Seminary (MGSB), the Museu Comarcal, Vilafranca del Penedès (MCV) and among private collectors, bone remains which, although designated as belonging to Sirenia, nevertheless clearly originate from Miocene Cetacea. Hence BATALLER's assumption calls for rectification. With few exceptions, the condition of the material was not such as to allow more precise taxonomic determination. In view of the extremely scanty information available concerning the fossil Cetacea of Spain, I should like nevertheless to publish the conclusions of my observations in the following note:

* A series of teeth from Sant Pere de Ribes are illustrated in the same work (Lámina 6), designated as *Tursiops* «from the Spanish Miocene». They are in fact clearly crocodile teeth. In their catalogue «*Mammalia tertiaria Hispaniae*» (1973), CRUSAFONT-PAIRÓ and CASANOVAS-CLADELLAS make no reference at all to the order of Cetacea.

SYSTEMATIC PALEONTOLOGY

A. Odontoceti

Order: CETACEA BRISSON, 1762
 Suborder: ODONTOCETI FLOWER, 1867
 Family: EURHINODELPHIDAE ABEL, 1901
 Genus: *Eurhinodelphis* DUS BUS, 1867
Eurhinodelphis sp. (cf. *E. sigmoideus* PILLERI, 1985)

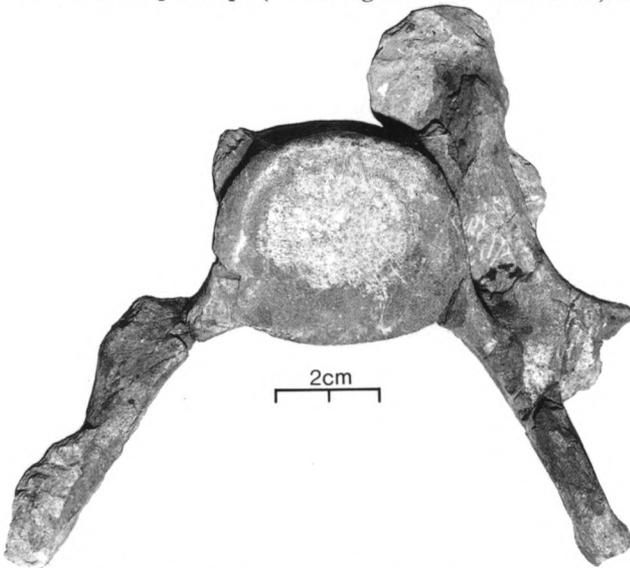


Fig. 1 - *Eurhinodelphis* sp. from Gelida (MGSB), 5th cervical vertebra.

Locality: Bosc d'en Juncosa, Gelida (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB, unnumbered) - This is a cervical vertebra, comparable in shape with a Eurhinodelphidae cervical vertebra. The measurements match those of the 5th cervical vertebra of *Eurhinodelphis sigmoideus* (PILLERI, 1985) from the Lower Miocene of Belluno. The find has already been described in detail in another work (PILLERI, 1988) and is mentioned again here for the sake of completeness. Within the Mediterranean Tethys, apart from Belluno (*Ziphiodelphis abeli*, *Eurhinodelphis bellunensis*, *Eurhinodelphis sigmoideus*), Eurhinodelphidae are known from the Middle Miocene of Apulia (*Ziphiodelphis abeli*, *Eurhinodelphis salentinus*, see PILLERI, 1985, 1987).

ODONTOCETI FLOWER, 1867
Genus et species ident.

Locality: C. Codorniu, Sant Sadurní d'Anoia (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB No. 31.257/1-4) - Indeterminate bone fragments, including a scapula fragment with cavitas glenoidalis.

ODONTOCETI FLOWER, 1867
Genus et species ident.

Locality: Saldonera de «C. Puig», Sant Pere de Ribes (Barcelona)
Age: Upper Burdigalian-Langhian

(No. 3.694, Olivella leg. 1978) - A number of small skull fragments, probably of Odontoceti, together with rib fragments of sea cows. The material is preserved at the Museu Comarcal, Vilafranca.

ODONTOCETI FLOWER, 1867
Genus et species indet.

Locality: Saldonera de, Banyeres del Penedès (Tarragona)
Age: Upper Burdigalian-Langhian

(MGSB No. 4.168) - A rib, a skull fragment.

ODONTOCETI FLOWER, 1867
Genus et species ident.
(Fig. 2a-d)

Locality: El Catllar (Tarragona)
Age: Upper Burdigalina-Langhian

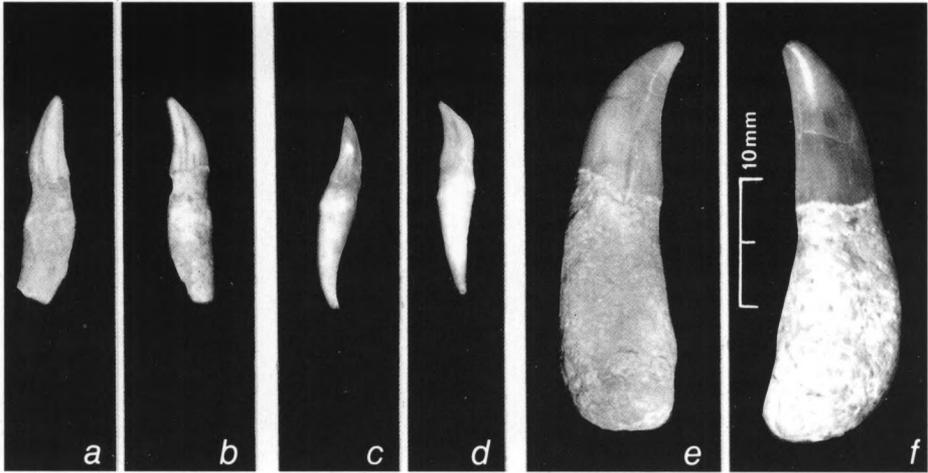


Fig. 2 - a - d = two teeth of *Acrodelphidae* (?) from El Catllar; e, f = larger tooth of *Champsodelphis* (?) from the same locality (coll. A. Ossó, Tarragona).

(Unnumbered; Coll. A. Ossó, Tarragona) - Two small slightly s-shaped curved teeth. The enamel of the clearly curved crown is smooth and shiny. The root bulge is more occlusally located. The root narrows into a point. The measurements are given in Table 1.

TABLE 1 - Measurements (mm)

Total length	16	15
Crown, height	6	5
Crown, labio-lingual diameter	3.5	3
Crown, mesio-distal diameter	3	2.7
Robot, labio-lingual diameter	4	3
Robot, mesio-distal diameter	4	3

Remarks: They may be teeth of small Delphinoidea, e.g., an acrodelphid. They originate from the same locality as the following specimen, to which the taxonomic determination *Champsodelphis* (*Acrodelphis*) might apply.

ODONTOCETI FLOWER, 1867
 Family: Delphinidae? Acrodelphidae?
Genus et species indet.

(Fig. 2e, f)

Locality: El Catllar (Tarragona)

Age: Upper Burdigalian-Langhian

(Unnumbered; Coll. A. Ossó, Tarragona) - A tooth with a slightly curved crown and clearly bulging root. The enamel is yellow, smooth and shiny. The measurements are given below (Table 2):

TABLE 2 - Measurements (mm)

Total length	31
Crown, height	14
Crown, labio-lingual diameter	7.3
Crown, mesio-distal diameter	5.5
Robot, labio-lingual diameter	9
Robot, mesio-distal diameter	9

Remarks: The crown is similar in shape to the teeth of recent or fossil *Tursiops*, while the bulging root is very reminiscent of the teeth of *Acrodelphis ombonii* (see PILLERI, 1985: Plate LI, Fig. E). However, the teeth of *A. ombonii* are further apart, and they lack the mesio-distal compression of the crown which is apparent in the present tooth. This tooth was found together with the two smaller teeth mentioned above in El Catllar. A crocodile tooth and two seal canines, which are illustrated in view of the rarity of the find (Fig. 3a-c; Fig. 4), originate from the same deposit.

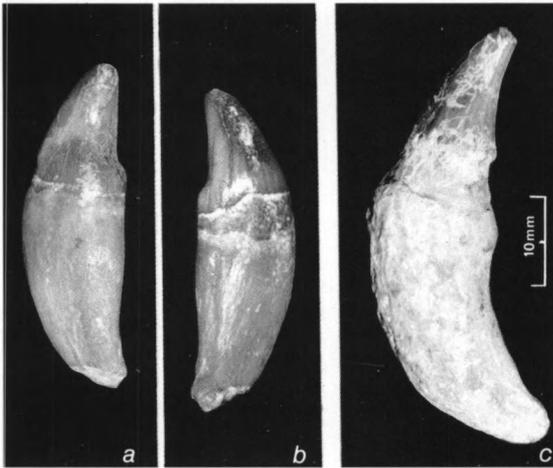


Fig. 3 - Two canine teeth of *Pinnipedia* sp. from El Catllar (coll. A. Ossó, Tarragona).

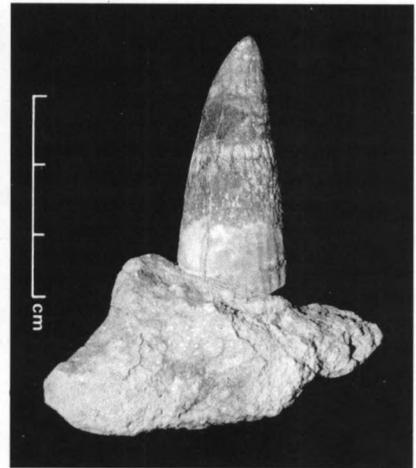


Fig. 4 - Crocodile tooth from El Catllar (coll. A. Ossó, Tarragona).

?ODONTOCETI FLOWER, 1867
Genus et species indet.

Locality: Hoya de Gul (Almería)

Age: Upper Burdigalian-Langhian

(MGB - No. 30.534, A. Cobos leg.) - Rib fragment of a cetacean, 10 cm long with clear spongiosa. The diameter is 19×30 mm. It is impossible to tell whether the rib belongs to a Mysticete or an Odontocete.

?ODONTOCETI FLOWER, 1867

Genus et species indet.

Locality: La Sanabra, Santa Margarida i Els Monjos (Barcelona)

Age: Upper Burdigalian-Langhian

(MGB - No. 6134, coll. Bataller) - Several cetacean rib fragments with spongiouse structure, previously designated as sirenian.

?ODONTOCETI FLOWER, 1867

Genus et species indet.

Locality: La Sanabra, Santa Margarida i Els Monjos (Barcelona)

Age: Upper Burdigalian-Langhian

(MGB - No. 6135, coll. Bataller) - Rib fragments with spongiouse bony structure, previosly designated as sirenian.

ODONTOCETI FLOWER, 1867

Genus et species indet.

Locality: La Bardera, Subirats (Barcelona)

Age: Upper Burdigalian-Langhian

(No. 31.261/a-b) - Two vertebrae from the mid-caudal region. The measurements are given in Table 3. Although listed by ALMERA (1896, p. 359) as «*Metaxytherium fossile*», they clearly belong to an Odontocete.

TABLE 3 - Measurements (mm)

	31261a	31261b
Horizontal diameter	32	32
Vertical diameter	30	30
Rostro-caudal length	44	47

B. Mysticeti

Ordo: CETACEA BRISSON, 1762

Subordo: MYSTICETI FLOWER, 1864

Genus et species indet.

(Plate 1)

Locality: Hoya de Gul (Almería)

Age: Upper Burdigalian-Langhian

(MGB - No. 30.533, A. Cobos leg.) - A large caudal vertebra with transverse processes broken off. The measurements are given in Table 4.



Plate 1

Caudal vertebra from Hoya de Gul, Almería (MGB - 30.533)

a = rostral *b* = caudal *c* = ventral view (the caudal apophysis is lacking).

TABLE 4 - Measurements (mm)

Corpus, horizontal diameter of the anterior apophysis	120
Corpus, vertical diameter of the anterior apophysis	100
Corpus, horizontal diameter of the posterior apophysis	130
Corpus, vertical diameter of the posterior apophysis	100
Corpus, rostro-caudal length	80
Processus transversus, medio-lateral width	50
Processus trasnversus, ventro-dorsal thickness	25
Canalis neuralis, width	35

Remarks: The shape and size are suggestive of a vertebra belonging to a small Mysticete, possibly a cetothaird.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Torre Cárdenas (Almería)

Age: Upper Burdigalian-Langhian, yellow marls

(MGB - No. 30.532, A. Cobos leg.) - Corpus of a caudal vertebra with the following measurements (Table 5).

TABLE 5 - Measurements (mm)

Corpus, horizontal diameters	63
Corpus, vertical diameter	62
Corpus, cranio-caudal length	70
Root of transverse Corpus, cranio-caudal length	40
<i>Idem.</i> dorso-ventral thickness	17

MYSTICETI FLOWER, 1864

Genus et species indet.

Locality: El Catllar (Tarragona)

Age: Upper Burdigalian-Langhian

(Plate 2)

(Unnumbered; Coll. A. Ossó, Tarragona) - A fairly large lumbar vertebra without left tranverse process, with following measurements (Table 6).

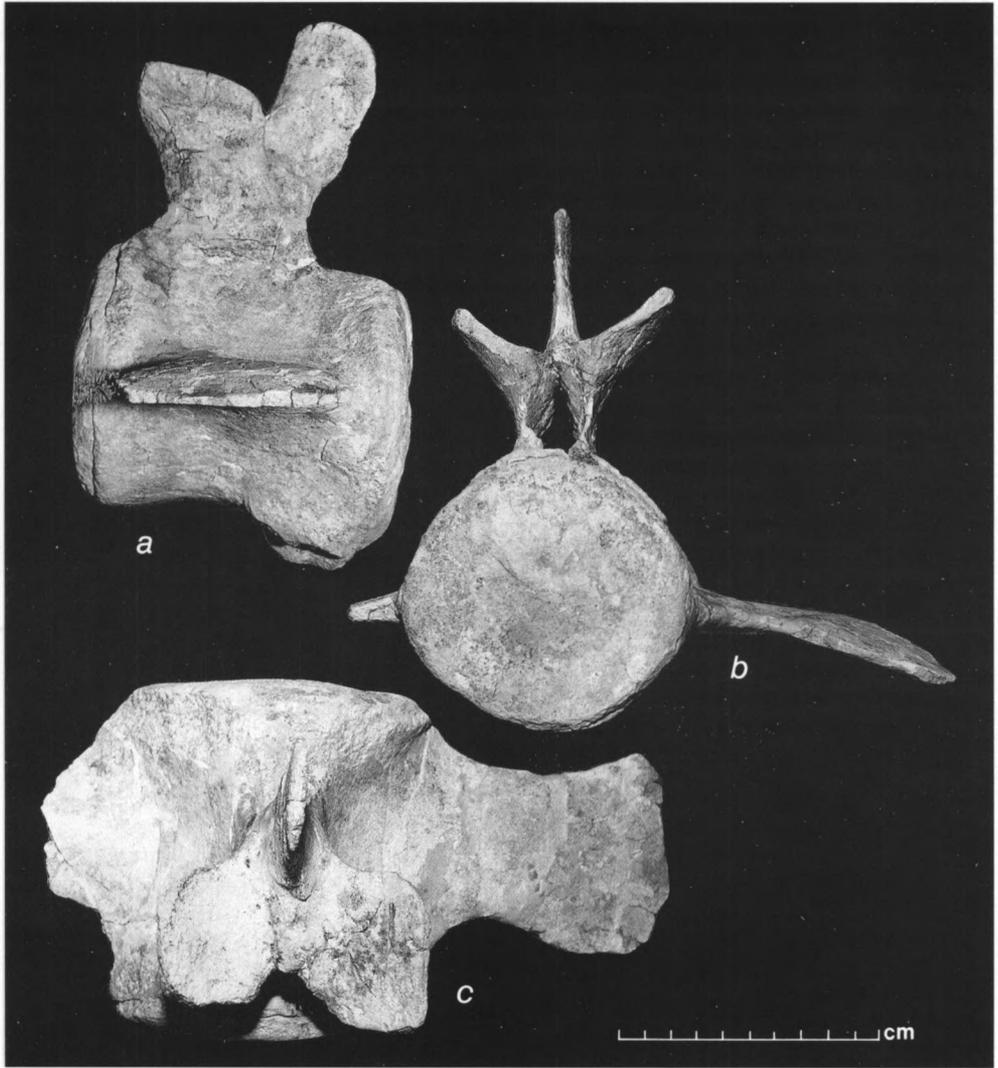


Plate 2

Lumbar vertebra from El Catllar (Coll. A. Ossó, Tarragona).

a = lateral

b = caudal

c = dorsal view

TABLE 6 - Measurements (cm)

Total height	20
Total width	31
Transverse process, lateral length	9
Transverse process, rostro-caudal width	7
Processus spinosus, height	10
Processus spinosus, rostro-caudal width	3
Corpus, anterior apophysis, horizontal diameter	9.5
Corpus, rostro-caudal length	11
Metapophysis, width	3.5
Metapophysis, rostro-caudal length	4.5
Canalis neuralis, horizontal diameter	1.5
Canalis neuralis, vertical diameter	3

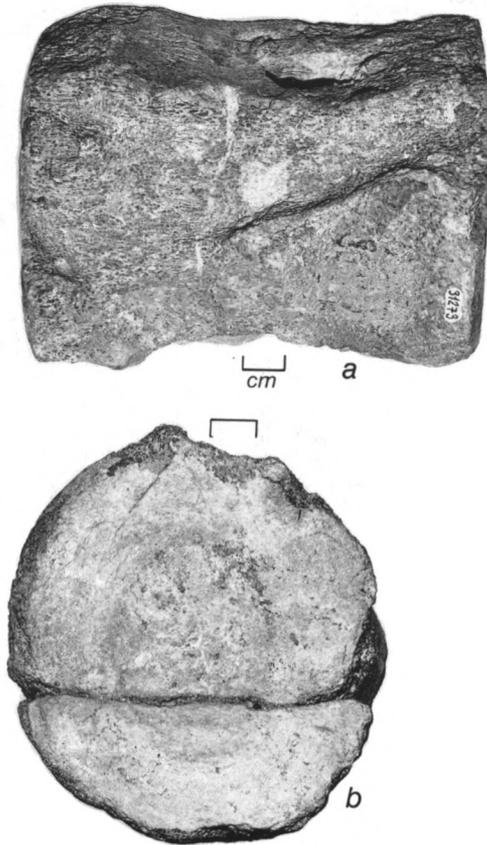


Fig. 5 - Centre of a caudal vertebra from Sant Llorenç d'Hortons (MGSB - 31.273): *a* = dorsal, *b* = rostral view.

MYSTICETI FLOWER, 1864
?Cetotherium sp.

Locality: Sant Llorenç d'Hortons (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB - No. 31.273, Casanova leg.) - Large vertebral corpus of the caudal series without apophyses. Horizontal diameter 83 mm, vertical diameter 80 mm and rostro-caudal length 105 mm.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Subirats (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB - No. 31.271) - Corpus of an anterior caudal vertebra without apophyses and two vertebral fragments. Horizontal diameter 90 mm, vertical diameter 80 mm and cranio-caudal length 95 mm.

?CETACEA, incertae sedis

Locality: Subirats (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB - No. 31.270) - Seven vertebral fragments, taxonomically unclassifiable.

(?)MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Montjuïc (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB No. C 52 A = Collector's No.) - Two rib fragments.

MYSTICETI FLOWER, 1864
?Cetotherium sp.

(Plate 3, 1)

Locality: Saldonera de «Griffi», Sant Pere de Ribes (Barcelona)
Age: Upper Burdigalian-Langhian

(MGSB - No. 24.663, Dr. S. Calzada leg. 1968) - 20 cm long distal fragment of a left mandibular ramus with a dorso-ventral diameter of 60 mm. Three vascular openings are visible on the dorsal margin. The dorsal and ventral margins, which run parallel to each other, as well as the measurements, seem to me characteristic for the genus classification.

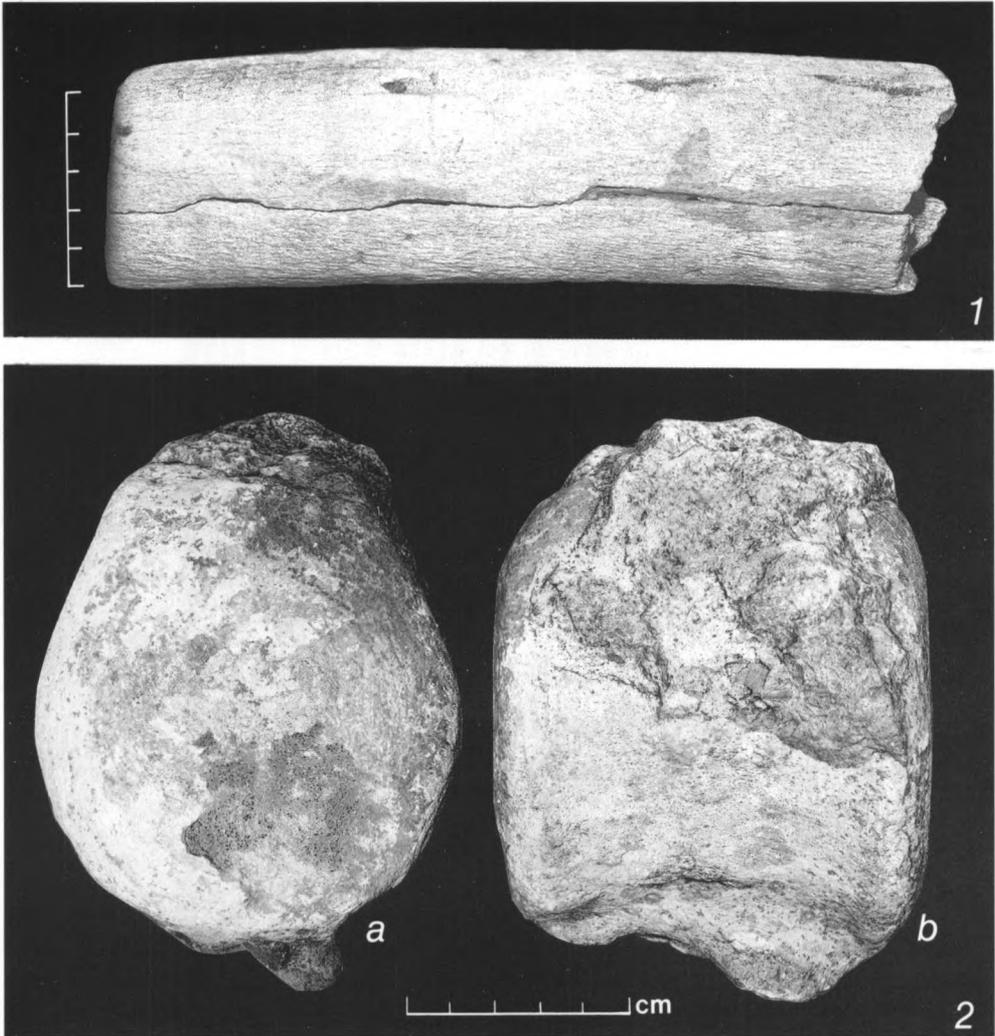


Plate 3

Fig. 1 = mandible fragment from Sant Pere de Ribes (MGSB - 24.663)

Fig. 2 = caudal vertebra from Sant Sadurní d'Anoia (MGB - 15.844)

a = rostral

b = lateral view

MYSTICETI FLOWER, 1864

Genus et species indet.

(Plate 3, 2)

Locality: Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGB - No. 15.844, coll. Mapa Geològic de Catalunya) - Caudal vertebra.
Horizontal corpus diameter 86 mm, vertical diameter 95 mm and cranio-caudal length 91 mm.

MYSTICETI FLOWER, 1864

Genus et species indet.

(Plate 4)

Locality: Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGB - No. 15.845) - Caudal vertebra. The measurements are given in Table 7.

TABLE 7 - Measurements (mm)

Corpus, horizontal diameter	100
Corpus, vertical diameter	110
Corpus, rostro-caudal length	100
Processus transversus, rostro-caudal length	45
Processus transversus, dorso-ventral thickness	10
Processus transversus, lateral width	35-40
Canalis neuralis, horizontal diameter	45

MYSTICETI FLOWER, 1864

Genus et species indet.

(Plate 5)

Locality: Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGB - No. 15.846, coll. Mapa Geològic de Catalunya) - Caudal vertebra. The measurements are given in Table 8.

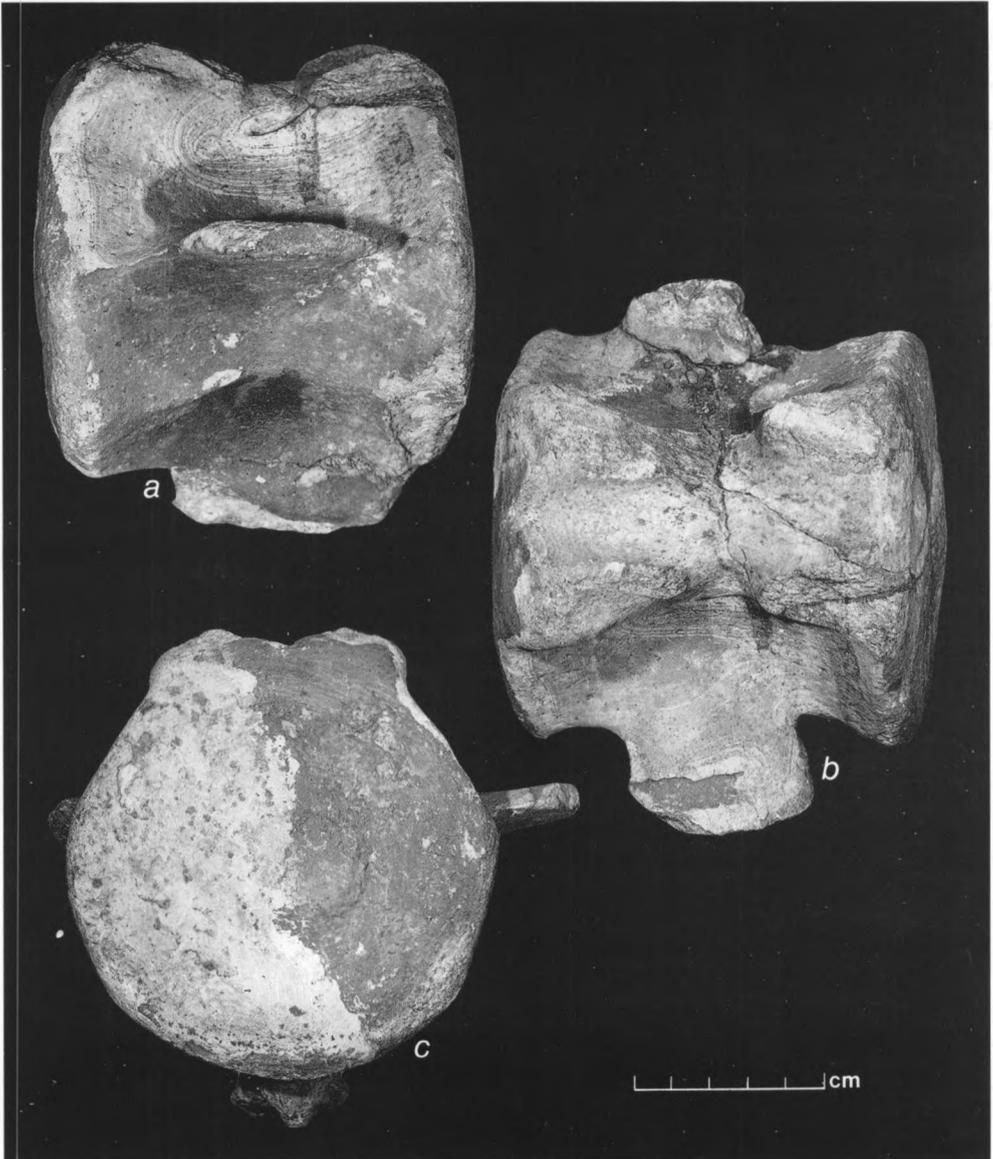


Plate 4
Caudal vertebra from Sant Sadurn d'Anoia (MGB - 15.845)
a = lateral
b = dorsal
c = rostral view

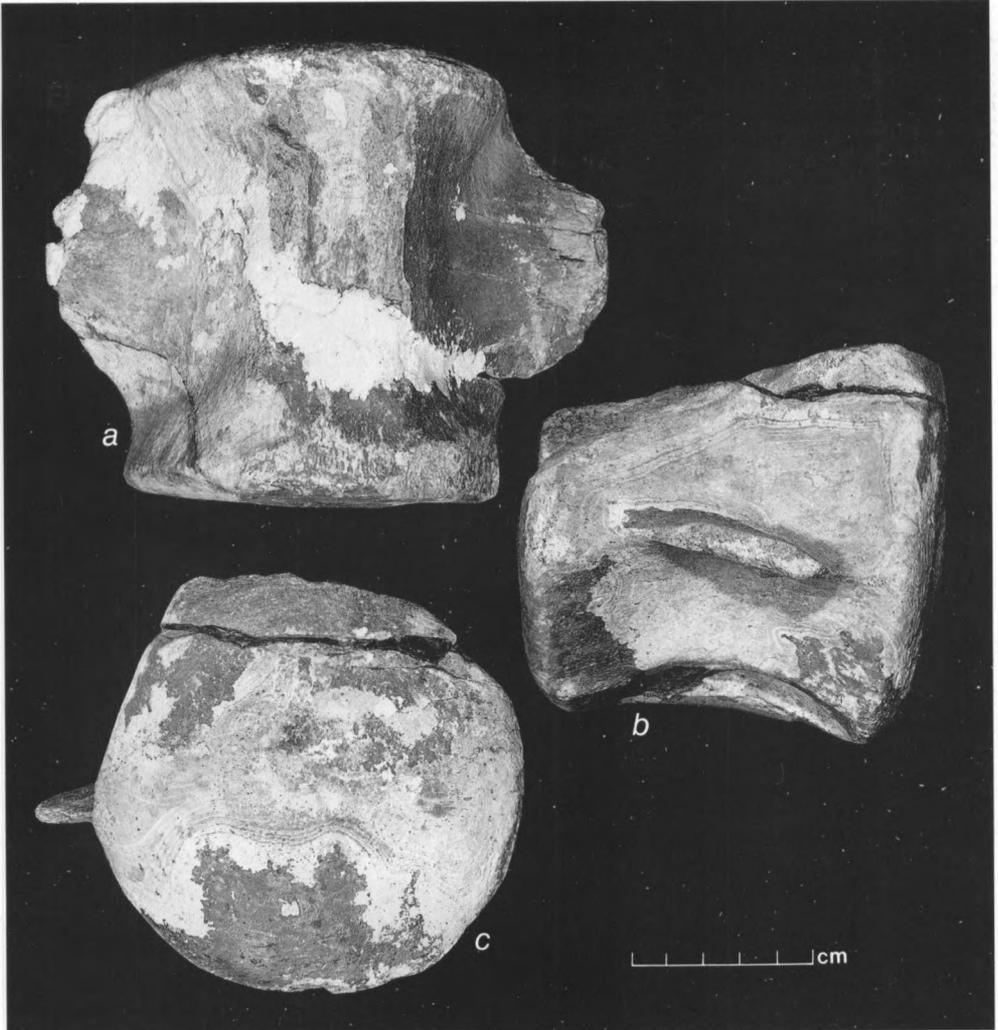


Plate 5
Caudal vertebra from Sant Sadurní d'Anoia (MGB - 15.846)
a = dorsal
b = lateral
c = rostral view

TABLE 8 - Measurements (mm)

Corpus, horizontal diameter	90
Corpus, vertical diameter	90
Corpus, rostro-caudal length	105
Processus transversus, cranio-caudal length	60
<i>Idem</i> , dorso-ventral thickness	19
Canalis neuralis, horizontal diameter	14

Remarks: A number of caudal vertebra fragments, such as those described below, were recovered from the Sant Sadurní deposit. They belong to small Mysticeti, probably of the family Cetotheriidae.

Family: CETOTHERIIDAE CABRERA, 1926

Genus: *Cetotherium* BRANDT, 1843

Cetotherium sp.

(Plates 6-8)

Locality: C. Codorniu, Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(No. 43.638, Museu Comarcal, Vilafranca del Penedès). A large neurocranium without condyles, partly encrusted with sediment. The measurements are given in Table 9.

TABLE 9 - Measurements (mm)

Length of fragment	287
Maximum width	285
Superoccipital, condyle-vertex distance	110-120
Foramen occipitale, horizontal diameter	60
Foramen occipitale, vertical diameter	43
Distance between bullae tympanicae (outer)	240

Description: This is a fairly large skull, which is unfortunately insufficiently complete to permit more precise taxonomic classification.

In dorsal view (Plate 6), the shape is roughly triangular with extremely concave parietal walls. The occipital region, which is flatter, is very wide posteriorly, narrowing gradually in the rostral direction to only 14 mm at the vertex. It is vaguely delimited by two severely abraded temporal margins. The sutures and the structure of the frontals are not discernible.

In lateral view (Plate 7), the occipital region rises at an angle of about 45° from the condyles to the vertex, after which in the fronto-nasal region, the profile descends and is slightly concave.

In the right lateral view, we recognize only a basal prominence, which may conceivably correspond to the processus zygomaticus. The temporal fossa is wide and extremely hollowed.

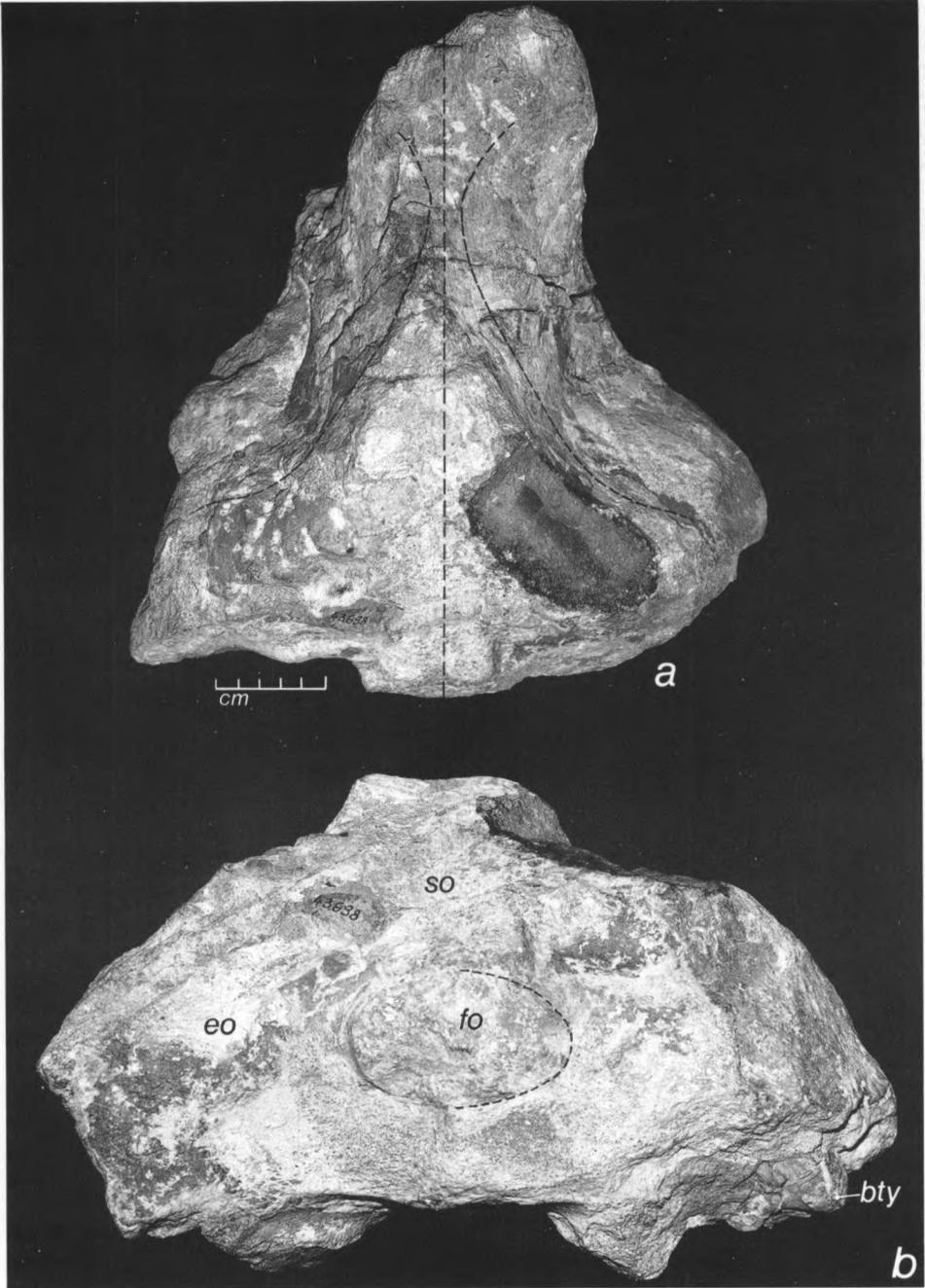


Plate 6

Neurocranium fragment of *Cetotherium* sp. from Sant Sadurn d'Anoia (Museum of Vilafranca - 43.638).

a = dorsal

bty = bulla tympanica

fo = foramen occipitale

b = caudal view

eo = exoccipitale

so = supraoccipitale

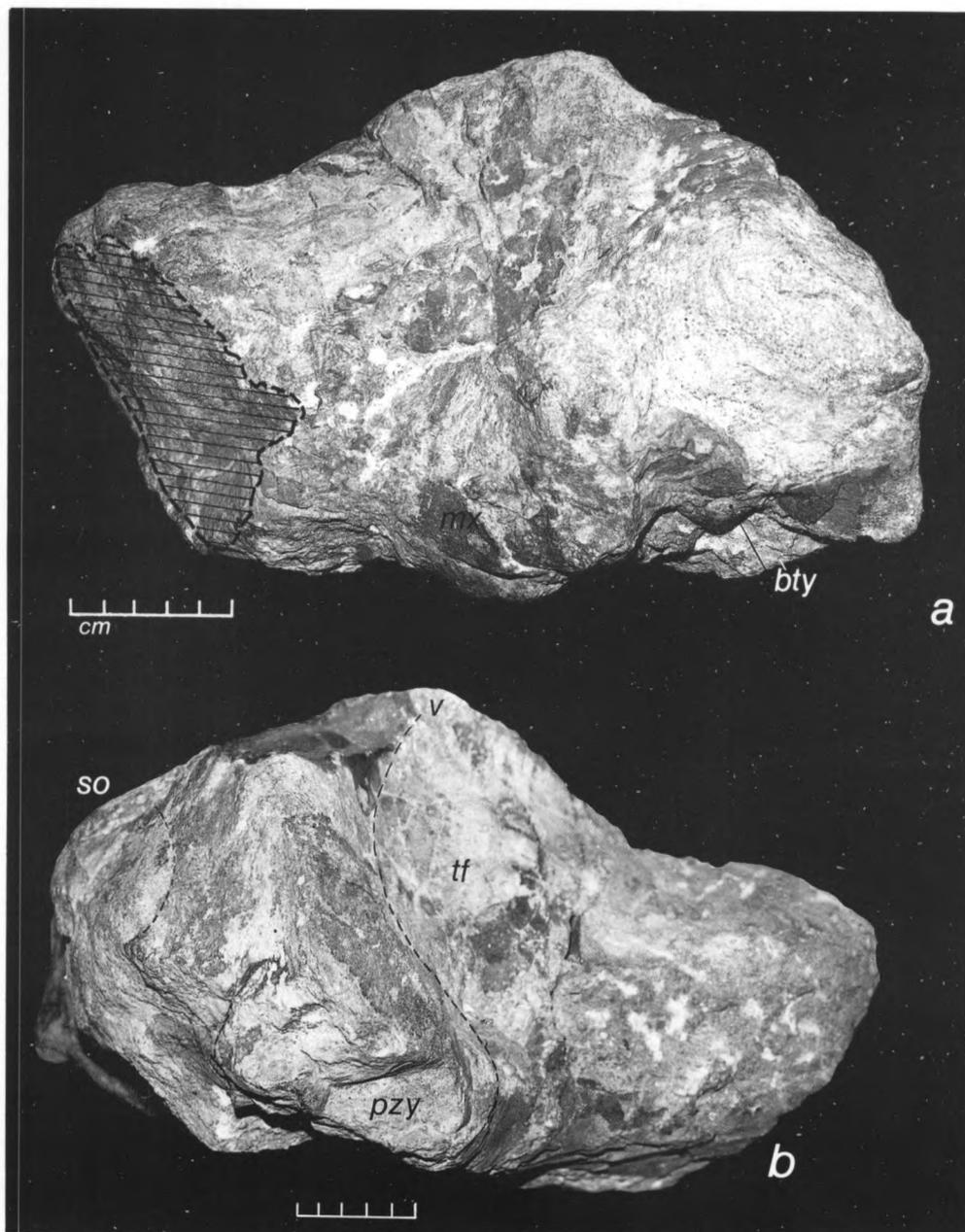


Plate 7

Neurocranium fragment of *Cetotherium* sp. from Sant Sadurn d'Anoia (Museum of Vilafranca - 43.638).

a = left lateral view

b = right lateral view

bty = bulla tympanica

so = supraoccipitale

pzy = processus zygomaticus (root)

tf = temporal fossa

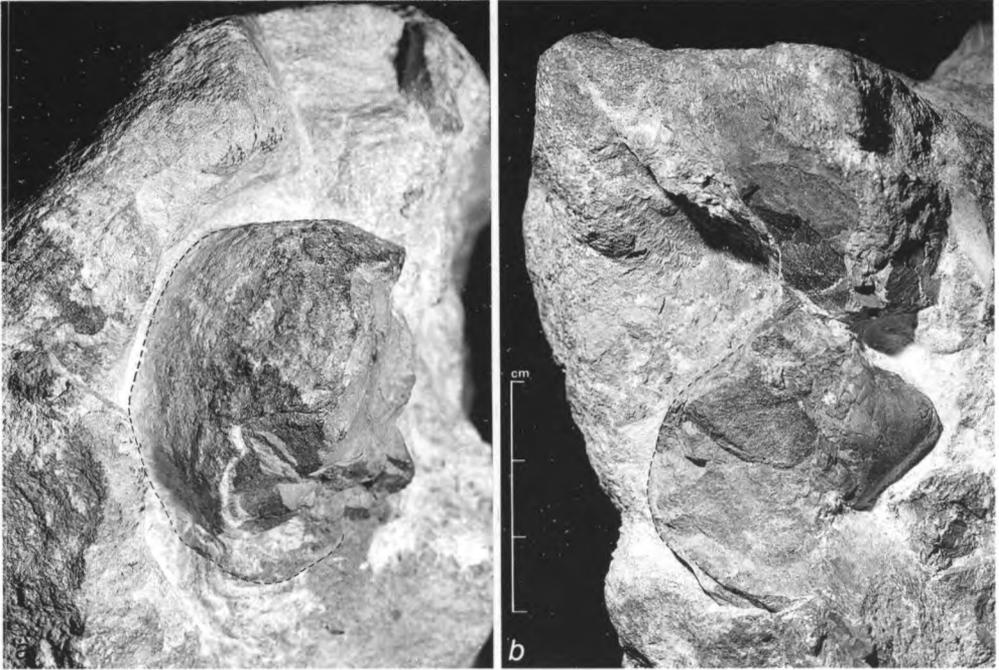


Plate 8

Tympanica of *Cetotherium* sp. from Sant Sadurní d'Anoia (Museum of Vilafranca - 43.638).

In caudal view, the skull is fairly flattened dorso-ventrally. In the centre, we recognize the contour of the foramen occipitale magnum and, on both sides of it, in the exoccipitale, the vague outline of the broken-off condyles.

The skull base is severely abraded by tidal effects, so that an intact structure is scarcely to be perceived. A piece of vomer is still present in the shape of an extremely elongated triangle with concave lateral margins. Both processus falcati are vaguely recognized, enclosing a concave basi-occipital. The distance between the processus falcati is 130 mm. At both caudo-lateral extremities there are remains of the somewhat dislocated bullae tympanicae, the shape of which can be seen from the illustration in Plate VIII. The right, relatively better preserved tympanic bulla, is striking owing to its wide transverse diameter and the flattened rostral pole. The antero-posterior and medio-lateral diameters of the bulla measure 50 and 40 mm respectively. Apart from the outlines, all structures, particularly the sigmoid process, are severely damaged.

With the exception of the paroccipital processes, the exoccipitalia are still present.

Taxonomy: The shape of the neurocranium and particularly that of the tympanicum argue persuasively for a Mysticete. Few Mysticeti are known from the European Miocene. CAPELLINI (1897) described an *Aulocetus calaritanus* from the Helvetian (Langhian) of Cagliari, Sardinia. The comparison with the present neurocranium reveals clear dimensional and morphological differences. Mention should merely be made of the fact that *A. calaritanus* displays a zygomatic width of nearly 60 cm and that the tympanicum is pointed rostrally. The relatively narrow occipital

region is extremely high; the supra occipitale displays a longitudinally elongated indentation.

The second CAPELLINI species, *Aulocetus lovisatii* from the same area, has a zygomatic width of about 50 cm and a bulla which is likewise narrower and more pointed rostrally.

A third species of the same author from the Miocene of San Marino, *Aulocetus sanmarinensis* (CAPELLINI, 1901) has a zygomatic width of 70 cm, and the crista lambdoidea forms - in dorsal view - a rostro-lateral convexity. The entire neurocranium is very compressed rostro-caudally. None of these three species, therefore, displays any similarity with the Catalan specimen.

A closer taxonomic resemblance emerges from a comparison with the skull of the Miocene *Cetotheria*.

The width of the present skull fragment, in which both zygomatic processes are missing, is 285 mm. The skull of *Cetotherium maicopicum* to name one example, has a zygomatic width of 370 mm. The distance between both exoccipital processes, without the two zygomatica, amounts to about 280 mm, which would correspond to the width of the present specimen. Both the quantitative and the morphological features are similar in both.

I was able to study the holotype of *Cetotherium rathkei* (Plate 9) in 1985 at the Palaeontology Institute of the Academy of Sciences in Moscow. The measurements are clearly different from those of the Catalan skull. Superimposition of the two profiles shows that the Catalan skull is clearly larger (Fig. 6). According to BRANDT (1873), the skull of *C. rathkei* had a zygomatic width of 31 cm. The width between the paroccipital processes is 22 cm, against a measurement of 28.7 cm in the Catalan specimen. However, the overall habitus is substantially the same in both, and they both have a box-shaped bulla tympanica (Fig. 6).

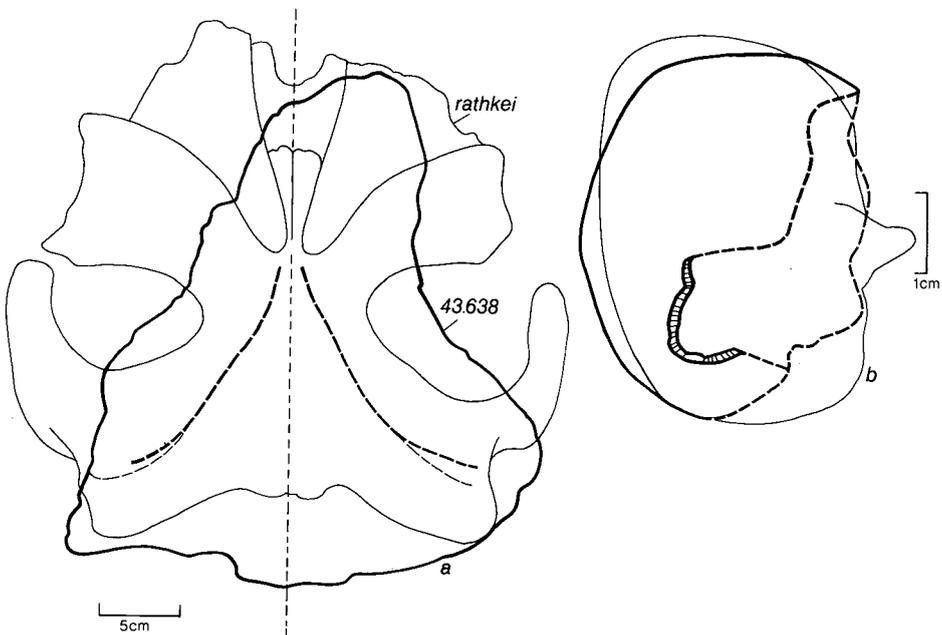


Fig. 6 - Superimposition of the skull outlines of (a) and tympanic bulla (b) of *Cetotherium rathkei*, and the skull fragment and bulla from Sant Sadurn d'Anoia (Museum of Vilafranca - 46.638).

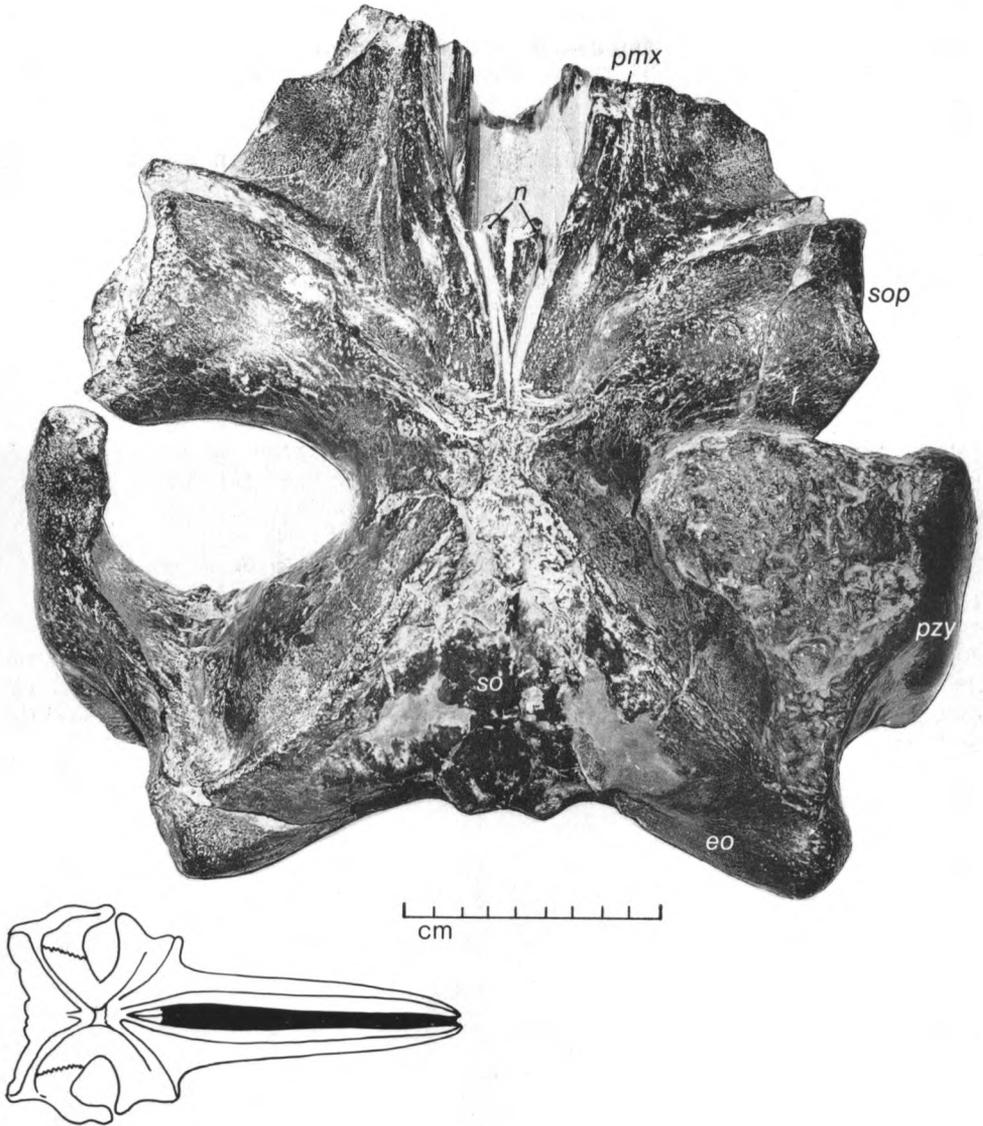


Plate 9

Skull fragment and restoration of *Cetotherium rathkei* (holotype, Institute of Paleontology, Moscow)

eo = exoccipitale

f = frontale

n = nasale

pmx = praemaxillare

pzy = processus zygomaticus

so = supraoccipitale

sop = supraoccipital process

Thus a comparison with the skull of known cetotheriidae shows that there is no doubt whatever with regard to the generic attribution for the Spanish specimen. A more precise identification is more difficult owing to the incomplete nature of the fragment. In view of the size differences, *Cetotherium rathkei* is unlikely, on the assumption that we are comparing specimens of the same age. In *Cetotherium maicopium*, the lateral margins of the parietal are slightly convex towards the outside in dorsal view, whereas in the present skull they are slightly concave.

The Catalan skull fragment acquires greater interest if we compare it with another specimen from Vila-seca in the Geological Museum of Barcelona, which will be discussed later.

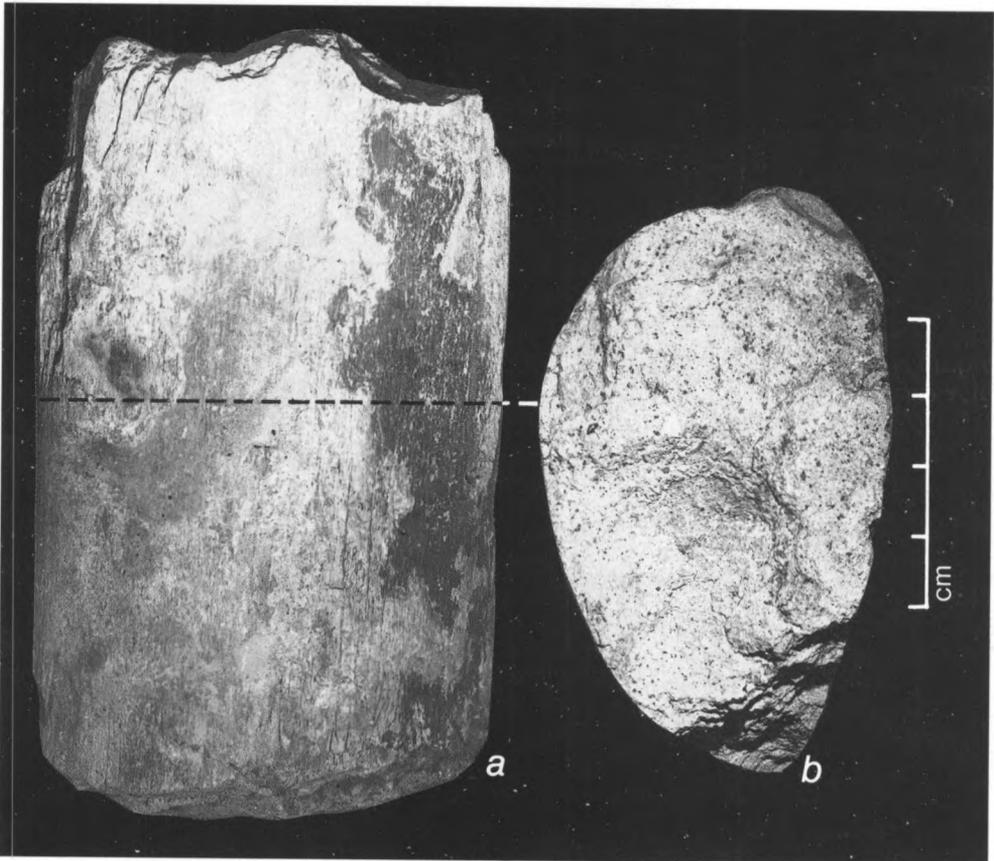


Fig. 7 - Portion of mandible from Sant Sadurn d'Anoia (MGB - 15.018): a = lateral view, b = cross section.

Subordo: MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: C. Codorniu, Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 15.018) - A mandibular fragment 11 cm in length. In cross-section, the rostro-caudal diameter is 68 mm and the medio-lateral diameter 39 mm. The visceral side is slightly flattened. The specimen from the Almera collection was identified as sirenid. The pronounced spongiosa had no pachyostosis. According to its size, it might be a small Mysticete, possibly a cetotheriid.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 20.799) - Corpus of a caudal vertebra. The horizontal diameter is 80 mm, as is also the vertical diameter. The cranio-caudal length is 112 mm.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 15.869) - Half a vertebral corpus, split lengthwise. The cranio-caudal length is 100 mm. The preserved root of the transverse process measures 48 mm and 15 mm in length and height respectively.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 15.011, coll. Mapa Geològic de Catalunya) - Half a vertebral corpus, split lengthwise. The horizontal diameter is 88 mm and the rostro-caudal length 82 mm.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 15.162, coll. Mapa Geològic de Catalunya) - Fragment of a caudal vertebral corpus. The horizontal diameter is 95 mm, the vertical diameter 86 mm and the width of the neural canal 14 mm.

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGB - No. 33.091, coll. Mapa Geològic de Catalunya) - Corpus of a caudal vertebra.

TABLE 10 - Measurements (mm)

Corpus, horizontal diameter	105
Corpus, vertical diameter	102
Canalis vertebralis, width	10
Processus transversus, rostro-caudal length	45
<i>Idem</i> , dorso-caudal thickness	7

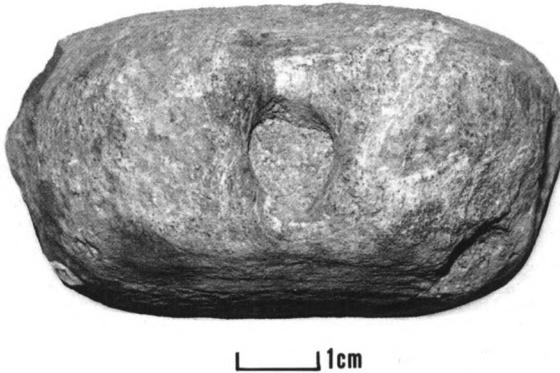


Fig. 8 - Caudal vertebra from Sant Sadurní d'Anoia (MGSB - 31.259).

MYSTICETI FLOWER, 1864
Genus et species indet.

Locality: C. Codorniu, Sant Sadurní d'Anoia (Barcelona)
 Age: Upper Burdigalian-Langhian

(MGSB - No. 31.259) - One of the last caudal vertebrae. The horizontal diameter is 77 mm, the dorso-ventral diameter 69 mm and the rostro-caudal length 40 mm. The present identification is «*Metaxytherium cuvieri* Christol». It is doubtless a cetacean vertebra.

?CETACEA, *incertae sedis*

Locality: Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGSB - No. 31.275) - 5 broken-off vertebral apophyses.

MYSTICETI FLOWER, 1864

Genus et species indet.

Locality: Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGSB - No. 31.274) - Two 11 cm-long mandible fragments measuring 70 × 45 mm in diameter.

MYSTICETI FLOWER, 1864 (?ODONTOCETI FLOWER, 1867)

Genus et species indet.

Locality: C. Codorniu, Sant Sadurní d'Anoia (Barcelona)

Age: Upper Burdigalian-Langhian

(MGSB - No. 31.260/1-4, coll. Faura i Sans) - This catalogue number includes a hyoid fragment (Fig. 9), a mandibular fragment with a cross-section diameter of 67 × 45 mm, an indeterminate skull fragment and a further innominate bone fragment with a just perceptible fovea articularis. The main measurements of the hyoid are as follows (Table 11).

TABLE 11 - Measurements (mm)

Basihyoideum, horizontal diameter	65
Basihyoideum, sagittal diameter	42
Canalis vertebralis, width	10
Thyrohyoideum, width	22(-27)
Thyrohyoideum, thickness	16

Remarks: All remains originate from the same locality. The measurements and shape of the mandibular fragment suggest a Mysticete. According to the measurements, the hyoid might well belong to an Odontocete.

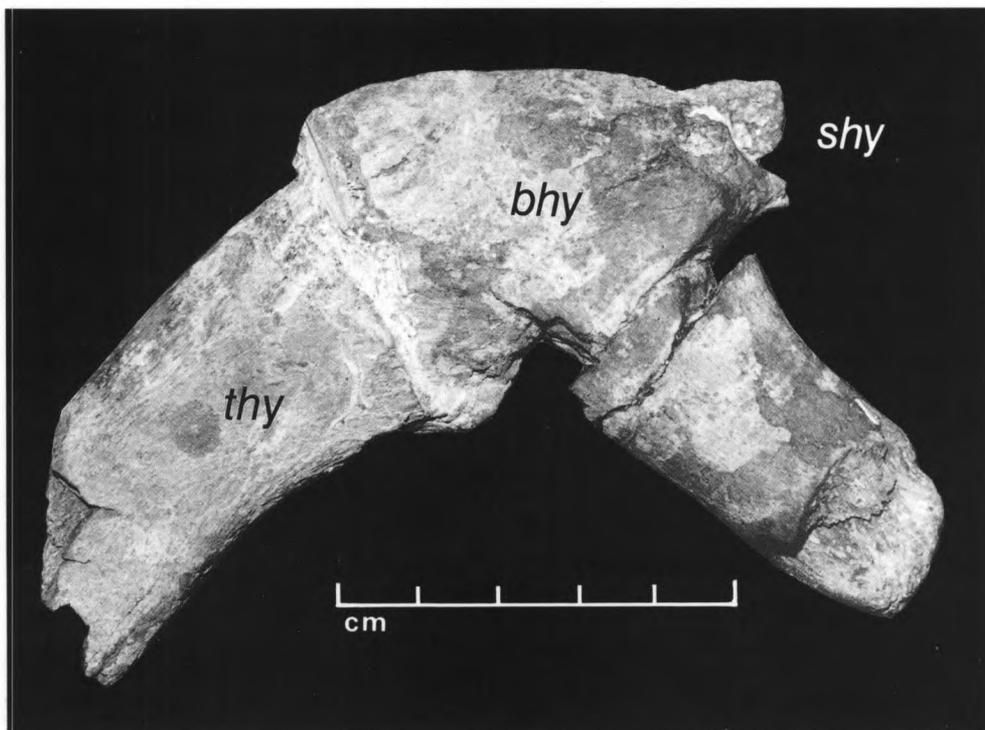


Fig. 9 - Hyoid bone from Sant Sadurní d'Anoia (MGSB - 31.260/1); bhy = basihyal, shy = stylohyal, thy = thyrohyal.

MYSTICETI FLOWER, 1864

Family: CETOTHERIIDAE CABRERA, 1926

Genus: *Cetotherium* BRANDT, 1843

Cetotherium sp.
(Plates 10, 11)

Locality: Vila-seca de Solcina (Tarragona)

Age: Upper Burdigalian-Langhian

(MGB - No. 30.540 a, b. Caselles leg.) - Two large sediment blocks, cut open lengthwise in order to expose the fossil. The specimen, designated «fossil vertebrate» has been exhibited for many years in the Geological Museum, to which it was donated by Mr. Pedro Casellas on 12 June 1908.

As can be seen the two illustrations (Plates 10, 11), it is predominantly the negative of an originally available and clearly complete skeleton, of which various parts have remained in the Museum. My intention is to study the specimen more thoroughly and, if possible, to cast a plastic positive. In the context of the present paper, I confine myself to the basic findings.

Description: Of the skull, there remains only a proximal fragment of the praemaxillaria of the mandible and a very well-preserved natural endocranial cast (Fig. 10). The

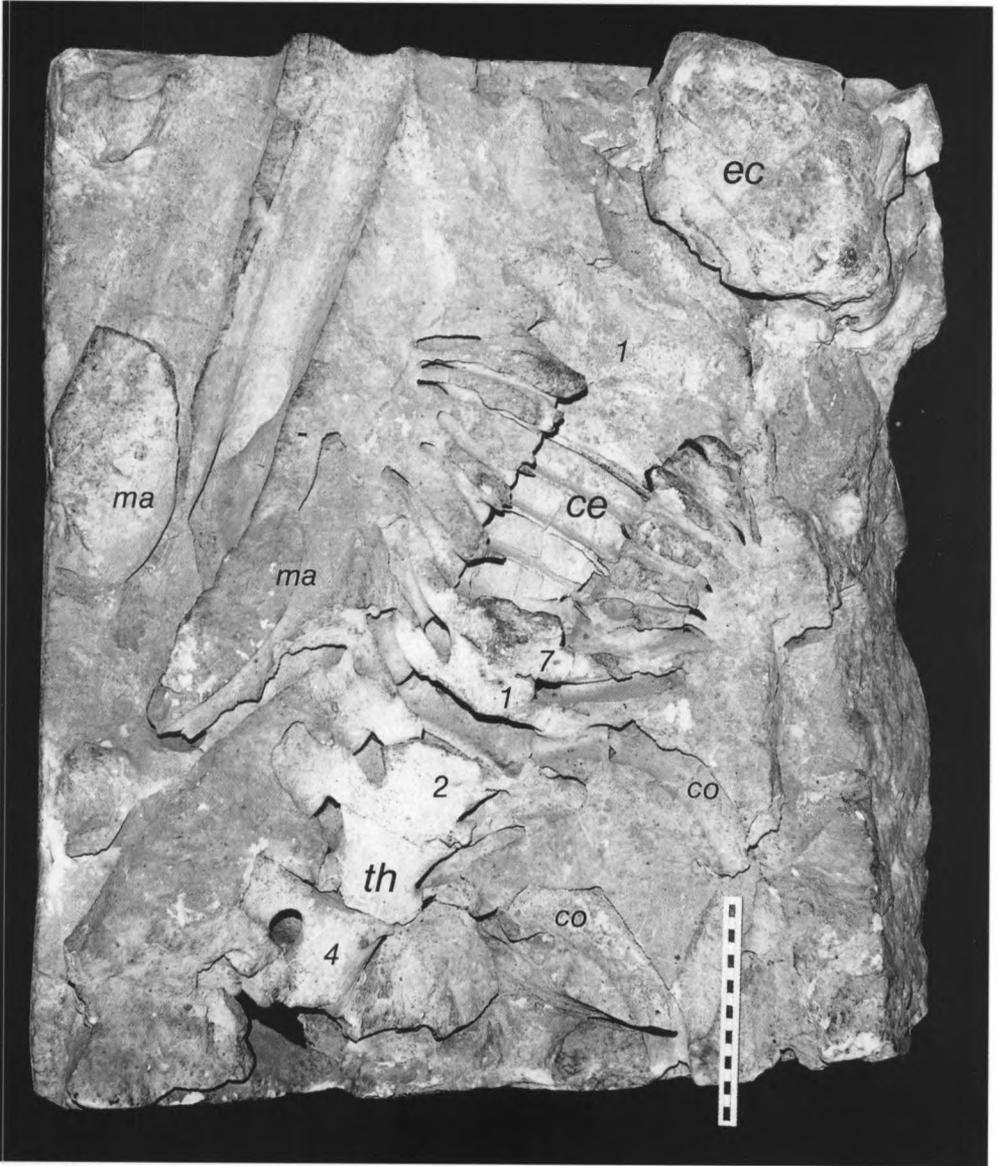


Plate 10

Cetotherium sp. in a matrix block from Vila-seca (MGB - 30.540a).

ce = cervicals (1-7)

co = rib

ec = endocranial cast

ma = mandibula

th = thoracic vertebrae (1-4)

(Scale = cm)



Plate 11

Cetotherium sp. from Vila-seca (MGB - 30.540b = second block of matrix belonging to No. 30.540a, see Plate X).

cc = cervicals (1-7)

th = thoracic vertebrae (1-5)

co = rib

(Scale = cm)



Fig. 10 - Natural endocranial cast of a *Cetotherium* sp. from Vila-seca (MGB - 30.540a): ce = cerebellum, fl = frontal lob, mx = maxilla fragment, nV = nervus trigeminus, ol = occipital lobe. (Scale = cm).

cervicals are also present, followed by five thoracic vertebrae. Of the vertebrae, the corpus and the lateral processes are modelled in one block and the arcus and processus spinosus in the other.

Belonging to this specimen, we also find the following as loose bone fragments:

1. Proximal portion of the right and left mandibular ramus (Nos. 10.108 and 10.109) (Plate 12) and smaller mandible fragments (Nos. 9.739, 9.740 and 9.768). The shape is apparent from the figs. in plates.

The 45 cm-long portion with the wide foramen mandibulare has a proximal and distal medio-lateral width of 6.5 and 4.5 cm respectively.

2. Fragment of processu zygomaticus? (No. 24.560) (Fig. 11).

3. Corpus of three cervicals (No. 9.765) (Fig. 12) with the following measurements (Table 12):

TABLE 12 - Measurements (mm)

Horizontal diameter	72	75	65
Vertical diameter	30	30	31
Rostro-caudal length	25	27	25

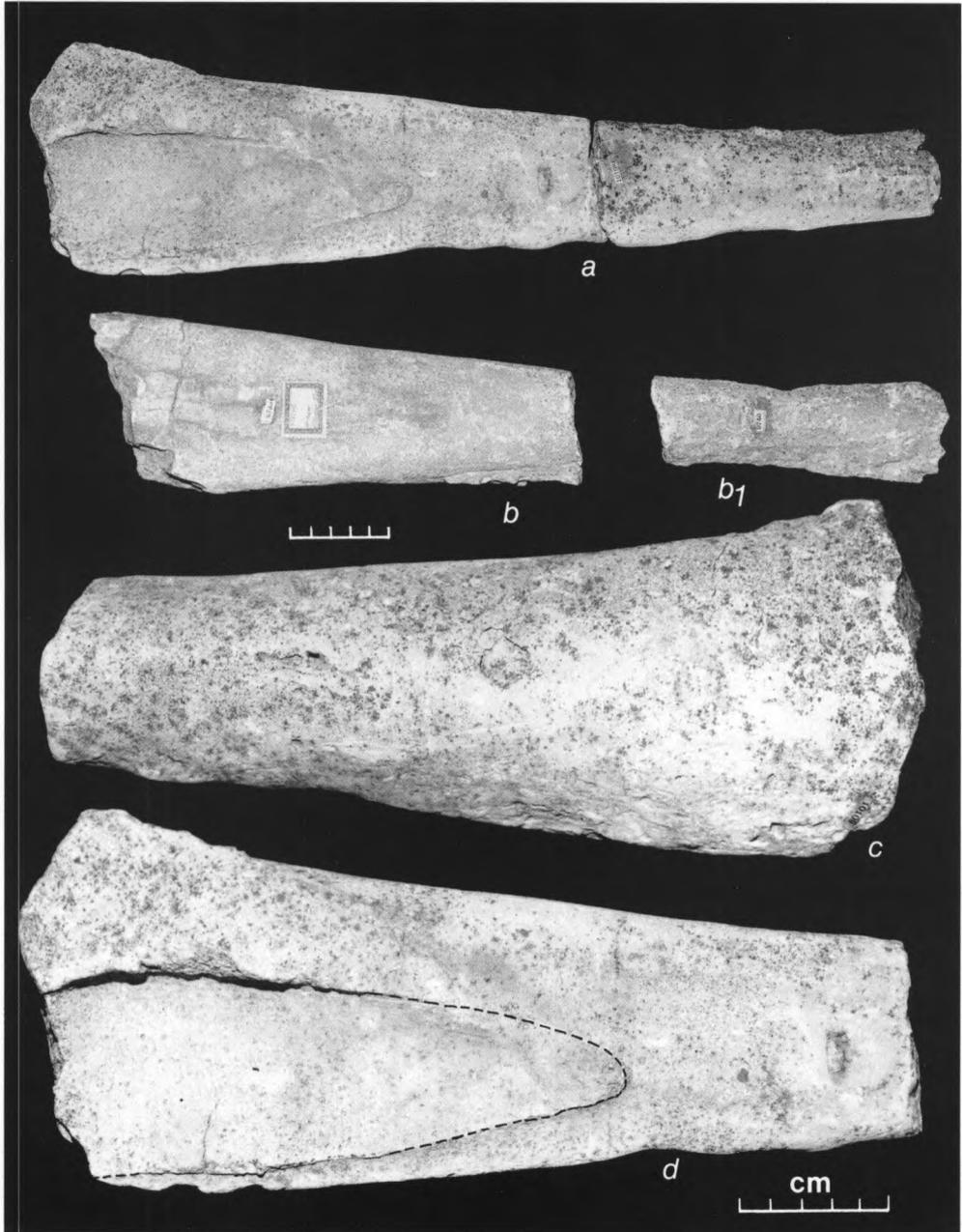


Plate 12

Cetotherium sp. from Vila-seca. Mandible fragments.

a = left ramus in medial view (MGB - 10.109)

b, b₁ = right ramus in lateral aspect (MGB - 9.739, 9.740)

c, d = left ramus, enlarged photograph

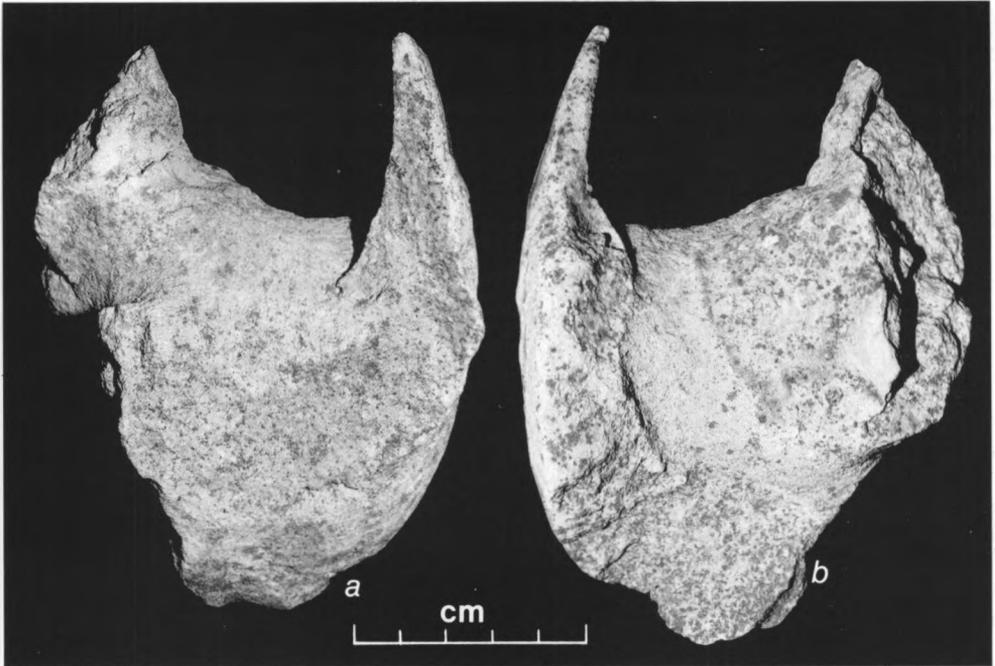


Fig. 11 - *Cetotherium* sp. from Vila-seca (MGB - 24.560) Fragment of the processus zygomaticus: *a* = dorsal, *b* = ventral view.



Fig. 12 - *Cetotherium* sp. from Vila-seca (MGB - 9.765). Centra of Cervicals.

4. Several small rib fragments (Nos. 9.763, 9.764, 9.766, 9.769).

The shape of the brain (= endocranial cast) (Fig. 10) is typical of Cetacea. The cerebrum is wider than it is long; in dorsal view, the cerebral and cerebellar hemispheres have the shape of a deltoid which is broader in the transverse direction. The sagittal sulcus can just be made out; there is a pronounced retraction between the two frontal poles. Lateral to the right frontal pole lies the thick strand corresponding to the V cerebral nerve and its rete mirabile. The main measurements (in cm) of the cast are as follows (Table 13).

TABLE 13 - Measurements (mm)

Parietal (maximum) width	20
Zygomatic skull width	26-28
Outer condylar width	11
Distance foramen occipitale-frontal pole	17

In comparison with the previous skull specimen from the Miocene of Sant Sadurní (MGSB No. 46.638), for the time being only the natural endocranial cast occurs as a possibility. If they are projected one upon the other (Fig. 13), it is clear that the brain model would perfectly fit the Sant Sadurní skull in both shape and size. We therefore have again fragments of a *Cetotherium*, a species determination of which may conceivably be possible once the positive cast has been produced.

Note: According to reports by Dr. J. Gallemí, Barcelona, the Mapa Geològic Collection was divided after his death between the city geology museum and that of the seminary, as a result of which parts of the same specimen may have been split up between the two museums.

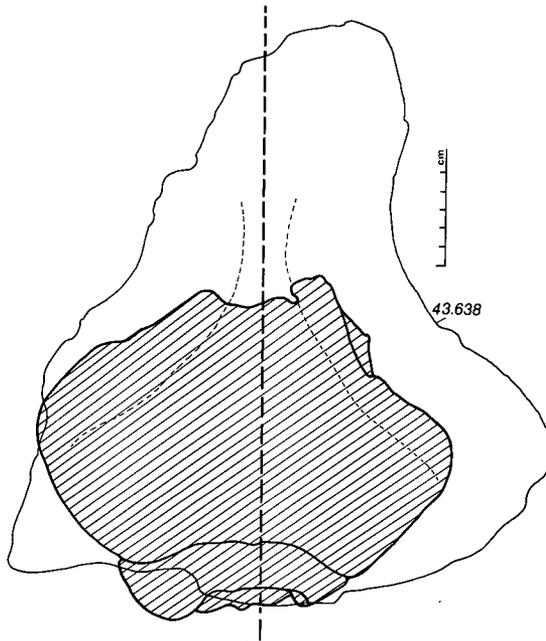


Fig. 13 - Superimposition of the endocranial cast of *Cetotherium* sp. from Vila-seca and the skull from Sant Sadurní d'Anoia (MGSB - 43.638).

The same applies to the material from Sant Sadurní d'Anoia. This relates particularly to the larger caudal vertebrae identified as Sirenian, which belong to all Mysticeti.

If we arrange them according to the horizontal diameter, we do not obtain a complete series. Gaps occur, and it is possible that the vertebrae do not all belong to the same individual.

Horizontal diameter	77	80	86	88	90	95	100	105
Vertical diameter	69	80	95	–	90	86	110	102
Rostro-caudal length	40	112	110	82	105	–	100	–

A determination on the basis of loose centra (corpora vertebralia) alone is not easy. In the light of the overall shape and in view of the fact that it was possible to identify two *Cetotherium* with a high degree of probability, it may be assumed that the vertebrae belong to this genus.

SUMMARY

Contrary to the opinion of earlier authors, fossil cetacean remains from the Iberian peninsula are in fact available. They belong to representatives both of the Odontoceti and the Mysticeti from the Burdigalian-Langhian (Lower-Middle Miocene), particularly from the region of Catalonia. The material consists solely of a number of teeth, skull and vertebral fragments, of which only a few are taxonomically identifiable. Among the Odontoceti, we can identify *Eurhinodelphis* (cf. *sigmoideus*) with certainty and probably *Champsodelphis* (*Acrodelphis*). Among the Mysticeti, *Cetotherium* sp. has been demonstrated. Isochronously with the Cetacea, we find remains of Sirenia, which occurred more frequently than the whales, together with teeth of Piniipedia and crocodiles.

ZUSAMMENFASSUNG

Entgegen die Meinung früherer Autoren liegen Reste fossiler Cetaceen aus der iberischen Halbinsel vor. Es handelt sich um Vertreter sowohl der Zahn- als auch Bartenwale aus dem unteren Miozän (Burdigalium-Langhium), vor allem aus der Gegend von Catalonien. Das Material umfasst nur einige Zähne, Schädel- und Wirbelfragmente, wovon nur wenige taxonomisch bestimmbar sind. Unter den Odontoceten liegt ein *Eurhinodelphis* (cf. *sigmoideus*) mit Sicherheit und wahrscheinlich *Champsodelphis* vor. Von den Mysticeten wurde *Cetotherium* sp. nachgewiesen. Isochron mit den Cetaceen liegen Reste von Sirenia, die häufiger waren als die Wale, und Zähne von Pinnipedia und Krokodilen vor.

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