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TAXONOMIC STATUS OF VICTORIAN FOSSIL WHALES ASSIGNED TO THE GENUS *CETOTOLITES* McCOY, 1879

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Abstract

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McCoy used the generic name *Cetotolites* McCoy, 1879 in the sense of a collective group genus in the Cetacea, thus formalising the name which Owen (1844, 1846) had proposed as a vernacular for isolated cetacean earbones. McCoy assigned to the genus three new species of fossil Cetacea (*Cetotolites leggei; C. pricei; C. nelsoni*) based on Late Oligocene tympanic bullae from Waurn Ponds, Victoria, Australia. Lectotypes are established here for the species. All the type specimens are incomplete, and are probably undiagnostic at the species level. The bulla of *Cetotolites nelsoni* is similar to that of the primitive toothed mysticete *Mammalodon colliveri* Pritchard, 1939, but it is not certainly conspecific. The names *Cetotolites leggei, C. pricei, C. nelsoni* and *nelsoni rugosa* are considered here to be *nomina dubia*.

Worn isolated fragments of fossil Cetacea should not be used as type specimens, since they generally lack synapomorphies. Many long established names based on such material should probably be discarded, since it is impossible to demonstrate their conspecificity with more-complete specimens.

Introduction

Tympanic bullae referred to species of the genus *Cetotolites* McCoy,1879, were among the many specimens of Victorian fossil Cetacea (whales, dolphins and porpoises) described by Frederick McCoy. McCoy (1879) established four new species and subspecies of *Cetotolites* on the basis of worn and polished tympanic bullae from the Jan Juc Formation at Waurn Ponds, near Geelong, Victoria. Subsequently, McCoy's names have been cited in the literature without comment on their status. I suggest in this article that none of the type specimens of *Cetotolites* species possesses characteristics which allow recognition of its zoological species and, thus, that the names are *nomina dubia*.

The term "cetotolites" (Greek: *ketos*, whale; *otos*, of the ear; *lithos*, stone) was used by Richard Owen (1844; 1846: 526-535; 1870) and a few contemporary authors as a vernacular name for fossil tympanic bullae and periotics of Cetacea. Owen did not employ the name in a binomen; indeed, McCoy appears to be the only person to have proposed such a binomen formally. McCoy (1879) noted that Owen had used the vernacular name "cetotolites" for isolated earbones which Owen himself had referred to previously established formal taxa. McCoy observed that it is difficult to determine the true relationships of isolated bullae such as the Waurn Ponds specimens, and proposed that the name *Cetotolites* be used as a formal generic name (in the modern sense of the collective group of genus rank) to encompass species based on isolated elements. McCoy believed that, although the true relationships of his proposed species of *Cetotolites* could not be determined, they probably represented species of "ziphioid" (sic) whales (Family Ziphiidae—beaked whales) which he supposed were represented by other fossils from Waurn Ponds.

Later authors have not discussed the validity of McCoy's species of *Cetotolites* nor proposed any new species, although the species have been mentioned in various published tables of Victorian fossils. The only comments on the systematics of *Cetotolites* species appear to be those of Mahoney and Ride (1975: 158, 164-167) who listed the species, type specimens, and collection data, and Fordyce (1982; 1984: table 1) who alluded to the possibly undiagnostic type specimens.

Complete redescriptions of the type specimens of *Cetotolites* species are not given here. Adequate, if somewhat antiquated, descriptions were given by

McCoy (1879) in his illustrated text. The type specimens are figured here (Figs. 1-6, 9, 10). Morphological nomenclature follows Kasuya (1973).

The generic name *Cetotolites*

McCoy (1879) did not specify a type species for the genus *Cetotolites*. He commented about this nominal genus (McCoy, 1879: 13-14): "As . . . I do not think it is possible satisfactorily to refer them to their true genera from such materials I propose to use provisionally the word Cetotolites as a generic term for such fossil Cetacean Ear-bones as I have to describe". In stating this, McCoy appears to have proposed that the name *Cetotolites* be used in the sense of a collective group. Collective groups require no type species (International Commission of Zoological Nomenclature [referred to hereinafter as the *Code*] 1985, Article 42b (i)), so the name *Cetotolites* cannot be a *nomen dubium* despite the lack of an originally-designated type species or the fact that the four species and subspecies of *Cetotolites* named by McCoy are considered herein to be *nomina dubia*.

The species of *Cetotolites*

McCoy (1879) presented formal descriptions for four species and subspecies of *Cetotolites*. A fifth species, *C. baileyi* was mentioned by McCoy (1883), but this was never described, defined, or accompanied by an indication. It is thus a *nomen nudum* (*Code*, Article 12). *Cetotolites baileyi* should not be confused with the fossil sperm whale *Physetodon baileyi* McCoy, 1879, which is based on teeth of probable Late Miocene age from near Beaumaris, Victoria (Fordyce, 1982; 1984).

McCoy (1879) indicated that he based *Cetotolites leggei, C. pricei* and *C. nelsoni* on a least 18 specimens, but only the five illustrated by McCoy (1879: pl. LIV) can be identified in the collections of the Museum of Victoria. At least 11 other Museum specimens are identified by attached labels, accompanying labels, or catalogue entries, as belonging to these three species. Some or all of these may be other syntypes available to McCoy during preparation of the 1879 article but, because there is no positive evidence of this, the type status of these 11 specimens is uncertain. Thus, they can and must be ignored during consideration of the nomenclatural status of *Cetotolites* species.

McCoy indicated that all specimens mentioned by him in 1879 came from Waurn Ponds Quarries, near Geelong, Victoria. This is not disputed as the locality for the five figured specimens (McCoy, 1879: pl. LIV) nor the four other specimens (P7457, P7458, P7459, P26523) which bear attached labels indicating Waurn Ponds as the locality. Waurn Ponds is given on the separate labels of seven other specimens. Two quarries, which are potential type localities, are at grid references BT613673 and BT611682 (1: 100 000 map, Series R 652, Sheet 7721, Geelong), or about 38°16'S, 144°16'E. Mahoney and Ride (1975: 163-164) gave further information about this locality. The type specimens probably came from the Waurn Ponds Member of the Jan Juc Formation (Torquay Group) which, according to Abele et al. (1976: fig. 13) is of Late Oligocene to earliest Miocene age.

Cetotolites leggei

Only two specimens (syntypes, according to Mahoney and Ride, 1975: 164) were mentioned by McCoy (1879: 14-15), and only two specimens are identifiable in the Museum collections. I designate specimen P7449 (a right bulla; McCoy, 1879: pl. LIV figs. 1, 1a) the lectotype of the nominal species *C. leggei*. It is not known if P7450 (a left bulla) is the second syntype mentioned by McCoy. Specimens P7449 and P7450 may be specimens 30431 and 30432 of an early Museum register (Mahoney and Ride, 1975).

The lectotype (P7449; Figs. 1, 2) lacks the anterior part of the involucrum, all of the dorsal part of the thin outer lip (including the anterior pedicle and accessory ossicle, base of the malleus, sigmoid process, conical process, and outer posterior pedicle); all these structures should normally be studied if one is to determine relationships from isolated bullae of Cetacea. The bulla is worn and polished, and much of the original surface is lost.

The absence of marked inner and outer prominences (typically separated by a marked interprominential notch) and of a ventral median groove suggest that the specimen is not related closely to modern odontocete groups, such as the delphinoids. It agrees with some physeterids in the absence of an interprominential notch, but this character may be convergent; physeterids are more derived in other features. Indeed, the large size and robust structure of the bulla argues against close relationship with any known odontocete. Its features are reminiscent of those of some archaeocetes and mysticetes (e.g. *Dorudon*, see Kellogg, 1936: fig. 80; *Mauicetus*, see Marples, 1956) but, as these may be shared primitive features, they indicate little about relationships. The deep posterior portion of the tympanic cavity, which is succeeded anteriorly by a smoothly elevated ridge, is more reminiscent of known odontocetes than of archaeocetes or mysticetes. Its significance is difficult to interpret.

Because this lectotype lacks any features at present recognisably diagnostic below the ordinal level, I suggest that the name *Cetotolites leggei* is a *nomen dubium* and that the nominal taxon can only be treated as Cetacea *indet.* The lectotype (P7449) and another specimen (P7450) identified as *C. leggei* are too incomplete to decide whether they are conspecific.

Cetotolites pricei

McCoy (1879: 16) stated that this species is "much more abundant" than *C. leggei* and that "several" specimens had been brought to the Museum. Mahoney and Ride (1975: 167) reported only one specimen (P7451, a right bulla), but two other specimens (P7452, a right bulla and P7453, a left bulla) identified by label as *C. pricei* are in the Museum collections. I designate specimen P7451 (McCoy, 1879: pl. LIV, Figs. 2, 2a) as the lectotype of the nominal species *C. pricei.* It is not known if the two other specimens were part of McCoy's type series. Specimens P7451, P7452, and P7453 may be specimens 30433, 30434 and 30435 respectively of the early Museum register (Mahoney and Ride, 1975).

The lectotype (P7451; Figs. 3, 4) is more complete than that of *C. leggei* in that more of the floor of the tympanic cavity and more of outer lip are preserved. The anterointernal face of the involucrum and the apex of the bulla are worn, and the original profiles are uncertain. This bulla is too incomplete and weathered to be certain of its affinities. The ventral median groove is more conspicuous than in P7449, and the relatively unworn posterior part of the involucrum differs in shape, but whether this reflects original morphological differences or erosion cannot be determined. It is not possible to say to which of the three cetacean suborders (Archaeoceti, Mysticeti and Odontoceti) the specimen should be referred, but the relatively large size argues against odontocete affinities.

Because this lectotype lacks any features at present recognisably diagnostic below the ordinal level, I suggest that the name *Cetotolites pricei* is a *nomen dubium* and that the nominal taxon can only be treated as Cetacea *indet.* The relationships (conspecific or congeneric) of referred specimens P7452 and P7453 to the lectotype cannot be determined, as all specimens are too incomplete.

Cetotolites nelsoni

McCoy (1879: 17) stated that 14 specimens were in the Museum, including not more than 13 syntypes of *Cetotolites nelsoni* (sensu stricto; referred to hereinafter without a subspecific epithet) and the holotype and possibly other specimens of *Cetotolites nelsoni rugosa* (see Mahoney and Ride, 1975: 166). Eleven specimens identified as *C. nelsoni* (sensu lato) are presently in the Museum. McCoy (1879: pl. LIV) figured two of these (P7454, a left bulla, McCoy's Figs. 3, 3a, 3b; and P7456, a right bulla, McCoy's Fig. 5). I designate specimen P7454 as the lectotype of the nominal subspecies *C. nelsoni nelsoni.* Specimen P7456 is designated a paralectotype. Mahoney and Ride (1975) identified specimen P7455 (a right bulla, McCoy's Figs. 4, 4a) as the holotype of the nominal subspecies *Cetotolites nelsoni rugosa.* The remaining eight specimens, labelled as *Cetotolites nelsoni* (subspecies unspecified) are possible paralectotypes, but it is not certain that they were part of McCoy's original type-series. These specimens are P7457 (right bulla), P7458 (left bulla), P7459 (left bulla), P7460 (left bulla), P7461 (right bulla), P7462 (left bulla), P7463 (left bulla), P26253 (left bulla). Specimen labels indicate that specimens P7457 to P7463 are specimens 30439 to 30445 respectively of the early Museum register.

The lectotype of *Cetotolites nelsoni* (Figs. 5, 6) is preserved poorly, with the dorsal edge of the thin external lip incomplete and the surface markedly weathered. Thus, its affinities are uncertain. Its relatively small size, conspicuous interprominential notch, outer posterior prominence and ventral median groove, and large tympanic cavity are odontocete-like, while the absence of a depression for the exit of the eustachian tube at the anterior end of the tympanic cavity, the elongate tabular dorsointernal face of the anterior part of the involucrum, and the relatively deep notch between the position of the inner and outer posterior pedicles could be interpreted as mysticete features.

The lectotype bulla (P7454) of *C. nelsoni* is similar to the hitherto undescribed bulla of the holotype of *Mammalodon colliveri* Pritchard, 1939 (Melbourne University, Geology Department MUGD 1874). *Mammalodon colliveri* is a latest Oligocene primitive toothed mysticete (Fordyce, 1982; 1984) which appears to be a relict species broadly representative of the earliest stages of evolution of baleen whales. The holotype was collected from Bird Rock, Torquay, Victoria, less than 15 km from Waurn Ponds quarries. It came from the uppermost Jan Juc Formation, which is laterally equivalent to the Waurn Ponds Limestone whence the lectotype of *C. nelsoni* was obtained; thus, the two specimens are roughly contemporaneous. The bullae (Figs. 7, 8) are both 53 mm long (length from anterior apex to the apex of the inner prominence), and both show the following features: relatively large elongate tabular dorsointernal face on anterior part of involucrum; steep external face on

anterior of involucrum; abrupt inflection between anterior edge of external lip and internal edge of involucrum; broadly rounded transverse ridge between anterior and posterior portions of tympanic cavity; dorsal surface of involucrum which rises abruptly behind its midpoint; concave profile of middle of internal face of involucrum (dorsal view); smoothly rounded inner posterior prominence (dorsal view); shallow interprominential notch; outer posterior prominence extends further posteriorly than inner; and deep cleft in position of elliptical foramen between inner and outer posterior pedicles. The bulla of *M. colliveri* differs from that of *C. nelsoni* in a rugose dorsal surface on the involucrum, rugosities on the floor of the tympanic cavity, a more rounded anterior profile of the external lip, a deeper and longer ventral median groove, and a flatter anterior ventral surface. These differences may reflect growth, postmortem wear, or interspecific differences. In my opinion it is not certain that the specimens are conspecific. The similarities do not necessarily mean conspecificity, since different species and genera of extant Cetacea may possess apparently identical bullae (Kasuya, 1973). Indeed, some of the features seen *C. nelsoni* are also present in bullae of Late Oligocene odontocetes.

Because the lectotype of *C. nelsoni* lacks any features at present recognisably diagnostic below the ordinal level I suggest that the name *Cetotolites nelsoni* is a *nomen dubium* and that the nominal taxon can only be treated as Cetacea *indet*. Since none of the other specimens of the type-series of *Cetotolites nelsoni* (sensu lato) is certainly conspecific with the lectotype, none clarifies the relationships of the species.

Cetotolites nelsoni rugosa

The holotype of *Cetotolites nelsoni rugosa* (P7455; Fig. 9) differs from the lectotype of *Cetotolites nelsoni nelsoni* in that the floor of the tympanic cavity is more rugose, and the interprominential notch, outer posterior prominence, and ventral median groove are more pronounced. Specimens P7454 and P7455 are so incomplete and eroded that it is impossible to say whether differences between them are ontogenetic or taxonomic. I suggest that the name *Cetotolites nelsoni rugosa* is a *nomen dubium* and that the nominal taxon can only be treated as Cetacea *indet*.

Discussion

This article uses the following assumptions about taxonomy which have been discussed widely in recent literature on cladistics (e.g. Ridley, 1986, and references therein), but which are not accepted in total by all taxonomists:

1. A classification scheme should reflect real (evolutionary) relationships between its consistituent taxa.

2. The primary aim of taxonomic names is to express such relationships; only secondarily do taxonomic names aid communication between taxonomists.

3. Evolutionary relationships between taxa can be assessed only in terms of shared evolutionary novelties, and it follows that any specimen too incomplete for low level synapomorphies to be identified cannot be classified to low taxonomic rank. Despite the fact that palaeontologists generally have less complete material to work with than neontologists, palaeontologists dealing with fossils that belong in an extant higher taxon should not expect nor be accorded more taxonomic latitude than that accorded to neontologists.

4. If the type specimens of long-established nominal species are particularly incomplete, nonmorphological criteria (e.g. geographic distribution, stratigraphic age, inferred ecology) should not be invoked to bolster the name, as such criteria introduce too many assumptions; rather, names of debatable application are dealt with best through the powers of the International Commission on Zoological Nomenclature.

Given these assumptions, I suggest that older names based on inadequate types should not be conserved at any cost; any short term instability in nomenclature which results from abandoning ill-defined names can only be to the benefit of long term stability. I also suggest that collective group names have no value in expressing real relationships within a classification scheme and that, if proposed as an aid to communication, they may be misleading. Any specimen which is too incomplete to be determined to low taxonomic rank (e.g. genus or species level) might usefully be described as an indeterminate taxon within a known higher taxon; I have followed this approach in my own work on cetacean taxonomy (e.g. Fordyce, 1983). In my opinion, it is unfortunate that many taxonomists consider it necessary for a specimen to be identifiable to species level before a formal published description is warranted.

More specifically, I suggest that McCoy's (1879) names should not be brought into modern use, and that other material should not be referred to the genus *Cetotolites*. The continued use of collective groups such as *Cetotolites* McCoy, 1879, and *Mizuhoptera* Hatai, Hayasaka and Masuda, 1963,

hinders rather than advances knowledge of cetacean systematics.

Tympanic bullae have been and still are used widely in cetacean taxonomy. However, there are few cases, even amongst extant species, in which the tympanic bulla alone can give an accurate idea of relationships at all taxonomic ranks down to species level. Much of the documented taxonomic variation in cetacean bullae appears to be variation in degree, rather than in kind, of superficially simple morphology. This, and the difficulty in identifying homologous features on bullae of different members of clades, has generally prevented the identification of primitive versus derived states. Accordingly, assessments of relationships that use bullae depend on the often-subjective basis of overall similarity, rather than on the more objective basis of the identification of synapomorphies. This makes it difficult to assess the taxonomic importance of any given character or the presence of convergence. In part, these problems reflect the fact that the functional morphology of the tympanic bulla is understood poorly. There appears to be no case where bullar functional morphology in any cetacean species has been correlated with a taxonomically-specific acoustic behaviour which, in turn, is linked to evolutionary-ecological adaptations. Similarly, it seems that there are no examples of correlations between bullar functional morphology and structure of the periotic and skull in any one species, although there are rough correlations at higher taxonomic levels. Pioneering articles by Kasuya (1973) and Fleischer (1973, 1976) on odontocetes have elucidated some of these problems. Because of the problems involved in systematics based on the bullae of extant Cetacea, it is difficult to work with fossil bullae. For this reason, I contend that names of *Cetotolites* species are *nomina dubia* and strongly support the suggestion of Barnes (1977) that isolated fossil bullae not be used as type specimens.

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Explanation of plate

Figures 1, 2—*Cetotolites leggei*, lectotype, right tympanic bulla, P7449, × 1. Figure 1—dorsal view. Figure 2—Ventral view.

Figures 3, 4—*Cetotolites pricei*, lectotype, right tympanic bulla, P7451, × 1. Figure 3—dorsal view. Figure 4—ventral view.

Figures 5, 6—*Cetotolites nelsoni*, lectotype, left tympanic bulla, P7454, × 1. Figure 5—dorsal view. Figure 6—ventral view.

Figures 7, 8—*Mammalodon colliveri*, holotype, right tympanic bulla, MUGD 1874, × 1. Figure 7—dorsal view. Figure 8—ventral view.

Figure 9—*Cetotolites nelsoni rugosa*, holotype, right tympanic bulla, P7455, × 1. Dorsal view.

Figure 10—*Cetotolites nelsoni*, paralectotype, right tympanic bulla, P7456, × 1. Dorsal view.


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