2018 PeerJ review – A Miocene *Caperea* from Australia

The evolutionary history of the extant pygmy right whale *Caperea marginata* is indeed poorly known and quite mysterious as *Caperea* or *Caperea*-like fossils are very rare globally. Thus, this contribution, reporting a Miocene *Caperea* from Australia, definitely should be published; besides, this paper is well written and illustrated. However, I do have some comments for authors to consider.

1, Occurrence of fossil *Caperea*

Marx et al cited some publications (Line 174–185) to show that the effort to work on fossils from the Northern Hemisphere is much more than what has been done in the South, and then suggested that the lack of fossil *Caperea* in the Northern Hemisphere from the Miocene and Pliocene is pretty likely to be a true scenario (Line 183–191), instead of sampling error, leading to their conclusion: an austral origin for *Caperea.* It is indeed a legitimate argument that after relatively long-term and extensive research on fossil vertebrates in the Northern Hemisphere, we only know two occurrences until recently – one from Okinawa and the other from Sicily.

However, it seems to me that we need to remember that both specimens from the Northern Hemisphere actually were found and collected long, long time ago – the Okinawa *Caperea* was collected in 1948 while the Sicily *Caperea* was uncovered in 1990 (Tsai et al. 2017 *Current Biology*), but both of them were not properly and correctly identified until some specialists in whales (or more precisely, specialists in the pygmy right whale) examined those specimens. For example, the specimen from Okinawa, which was sent to and curated at the Smithsonian Institution, was originally identified and labelled as “gray whale” (personal and unpublished observation from the written label at the Smithsonian Institution), which is so different and disparate from the currently published identification.

Similarly, this specimen now described by Marx et al was also recovered in the first half of the 20th century (Line 48), but previously no one realised that this specimen actually belongs to the enigmatic pygmy right whale until it was identified by two

authors of this paper in 2017. Given that at least three specimens (from Okinawa, Sicily, and Australia) had long been found, but went unnoticed, it then clearly suggests that this weirdo, *Caperea* or its related species, is still poorly understood and known and seems to me that there may have more "hidden" *Caperea* fossils still waiting for proper identification and re-examination from both hemispheres in the museums' collections. Thus, it may still be too early to jump to conclusions that the absence of *Caperea* from the Miocene and Pliocene of the Northern Hemisphere is a genuine phenomenon as authors suggested (Line 183–184), but I totally understand why and how authors came to this point.

2, Origins of *Caperea*

One paper tried to established an "ontogenetic clade" for recognising ancestor-descendant relationships in a phylogenetic framework and then proposed that *Miocaperea* is very likely to be interpreted as the ancestry of extant pygmy right whale as *Miocaperea* was phylogenetically bracketed between adult and juvenile *Caperea* in a morphologically based context (Tsai & Fordyce 2015 *Biology Letters*). Given some similarities to the extant *Caperea* and some differences from the fossil *Miocaperea* (Line 135–142), it would be interesting to see how authors would fit the position of NMV P233333 relative to both *Caperea* and *Miocaperea*. I understand that the material, NMV P233333, is limited because it only preserves part of an isolated periotic, but my impression is that, considering its morphological features and geological occurrence, NMV P233333 may be able to give some scope to briefly discuss this issue.

3, other comments

Some measurements appeared in the text of Description, but I guess it may be helpful to have a Table including some commonly used measurements.

Authors indicated that morphological terms follow Mead & Fordyce 2009, unless stated (Line 50–51), but some terms used in the paper, for example *posterior cochlear crest* (e.g. Line 103, Figs. 2 and 4) and I don't see how authors justified this

usage in the text, were not recommended by Mead & Fordyce 2009 – in this case, Mead & Fordyce 2009 used *caudal tympanic process* (page 114).

In the Abstract, authors said that “there are only three confirmed fossil occurrences” (Line 14), from the context, it seems to me that they were referring to Neobalaeninae; then, it should be five for Neobalaeninae – two from the Northern Hemisphere and three from the South prior to this paper.

Regards
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