2016 年度秋季 9 回

日時：1 月 11日（水）17 時～

場所：自然系学系B 棟 114 教室

EARTH EVOLUTION SCIENCES UNIVERSITY OF TSUKUBA
筑波大学 地球進化科学

地質学セミナー

Way to the extreme: baleen whale evolution

Guest Speaker: Cheng-Hsiu Tsai (JSPS Postdoctoral Research Fellow at the Department of Geology and Paleontology, National Museum of Nature and Science)

Baleen whales (Cetacea: Mysticeti) represent one of the best extreme examples in evolution—the unparalleled body size. The blue whale (Balaenoptera musculus) can reach more than 30 m in length, thus well-known as the largest animal to have ever appeared in the history of Life. However, the origin and evolution of the blue whale or baleen whales as a whole are still poorly understood. In this talk, I will briefly explain how my research attempts to decipher the mystery of baleen whale evolution. We only have 20 minutes here; thus, I mainly focus on two aspects: one on the early evolution of body size and the other on a new species of fossil whales indicating the rise of Balaenopteridae which includes the blue whale, in turn providing insights into the origin of the largest animal.

The oldest known mysticete, the Eocene Llanocetus denticrenatus (34 Ma), was estimated to have reached at about 10 m in length. As a result, the evolution of body size in Mysticeti had been proposed to evolve from a large body size. However, I recently co-authored a paper, describing a new taxon of fossil whales, Fucaia buelli, which represents the second oldest (31–33 Ma, only after Llanocetus) and one of the smallest mysticete species (about 2 m in length). Taxonomically and phylogenetically, Llanocetus and Fucaia belong to two separate mysticete lineages, Llanocetidae and Aetiocetidae respectively, indicating independent evolutionary histories. Thus, the evolutionary scenario in terms of body size in Mysticeti clearly should be more complicated than previously thought. I then compiled all known early mysticetes with estimated body sizes and geological occurrences onto phylogenetic trees to reconstruct the detailed evolution of body size. Results provide novel insights into the origin and evolution of body size, showing that mysticetes evolved from a small body size, and acquired large body size multiple times and at least back to the Paleogene.

Baleen-bearing mysticetes mainly perform three types of feeding strategies: gulp-feeding, or known as lunge feeding, in rorquals (Balaenopteridae), skim-feeding in right whales (Balaenidae), and suction feeding in gray whales (Eschrichtiidae). Given that blue whales, the largest animals, and other rorquals are basically gulp-feeders, gulp-feeding is then probably a key to facilitating rorquals to feed on large quantity of food and in turn acquire unparalleled body size. Besides, the osteological correlative of gulp-feeding may lie at the morphology of mandible, especially a well-developed and posterolaterally reflected coronoid process where is the attachment for a large muscle, temporalis—a key muscle to perform gulp-feeding. Horopeta umarere, a new taxon of fossil whales from the Oligocene, roughly 25–27 Ma in age, that I authored, is the earliest known mysticete that had already acquired the mandibular morphology similar to modern gulp-feeders. The holotype and the only known specimen of Horopeta is morphologically not perfectly preserved, but the occurrence of a possible Oligocene gulp-feeder indeed casts new lights on the early origin and evolution of Balaenopteridae, in turn the rise of the largest animal, the blue whale, on Earth.

Tsai was preparing a fossil whale in 2012, later to be the holotype of Horopeta umarere. (Photo by R. Ewan Fordyce)

本年度の地質学セミナーは今回で最後です.
This is the last geology seminar.