Researchers identify new NZ fossil whale species

September 11 2015, by Ewan Fordyce

Artistic depictions of Tokarahia kauaeroa (top centre, copyright: Chris Gaskin, University of Otago Geology Museum) and Waharoa ruwhenua (bottom centre, copyright: Robert Boessenecker) with photographs of respective fossil skulls.

University of Otago palaeontology researchers are continuing to rewrite the history of New Zealand's ancient whales by describing two further genera and three species of fossil baleen whales.

They have named these newly described filter-feeding baleen whale species Waharoa ruwhenua, Tokarahia kauaeroa and re-identified Tokarahia lophocephalus, a poorly known species discovered in the 1950s.

All are eomysticetids—a whale family occupying an important position in the evolutionary tree of cetaceans—and Tokarahia appears to be a transitional fossil between primitive toothed baleen whales and modern

baleen whales.

These filter-feeding whales lived around 25-30 million years ago when the continent of Zealandia was reduced to low islands surrounded by extensive shallow seas. Their fossils were collected from rock formations in the South Island's Waitaki river area.

The whales join two other eomysticetid species that recent Otago Geology PhD graduate Dr Robert Boessenecker and his supervisor Professor Ewan Fordyce have previously identified.

These five whale species are the only members of the Eomysticetidae family to have been identified in the Southern Hemisphere.

The pair's latest findings appear in separate articles in the *Zoological Journal of the Linnean Society* and the journal *PeerJ*.

Specimens of Waharoa ruwhenua excavated by Professor Fordyce and other colleagues include an adult and juveniles, allowing insights into growth and feeding adaptations.

"The skulls of these three specimens were spectacularly preserved, revealing that eomysticetids had unusually long and delicate surfboard-like snouts, with blowholes placed far forward on the skull, and enormous attachment areas for jaw muscles," Dr Boessenecker says.

The delicate nature of the jaws and skulls indicate that they were likely not "lunge feeders" like humpback whales, but were adapted for right whale-like skim feeding— "they would have been a sort of slow-cruising vacuum cleaner for krill," he says.

The adult size of these whales is estimated to be between five and six metres long. The researchers say that the presence of a small juvenile

indicates that the continental shelf waters of Zealandia were potentially a calving ground for baleen whales.

The researchers' discovery and description of the Tokarahia kauaeroa and Tokarahia lophocephalus whales helps to fill in an important gap in the history of the evolution of primitive toothed whales into baleen whales.

Dr Boessenecker and Professor Fordyce found that Tokarahia kauaeroa had skeletal features falling between those of primitive "archaeocete" whales and modern baleen whales.

"This makes this whale a hallmark example of a 'transitional fossil'," Dr Boessenecker says.

The specimen of Tokarahia lophocephalus that Professor Fordyce and colleagues excavated preserves a single isolated peg-like tooth - suggesting that although these baleen whales were filter feeders, they still retained primitive teeth that had no role in feeding.

Isotopic analysis of bones indicated that Tokarahia was undergoing north-south migration within the southern ocean, likely on a yearly basis.

Dr Boessenecker says that taken together, these three new fossils considerably add to our knowledge of the New Zealand fossil record.

"More importantly though, they fill in major gaps of knowledge—anatomy, growth, paleoecology—in whale evolution between 'toothy' archaeocete ancestors and toothless modern species," he says.

Professor Fordyce added that these "dawn" baleen whales probably ranged south into the richly productive waters of the Southern Ocean,

newly developed after the last remnants of the Gondwana continents broke apart.

"These early baleen whales are 'children of climate change' since their history is linked closely to an Antarctic cooling pulse that led to the development of modern ocean circulation," he says.

Provided by University of Otago