

MIOCENE BENTHIC FORAMINIFERA FROM NOSY MAKAMBY and AMPARAFAKA, (Mahajanga Basin, northwestern Madagascar) Tolotra N. Ramihangihajason¹, Tsiory H. Andrianavalona¹, Rachel Razafimbelo², Lydia Rahantarisoa², Jason R. Ali³, Karen E. Samonds⁴

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ABSTRACT

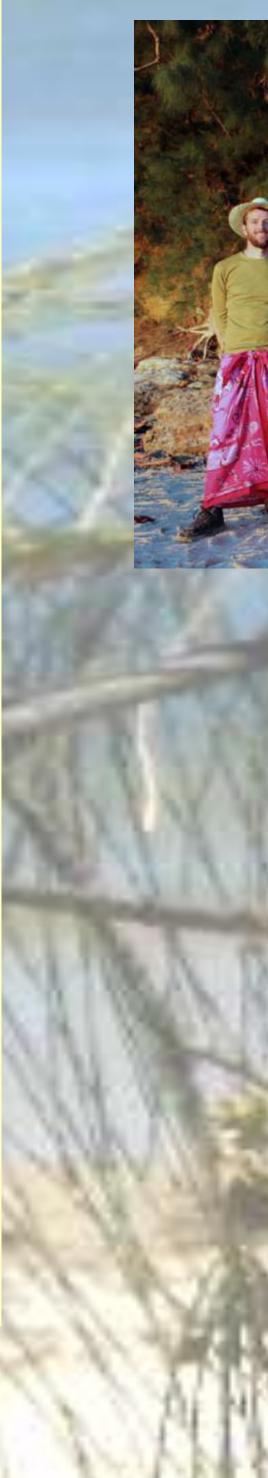
Madagascar is well known for its fossil deposits, and hosts one of the most significant Upper Cretaceous terrestrial faunal sites (Mahajanga & Morondava Basins in the west and northwest of the island). Cenozoic marine fossils have received far less attention from the paleontological community, with most of the work dating from the 19th and early 20th centuries.

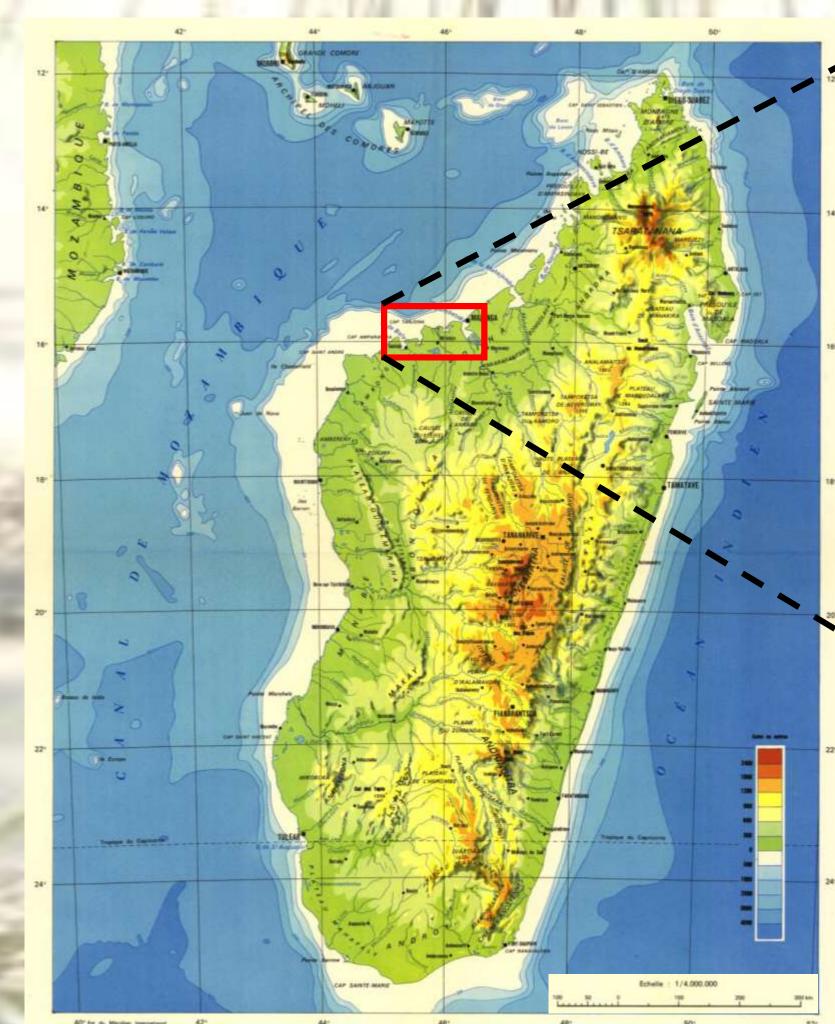
Our study reports a new comprehensive microfossil assemblage largely recovered from a Miocene sequence on Nosy Makamby, a small island off northwest Madagascar. This island is approximately 50 km west along the coast from the regional capital of Mahajanga. Samples from the nearby region of Amparafaka are also described. This work was based on two field expeditions conducted in 2010 and 2011.

After washing, sieving and sorting the sediments from the island (~30 kg), twenty-five genera of foraminifera were identified including: Alveolina, Ammodiscus, Ammonia, Archaias, Bolivina, Borelis, Cassidulina, Cyclammina, Cycloforina, Dentalina, Elphidium, Hauerina, Lagena, Lepidocyclina, Nodosaria, Nonion, Nonionella, Peneroplis, Pyrgo, Quinqueloculina, Rhabdammina, Spirillina, Spirolina, Spiroloculina and Triloculina.

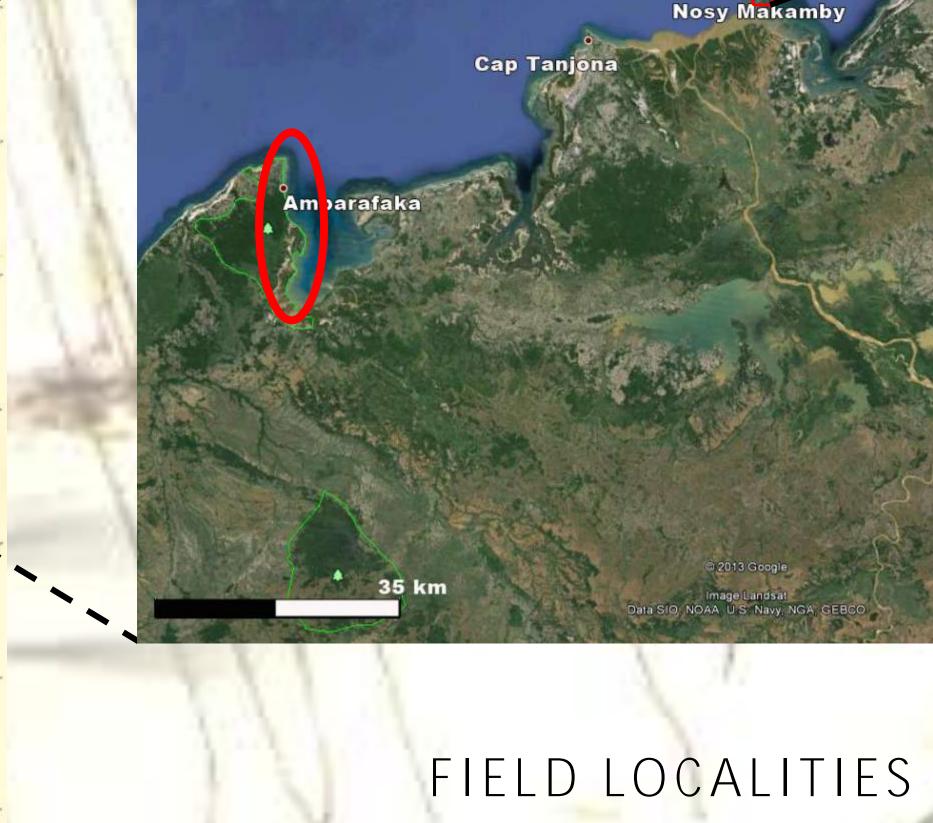
In association with the foraminifera, ostracods plus a variety of others macrofossils including bivalves, gastropods, echinoids, sharks, non-diagnostics reptiles (turtles, crocodylians) and sirenians are found. Together, this assemblage indicates that the Nosy Makamby region was a tropical, near-shore environment during the late Miocene.

METHODS





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47 collections of rock/sediment samples were collected from Nosy Makamby and Amparafaka.

Sediment samples were washed and sieved over a succession of 4 sieves (Neumann, 1967). Resulting residue was sorted.

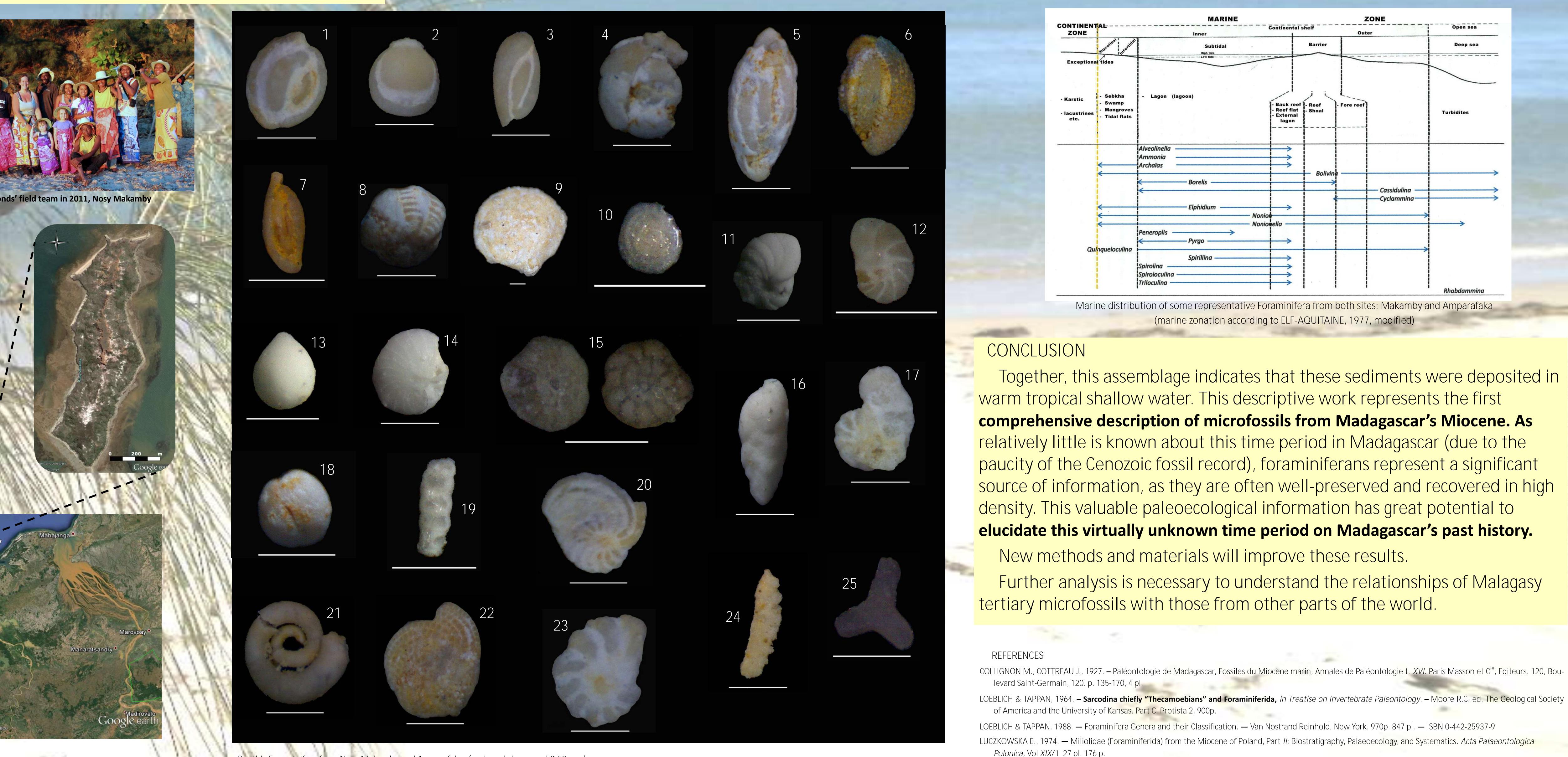
Specimens were photographed using a USB microscope (VEHO VMS-001).

Species distributions and stratigraphic ranges were compiled for each genus (see Luczkowska 1974, Murray 2006).

Genera were identified using descriptions and comparative material following Loeblich and Tappan (1964, 1988).

RESULTS

(1927).



Benthic Foraminifera from Nosy Makamby and Amparafaka: (each scale bar equal 0.50 mm) Ouinqueloculina; 2 Pyrgo; 3 Triloculina; 4 Hauerina; 5 Spiroloculina; 6 Alveolinella; 7 Cycloforina; 8 Borelis; 9 Lepidocyclina; 10 Ammodiscus; 11 Nonion; 12 Nonionella; 13 Lagena; 14 Elphidium; 15 Ammonia; 16 Bolivina; 17 Spirolina; 18 Cassidulina; 19 Nodosaria; 20 Peneroplis; 21 Spirillina; 22 Archaias; 23 Cyclammina; 24 Dentalina; 25 Rhabdammina.

→ 25 genera of benthic Foraminifera are identified from the deposits of Makamby and Amparafaka.

Miliolids are the dominant group - they form more than 50% of the entire microfossil population in both regions.

 \rightarrow No planctonic foraminifera were found in all of the samples examined. Miogypsina irregularis was not found during the course of our research, contrary to what was reported by Collignon and Cottreau

DISCUSSION

ACKNOWLEDGEMENTS : For research permits we are thankful to the Ministry of Mines of Madagascar and the Département de Paléontologie et d'Anthropologie et d'Anthropologie et d'Anthropologie et d'Anthropologie Biologique of the University of Antananarivo. For project funding we are grateful to the Committee for Research and Exploration, National Geographic Society. Special thanks to Karen E. Samonds who allowed me to work with her and for the logistical assistance of Jean-Luc Raharison, Haingoson Andriamialison, Tsiory Andrianavalona, and the entire field team.



The association of Alveolinella, Ammonia, Archaïas, Elphidium, Peneroplis, Spirillina, Spirolina, Spiroloculina and Triloculina suggests that this site was located in the inner shelf during the Miocene (Murray, 2006).

Additionally, the dominance of Miliolids corroborates that deposits of both regions were from the inner shelf. *Quinqueloculina* is the most common genus as it represents nearly 50% of Miliolids in both Makamby and Amparafaka; this further indicates a costal environment (Luczkowska, 1974).

However, some deep-sea forms (e.g., Cassidulina, Cyclammina,

Rhabdammina) were also recovered intermixed with the inner-shelf genera. This may be the result of upwelling, which could also explain the abundance of Invertebrate fossils seen in some of the deposits from Makamby.

www.cambridge.org/9780521828390 NEUMANN M., 1967. – Manuel de Micropaléontologie des Foraminifères (Systématique et Stratigraphie). Gauthier-Villards, Paris. Tome I, 297 p. 60 pl. 182 figs.

MURRAY J.W., 2006. – Ecology and application of Benthic Foraminifera. Cambridge University Press, New York. 426 p. ISBN -13 978-0-511-33519-8 available in