Western Indian Ocean JOURNAL OF Marine Science

Volume 17 | Issue 1 | Jan – Jun 2018 | ISSN: 0856-860X

Chief Editor José Paula

Western Indian Ocean JOURNAL OF Marine Science

Chief Editor **José Paula** | Faculty of Sciences of University of Lisbon, Portugal

Copy Editor **Timothy Andrew**

Editorial Board

Serge ANDREFOUËT
France

Ranjeet BHAGOOLI
Mauritius

Salomão BANDEIRA
Mozambique

Betsy Anne BEYMER-FARRIS
USA/Norway

Jared BOSIRE
Kenya

Atanásio BRITO
Mozambique

Louis CELLIERS
South Africa

Lena GIPPERTH
Sweden

Johan GROENEVELD
South Africa

Issufo HALO
South Africa/Mozambique

Christina HICKS
Australia/UK

Johnson KITHEKA
Kenya

Kassim KULINDWA
Tanzania

Thierry LAVITRA
Madagascar

Blandina LUGENDO
Tanzania

Aviti MMOCHI
Tanzania

Nyawira MUTHIGA
Kenya

Brent NEWMAN
South Africa

Jan ROBINSON
Seycheles

Sérgio ROSENDO
Portugal

Melita SAMOILYS
Kenya

Max TROELL
Sweden

Published biannually

Aims and scope: The *Western Indian Ocean Journal of Marine Science* provides an avenue for the wide dissemination of high quality research generated in the Western Indian Ocean (WIO) region, in particular on the sustainable use of coastal and marine resources. This is central to the goal of supporting and promoting sustainable coastal development in the region, as well as contributing to the global base of marine science. The journal publishes original research articles dealing with all aspects of marine science and coastal management. Topics include, but are not limited to: theoretical studies, oceanography, marine biology and ecology, fisheries, recovery and restoration processes, legal and institutional frameworks, and interactions/relationships between humans and the coastal and marine environment. In addition, *Western Indian Ocean Journal of Marine Science* features state-of-the-art review articles and short communications. The journal will, from time to time, consist of special issues on major events or important thematic issues. Submitted articles are subjected to standard peer-review prior to publication.

Manuscript submissions should be preferably made via the African Journals Online (AJOL) submission platform (http://www.ajol.info/index.php/wiojms/about/submissions). Any queries and further editorial correspondence should be sent by e-mail to the Chief Editor, wiojms@fc.ul.pt. Details concerning the preparation and submission of articles can be found in each issue and at http://www.wiomsa.org/wio-journal-of-marine-science/ and AJOL site.

Disclaimer: Statements in the Journal reflect the views of the authors, and not necessarily those of WIOMSA, the editors or publisher.

Copyright © 2018 —Western Indian Ocean Marine Science Association (WIOMSA)
No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means without permission in writing from the copyright holder.

ISSN 0856-860X

Cover image: Maputo (© Jose Paula, 2010)

Hand-held Sediment Corer for Use in Shallow, Turbulent Coastal Environments

Stephanie V. Stainbank, Michael H. Schleyer*

Oceanographic Research Institute, PO Box 10712, Marine Parade, 4056 Durban, South Africa

* Corresponding author: schleyer@ori.org.za

Abstract

A simple, cheaply-constructed corer is described for operation by SCUBA divers on marine sediments at shallow depths. It proved effective in the collection of bioclastic, reef-associated sediments to a depth of 1 m, retaining their integrity for palaeoclimatological research.

Keywords: diver-operated coring device, palaeoclimatology, sedimentation

Introduction

Palaeoclimatic reconstructions, derived from the analysis of sediment, coral or ice cores, provide a means to extract information beyond modern instrumental records (Bradley, 2014). They also provide a means to determine the response of organisms to past environmental changes (Bradley, 2014). Marine sediment cores are conventionally collected using heavy machinery and research vessels employing a variety of equipment such as vibra-, gravity-, piston-, box- or multi-corers (Schwartz, 2005). Their application is not always feasible due to financial limitations or sampling location, e.g. shallow intertidal regions, coastal areas or coral reefs that are inaccessible to large research vessels. We therefore developed an alternative coring method, a hand-held hammer corer, which can be cheaply manufactured and operated by SCUBA divers in shallow (<30 m) environments. The aim was to manufacture an economical, easy to use corer for the collection of ±1 m long cores in diver-accessible environments.

Corer design

The corer weighs ~35 kg and relies on a percussive hammer for its action, which slides along a fixed barrel (Fig. 1). It is constructed of stainless steel and has handles on top of the barrel to steady it. A hole in the barrel is used to secure core cylinders to the corer, with a pin that also serves as a stop for the sliding hammer when it is lifted. The corer can be used to drive 75 mm diameter, 1.75 m long, stainless steel core barrels into the sediment. A brass shim-stock core-catcher is riveted to the bottom of the core cylinder to minimize sediment loss (Fig. 2). This is pliable, with teeth bent inwards to retain and maintain the integrity of the sediment core. A stainless steel collar with a scampered edge is used to secure the core-catcher flush against the cylinder edge. The corer was designed for use by either one or two divers.

Trial cores

Trial cores were collected using the corer on the inshore edge of Two-mile Reef (TMR), Sodwana Bay, South Africa (Fig. 3). This shallow reef environment is known for its turbulence (Schleyer, 2000). Three cores were collected at the outer fringe of a bioclastic sediment field, on the inshore side of TMR (Fig. 3) in water depths ranging from 15.2 – 16.3 m.

Three cores (X, Y & Z) were collected by divers as depicted in Fig. 4. Upon reaching maximum penetration, the core cylinders were marked at the sediment surface, extracted, capped on both ends, and lifted to the surface using air-lift bags. It took 40 minutes on average to drive each core. Upon splitting, all three cores were intact, displayed banding and all manifested varying degrees of compaction but no disturbance (Fig. 5). Radiocarbon dating of the longest core (X)

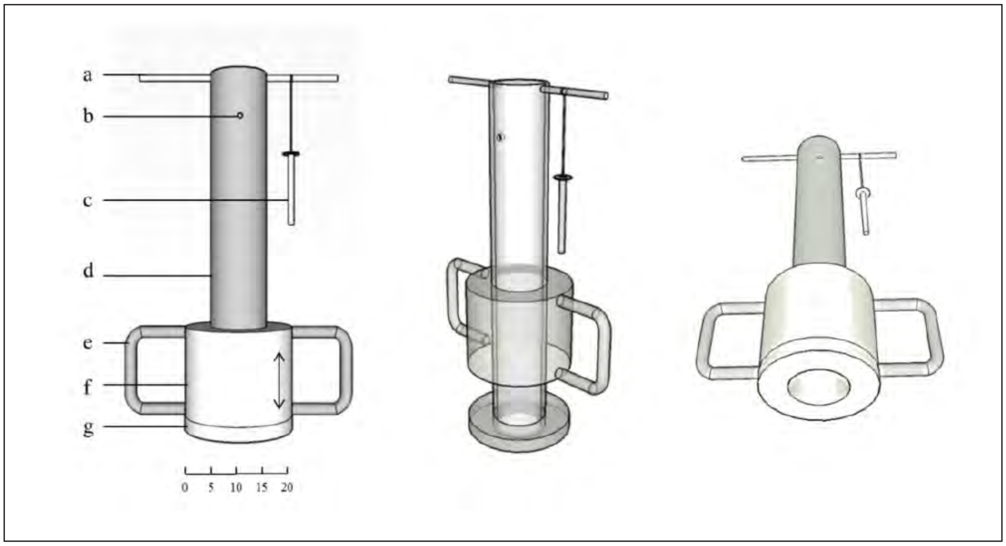

Figure 1. Scaled diagram of the hammer corer: a) top handle, b) hole in sleeve for core barrel securing pin, c) securing pin, d) stainless steel barrel which acts as the hammer slide, e) hammer handle, f) sliding hammer, and g) impact flange.

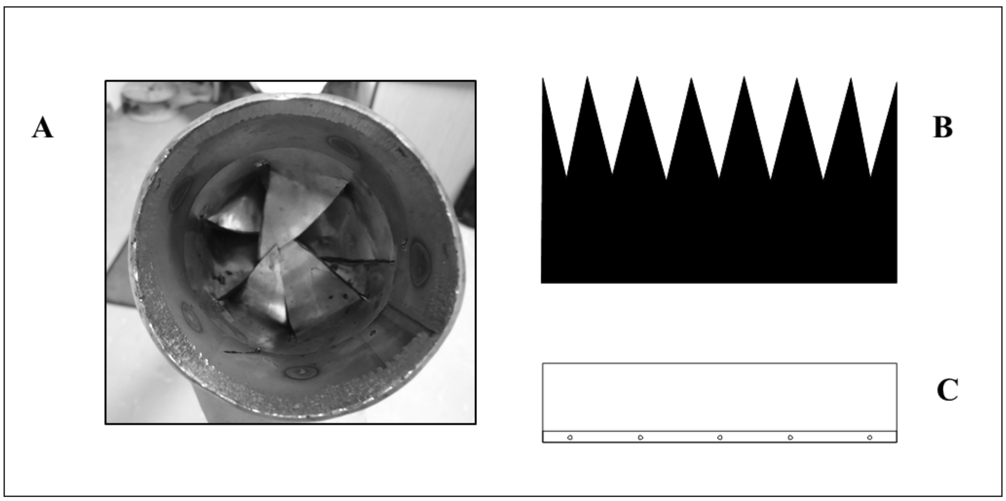

Figure 2. a) Core-catcher inside stainless steel core barrel, b) core-catcher prior to bending and c) scampered stainless steel collar used to secure core-catcher.

provided a Late Holocene starting calendar age of AD 680-920 (BP 1270-1030).

Conclusion

Overall, the hand-held hammer corer was successfully used to collect bioclastic sediment cores from a shallow, turbulent, reef-associated environment. The corer was easy to operate by one or two divers, and cores were retrieved in a short period of time. The handmade core-catcher closed upon retrieval of the cores and prevented sediment loss. The cores were intact and displayed common banding (Fig. 5). Their integrity was thus maintained, with limited disturbance during collection. A problem was encountered where coral rubble was present and this hindered the collection of cores in scattered reef habitat. The corer nevertheless provided an economical means to gather sediment cores from a shallow, turbulent reef environment and these could be used for palaeo-climatological analysis.

Acknowledgements

We are grateful to Mr Mike Gower who generously constructed the corer at nominal cost. The South African Association for Marine Biological Research (SAAMBR) and the Applied Centre for Climate and Earth Systems Science (ACCESS) provided support for the research, and our colleagues willingly assisted with core collection in the field.

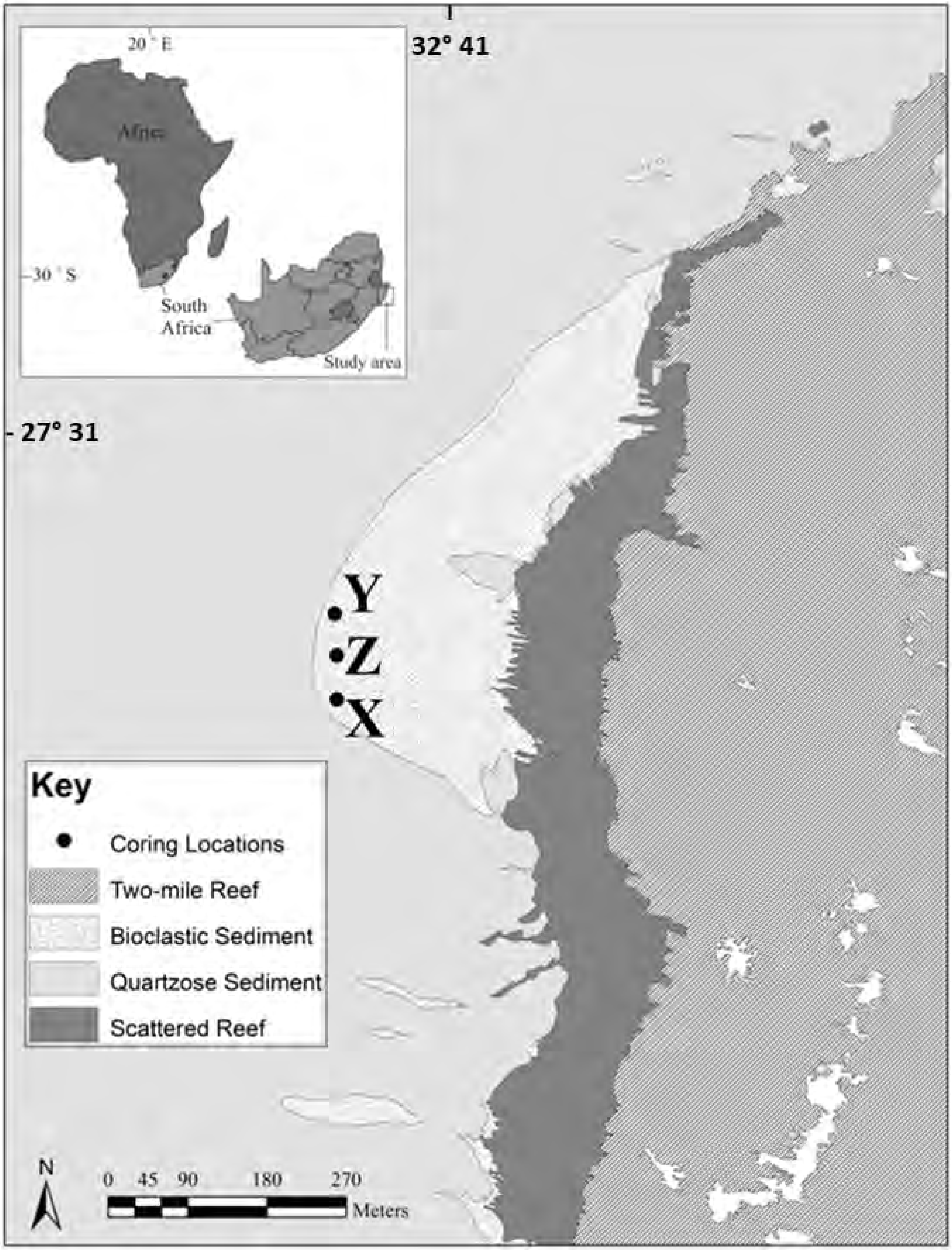

Figure 3. Map showing coring locations on the inshore edge of Two-mile Reef, Sodwana Bay, South Africa.

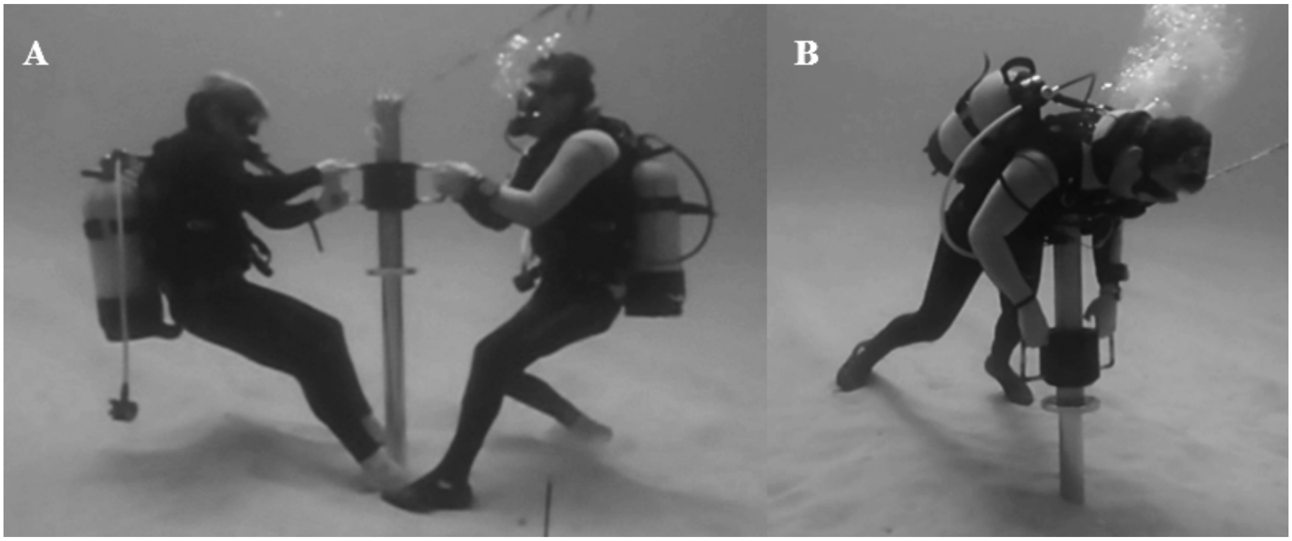

Figure 4. Corer being operated by a) a pair of divers, and b) a single diver.

Figure 5. Sediment cores (X, Y and Z) collected inshore of Two-mile Reef. Bands common to all three cores are evident. The cores were 61, 49 and 47 cm in length, respectively; the scale bars are graduated in cm.

References

Bradley R (2014) Paleoclimatology: Reconstructing Climates of the Quaternary. UK: Academic Press, Elsevier, 696 pp

Schleyer MH (2000) South African coral communities. In: McClanahan T, Sheppard C, Obura D (eds) Coral reefs of the Indian Ocean: Their ecology and conservation. Oxford University Press, New York, pp 83-105

Schwartz M (2005) Encyclopedia of Coastal Science. Springer, Netherlands, 1086 pp