A comparison of the population ecology of reef flat corals of the family Faviidae (Goniastrea, Platygyra).

Thesis submitted by
Russell Clayton BABCOCK Bsc(Hons) (*JCU*)
in May 1986

for the degree of Doctor of Philosophy in
the Department of Marine Biology at
James Cook University of North Queensland

I, the undersigned, the author of this thesis, understand that James Cook University of North Queensland will make it available for use within the University Library and, by microfilm or other photographic means, allow acess to users in other approved libraries. All users consulting this thesis will have to sign the following statement:

> "In consulting this thesis I agree not to copy or closely paraphrase it in whole or in part without the written consent of the author; and to make proper written acknowledgement for any assistance which I have obtained from it."

Beyond this, I do not wish to place any restriction on access to this thesis.

.... 1/8/86....

DECLARATION

I declare that this is my own work and has not been submitted in any form for any other degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

R. C. Babcock
26 May 1986

ACKNOWLEDGEMENTS

I would like to thank my supervisors J. Collins and M. Pichon for their advice and assistance at all stages in the preparation of this thesis. I also wish to thank: P. Harrison, A. Heyward, J. Oliver, C. Wallace and B. Willis for invaluable stimulation, criticism and practical support; T. Done, V. Harriott, R. Jones, R. Kenny, H. Marsh, P. Sammarco, R. Smith and J. Veron for their comments made on the various manuscripts and chapters which have gone into this thesis, and the many people who have provided field assistance throughout the study.

I also wish to thank my wife Margie for her patience and unflagging support in all areas, and for her determination that this thesis must be finished. Finally I must also thank Sarah and Emma, my parents, and my wife's parents for their understanding and support, which has helped in so many ways.

TABLE OF CONTENTS

Figures

ABSTRACT

The spatial distribution, abundance and growth rates of Goniastrea aspera, G. favulus and Platygyra sinensis were studied at two fringing reefs in the central Great Barrier Reef region. All three species exhibited similar degrees of spatial aggregation, despite the reproductive behaviour of G. favulus which was the only one of the species to spawn eggs with benthic development. Growth rates and recruitment rates in G. aspera and G. favulus were positively related to abundances at the two sites. Growth rates of both adults and juveniles were also used to estimate colony ages.

Gametogenic cycles and size specific fecundities were determined for each species at both sites. Goniastrea aspera, G. favulus and P. sinensis were among a large number of species studied which were observed to participate in annual mass spawning events. These mass spawnings are predictable and take place on only a few nights a year, after full moons in October and November. Studies of development subsequent to spawning showed that larvae did not become mobile for at least 36 hours, and the first larvae were capable of settling only after 4 to 5 days. Frequency distributions and rates of mortality based on both size and age were studied in marked quadrats at the two sites.

Frequency distributions based on size differed in some respects from those based on age, particularly with respect to the older age classes which decreased in mean size in many populations. Mortality patterns showed greater similarities between the two methods, however differences were again apparent in the older/larger classes since partial mortality to individuals is not accounted for in age based measurements. Finally, life tables were generated for each species. The life history patterns of G. aspera, G. favulus and P. sinensis appear to demonstrate a number of trade-offs that can be made between traits such as egg size, egg number, larval mortality, age at first reproduction, and mean colony age and generation times.