THE BIOLOGY AND FUNCTIONAL MORPHOLOGY OF THE CORAL-SAND BIVALVE **FIMBRIA FIMBRIATA** (Linnaeus 1758).

BY BRIAN MORTON

Department of Zoology, The University of Hong Kong

SUMMARY

Fimbria fimbriata Linnaeus 1758 is an infaunal inhabitant of coral sands in the Indo-Pacific. The structure and mineralogy of the shell (Taylor, Kennedy and Hall, 1973) confirms its taxonomic position as a member of the Lucinacea. Nicol (1950) erected (giving no reasons) a new family, taking its name (the Fimbriidae) from the genus. This study supports the view of Allen and Turner (1970) and Boss (1970) that *Fimbria* is closely related to the Lucinidae Fleming 1828 though a study of fossil fimbriids will have to be undertaken before the extreme view of Allen and Turner (1970) that *Fimbria* is a lucinid, can be validated. The Lucinidae and *F. fimbriata* possess the following features in common.

1. An enlarged anterior half of the shell with an antero-dorsal inhalant stream.
2. A single (inner) demibranch with type G ciliation (Atkins, 1937b).
3. Reduced labial palps.
4. "Mantle palps".
5. A stomach closely similar in structure.
6. A unique method of withdrawing the posterior exhalant siphon.

The specialisations adapting *Fimbria* for a deposit feeding mode of life have also been elucidated and include:

1. Reduced ctenidia and labial palps.
2. The modification of the foot to form a food collecting organelle.
3. The development of "mantle palps".
4. Complex, efficient and complementary rejectory tracts on the visceral mass and inner mantle surface.
5. The copious production of mucus from all organs involved in the processing of potential food material.
6. Few sorting areas in the stomach.
7. Strong rejectory tracts in the stomach.
8. A small number of large apertures leading from the stomach to the digestive diverticula.
9. A short intestine.
10. An extensive pedal gape bordered by many sensory papillae.

The mode of life of *F. fimbriata* is described; the morphological features it possesses must be seen from two viewpoints. Primitive features give some support to the contention of McAlester (1966) that the Lucinacea are a phylogenetically old and quite distinct separate line of evolution in the Bivalvia. This study supports the view of Boss (1970), however, that the Lucinacea possess many typical heterodont characters and, though primitive, must be considered a significant component of the mainstream of eulamellibranch evolution.

Alternatively the specialisations of *F. fimbriata* suit it to life in nutrient deficient sediments and waters and are generally uniquely different to the solutions offered by other bivalves to similar modes of life.

Records of the Australian Museum, 1979, **Vol. 32 No 11,** 389-420, Figures 1-21.

LIST OF CONTENTS

INTRODUCTION

SYSTEMATICS

BIOLOGY

THE SHELL AND LIGAMENT

THE ORGANS OF THE MANTLE CAVITY

THE DIGESTIVE SYSTEM

THE PERICARDIUM AND KIDNEY

DISCUSSION

ACKNOWLEDGEMENTS

REFERENCES

ABBREVIATIONS USED IN THE FIGURES

INTRODUCTION

Fimbria fimbriata (Linnaeus 1758), like many members of the Lucinacea (Allen, 1958) is an inhabitant of coral sands in the tropics. It has been little studied though both Valenciennes (1845a, b) and Thiele (1935) commented on various aspects of its anatomy. Later descriptions of the species are incomplete (Allen and Turner, 1970; Boss, 1970) because living material was unavailable. These examinations of preserved material left unanswered a wide range of questions with respect to the mode of life and the functional significance of the organs of the mantle cavity and alimentary canal. More importantly the relationships of *Fimbria* within the Lucinacea would benefit from a closer inspection of the living animal especially since Allen and Turner (1970) assert that it is a member of the Lucinidae and further question its present placement in, and the validity of, the Fimbriidae (Nicol, 1950).

This paper reports upon a study of living *Fimbria fimbriata*.

SYSTEMATICS

Fimbria fimbriata (Linnaeus 1758) is a member of the Fimbriidae Nicol 1950 one of six families of the Lucinacea Fleming 1828 recognised by Chavan (1969). In the Fimbriidae Chavan (1969) further recognises 9 genera of which only *Fimbria** Megerle von Mühlfeld 1811 (=*Corbis* Cuvier 1817) is extant. Synonyms of *F. fimbriata* (Linnaeus 1758) include *F. fimbricatum* Roeding 1798, *F. magna* Megerle von Mühlfeld 1811, *F. perforata* Schumacher 1817 (Cernohorsky, 1972). According to Nicol (1950) there are only two living species, both distributed in the Indo-Pacific.

A recent study of *Fimbria fimbriata* by Allen and Turner (1970) has suggested that this genus is more closely allied with the Lucinidae Fleming 1828 and contend that in the original description of the genus no reasons were given for the erection of the Fimbriidae by Nicol (1950). Boss (1969, 1970) accepted the view of Nicol, however, and wrote "Most probably a basic lucinoid stock gave rise to the distinct fimbriids which paralleled the lucinids. . . ." Not until further study has been undertaken of the fossil fimbriids,

* The nudibranchiate genus *Fimbria* Bohadsch 1761 (Taylor and Sohl, 1962) has been rejected by the I.C.Z.N. thereby invalidating the family name based on this genus.