

THE PALEONTOLOGICAL SOCIETY

MEMOIR 3

THE EVOLUTION OF THE *ARGOPECTEN GIBBUS* STOCK (MOLLUSCA: BIVALVIA), WITH EMPHASIS ON THE TERTIARY AND QUATERNARY SPECIES OF EASTERN NORTH AMERICA

THOMAS R. WALLER
Department of Paleobiology
Smithsonian Institution
Washington, D.C.

September 1969

CONTENTS

ABSTRACT	1
INTRODUCTION	2
Stratigraphic setting	2
Field work and materials	2
Summary of past work	4
Basis for recognition of the <i>Argopecten gibbus</i> group as a stock	6
The species concept as applied to the <i>Argopecten gibbus</i> stock	8
Methods of morphometry and comparison	8
Glossary of morphological terms and measurements	9
Morphometry	13
Computations, statistics, and methods of comparison	14
FUNCTIONAL SHELL MORPHOLOGY IN THE PECTINIDAE	16
Introduction	16
Shell thickness, convexity, and symmetry	16
Ornamentation	18
Ligamenture, auricles, and dentition	19
Shell gapes	20
Musculature	21
The adductor muscle	21
The pedal retractor	22
The pallial muscles	22
The gill suspensory and retractor muscles	23
Shell structure and composition	23
SIZE-CORRELATED MORPHOLOGY TRENDS	23
EVOLUTION	25
SYSTEMATICS AND ECOLOGY	31
Genus <i>Argopecten</i> Monterosato, 1889	32
<i>Argopecten gibbus</i> species-group	36
<i>Argopecten gibbus</i> (Linné)	36
<i>Argopecten nucleus</i> (Born)	38
<i>Argopecten irradians sablensis</i> (Clarke)	39
<i>Argopecten irradians irradians</i> (Lamarck)	40
<i>Argopecten irradians concentricus</i> (Say)	41
<i>Argopecten irradians amplicostatus</i> (Dall)	43
<i>Argopecten circularis</i> (Sowerby)	46
<i>Argopecten purpuratus</i> (Lamarck)	48
<i>Argopecten vicenarius vicenarius</i> (Conrad)	49
<i>Argopecten vicenarius charlottensis</i> (Mansfield)	50

<i>Argopecten anteampliostatus</i> (Mansfield)	51
<i>Argopecten comparilis</i> (Tuomey & Holmes)	52
<i>Argopecten</i> species <i>a</i>	54
<i>Argopecten choctawhatcheensis</i> (Mansfield)	55
<i>Argopecten charltonius</i> (Mansfield)	56
<i>Argopecten nicholsi</i> (Gardner)	57
<i>Argopecten eboreus</i> species-group	59
<i>Argopecten eboreus</i> (Conrad)	59
COMPARATIVE MORPHOLOGY AND INFRASPECIFIC VARIATION	61
The living and Pleistocene members of the <i>Argopecten gibbus</i> stock	61
Interspecific variation	61
Infraspecific variation	64
<i>Argopecten irradians</i>	64
<i>Argopecten gibbus</i>	65
<i>Argopecten nucleus</i>	66
<i>Argopecten purpuratus</i>	66
<i>Argopecten circularis</i>	66
The Pliocene members of the <i>Argopecten gibbus</i> stock	68
Interspecific variation	68
The <i>Argopecten eboreus</i> species-group	68
The <i>Argopecten gibbus</i> species-group	69
Infraspecific variation	71
The upper Miocene members of the <i>Argopecten gibbus</i> stock	72
Interspecific variation	72
Infraspecific variation	73
The middle Miocene members of the <i>Argopecten gibbus</i> stock	75
Interspecific variation	75
Infraspecific variation	75
ACKNOWLEDGMENTS	75
REFERENCES CITED	76
APPENDIX	90
Discussion of stratigraphic problems	90
Formations of the Alum Bluff and Choctawhatchee Groups	90
Charlton Formation	91
Caloosahatchee Marl and Unit A	91
Register of numbered localities	93
Fossil localities	93
Localities of living material	96
Data tables	97
Index	122

CONTENTS

v

PLATES

(Between pages 82–89)

TEXT-FIGURES

1. Index map of cited localities in the western Atlantic, Gulf of Mexico, and coastal plains of the eastern United States and Mexico	7
2. Anterior outline of <i>Argopecten purpuratus</i>	9
3. Internal shell morphology of <i>Argopecten</i>	10
4. Scheme of measurement for <i>Argopecten</i>	10
5. Ontogenetic changes in the outline and interior of the shell of <i>Argopecten comparilis</i> ..	22
6. The Cenozoic evolution of the <i>Argopecten gibbus</i> stock	26
7. Bivariate scatter and Dice-Leraas diagrams comparing the holotype of <i>Pecten solidulus</i> Reeve to <i>Argopecten circularis</i> and <i>Argopecten gibbus</i>	35
8. Modified Dice-Leraas diagrams showing variation in counts of plicae and posterior auricular costae of right valves	62
9. Comparative convexity in the <i>Argopecten gibbus</i> stock	67
10. Distribution of some reduced major axes of the <i>Argopecten gibbus</i> stock in the Quaternary	in pocket
11. Distribution of some reduced major axes of the <i>Argopecten gibbus</i> stock in the Pliocene	in pocket
12. Distribution of some reduced major axes of the <i>Argopecten gibbus</i> stock in the upper Miocene	in pocket
13. Distribution of some reduced major axes of the <i>Argopecten gibbus</i> stock in the middle Miocene	in pocket

TABLES

1. Stratigraphic units checked for samples of the <i>Argopecten gibbus</i> stock	3
2. Specific and subspecific names applied to Miocene and Pliocene species of the <i>Argopecten gibbus</i> stock of the southeastern United States	5
3. Alphabetical list of studied shell measurements	11
4. Alphabetical list of studied form ratios	11
5. Size-correlated morphological trends generalized for the entire <i>Argopecten gibbus</i> stock ..	24
6. External measurements of the holotype of <i>Pecten solidulus</i> Reeve, type species of <i>Argopecten</i> , taken from photographs	33
7. Heights and geographic localities of samples constructed for comparison with the holotype of <i>Pecten solidulus</i> Reeve	34
8-43. Data tables	97