LATE EOCENE MOLLUSCA

and

related composite species

from

SOUTHERN AUSTRALIA

by

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(Volume I)

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of Philosophy

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PART I

LITHOSTRATIGRAPHY

TORTACHILLA LIMESTONE

BLANCHE POINT FORMATION
- 'Transitional Marl' Member
- Gull Rock Member
- 'Soft Marl' Member

OBSERVATIONS ON SEDIMENTARY CYCLOTHEMS IN THE EOCENE DEPOSITS OF THE ST. VINCENT BASIN AND CORRELATION WITH COEVAL EPISODES IN THE SOUTHERN AND WESTERN AUSTRALIAN PERICRATONIC BASINS
- Middle-Late Eocene cyclothem in the St. Vincent Basin

ADDENDUM

BIOSTRATIGRAPHY

MATERIALS AND METHODS

BIOSTRATIGRAPHIC SIGNIFICANCE OF THE TORTACHILLA AND BLANCHE POINT FAUNAS
- Tortachilla Limestone
- Blanche Point Formation
  - 'Transitional Marl' Member
  - Gull Rock Member
  - 'Soft Marl' Member
CONTENTS

PART I (cont'd)

- Stratigraphic significance of the Phygraea tarda Horizon in interbasin correlations 41
- The age of the topmost Knight Group and of the Buccleuch Beds (Padthaway Ridge, Murray Basin) 43

TOWARD A MOLLUSCAN ZONATION FOR THE LATE EOCENE 45
- Chlamys aldingensis zone 45
- Orbitestella margaritata zone 45
- Orbitestella spinosa zone 48
- Orbitestella rugosa zone 48

PALAEOECOLOGY

Terms adopted 50
Diversity 50
Disarticulation indexes 51

MOLLUSCAN ASSEMBLAGES 52
- Tortachilla Limestone Assemblages 54
- Blanche Point Formation Assemblages 60
  - 'Transitional Marl' Member 60
  - Gull Rock Member 64
  - 'Soft Marl' Member 67

PALAEOClimatological significance of the Late Eocene Mollusca 68
- Observations on Hiatella as a possible palaeotemperature indicator 73

CONCLUSIONS 74

PALAEOBiogeographical Observations on the Australian Late Eocene 75

MOLLUSCA 75

LARVAL BIOLOGY IN MOLLUSCA 80
- Duration of larval life in Mollusca 80
CONTENTS

PART 1 (cont'd)

- Correlation of larval dispersal, currents, and geographical distribution 81

PALAEOBIOGEOGRAPHICAL RELATIONSHIPS OF THE AUSTRALIAN LATE EOCENE 82
MOLLUSCA

- Approach and limitations of the present discussion 83
- Composition of the Southern Australian Late Eocene Mollusca according to their supraspecific affinities 84
- Possible Early Palaeogene Molluscan dispersal routes 85
- Relationships between Australian and New Zealand Mollusca, as suggested by the Australian Late Eocene Mollusca 90
- Late Eocene Mollusca and Post-Eocene dispersal patterns 91
- Palaeobiogeographical significance of the Southern Australian Tertiary composite species. 92

PART 2

INTRODUCTION

- Classification 94
- Terminology 94
- Photography 95
- Sampling 95
- Preservation 96
- Parameters 97
- Collections 97
SYSTEMATIC DESCRIPTIONS

SCAPHOPODA Bronn

- Laevidentaliidae Palmer
  (Gadilina Foresti)
  98

- Denticulidae Gray
  (Fissidentalis Fischer)
  100

GASTROPODA Cuvier

PROSOBRANCHIA Milne-Edwards

ARCHAEOGASTROPODA Thiele

- Pleurotomariidae Swainson
  (Mikadotrochus Lindholm, Perotrochus Fischer)
  103

- Scissurellidae Gray
  (Scissurella d'Orbigny)
  113

- Fissurellidae Fleming
  (Emarginula Lamarck)
  115

- Trochidae Rafinesque,
  (Pterioulax Cossmann, Olivia Cantraine, Basilissa
  Watson, incertae sedis, Fautor Iredale)
  116

- Turbinidae Rafinesque
  (Pseudostraulium Schepman, Austroliotia Cotton,
  Cycloliotia gen. nov., ?Cantrainea Jeffreys, Vexinia
  Cossmann)
  124

- Cyclostremaidae Fischer
  (Crossecola Iredale, Leucorrhynchia Crosse,
  ?Parviturbo Pilsbry & McGinty)
  137

MESOGASTROPODA Thiele

- Rissoidae H. & A. Adams
  (Nobolira Finlay, Haurakia Iredale, Turboella (Leach)
  Gray, Merelina Iredale)
  148

- Caecidae Gray
  (Strebroceras Carpenter)
  154

- Orbitestellidae Iredale
  (Orbitestella Iredale)
  156
PART 2 (cont'd)

- Incertae sedis
  (?Elachorbis s. l. plicatella Group)

- Turritellidae Woodward
  (Spirocolpus Finlay, Sigmesalia Finlay & Marwick)

- Siliquariidae Gray
  - Nomenclature and controversies in Siliquariidae
  - Shell morphology of Siliquariidae
  - Generic and suprageneric classification of
    Siliquariidae Gray (Tenagodes Guettard, Siliquaria
    Bruguierë, Pyxipoma MBurch, Campylothyrös gen. nov.)
  - Notes on evolution and Tertiary dispersal of Siliquar-
    iidae
  - Description of the Tertiary species ascribed Tenagodes
    occlusus T. Woods
      (Pyxipoma, Siliquaria obtusa Group, Siliquaria
      striata Group, Siliquaria kaurna Group)

- Eulimidae H. & A. Adams
  (Niso Risso, Margineulima Cossmann)

- Aclididae Cossmann
  (Graphis Jeffreys)

- Naticidae Forbes
  (Polinices Montfort, Lunatia Gray, Tanea Marwick,
  Ectosinum Iredale)

- Cymatiidae
  (Austrosassia Finlay, Cymatiella Iredale,
  Personella Conrad)

NEOGASTROPODA WENZ

- Muricidae Fleming
  (Laevityphis Cossmann, Talityphis Josseaume,
  Pterynotus Swainson, Pterochelus Josseaume,
  Trophonopsis Bucquoy, Dautzenberg & Dollfus,
  Enantiemene Iredale)

- Fascioliariidae Chenu
  (Brochitas Finlay, Fusinus Rafinesque)

- Olividae
  (Gracilispira Olson)

- Mitridae Swainson
  (Austromitra Finlay)
CONTENTS

PART 2 (cont'd)

- Volutidae
  (Notopeplum Finlay)

- Volutomitridae Gray
  (Wainmatea Finlay)

- Cancellariidae H. & A. Adams
  (Inglisella Finlay)

- Marginellidae Fleming
  (Hioginella Laseron, Carinaginella Laseron,
  Alaginella Laseron, Marginella s.l., Plicaginella
  Laseron, Cottonella gen. nov., Kaurnaginellä gen.
  nov., Cassoginella Laseron, Conuginella Laseron)

- Turridae
  (Comitas Finlay, Knefastia Dall, Vexithara Finlay,
  Rugobela Finlay)

EUTHYNEURA Spengel

ENTOMOTENIATA Coissmann

- Pyramidellidae d'Orbigny
  (Chemnitzia d'Orbigny, Turbonilla Risso, Syrnola A.
  Adams, Pachysyrnola Coissmann, Auristomia Monerosato,
  Coissmannica Dall & Bartsch)

HETEROGASTROPoda Kosuge

- Triphoridae Jousseaume
  (Kosugia gen. Nov., Inella Bayle, Viriola Jousseaume
  Ogliva Harris & Burrows, Tisotriphora Cotton & Godfrey)

- Triphoridae Jousseaume
  (Granulotriforis Kosuge)

- Architectonicidae
  (Pseudomalaxis Fischer)

- Matilididae
  (Acrocoelum Coissmann)

- Epitoniiidae
  (Cirsotrema Mörch)

CEPHALASPIDEA Fischer

- Acteonidae
  (Acteon Montfort, Kleinaclcteon Vokes, Kaurnacteon
  gen. nov., Tornatellaea Conrad, Triploca Tate,
  Tenuiacteon Aldrich, Obussena Iredale)

- Scaphandridae
  (Actocina Gray, Cyclichna Loven, Cyclichnania Marwick)
CONTENTS

PART 2 (cont'd)

- Retusidae
  (Decorifer Iredale)

PTEROPODA Cuvier

- Observations on the classification
- Notes on the pteropod shell structure
- Cavoliniidae
  ((Praehyalocylis (Korobkov) Korobkov & Makarova)
   Bovicornu O. Meyer))

BIVALVIA (Buonanni) Linne

PALEOTAXODONTA Korobkov

NUCULOIDIA Dall

- Nuculidae Gray
  (Pronucula Hedley, Saccella Link, Ledella Verrill
   & Bush, Poroleda Tate)

PTERIOMORPHA Beurlen

ARCOIDA Stoliczka

- Arcidae Lamarck
  (Arca (Rumphius) Linne, Barbatia Gray)

- Parallelodontidae Dall
  (Notogrammatodon Maxwell, Ludbrookella subgen. nov.
   Grammatodon s.t.)

- Cucullaeidae Stewart
  (Cucullaea Lamarck)

- Noetidae Stewart
  - Striarcinae McNeil
    (Scapularca Cossmann, Striarca Conrad,
     Ovalarca Woodring, Arcopsis Koenen,
     Allassinazella gen. nov.)

- Limopsidae Dall
  - Limopsis Sassi
    - Historical review of Limopsis Sass
    - Observations on Limopsis Sassi s.s
    - Historical review of the Australian species here discussed
<table>
<thead>
<tr>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART 2 (cont'd)</td>
</tr>
<tr>
<td>- Observations of evolutionary trends in L. campa stock</td>
</tr>
<tr>
<td>- Environmental observations</td>
</tr>
<tr>
<td>- Pectunculina d'Orbigny</td>
</tr>
<tr>
<td>- Glycymerididae Newton (Glycymeris Da Costa)</td>
</tr>
<tr>
<td>- ?Philobryidae Bernard (Limarca Tate)</td>
</tr>
</tbody>
</table>

MYTILOIDA Ferussac

- Mytilidae Rafinesque (Septifer Recluz) | 389 |
- Pinnidae Leach (Pinna Linné) | 390 |

PTERIOIDA Newell | 391 |

PTERIINA Newell

- Malleidae Lamarck (Vulsella Roding) | 391 |
- Pteriidae Gray (Pinctada Röding) | 392 |
- Pectinidae Rafinesque (Chlamys Röding, Parvamussium Sacco) | 396 |
- Spondylidae Gray (Spondylus Linné) | 400 |
- Dimyidae Fischer (Dimya Rouault) | 402 |
- Limidae Rafinesque (Ctenoides Morch, Divarilima Powell, Isolimea Iredale) | 404 |

OSTREINA Féruissac

- Gryphaeidae Vyalov (Pycnodonte Fischer de Waldheim, Phygraea Vyalov) | 408 |

HETERODONTA Neumayr | 415 |

VENEROIDA H. & A. Adams |
- Carditidae Fleming (Paraglans Chavan) | 416 |

MYOIDA Stoliczka | 417 |
CONTENTS

PART 2 (cont'd)

MYINA Stoliczka
- Corbulidae
  (Caryocorbula Bruguière)
- Hiatellidae
  (Hiatella Bosc)

PHOLADINA H. & A. Adams
- Pholadidae Lamarck
  (Pholadopsis Conrad)

ANOMALODESMATA Dall

PHOLADOMYOIDA Newell
- Clavagellidae d'Orbigny
  (Clavagella Lamarck)

APPENDICES

A - Localities
B - Descriptions of detailed sections
C - Sample check-lists
D - 1. Late discovered species of stratigraphic significance
    2. Notes on the Australian Eocene Nautiloidea
E - 1. J.M. Lindsay's personal communication on the age
    of the Phygraea tarda horizon in the Eucla Basin.
    2. B.J. Cooper's personal communication on the Latest
       Eocene interval of the Willunga Bore WLG 40.
F - Published papers

BIBLIOGRAPHIC REFERENCES

PLATES
SUMMARY

Late Eocene Mollusca and related Tertiary composite species from Southern Australia mainly from the Maslin and Aldinga Bays outcrops (Willunga SubBasin, St. Vincent Basin, South Australia), are discussed here. They include Gastropoda, Bivalvia, and Scaphopoda only.

SYSTEMATICS. Of the 215 species dealt with here, 81 previously known forms are revised, 82 are newly instituted, and 52 informally described. Also recognized for the first time are 7 new genera, Allasinazella (Striarcinae), Kaurnacteon (Acteonidae), Kosugeia (Triphoridae), Cottonella and Kaurnaginella (Marginellidae), Cycloliotia (Liotiinae), and Campylothrysos (Siliquariidae); 1 new subgenus Ludbrookella (Grammatodontinae); and the two subfamilies, Siliquariinae Gray and Stephopominae subfam. nov. Several genera and subgenera have been recorded for the first time in Australia and several others have had their stratigraphic range extended as far back as the Late Eocene.

The following groups are discussed in more detail: Pseudomalaxis Fischer (Buonaiuto, 1975; this study), Crossea A. Adams, Liotina Fischer and its subgenus Austroliotia Cotton, Siliquariidae Gray, Orbitestellidae Iredale, Pyramidellacea d'Orbigny, Marginellidae Jousseaume, Pteropoda Cuvier, Pleurotomariidae Swainson, Triphoracea Kosuge, Limopsis Sassi, and Striarcinae McNeil.

BIOSTRATIGRAPHY. As shown in the following synoptic table, an informal zonation is based on the stratigraphic distribution of the species in the Tortachilla Limestone, Blanche Point Formation, Lower Port Willunga Formation (St. Vincent Basin), and in the Knight Group and Buccleuch Beds (Murray Basin).
<table>
<thead>
<tr>
<th>EPOCH</th>
<th>Standard Foraminiferal Zones</th>
<th>Molluscan zonation Zones</th>
<th>Molluscan assemblages</th>
<th>BASINS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>St. Vincent</td>
</tr>
<tr>
<td>Late Eocene</td>
<td></td>
<td></td>
<td></td>
<td><strong>to define</strong></td>
</tr>
<tr>
<td>P.16</td>
<td>Orbitestella rugosa</td>
<td>Dimyga asseretoi</td>
<td>Ledella-Pectunculina-Zeacoelopus</td>
<td>Pt. WILLUNGA</td>
</tr>
<tr>
<td></td>
<td>Orbitestella spinosa</td>
<td>Spirocolpus-Dimyga-Ledella</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>transitional F. Marl</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>'TORTACHILLA LIMESTONE'</strong></td>
</tr>
<tr>
<td>P.15</td>
<td>Hantkenina primitiva</td>
<td>Vulsella laevigata</td>
<td>Spirocolpus-Trophon Chlamya-Chlamys Chlamya-Pycnodonte Spirocolpus-Dimyga Turritella-Dosinia</td>
<td>Barren</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dosina-Turritella-Chlamys Dimyga Chlamya-Hiatella Barren</td>
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</table>
P A L A E O E C O L O G Y. The quantitative analysis of the Molluscan faunas of the Tortachilla Limestone and the Blanche Point Formation revealed a number of distinct assemblages, as shown in the table above.

The succession of these assemblages suggests a supralittoral to subtidal environment of deposition for the Tortachilla Limestone. In the Blanche Point Formation the assemblages indicate a gradual transition from subtidal to shallow-medium sublittoral conditions in the 'Transitional Marl' Member, a medium to possibly deep sublittoral-shallow bathyal environment, for the lower Gull Rock Member; a return to shallow medium sublittoral in the upper Gull Rock Member; and again, a reversal to deeper conditions in the 'Soft Marl' Member. Two continental to supralittoral episodes are recognized here: the older represented by the lacuna between Tortachilla Limestone and Blanche Point Formation; the younger by the Chinaman Gully Formation.

The higher diversity indexes of the assemblages suggest that biologically accommodated conditions for Mollusca persisted almost continuously throughout both Tortachilla Limestone and Blanche Point Formation, with the exception of the Phygraea tarda assemblage and the overlying Bryozoa assemblage, which indicate biologically stressed conditions.

The molluscan faunas indicate warm temperate to subtropical climatic conditions persisting throughout the Late Eocene, with a climatic optimum in the middle 'Transitional Marls' (Roughly late zone P15-early P16), and less warm conditions in the Gull Rock and 'Soft Marl' Members. Climatic minima seems to coincide with regressive events at the Tortachilla Limestone/Blanche Point Formation boundary (roughly middle zone P15) and at the Chinaman Gully Formation continental episode (roughly middle zone P16).
PALAEOBIOGEOGRAPHY. The 169 taxa hitherto recorded in the Late Eocene of Southern Australia suggest a high degree of endemism (∼39%) and a high affinity with the Boreal Proto Atlantic (∼24%) and with New Zealand (∼8%) faunas. Cosmopolitan elements are heavily represented (∼18%). A very low affinity with the Central and Eastern Tethys is indicated. A north-south ProtoAtlantic-ProtoSouthern Ocean route is suggested as the most active for the dispersal of the Mollusca during the Late Eocene. The analysis of the Australian forms endemic in the Late Eocene suggests post Eocene dispersal patterns toward the Indo Pacific and the Eastern Tethys.

LITHOSTRATIGRAPHY. The Tortachilla Limestone and the Blanche Point Formation of the Eastern St. Vincent Basin and their relationships are discussed and revised here. The Bucchleuch Beds (Murray Basin) are correlated with the Aldinga Member of the Port Willunga Formation, on the basis of Molluscan data.