MOLLUSCAN PALEONTOLOGY OF THE PLIOCENE-PLEISTOCENE LOWER SAUGUS FORMATION, SOUTHERN CALIFORNIA

by Lindsey T. Groves

With the assistance of a generous COA research grant in 1987 to help with field and photographic expenses, I completed my Master of Science thesis in late 1990 at California State University, Northridge. In my work on the paleontology of the lower Saugus Formation, I completely documented a rich invertebrate fauna of Pliocene-Pleistocene age through illustrations and extensive synonymies. I also included sections on stratigraphy, paleoenvironment, paleobiogeography, geologic age, and correlation of the lower Saugus Formation to others of similar age in central and southern California.

My study area was in the eastern Santa Susana Mountains in Los Angeles and Ventura Counties (Fig. 1). Because most of this area is on private property, permission from land owners was required prior to entry. The richest fossiliferous deposit of the lower Saugus Formation is located in Gillibrand Quarry north of Simi Valley, California. From this locality nearly 89% of the total number of fossil species were collected from a particularly rich horizon informally named the "Pecten bed" for the abundant specimens of Patinopecten healeyi (Arnold, 1906) and Pecten (Pecten) bellus (Conrad, 1857). This locality is interpreted to have been deposited as an embayed channel and may represent a faunal community. Because of excellent preservation displayed by many specimens, post-mortem transport was probably minimal.

Fossils of the lower Saugus Formation are predominantly molluscan and include 43 bivalve species, 49 gastropod species, and one scaphopod species (Table 1). Table 1 also indicates important terminal Pliocene index species and other extinct species. The commonest index species are Patinopecten healeyi (Fig. 2.1) and Opalia varicostata Stearns, 1875 (Fig. 2.2). Non-molluscan invertebrates included a sponge, bryozoans, brachiopods, crabs, barnacles, and echinoids.

Malacology Section, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007. Lindsey Groves is currently at work fulfilling a subsequent COA grant award on the fossil and Recent Cypraeaceans of the eastern Pacific region. We hope to read of this research as well within the coming year.

Examples of lower Saugus Formation terminal Pliocene index fossils. 2.1, Patinopecten healeyi (Arnold, 1906) from Gillibrand Quarry (CSUN loc. 725), exterior of right valve, x 0.5. 2.2, Opalia varicostata Stearns, 1875, from Las Llajas Canyon (CSUN loc. 1161), apertural view, x 0.9.

An analysis of latitude and paleobathymetry of this fauna revealed that most of the species live today at the same latitude as the study area (34° 18') between 20 and 30 meters depth. A logical interpretation would be that oceanic temperatures during lower Saugus Formation deposition were similar to those of today (12 to 18°C) with a normal salinity of 33 to 34 parts per thousand. A few species are geographically anomalous and several are bathymetrically anomalous. Mya truncata Linne, 1758 and Lacuna carinata Gould, 1849 live today north of 34° 18' N latitude, and Miltha xantusi (Dall, 1905), Dosinia ponderosa (Gray, 1838), Cheilea cepacea (Broderip, 1834), and Calyptraeidae (Trochita) spirata (Forbes, 1852) all live today significantly south of the study area latitude. Deep water species such as Fusirita oregonense (Redfield, 1848) and Neptunaea tabulata (Baird, 1863) are found in the same stratigraphic horizons with shallow water species such as Littorina scutulata Gould, 1849. These anomalous conditions indicate the probability of currents mixing adjacent warm — and cold-water habitats in the eastern Ventura Embayment during the Pliocene-Pleistocene, and probably account for the mixed assemblage.

The San Diego Formation, San Diego County, California, contains more Pliocene index species common to the lower Saugus Formation than to any other formation in California. The species in common are: Lyropecten cerrosensis (Gabb, 1866); Patinopecten healeyi; Pycnodonte erici (Hertlein, 1929); Dendostrea vespertina (Conrad, 1854); Opalia varicostata; Musashia (Nipponomelon) oregonensis (Dall, 1907); and Terebra (Strioterebra) martini English, 1914. Other forma-
tions of similar age in central and southern California are the San Joaquin Formation [Fresno and Kings Counties], the Careaga Formation [San Luis Obispo and Santa Barbara Counties], the Potato Harbor Formation [Santa Cruz Island], the basal Los Pasas Formation [Ventura County], the Niguel Formation [Orange County], and an unnamed Pliocene section on Cape Clementine.

I am very grateful to my thesis committee members Dr. Richard L. Squires (California State University, Northridge), Dr. Jon R. Sloan (CSUN), and Dr. George L. Kennedy (Los Angeles County Museum of Natural History, Invertebrate Paleontology) for their encouragement and insight throughout the duration of this project. Special thanks to the Conchologists of America for their generosity in support of my research.

TABLE 1. MOLLUSKS OF THE LOWER SAUGUS FORMATION

BIVALVI

<table>
<thead>
<tr>
<th>Species</th>
<th>Author</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Acilia (Truncacilia) castrensis</td>
<td>Hinds, 1843</td>
<td></td>
</tr>
<tr>
<td>Nuculana (Hextylida) hamata</td>
<td>Carpenter, 1864</td>
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</tr>
<tr>
<td>Nuculana (Succelia) sophia</td>
<td>Dall, 1896</td>
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<tr>
<td>Yoldia (Cnestium) acisurata</td>
<td>Dall, 1895</td>
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<tr>
<td>Glycymeris (Asinolia) profunda</td>
<td>Dall, 1878</td>
<td></td>
</tr>
<tr>
<td>Lithophaga (Dibetas) plumula</td>
<td>Hanley, 1864</td>
<td></td>
</tr>
<tr>
<td>Modiolus capax</td>
<td>Conrad, 1837</td>
<td></td>
</tr>
<tr>
<td>Modiolus rectus</td>
<td>Conrad, 1837</td>
<td></td>
</tr>
</tbody>
</table>

* = Living species; ** = Extinct Terminal Pliocene index fossil species

GASTROPODA

Haliosis (Sulculus) rufescens Swainson, 1822
Pancurella (Cranopsis) eruculata (Gould, 1846)
Diodora arnoldi McLean, 1906
Diodora aspera (Rathke, 1833)
Astraea (Megastraea) undosa (Wood, 1828)
Tegula (Chlorostoma) gallina (Forbes, 1852)
Callospira annulata (Lightfoot, 1786)
Callospira gemulata (Carpenter, 1864)
Brittium (Stylium) quadrifasciolatum Carpenter, 1864
Turritella cooperi Carpenter, 1864
Littorina scutulata Gould, 1849
Lacuna carinata Gould, 1849
Chicera cepacea (Brodieri, 1834)
Cypraea fastigata Gould, 1846
Cypraea (Trachychia) variata (Forbes, 1852)
*Crepidula princeps Conrad, 1856
Neverita (Glossoulia) reclinata (Deshayes, 1839)
Sinum scapulatum (Conrad, 1849)
Fusitation orogenetis (Redfield, 1848)
Sella montereyensis Bartosh, 1907
Nildicula tinctor (Carpenter, 1864)
**Opalia varicosata Stearns, 1875
Ocenebra beta (Dall, 1919)
Ocenebra lurida (Mulderdoeff, 1848)
Forreria belcheri (Hinds, 1844)
Culcanthus faris (Carpenter, 1866)
**Culcanthus humeralma (Gabb, 1869)
**Culcanthus kettlemennensis (Arnold, 1909)
Neptunea (Sulcosipho) tabulata (Baird, 1846)
Nassarius (Carinata) perginaux (Hinds, 1844)
*Mitrella carinata (Hinds, 1844)
*Mitrella tuberosa (Carpenter, 1864)
Amphissa vericoloria (Dall, 1871)
**Musashia (Nipponomelon) orogenetis (Dall, 1907)
Olivella (Callianax baetica Carpenter, 1864)
Olivella (Callianax hapatensis (Sowerby, 1825)
Mitra (Atrimitra) idar Melvill, 1893
Admire gracilis (Carpenter, in Gabb, 1869)
Crotalaria conradiana (Gabb, 1866)
Agathotoma hexagona (Gabb, 1865)
Clathromangia variegata (Carpenter, 1864)
Ophiopsermella inermis (Hinds, 1843)
Globidrillia hemphilli (Steams, 1871)
Cnus (Cheleconus) californicus Reeve, 1844
**Terebra (Striotrebera) martini English, 1914
Terebra (Striotrebera) pedroano Dall, 1908
Turbonilla (Chromitoma) murciatoidea Dall and Bartosh, 1907
Turbonilla (Mormola) ambigua Dall and Bartosh, 1909
Bulla gouldiana Pilsbry, 1895

SCAPHOPODA

Dentalium neohexagonum Sharp and Pilsbry, 1897
** = Extinct terminal Pliocene index fossil species
* = Other extinct species

NEW COA GRANTS

1992 mollusk research grants, up to $1,500.00 per applicant, are available to qualified persons undertaking recent or fossil laboratory or field research work. The deadline for applications is May 1, 1991. Mail to Dr. R. Tucker Abbott, Grants Chair-
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