

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

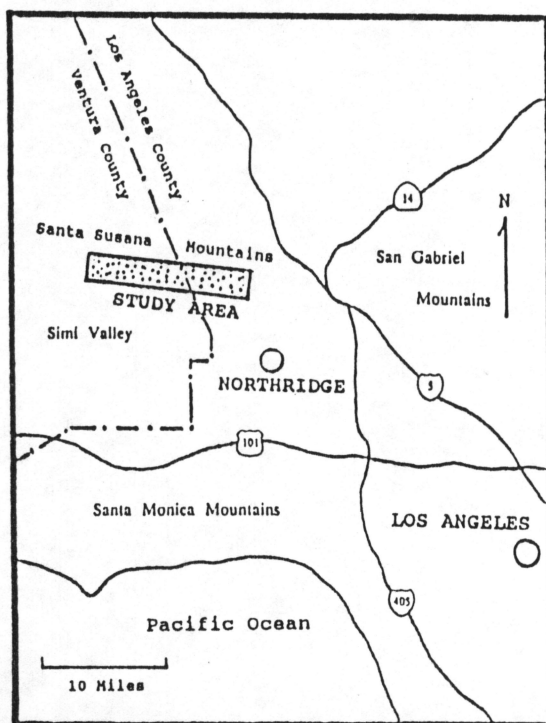
by Lindsey T. Groves

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.

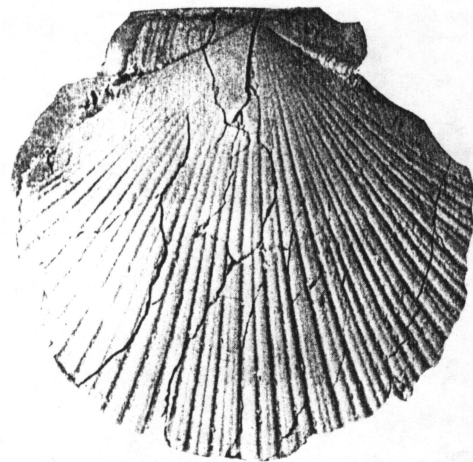
My study area was in the eastern Santa Susana Mountains in Los Angeles and Ventura Counties (Fig. 1). Because most of this area is on private property, permission from land owners was required prior to entry. The richest fossiliferous deposit of the lower Saugus Formation is located in Gillibrand Quarry 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 Cypraeaans of the eastern Pacific region. We hope to read of this research as well within the coming year.



Location map of the study area in the eastern Santa Susana Mountains, Los Angeles and Ventura Counties, southern California.



2.1
= LACMIP
11614



2.2

= LACMIP
11615

CSUN 725 = LACMIP
29227

CSUN 1161 =
LACMIP 12600

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 Lajas 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 *Calyptrea (Trochita) spirata* (Forbes, 1852) all live today significantly south of the study area latitude. Deep water species such as *Fusitriton oregonense* (Redfield, 1848) and *Neptunea 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 Las Posas Formation [Ventura County], the Niguel Formation [Orange County], and an unnamed Pliocene section on San Clemente Island.

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

BIVALVIA

Acila (Truncacilia) castrensis (Hinds, 1843)
Nuculana (Thestyloda) hamata (Carpenter, 1864)
Nuculana (Saccella) taphria Dall, 1896
Yoldia (Cnesterium) scissurata (Dall, 1895)
Glycymeris (Axinola) profunda (Dall, 1878)
Lithophaga (Diberus) plumula (Hanley, 1844)
Modiolus capax (Conrad, 1837)
Modiolus rectus (Conrad, 1837)
 **Chlamys opuntia* (Dall, 1898)
Chlamys hastata hastata (Sowerby, 1842)
Chlamys hastata hericius (Gould, 1850)
 ***Lyropecten cerrosensis* (Gabb, 1866)
 **Swiftopecten parmeleii* (Dall, 1898)
Crassadoma gigantea (Gray, 1825)
 **Pecten (Pecten) bellus* (Conrad, 1857)
 ***Pecten (Pecten) lecontei* Arnold, 1906
 **Flabelliptecten stearnsii* (Dall, 1878)
 ***Patinopecten healeyi* (Arnold, 1906)
Pododesmus (Monia) macroschisma (Deshayes, 1839)
 ***Pycnodonte erici* (Hertlein, 1929)
 ***Dendostrea vespertina* (Conrad, 1854)
 ***Lopha veatchii* (Gabb, 1866)
Lucina (Lucinoma) acutilineata (Conrad, 1849)
Lucina (Here) excavata Carpenter, 1857
Miltha xantusi (Dall, 1905)
Epilucina californica (Conrad, 1837)
Chama arcana Bernard, 1976
 **Cyclocardia occidentalis* (Conrad, 1855)
 **Eucrassatella lomitensis* (Oldroyd, 1924)
Trachycardium (Dallocardium) quadragenarium (Conrad, 1837)
Tresus nuttallii (Conrad, 1837)
Solen sicarius Gould, 1850
Leporimetis obesa (Deshayes, 1855)
Macoma inquinata (Deshayes, 1855)
Gari (Gobraeus) edentula (Gabb, 1869)
Saxidomus nuttallii Conrad, 1837
Dosinia ponderosa (Gray, 1838)
 **Humiliaria perlaminosa* (Conrad, 1855)
Mya truncata Linne, 1758

Panopa abrupta (Conrad, 1849)
Penitella penita (Conrad, 1837)
Cyathodonta pedroana Dall, 1915
Thracia (Homoeodesma) trapezoides Conrad, 1849

GASTROPODA

Haliotis (Sulculus) rufescens Swainson, 1822
Puncturella (Cranopsis) cucullata (Gould, 1846)
Diodora arnoldi McLean, 1966
Diodora aspera (Rathke, 1833)
Astraea (Megastraea) undosa (Wood, 1828)
Tegula (Chlorostoma) gallina (Forbes, 1852)
Calliostoma annulata (Lightfoot, 1786)
Calliostoma gemmulata (Carpenter, 1864)
Bittium (Stylidium) quadrifiliatum Carpenter, 1864
Turritella cooperi Carpenter, 1864
Littorina scutulata Gould, 1849
Lacuna carinata Gould, 1849
Cheilea cepacea (Broderip, 1834)
Calyptraea fastigata Gould, 1846
 **Calyptraea filiosa* (Gabb, 1866)
Calyptraea (Trochita) spirata (Forbes, 1852)
 **Crepidula princeps* Conrad, 1856
Neverita (Glossaulax) reclusiana (Deshayes, 1839)
Sinum scopulosum (Conrad, 1849)
Fusitriton oregonense (Redfield, 1848)
Seila montereyensis Bartsch, 1907
Nitidiscala tincta (Carpenter, 1864)
 ***Opalia varicostata* Stearns, 1875
Ocenebra beta (Dall, 1919)
Ocenebra lurida (Middendorff, 1848)
Forreria belcheri (Hinds, 1844)
 **Calicantharus fortis* (Carpenter, 1866)
 ***Calicantharus humerosus* (Gabb, 1869)
 ***Calicantharus kettlemanensis* (Arnold, 1909)
Neptunea (Sulcosipho) tabulata (Baird, 1863)
Nassarius (Caesia) perpinguis (Hinds, 1844)
Mitrella carinata (Hinds, 1844)
Mitrella tuberosa (Carpenter, 1864)
Amphissa versicolor Dall, 1871
 ***Musashia (Nipponomelon) oregonensis* (Dall, 1907)
Olivella (Callianax) baetica Carpenter, 1864
Olivella (Callianax) biplicata (Sowerby, 1825)
Mitra (Atrimitra) idae Melvill, 1893
Admete gracilior (Carpenter, in Gabb, 1869)
Crockerella conradiana (Gabb, 1866)
Agathotoma hexagona (Gabb, 1865)
Clathromangelia variegata (Carpenter, 1864)
Ophiidermella inermis (Hinds, 1843)
Globidriella hemphilli (Stearns, 1871)
Conus (Chelyconus) californicus Reeve, 1844
 ***Terebra (Strioterebra) martini* English, 1914
Terebra (Strioterebra) pedroana Dall, 1908
Turbonilla (Chemnitzia) muricatoides Dall and Bartsch, 1907
Turbonilla (Mormula) ambusta Dall and Bartsch, 1909
Bulla gouldiana Pilsbry, 1895

SCAPHOPODA

Dentalium neohexagonum Sharp and Pilsbry, 1897

** = Extinct terminal Pliocene index fossil species
 * = Other extinct species

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REPRINTS

The Associazione Malacologica Internazionale and Carlo Settepassi's *Atlante Malacologico* are collaborating to re-issue a series of antique malacological texts. The three works currently being undertaken, in numbered copies with cloth binding and leather inset, are *Coquilles vivantes, Famille des enroulées* (Cones) by L.C. Kiener and P. Fischer, 1835, with 111 color plates, *Manuel de Conchyliologie et de Paleontologie conchyliologique* by Paul Fischer (1880-1887), and *On the Mollusca procured during the "Lightning" and Porcupine" Expeditions 1886-1870* by J. Gwyn Jeffreys. These high quality reproductions (as well as further information about them) are available by advance order from AMI, Casella Postale n. 45 — 00125 Acilia — Rome, ITALY.

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 Chairman, Conchologists of America, P.O. Box 2255, Melbourne, FL 32905-2255. Applicants must outline the proposed project, amounts and purposes for which the award will be used, including requested supplies, expendable equipment, living and/or travel expenses, publication or illustration costs. Please submit a short biography, educational status or pertinent job experience, and a letter of recommendation from a scholastic or professional source. Awards are judged by the COA committee by June 1, and are made only to citizens or permanent residents of the Americas. They do not cover salaries, overhead, permanent equipment, or conference or meeting costs. If awarded, the recipient is expected to submit a popular written account of the project, suitable for publication in *American Conchologist*.

— R. Tucker Abbott

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