



Figures 24–32. *Mesalia clarki* (Dickerson, 1914). Specimens coated with ammonium chloride. All from LACMIP loc. 10508. **24.** Hypotype LACMIP 13405, apertural view, height 21.5 mm, diameter, 19.6 mm. **25.** Hypotype LACMIP 13406, slightly oblique apertural view, height 23.1 mm, diameter 10.8 mm. **26–27.** Hypotype LACMIP 13407, height 22.6 mm, diameter 9.4 mm. **26.** Abapertural view. **27.** Oblique apertural view. **28.** Hypotype LACMIP 13408, apertural view, height 23.2 mm, diameter 9.2 mm. **29.** Hypotype LACMIP 13409, abapertural view, height 21.5 mm, diameter 11 mm. **30.** Hypotype LACMIP 13410, abapertural view, height 23.6 mm, diameter 9.7 mm. **31.** Hypotype LACMIP 13411, base, diameter 9.5 mm. **32.** Hypotype LACMIP 13408, base of same specimen shown in Figure 28, diameter 8.9 mm.

specimens have nearly uniform sculpture and flattish whorls (Figure 24), others have carinate whorls (Figure 26), whereas others have uniform sculpture with convex whorls (Figure 29).

Zinsmeister (1983: pl. 2, fig. 14), Zinsmeister and Paredes-Mejia (1988: table 1), and Paredes-Mejia (1989: table 3) reported *M. clarki* from the Santa Susana Formation in the Simi Hills, southern California. These re-

ports, however, were based on the misidentification of a specimen of *Mesalia martinezensis* that happens to lack a strong anterior carina on the otherwise convex whorls.

Mesalia clarki resembles *Motyris aralica* (Michailovski, 1912; Wenz, 1939: 652, fig. 1856) from upper Eocene rocks in the Aral Sea region. *Motyris* Eames, 1952, was formerly known as *Tomyris* Michailovski, 1912. See Marwick (1957: 162–163) for more taxonomic information about *Motyris*. *Mesalia clarki* differs from *M. aralica* by not having tabulate whorls with strongly indented sutures. The full aperture of *M. aralica* is unknown, and details about its apical whorl development are wanting. The only other species of *Motyris* that we are aware of is *Motyris pseudoaralica* Eames (1952: 30–31, pl. 1, fig. 15; pl. 2, figs. 58a, b) from Pakistan, but its aperture is unknown. We believe that when the great variability of *Mesalia* is taken into account, *Motyris* will prove to be congeneric.

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LITERATURE CITED

- Abbass, H. L. 1963. A monograph on the Egyptian Cretaceous gastropods. United Arab Republic, Ministry of Industry, Geological Survey and Mineral Research Department, Geological Museum, Palaeontological Series Monograph 2, 146 pp.
- Abbott, P. L., D. P. Smith, W. V. Sliter, and L. R. Saul. 1995. Paleogeography of three Paleocene limestones in Baja California, Mexico. In: A. E. Fritsche (ed.) Cenozoic Paleogeography of the Western United States—II. Pacific Section (Society for Sedimentary Geology), Book 75: 1–8.
- Adams, A. and L. A. Reeve. 1848–1850. Mollusca. In: A. Adams (ed.) The Zoology of the Voyage of H. M. S. Samarang, under the Command of Captain Sir Edward Belcher . . . During the Years 1843–1846. Reeve et al., London, x + 87 pp.
- Adanson, M. 1757. Histoire naturelle du Sénégal: Coquillages, avec la relation abrégée d'un voyage fait ce pays, pendant les années 1749–53. Bauche, Paris, 2 Parts: Voyage, viii + 190 pp.; Coquillages, xcvi + 275 pp.
- Adegoke, O. S. 1977. Stratigraphy and paleontology of the Ewekoro Formation (Paleocene) of southwestern Nigeria. *Bulletins of American Paleontology* 71(295): 1–379.
- Afonso, C. M. L., P. M. M. Morenito, and F. F. L. M. Titselaar. 2000. Collecting shells in "Ria Formosa," a coastal lagoon system in southern Portugal. *Vita Marina* 47: 9–17.
- Aldrich, T. H. 1894. The (Midway) Clayton Tertiary section and its fossils. In: E. Smith, J. Allen, C. Lawrence and D. W. Landgon, Jr., Report on the Geology of the Coastal Plain of Alabama. Alabama Geological Survey, 759 pp.
- Allison, E. C. 1955. Middle Cretaceous Gastropoda from Punta China, Baja California, Mexico. *Journal of Paleontology* 29: 400–432.
- Allmon, W. D. 1996. Systematics and evolution of Cenozoic American Turritellidae (Mollusca: Gastropoda) I: Paleocene and Eocene coastal plain species related to "*Turritella mortoni* Conrad" and "*Turritella humerosa* Conrad." *Palaeontographica Americana* 59: 1–134.
- Alves, F. L. Chfcharo, A. Nogueira and J. Regala. 2003. Changes in benthic community structure due to clam dredging on the Algarve coast and the importance of seasonal analysis. *Journal of the Marine Biological Association of the United Kingdom* 83: 719–729.
- d'Archiac, A. and H. Haime. 1854. Description des animaux fossiles du groupe nummulitique de l'Inde. Guide et J. Baur, Paris, pp. 225–373.
- Ardevini, R. and T. Cossignani. 2004. West African seashells (including Azores, Madeira and Canary Is.). Volume 2. L'Informatore Piceno, Ancona, Italy, 319 pp.
- Bandel, K. 2000. Some gastropods from the Trichinopoly Group Tamil Nadu, India and their relation to those from the American Gulf Coast. *Geological Society of India, Memoir* 46: 65–111.
- Barthel, K.W. and W. Herrmann-Degen. 1981. Late Cretaceous and early Tertiary stratigraphy in the Great Sand Sea and its SE margins (Farafo and Dakhla oases), SW Desert, Egypt. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie* 21: 141–182.
- Bosc, L. A. G. 1801. Histoire naturelle des coquilles. In: G. L. L. de Buffon (ed.) Histoire naturelle de Buffon, etc., nouvelle édition. Mollusca: Volume 4. Détéville, Paris, 280 pp.
- Bouchet, P. 1977. Distribution des mollusques dans les mangroves du Sénégal. *Malacologia* 16: 67–74.
- Bouchet, P., J. Frýda, B. Hausdorf, W. Ponder, Á. Valdés and A. Warén. 2005. Working classification of the Gastropoda. In: P. Bouchet and J.-P. Rocrois (eds.) Classification and Nomenclator of Gastropod Families. *Malacologia* 47: 239–284.
- Bowles, E. 1939. Eocene and Paleocene Turritellidae of the Atlantic and Gulf coastal plain of North America. *Journal of Paleontology* 13: 267–336.
- Brabb, E. E., H. S. Sonnemap and J. R. Switzer, Jr. 1971. Preliminary geologic map of the Mount Diablo-Bryon area, Contra Costa, Alameda and San Joaquin counties, California. U. S. Geological Survey Open File Map 71-53 (scale 1:62,500).
- Briart, A. and F.-L. Cornet. 1873. Description des fossiles du Calcaire grossier de Mons. Gastéropodes. Mémoires Couronnés et Mémoires des Savants étrangers, l'Académie Royale des Sciences, des lettres et des Beaux-arts de Belgique, Part 2, 37: 1–94.
- Colburn, I. P. 1996. Stratigraphic and sedimentary structures of the Paleogene successions in the west central Santa Monica Mountains, Los Angeles County, California. In: P. L. Abbott and J. D. Cooper (eds.) Field Conference Guide 1996. Pacific Section, SEPM Book 80, pp. 93–116.
- Conrad, T. A. 1855. Remarks on the fossil shells from Chili, collected by Lieut. Gilliss, with description of the species. Appendix H. U. S. Naval Astronomy Expedition to the

- Southern Hemisphere during 1849–52. U. S. 33rd Congress, First Session, House Document 121, Volume 2: 282–286.
- Conrad, T. A. 1857. Description of the Tertiary fossils collected on the survey [Williamson's survey]. In: Reports of Explorations and Surveys . . . Route for a Railroad from the Mississippi River to the Pacific Ocean. U. S. 34th Congress, First Session, Senate Executive Document 78, House Executive Document 91, Volume 5, pt. 2, appendix, article 2: 317–329.
- Cossmann, M. 1912. Essais de paléonchologie comparée. Volume 9. Privately published, Paris, 216 pp.
- Cossmann, M. and G. Pissarro. 1910–1913. Iconographie complète des coquilles fossiles de l'Eocène des environs de Paris. Société Géologique de France. Volume 2 (Gastropodes, etc.). Paris, 65 pls.
- Cotton, B. C. 1932. Notes on Australian Mollusca, with descriptions of new genera and new species. Records of the South Australian Museum 4: 537–547.
- Cox, L. R. 1930. The fossil faunas of the Samana Range and some neighbouring areas: Part 8. The Mollusca of the Hangu Shales. Palaeontologica Indica, Memoirs of the Geological Survey of India, New Series, 15: 129–222.
- Cox, L. R. 1960. General characteristics of Gastropoda. In: R. C. Moore (ed.) Treatise on Invertebrate Paleontology. Part I, Mollusca. Geological Society of America and University of Kansas Press, pp. 184–169.
- Davies, A. M. 1971. Tertiary faunas, a text-book for oilfield palaeontologists and students of geology, Volume 1, The composition of Tertiary faunas, revised by F. E. Eames and R. J. G. Savage. Second ed. George Allen & Unwin Ltd., London, 571 pp.
- Davies, A. M. 1975. Tertiary faunas, a text-book for oilfield palaeontologists and students of geology, Volume 2, The sequence of Tertiary faunas, revised by F. E. Eames and R. J. G. Savage. Second ed. George Allen & Unwin Ltd., London, 447 pp.
- Demir, M. 2003. Shells of Mollusca collected from the seas of Turkey. Turkish Journal of Zoology 27: 101–140.
- Deshayes, G. P. 1832. Description des coquilles fossiles des environs de Paris. Volume 2. Livraisons 27–29. Levrault, Paris, pp. 163–290.
- Deshayes, G. P. 1843. Histoire naturelle des animaux sans vertèbres. Second ed., Volume 9. J.-B. Ballière, Paris, 728 pp.
- Deshayes, G. P. 1861. Description des animaux sans vertèbres découverts dans le bassin de Paris. Volume 2; Atlas, pt. 2. J.-B. Baillière et fils, Paris, pp. 1–432.
- Dickerson, R. E. 1914a. Fauna of the Martinez Eocene of California. University of California Publications Bulletin of the Department of Geology 8(6): 61–180.
- Dickerson, R. E. 1914b. The Martinez Eocene and associated formations at Rock Creek on the western border of the Mohave Desert area. University of California Publications, Bulletin of the Department of Geology 8(14): 289–298.
- Dockery, D. T., III. 1986. Punctuated succession of Paleogene mollusks in the northern Gulf Coastal plain. Palaios 1: 582–589.
- Douvillé, H. 1904. Paléontologie, mollusques fossiles. In: J. De Morgan, Mission Scientifique en Perse, Volume 3, part 4. E. Leroux, Paris, pp. 191–380.
- Douvillé, H. 1928. Les couches à *Cardita beaumonti*. Fascicle 1. Memoirs of the Geological Survey of India, Palaeontologica Indica, New Series, Volume 10, Memoir 3: 1–72.
- Eames, F. E. 1952. Description of the Scaphopoda and Gastropoda of the western Punjab and in the Kohat district. Philosophical Transactions of the Royal Society of London, Series B, 236: 1–168.
- Finlay, H. J. and J. Marwick. 1937. The Wangaloan and associated molluscan faunas of Kaitangata-Green Island subdivision. New Zealand Geological Survey, Palaeontological Bulletin 15, 140 pp.
- Fleming, J. 1822. The philosophy of zoology or a general view of the structure, functions and classification of animals, etc. Volumes 1 and 2. Edinburgh, 618 pp.
- Forbes, E. 1846. Report on the fossil Invertebrata from South India collected by MM. Kaye and Cunliffe. Transactions of the Geological Society of London, Series 2, 7: 97–174.
- Gabb, W. M. 1860. Descriptions of new species of American Tertiary and Cretaceous fossils. Journal of The Academy of Natural Sciences of Philadelphia, Series 2, 4(4): 375–406.
- Gabb, W. M. 1864. Descriptions of the Cretaceous fossils. Geological Survey of California, Palaeontology 1(4): 57–217.
- Gabb, W. M. 1869. Cretaceous and Tertiary fossils. Geological Survey of California, Palaeontology 2: 1–299.
- Glibert, M. 1973. Revision des Gastropoda du Danien et du Montien de la Belgique. I. Les Gastropoda du Calcaire de Mons. Institut Royal des Sciences Naturelles de Belgique Mémoire 173, 116 pp.
- Gordon, W. A. 1973. Marine life and ocean surface currents in the Cretaceous. Journal of Geology 81: 269–284.
- Gradstein, F. M., J. G. Ogg and A. G. Smith. 2004. A geologic time scale 2004. Cambridge University Press, Cambridge, 589 pp.
- Gray, J. E. 1840. Shells of molluscos animals. In: Synopsis of the contents of the British Museum, edition 42, London, pp. 105–156.
- Gray, J. E. 1847. A list of the genera of Recent Mollusca, their synonyma and types. Proceedings of the Zoological Society of London 15: 129–219.
- Grzybowski, J. 1899. Die Tertiärlagerungen des nördlichen Peru und ihre Molluskenfauna. Neues Jahrbuch für Mineralogie, Geologie und Paläontologies, Beilage, Band 13: 610–664.
- Hanna, G. D. and L. G. Hertlein. 1939. Two new species of gastropods from the middle Eocene of California. Journal of Paleontology 23: 392–394.
- Habe, T. 1955. Notes on the systematic position of the genus *Orectospira* Dall, 1925. Conchological Club of Southern California Minutes 147: 4.
- Haq, B. U. 1981. Paleogene paleoceanography: Early Cenozoic oceans revisited. Oceanologia Acta. Proceedings, 26th International Geological Congress, Geology of Oceans Symposium, Paris, pp. 71–82.
- Hertlein, L. G. 1928. Preliminary report on the paleontology of the Channel Islands, California. Journal of Paleontology 2: 142–157.
- Hidalgo, J. G. 1917. Fauna malacológica de España, Portugal y Las Baleares. Moluscos testáceos marinos. Trabajos del Museo Nacional de Ciencias Natureles, Serie Zoológica, 30, 752 pp.
- Hodson, F. 1926. Venezuela and Caribbean turritellas. Bulletins of American Paleontology 11(45): 1–50.
- Hoots, H. W. 1931. Geology of the eastern part of the Santa Monica Mountains, Los Angeles County, California. U. S. Geological Survey Professional Paper 165-C: 1–134.
- Johnson, C. C. 1999. Evolution of Cretaceous surface current circulation patterns, Caribbean and Gulf of Mexico. In: E. Barrera and C. C. Johnson (eds.) Evolution of the Creta-

- ceous Ocean-Climate System. Geological Society of America Special Paper 332: 329–343.
- Jones, D. L., W. V. Sliter and W. P. Popenoe. 1978. Mid-Cretaceous (Albian to Turonian) biostratigraphy of northern California. *Annales du Muséum d'Histoire Naturelle de Nice* 4: xx11.1–xx11.13.
- Keen, A. M. and H. Benton. 1944. Check list of California Tertiary marine Mollusca. Geological Society of America Special Papers 56: 1–280.
- Kew, W. S. W. 1924. Geology and oil resources of a part of Los Angeles and Ventura counties, California. U. S. Geological Survey Bulletin 753: 1–202.
- Kiel, S., K. Bandel, and M. C. Perrilliat. 2002. New gastropods from the Maastrichtian of the Mexcala Formation in Guerrero, southern Mexico, part 2: Archaeogastropoda, Neritimorpha and Heterostropha. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen* 226: 319–342.
- Kiel, S. and K. Bandel. 2004. The Cenomanian Gastropoda of the Kassenberg quarry in Mülheim (Germany), Late Cretaceous). *Paläontologische Zeitschrift* 78: 103–126.
- Kiener, L. C. 1843. *Spécies général et iconographie des coquilles vivantes, comprenant la collection du Muséum d'Histoire naturelle de Paris*. Pt. 10, Genre *Turritella*. Rousseau et Baillièrre, Paris, 56 pp.
- Kollmann, H. A. and G. S. Odin. 2001. Gastropods from the Upper Cretaceous geological site at Tercis les Bains (SW France). In: G. S. Odin (ed.) *The Campanian-Maastrichtian Stage Boundary*. Elsevier Science, Amsterdam, pp. 437–451.
- Kollmann, H. A. and J. S. Peel. 1983. Paleocene gastropods from Nûgssuaq, west Greenland. *Gronlands Geologiske Undersøgelser Bulletin* 146, 115 pp.
- Kooser, M. A. 1980. Stratigraphy and sedimentology of the San Francisquito Formation, Transverse Ranges, California. University of California, Riverside, unpubl. Ph. D. dissertation, 201 pp.
- Lamarck, J. B. 1799. Prodrome d'une nouvelle classification des coquilles. *Mémoires de la Société d'histoire Naturelle de Paris*, pp. 63–91.
- Lamarck, J. B. 1804. Suite des Mémoires sur les fossiles des environs de Paris. *Annales de Muséum d'Histoire Naturelle, Paris*, Volumes 4 and 5, variously paged. [Reprinted 1978, Paleontological Research Institution, Ithaca, New York].
- Lamarck, J. B. 1822. *Histoire naturelle des animaux sans vertèbres*. Volume 7, Paris, 711 pp.
- Laubrière, L. B. 1881. Description d'espèces nouvelles du bassin de Paris. *Bulletin de la Société Géologique de France, Série 3*, 9: 277–284.
- Le Renard, J. 1994. Révision des mollusques paléogènes du Bassin de Paris. I-Rectification de nomenclature d'espèces. *Cossmanniana* 3(2): 35–40.
- Locard, A. 1897. Expéditions scientifiques du Travailleur et du Talisman, pendant les années 1880, 1882, 1883. *Mollusques Testacés I*. Masson, Paris, 516 pp., II, 595 pp.
- Lovén, S. L. 1847. *Malacozoologi. Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar* (1847): 175–199.
- Macedo, M. C. C. and J. P. Borges. *Conchas marinhas de Portugal* (Seashells of Portugal). Vergo, Lisbon, Portugal, 515 pp.
- Mallory, V. S. 1959. Lower Tertiary biostratigraphy of the California Coast Ranges. *The American Association of Petroleum Geologists, Tulsa, Oklahoma*, 416 pp.
- Maltzan, H. v. 1884. Diagnosen neuer Seneganybischer Gastropoden. *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft* 16(5): 65–73.
- Marwick, J. 1957. Generic revision of the Turritellidae. *Proceedings of the Malacological Society of London* 32, pt. 4: 144–166.
- Merriam, C. W. 1941. Fossil turritellas from the Pacific coast region of North America. University of California Publications, Bulletin of the Department of Geological Sciences 26(1): 1–214, pls. 1–41.
- Michailovski, G. P. 1912. O nekotorych novych ili redkich rakovinach iz tretichnykh otozenij severnago poberezja aralskago mora. *Sitzungsberichte Naturforscher Gesellschaft Jurjev Dorpat* 21: 120–138.
- Müller, C. 1898. Die Molluskenfauna des Untersenon von Braunschweig und Ilsede. I. Lamellibranchiata und Glossophoren. *Atlas zu den Abhandlungen der Königlich Preussischen Geologischen Landesanstalt, Neue Folge* 25, 18 pls.
- Müller, J. 1847–1851. *Monographie der Petrefacten der Aachener Kreideformation*. Henry & Cohen, Bonn, 3 parts, 163 pp.
- Nelson, R. N. 1925. A contribution to the paleontology of the Martinez Eocene of California. University of California Publications, Bulletin of the Department of Geological Sciences 15(11): 397–466.
- Olsson, A. A. 1929. Contributions to the Tertiary paleontology of northern Peru, Part 2: Upper Eocene Mollusca and Brachiopoda. *Bulletins of American Paleontology* 15(57): 67–116.
- Olsson, A. A. 1944. Contributions to the paleontology of northern Peru. Part 7. The Cretaceous of the Paita region. *Bulletins of American Paleontology* 28(111): 163–304.
- Palmer, K. V. W. and D. C. Brann. 1966. Catalogue of the Paleocene and Eocene Mollusca of the southern and eastern United States. *Bulletins of American Paleontology* 48(218): 471–1057.
- Paredes-Mejia, L. M. 1989. Late Cretaceous-early Cenozoic stratigraphy and paleontology (Mollusca: Gastropoda) of the Sepultura Formation, Mesa San Carlos, Baja California Norte, Mexico. Purdue University, unpub. M. S. thesis, 527 pp.
- Pasteur-Humbert, C. 1962. Les mollusques marins testacés du Marco. Catalogue non critique. I. Les gastéropodes. *Travaux de l'Institut Scientifique Chérifien, Série Zoologie* 23: 1–224.
- Perrilliat, M. C. 1989. Mollusca. In A. L. Carreño and five others (eds.) *Fósiles tipo mexicanos. Centenario del Instituto de Geología. Universidad Nacional Autónoma de México, Instituto de Geología, Mexico, D. F.*, pp. 117–370.
- Pervinquier, L. 1912. Études de paléontologie Tunisienne. II. Gastropodes et Lamellibranches des terrains Crétacés. *Direction Générale des Travaux Publics, Carte Géologique de la Tunisie*. J. Lamarre, Paris, xiv + 352 pp.
- Poppe, G. T. and Y. Goto. 1991. *European seashells. Volume 1* (Polyplacophora, Caudofoveata, Solenogastrea, Gastropoda). Verlag Christa Hemmen, Wiesbaden, Germany, 352 pp.
- Quaas, A. 1902. Beiträge zur Kenntniss der Fauna der obersten Kreidebildung in der libyschen Wüste. II. Die Fauna der Überwegschichten und der Blätterthone in der libyschen Wüste. *Palaeontographica* 30 (2): 153–334.
- Reeve, L. A. 1849. *Conchologia iconica; or illustrations of the shells of molluscous animals*. Volume 5, 147 pls.
- Roemer, F. 1849. Texas, mit besonderer rücksicht auf

- Deutsche Auswanderung und die physischen Verhältnisse des Landes nach eigener Beobachtung geshildert. Bonn, 469 pp.
- Saul, L. R. 1983a. Notes on Paleogene turritellas, venericardias, and molluscan stages of the Simi Valley area, California. In: R. L. Squires and M. V. Filewicz (eds.) Cenozoic Geology of the Simi Valley Area, Southern California. Pacific Section, SEPM Fall Field Trip Volume and Guidebook, Book 35, pp. 71–80.
- Saul, L. R. 1983b. *Turritella* zonation across the Cretaceous-Tertiary boundary, California. University of California Publications Geological Sciences 125: x + 1–165.
- Saul, L. R. 1986. Pacific west coast Cretaceous molluscan faunas: Time and aspect of changes. In: P. L. Abbott (ed.) Cretaceous Stratigraphy Western North America. Pacific Section, Book 46: 131–135.
- Saul, L. R. and R. L. Squires. 1997. New species of neritid gastropods from Cretaceous and Lower Cenozoic strata of the Pacific slope of North America. *The Veliger* 40: 131–147.
- Schenck, H. G. and A. M. Keen. 1940. California fossils for the field geologist. Preliminary ed. Stanford University, Stanford, California, 86 pp.
- Serra, G. 1937. Di alcune Turritellidae del Maestrichtiano della Tripolitania. *Bollettino della Società Geologica Italiana* 61: 303–316.
- Smith, E. A. 1915. On the genera *Eglisia*, *Callostracum*, *Mesalia*, *Turritellopsis*, and *Tachyrhynchus*. *Annals and Magazine of Natural History* 15: 360–377.
- Squires, R. L. 1987. Eocene molluscan paleontology of the Whitaker Peak area, Los Angeles and Ventura counties, California. *Natural History Museum of Los Angeles County, Contributions in Science* 388: 1–93.
- Squires, R. L. 1997. Taxonomy and distribution of the buccinid gastropod *Brachysphingus* from uppermost Cretaceous and Lower Cenozoic marine strata of the Pacific slope of North America. *Journal of Paleontology* 71: 847–861.
- Squires, R. L. 2003. Turnovers in marine gastropod faunas during the Eocene-Oligocene transition, west coast of the United States. In: D. R. Prothero, L. C. Ivany and E. A. Nesbitt (eds.) *From Greenhouse to Icehouse: The Marine Eocene-Oligocene Transition*. New York, Columbia University Press, pp. 14–35.
- Squires, R. L. and G. L. Kennedy. 1998. Additions to the late Paleocene molluscan fauna from the Santa Monica Mountains, Los Angeles County, southern California. *The Veliger* 41: 157–171.
- Squires, R. L. and L. R. Saul. 1998. New upper Paleocene species of the bivalve *Plicatula* from southern California. *Journal of Paleontology* 72: 1024–1029.
- Squires, R. L. and L. R. Saul. 2001. A new genus of aporrhaid gastropod from upper Paleocene rocks in southern California. *The Veliger* 44: 327–330.
- Squires, R. L. and L. R. Saul. 2006. Additions and refinements to Aptian to Santonian (Cretaceous) *Turritella* (Mollusca: Gastropoda) from the Pacific slope of North America. *The Veliger* 48: 46–60.
- Stanton, T. W. 1896. The faunal relations of the Eocene and Upper Cretaceous on the Pacific coast. U. S. Geological Survey, Annual Report 17, pt. 1: 1009–1048.
- Stenzel, H. B. and F. E. Turner. 1940. Turritellidae from the Paleocene and Eocene of the Gulf Coast. University of Texas Publication 3945: 831–844.
- Stenzel, H. B. and F. E. Turner. 1942. Eocene and Paleocene Gastropoda *Mesalia*. In: *Type invertebrate fossils of North America*. Bureau of Economic Geology, Austin, Texas, cards 109–121.
- Stewart, R. B. 1927. Gabb's California fossil type gastropods. *Proceedings of The Academy of Natural Sciences of Philadelphia* 78: 287–447.
- Stilwell, J. D., W. J. Zinsmeister, and A. E. Oleinik. 2004. Early Paleocene mollusks of Antarctica: Systematics, paleoecology and paleobiogeographic significance. *Bulletins of American Paleontology* 367: 1–89.
- Stoliczka, F. 1868. Cretaceous fauna of southern India. Volume 2. The Gastropoda. *Memoirs of the Geological Survey of India, Palaeontologia Indica*, 204 pp.
- Strathearn, G. E., K. Griffis and B. L. Ingram. 1988. Palynomorphs and benthic foraminifera from a portion of the Coal Canyon Formation (Paleocene-Eocene). In: M. V. Filewicz and R. L. Squires (eds.) *Paleogene Stratigraphy, West Coast of North America*. Pacific Section, SEPM, Book 58, pp. 73–82.
- Sundaram, R., R. A. Henderson, K. Ayyasami, and J. D. Stilwell. 2001. A lithostratigraphic revision and palaeoenvironmental assessment of the Cretaceous System exposed in the onshore Cauvery basin, southern India. *Cretaceous Research* 22: 743–762.
- Tantawy, A. A., G. Keller, T. Adatte, W. Stinnesbeck, A. Kassab, and P. Schulte. 2001. Maastrichtian to Paleocene depositional environment of the Dakhla Formation, Western Desert, Egypt: Sedimentology, mineralogy, and integrated micro- and macrofossil biostratigraphies. *Cretaceous Research* 22: 795–827.
- Thiele, J. 1929–1935. *Handbuch der systematischen Weichtierkunde*. Gustav Fischer, Jena, 1154 pp.
- Waring, C. A. 1914. Eocene horizons of California. *Journal of Geology* 22(8): 782–785.
- Waring, C. A. 1915. Fossils characteristic of California formations. In: R. P. McLaughlin and C. A. Waring, *Geologic Oil Field Maps and Drawings*. Map Folio accompanying California State Mining Bureau Bulletin 69.
- Waring, C. A. 1917. Stratigraphic and faunal relations of the Martinez to the Chico and Tejon of southern California. *Proceedings of the California Academy of Sciences*, 4th Series, 7(4): 41–124.
- Weaver, C. E. 1953. Eocene and Paleocene deposits at Martinez, California. University of Washington Publications in Geology 7: 1–102.
- Wenz, W. 1938–1944. *Gastropoda*. Teil 1: Allgemeiner Teil und Prosobranchia. In: O. H. Schindewolf (ed.) *Handbuch der Paläozoologie*, Band 6. Gebrüder Borntraeger, Berlin: 1639 pp. [Reprinted 1960–1961].
- Whidden, K. J., D. J. Bottjer, S. P. Lund and W. V. Sliter. 1995. Paleogeographic implications of Paleogene shallow-water limestones in the southern San Rafael Mountains, California. In: A. E. Fritsche (ed.) *Cenozoic Paleogeography of the Western United States—II*. Pacific Section (Society for Sedimentary Geology), Book 75: 193–211.
- White, C. A. 1887. Contributions to the paleontology of Brazil; comprising descriptions of Cretaceous invertebrate fossils, mainly from the provinces of Sergipe, Pernambuco, Para and Bahia. *Archivos do Museu Nacional do Rio de Janeiro* 7: 1–273.
- Whitfield, R. P. 1891. Observations on some Cretaceous fossils from the Beyrât District of Syria, in the Collection of the American Museum of Natural History, with descriptions of some new species. *Bulletin of the American Museum of Natural History* 3(2): 381–441.

- Wiedey, L. W. 1928. Notes on the Vaqueros and Temblor formations of the California Miocene with descriptions of new species. *Transactions of the San Diego Society of Natural History* 5(10): 95-182.
- Woods, H. 1922. Mollusca from the Eocene and Miocene deposits of Peru. In: T. O. Bosworth (ed.) *Geology of the Tertiary and Quaternary periods in the north-west part of Peru*. MacMillan and Company, London, pp. 51-139.
- Zinsmeister, W. J. 1974. Paleocene biostratigraphy of the Simi Hills, Ventura County, California. University of California, Riverside, unpub. Ph. D. dissertation, xii + 236 pp.
- Zinsmeister, W. J. 1983. Late Paleocene ("Martinez Provincial Stage") molluscan fauna from the Simi Hills, Ventura County, California. In: R. L. Squires and M. V. Filewicz (eds.) *Cenozoic Geology of the Simi Valley Area, Southern California*. Pacific Section, SEPM Fall Field Trip Volume and Guidebook. Book 35, pp. 61-70.
- Zinsmeister, W. J. and L. M. Paredes-Mejia. 1988. Paleocene biogeography of the west coast of North America: A look at the molluscan fauna from Sepultura Formation, Mesa San Carlos, Baja California Norte. In: M. V. Filewicz and R. L. Squires (eds.) *Paleogene Stratigraphy, West Coast of North America*. Pacific Section, SEPM West Coast Paleogene Symposium, Volume 58, pp. 9-22.

APPENDIX

LOCALITIES CITED

Localities are LACMIP, unless otherwise noted. All quadrangle maps are U. S. Geological Survey maps.

7060. Elevation 1427 ft., on ridge between Temesal and Santa Ynez canyons at edge of fire road on top of ridge, Topanga Canyon Quadrangle (7.5 minute, 1952, photorevised 1981), Los Angeles County, southern California. Paleocene. Santa Susana Formation. Coll.: H. D. B. Wilson, June 1, 1941.
10508. North slope of Trailer Canyon near top of ridge between Quarry and Trailer canyons at approximately 1325 ft. elevation and just west of saddle, just below coralline algal beds in limy siltstone west of small fault, road cut north side of unpaved road 5600 ft. north of San Vicente y Santa Monica Grant boundary, 10,400 ft. east of Los Angeles City boundary, Topanga Quadrangle (7.5 minute, 1952, photorevised 1981), east of Santa Ynez Canyon, Palisades Highlands, Santa Monica Mountains, Los Angeles County, southern California. Lower upper Paleocene (lower Thanetian). Santa Susana Formation. Coll.: G. Strathearn and others, fall, 1982.
11717. Float at about 1600 ft. elevation in bottom of south-flowing gully joining Quarry Canyon at about 1410 ft. elevation; 1500 ft. SW of hill 2036, Topanga Quadrangle (7.5 minute, 1952, photorevised 1981), Los Angeles County, southern California. Paleocene. Santa Susana Formation. Coll.: J. M. Alderson, November 11, 1980.
21581. Black nodular shale and conglomerate on road 1.1 mi. east from Cienaga Camp at Fish Canyon forks toward Warm Springs summit; on northwest side of ravine; north side East Fork Fish Canyon, T. 6 N, R. 16 W, approximately 2050 ft. north, 750 ft. east of bench mark 2205, Warm Springs Mountain Quadrangle (7.5 minute, 1958, photorevised 1974), Los Angeles County, southern California. Paleocene (upper Danian). San Francisquito Formation. Coll.: R. W. Webb and E. H. Quayle, June 23-24, 1941.
21607. South 1/2, SE 1/4, section 25, T. 2 N, R. 18 W, Calabasas Quadrangle (7.5 minute, 1952, photorevised 1967), Ventura County, southern California. Lower upper Paleocene (lower Thanetian). Santa Susana Formation. Coll.: Kinney and Sherman, date unknown.
21554. Reworked fossil boulders in conglomerate, in second spur canyon off Poison Oak Canyon east of Las Lajas Canyon, 2800 ft. up canyon (north) from Poison Oak Canyon; on west slope 25 ft. above bottom of canyon, Santa Susana Quadrangle (7.5 minute, 1951, photorevised 1969), north side Simi Valley, Ventura County, southern California. Paleocene. Santa Susana Formation. Coll.: P. L. Goldman, date unknown.
22330. Beds cropping out on nose of spur on west side of Meier Canyon, approximately 600 ft. north of second "n" in "Meier Canyon," Santa Susana Quadrangle (7.5 minute, 1951, photorevised 1969), south side of Simi Valley, Simi Hills, Ventura County, southern California. Lower middle Paleocene (Selandian) = *Turritella peninsularis* Zone. Santa Susana Formation, "Martinez marine member." Coll.: W. P. Popenoe, April 3, 1946.
22557. Sandstone bed below small waterfall [dry] west of road going south through Barclay Ranch, 10,162 ft. south and 5660 ft. west of junction of Southern Pacific railroad and Los Angeles Ave. about 0.25 mi. east of Santa Susana, Santa Susana Quadrangle (7.5 minute, 1951, photorevised 1969), Simi Hills, Ventura County, southern California. Paleocene. Santa Susana Formation. Coll.: M. Murphy, spring, 1950.
22698. On first large ridge; trending southwest to west of ridge trending south of hill 2150. Bearing from the northwest corner of the Calabasas Quadrangle is S14°E; distance 12,210 ft., Calabasas Quadrangle (7.5 minute, 1952, photorevised 1967), Simi Hills, Ventura County, southern California. Paleocene. Santa Susana Formation. Coll.: J. H. Fantozzi, June 1, 1951.
25281. Sandstone at elevation of 1000 ft., about 400 ft. south and 1000 ft. west of northeast corner of section 5, T. 1 S, R. 17 W, Malibu Beach Quadrangle (7.5 minute, 1950, photorevised 1967), on west side of northern tributary to Stokes Canyon, western Santa Monica Mountains, Los Angeles County, southern California. Reworked Paleocene (Selandian) fossils in middle Miocene Calabasas Formation, Stokes Canyon Breccia Member. Coll.: J. Stark and T. Susuki family, May 5, 1965.
26897. Gully west side of Temesal Canyon opposite 2nd 'e' of Temesal at about 1475 ft. elevation; approximately 1082 m (3550 ft.) south; 533m (1750 ft.) east of hill 22036; San Vicente and Santa Monica Grant, Topanga Quadrangle (7.5 minute, 1952, photorevised 1967), Santa Monica Mountains, Los Angeles County, southern California. Middle upper Paleocene (middle Thanetian). Santa Susana Formation. Coll.: J. M. Alderson, March 9, 1980.
- UCMP 1540. Elevation 1000 ft., 1 mi. south of Stewartville (site), northeast corner of NW 1/4, section 15, T. 1 N, R. 1 E, Antioch South Quadrangle (7.5 minute, 1973, photorevised), 300 ft. south of basal Tejon conglomerate and 600 ft. north of Chico-Martinez contact, northeast side of Mount Diablo, Contra Costa County, northern California. Upper middle Paleocene (Selandian) = *Turritella infra-granulata pachecoensis* Zone. "Martinez" Formation, lower member. Coll.: R. E. Dickerson, circa 1912.