

Stanton, R. J.,
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MEGAFUNA OF THE UPPER MIOCENE CASTAIC
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BY
ROBERT J. STANTON, JR.

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MEGAFUNA OF THE UPPER MIOCENE CASTAIC FORMATION, LOS ANGELES COUNTY, CALIFORNIA

ROBERT J. STANTON, JR.
Shell Development Company, Houston, Texas

ABSTRACT—The upper Miocene Castaic Formation contains a megafauna of about 100 species, most of which are pelecypods and gastropods. Minor elements of the fauna are scaphopods, brachiopods, echinoderms, barnacles, bryozoans, and vertebrates. The occurrence of many of the species in the Castaic Formation represents a southward extension of their reported upper Miocene distribution. Eight of the species had not previously been reported from south of the Coalinga-San Luis Obispo region; twelve, from south of Santa Maria or the San Joaquin Valley. Twenty-six taxa which occur in the Castaic Formation have been reported from Pliocene or younger strata of the Pacific Coast of North America but had not been reported from Miocene strata. In addition to these range and distribution extensions, the fauna of the Castaic Formation is significant because it contains numerous taxa which are found today only in the Recent Panamanian Molluscan Province and which have not previously been recognized in late Tertiary strata of the California Coast Ranges. The Castaic Formation was deposited very near the northern limit of the late Miocene equivalent of the Recent Panamanian Molluscan Province.

INTRODUCTION

THE Castaic Formation consists of upper Miocene marine clastic sediments deposited northeast of the San Gabriel Fault at the eastern end of the Ventura basin (text-fig. 1). The formation is approximately 7000 feet thick and crops out in an area several miles wide and about 24 miles long parallel to the fault. The formation has been correlated with the Cierbo and Neroly Pacific Coast megafaunal "stages" or with Mohanian and Delmontian microfossil stages (Durham, Jahns, & Savage, 1954, fig. 2; Paschall & Off, 1961, fig. 3).

The sediments of the Castaic Formation were deposited at the margin of the transgressing late Miocene sea. Three facies can be recognized in the formation. Along the western edge of the basin of deposition, northwest of the location of Castaic, the coarse-grained, unsorted, and unstratified clastics of the Violin Breccia were deposited adjacent to the active San Gabriel fault. Along the eastern side of the depositional area, sand and pebble- to cobble-gravel were deposited as onlapping basal sediments at the edge of the transgressing sea. Northwest of San Francisquito Canyon, the basal sediments were pebbly sand to cobble-gravel and were deposited in wedge- and bar-shaped bodies along a coast of relatively high relief. Southeast of San Francisquito Canyon the basal sediments were sand and minor amounts of gravel and were deposited in more laterally continuous bodies with less marked overlap along a coast of lower relief. The third facies is composed of alternating units of mudstone and sandstone deposited in mid-basin.

No megafossils have been found in the Violin Breccia. The mid-basin facies contains a very

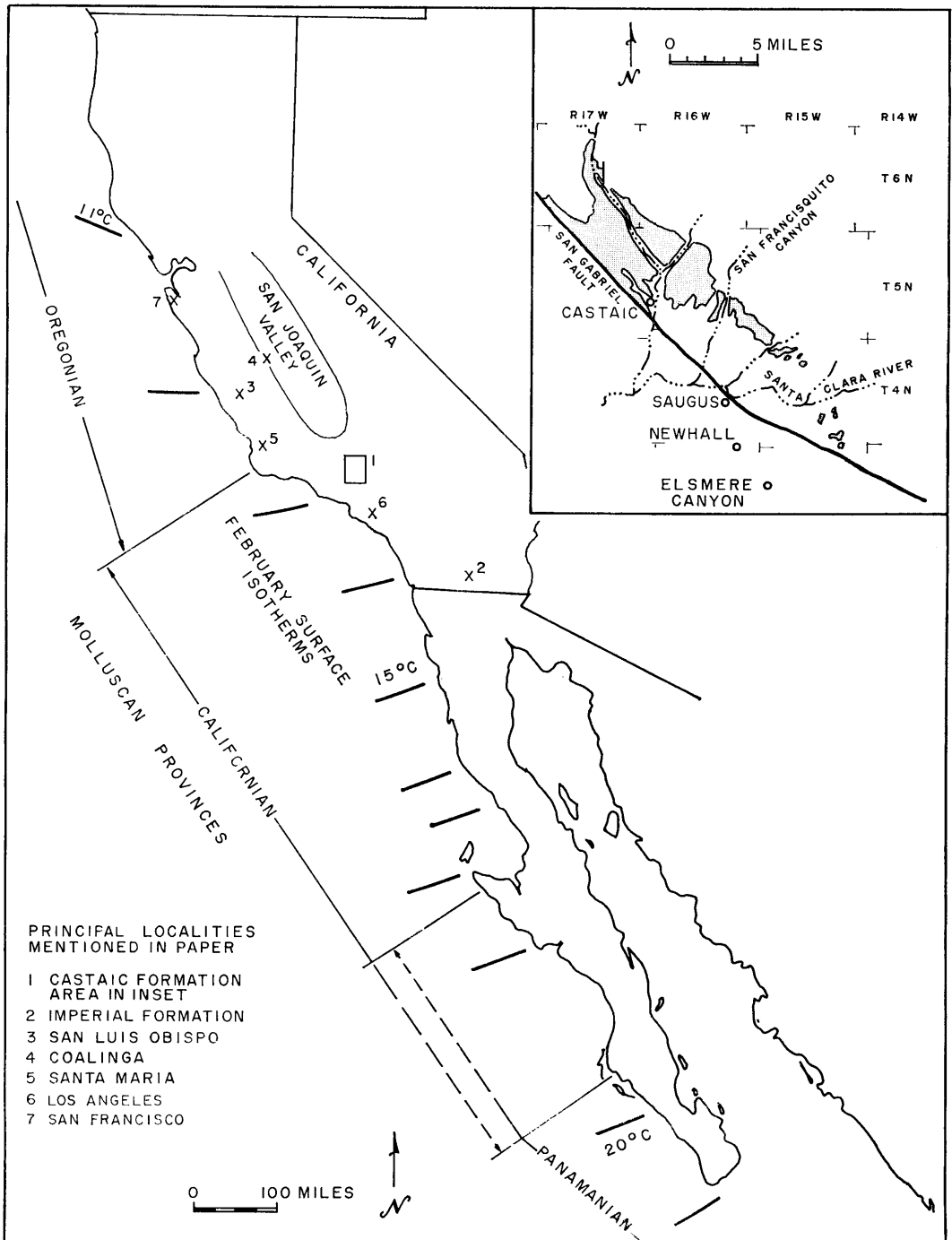
sparse megafauna. Megafossils are common in the basin margin facies and comprise the bulk of the fauna described in this paper.

Coarse-grained upper Miocene clastics bearing a megafauna of relatively shallow-water species, predominantly mollusks, are common in the California Coast Ranges. The fauna from this facies has been described extensively from central California, particularly from the San Francisco Bay, Coalinga, and San Luis Obispo areas. The Castaic Formation represents the southernmost exposure of this type of lithology in upper Miocene strata. For many of the species listed in this paper (see check list, text-fig. 2), the occurrence in the Castaic Formation represents a southward extension of their reported late Miocene distribution. The following species have not previously been reported from upper Miocene strata south of the Coalinga-San Luis Obispo region:

Anadara (Anadara) trilineata trilineata (Conrad), *Crenomytilus coalingensis* (Arnold), *Chlamys hodgei* (Hertlein), *Chama pellucida* Broderip, *Calliostoma spendens* Carpenter *diabloense* Clark, *Crepidula adunca* Sowerby, *Sinum scopulosum* (Conrad), and *Forreria carisaensis* (Anderson).

In addition, the following species have not previously been reported from upper Miocene strata south of the Santa Maria area or the San Joaquin Valley:

Glycymeris grewingki Dall, *Hinnites multirugosus* var. *crassiplicatus* (Gale), *Lucina (Here) excavata* Carpenter, *Millha xantusi* (Dall), *Lucinoma acutilineata* (Conrad), *Amiantis stalderi* (Clark), *Clementia (Egesta) pertenuis* (Gabb), *Psammotreta (Florimetis) biangulata*



TEXT-FIG. 1—Index map of Castaic Formation and principal localities mentioned in paper.

(Carpenter), *Corbula (Lentidium) luteola* Carpenter, *Crepidula princeps* Conrad, *Neverita reclusiana* (Deshayes), and *Olivella (Olivella) pedrona* (Conrad).

Many of these species occur in Pliocene strata of both southern and central California and, in particular, in the lower Pliocene strata of the Towsley Formation in Elsmere Canyon, adjacent to the outcrop area of the Castaic Formation but west of the San Gabriel fault. Durham (1948) has pointed out the close similarity of the Castaic and Elsmere Canyon faunas. The age of the Towsley Formation is Mohnian (upper Miocene) to lower Pliocene, but the exact stratigraphic relationship of the Elsmere Canyon strata to the rest of the Towsley Formation is not known (Winterer & Durham, 1962, p. 320-321). Where the Towsley and Castaic Formations occur together, they are separated by an angular unconformity. Winterer & Durham (1962) present the arguments for early Pliocene age of the Elsmere Canyon strata and indicate it so on their pl. 45, section A-A'. In summary, the Castaic Formation is at least in part older than the Towsley Formation; the Castaic fauna resembles the Elsmere Canyon fauna but seems to be slightly older; in this paper, the Elsmere Canyon fauna is considered early Pliocene.

The following taxa have been reported from Pliocene or younger strata of the Pacific Coast of North America but have not previously been reported from upper Miocene strata:

Glycymeris cf. *G. gigantea* (Reeve), *Chlamys parmeleei* (Dall), *Pododesmus* sp., *Spondylus* sp., *Eucrassatella (Hybolophus) subgibbosa* (Hanna), *Pseudochama* sp., *Chione fernandoensis* English,

Chione elsmerensis English, *Calliostoma coalin-gense* Arnold, *Liotia carinata* Carpenter, *Nerita* sp., *Tegula gallina* (Forbes), *Polinices uber* (Valenciennes), *Lunatia lewisii* (Gould), *Jaton eldridgei* (Arnold), *Pyrene* sp., *Kelletia vladimiri* Kanakoff, *Calicantharus fortis* (Carpenter) *angulatus* (Arnold), *Cancellaria rapa* Nomland, *Oliva spicata* (Röding), *Marginella* cf. *M. albuminosa* Dall, *Conus californicus* Hinds, *Conus* sp.—large form, *Lora oldroydi* (Arnold), *Clavus (Clathrodrillia) elsmerensis* (English), and *Astrodapsis fernandoensis* Pack.

Of these taxa, the following have been reported from the Imperial Formation, which is generally considered to be lower Pliocene (Durham, 1954b) but may be wholly or in part upper Miocene (Dibblee, 1954):

Glycymeris gigantea (Reeve), *Spondylus* sp., *Eucrassatella (Hybolophus) subgibbosa* (Hanna), *Nerita* sp., *Polinices uber* (Valenciennes), *Oliva spicata* (Röding), and large conids allied to the *Conus* sp. of the Castaic Formation.

Recent shallow marine molluscan provinces are shown in text-figure 1. The Panamanian province contains a tropical fauna and extends as far south as northern Peru; the Californian and Oregonian provinces contain temperate faunas. Each province is characterized by distinct faunas. The fauna changes relatively slowly within provinces and rapidly at province boundaries. Newell (1948) and Valentine (1961) discuss the provinces in more detail and present a sound basis for the subdivision into provinces.

The following taxa present in the Castaic Formation have not previously been reported from upper Miocene strata of the California Coast

EXPLANATION OF PLATE 5

- FIGS. 1—*Anadara* aff. *A. (Anadara) montereyana* (Osmont), $\times 0.5$, CIT locality 1671; latex cast of whole specimen, valves offset; exterior of right valve, hinge of left.
 2,3—*Glycymeris* cf. *G. gigantea* (Reeve), $\times 0.5$, CIT locality 2075; 2, whole specimen, valves offset; exterior of left valve, part of right hinge; 3, hinge of a right valve.
 4,5—*Chlamys hodgkii* (Hertlein), $\times 1$, CIT locality 1663; 4, right valve; 5, left valve.
 6—*Hinnites multirugosus* var. *crassiplicatus* (Gale), $\times 1$, CIT locality 2069; incomplete articulated specimen, exterior of left valve, hinge of right.
 7—*Pododesmus* cf. *P. macroschisma* (Deshayes), $\times 1$, CIT locality 1670.
 8—*Spondylus* sp., $\times 0.5$, CIT locality 2104; specimen has been sectioned obliquely showing outer dark shell layer, inner light layers.
 9-12—*Eucrassatella subgibbosa* (Hanna), CIT locality 1663; 9, $\times 1$, exterior of left valve; 10, $\times 2$, left hinge; 11, 12, $\times 2$, right hinges.
 13,14—*Dosinia* sp., $\times 1.5$, CIT locality 2093; 13, incomplete left hinge; 14, incomplete right hinge, posterior cardinal broken.