systems result in sediment bypassing the old middle-fan region. At the lower end of the main valleys on Monterey fan, channels and isolated depressions are observed but the characteristic morphology of suprafans is not clearly developed. Large sediment waves are present on the upper fan valley levee and at various locations on Monterey fan, but are absent on the smaller Navy and La Jolla fans.

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Holocene Mollusk Distribution Patterns in Northern Gulf of Alaska

Three recurring mollusk association types are defined in the northern Gulf of Alaska: (1) the shallow-water *Yoldia-Siliqua-Lyonsia* sand association; (2) the shallow to intermediate depth *Cyclocardia*-boreal turrid mud association (with a typical phase developing in offshore muds and a *Clinocardium-Nitidella* nearshore mud phase developing in Yakutat and Icy Bays); and (3) the deep-water *Cadulus*-thin shelled protobranch mud association. Associations are defined from 148 bottom samples containing 113 species.

Substrate exerts a strong influence on shallow-water species composition. An unidentified depth-related factor, independent of substrate type, influences both species composition and taxonomic structure. Dramatic changes in taxonomic structure that occur with depth on fine-grained glacial marine sediments in the Gulf of Alaska provide a model for paleobathymetric interpretation of high latitude late Cenozoic fossil mollusk faunas. The major structural shifts include: decrease in the proportion of heterodont, suspension-feeding bivalves; increase in the proportion of thin-shelled, deposit-feeding protobranch bivalves; and increase in the proportion of carnivorous neogastropods, particularly small-shelled, toxoglossate turrids.

The most abrupt and most readily recognized faunal break occurs at 200 m, separating the typical *Cyclocardia*-boread turrid mud association from the *Cadulus*-thin shelled protobranch mud association. Although the two associations have species in common, many species drop out as the 200-m isobath is approached and others appear at or not far below it. More precise definition of this faunal break should be explored because of its potential application in paleoecologic analysis.

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Benthic Foraminiferal Biofacies of Eastern Pacific Margin Between 32°S and 32°N

Quantitative analyses of benthic foraminifera from the Peru-Chile Trench area, off Central America, and the Gulf of California allow assessment of general faunal trends between 32°S and 32°N along the eastern margin of the North Pacific and South Pacific. Six widespread faunal divisions can be recognized in this broad region reflecting major variations in substrate and water-mass character across the neritic-to-abyssal gradient. The 50-m isobath represents the average line of wave touchdown on open shelves, in turn separating inner and outer neritic substrates, mixing, and biofacies. Inner neritic biofacies (<50 m) are characterized by *Bulimina denudata, Hanzawaia nitidula, Nonionella basispinata,* and *N. stella.* The 100 to 150-m depth interval encompasses the base of the mixed (surface) layer, the base of the effective photic zone, and average point of shelf-slope declivity in turn separating outer neritic and upper bathyal biofacies. Outer neritic biofacies (50 to 150 m) include *Cancris panamensis, Cassidulina* spp., *Uvigerina juncea,* and *Valvulineria inflata.* A well developed oxygen minimum layer intersects the upper and middle slope areas between depths of 150 and 1,500 m with the core of this feature commonly found at depths of 200 to 600 m. Upper bathyal biofacies (150 to 500 m) reflect this association and include high relative and absolute abundances of *Bolivina interjuncta, B. rankini, B. seminuda, Buliminella exilis tenuata, Martinotiella communis, Suggrunda eckisi,* and *Trifarina carinata.* Middle slope faunas are influenced by the deeper portions of the oxygen minimum, the base of the permanent thermocline, and the presence of Pacific deep water. Middle bathyal biofacies (500 to 2,000 m) include *Bulimina striata mexicana, B. rostrata, Cassidulina cushmani, Cibicides mckannai, Uvigerina peregrina dirupta,* and *U. hispida.* A lower-slope bathyal biofacies (2,000 to 4,000 m) includes *Gyroidina neosoldani, Melonis pompilioides,* and *Uvigerina senticosa.* Increasing relative and absolute abundances of agglutinated species between 3,000 and 4,000 m reflect the elevated calcium carbonate lysocline and compensation depth in this region with the abyssal biofacies (>4,000 m) dominated by various species of *Alveolophragmium, Bathysiphon, Cystammina, Glomospira, Reophax, Rhabdammina, Spiroplectammina,* and *Trochammina.* Deviations from these general trends occur in conjunction with substrate anomalies, complex water-mass associations (i.e., double oxygen minima), and in marginal basins where sill depth effectively controls water-mass character, substrate, and biofacies.

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Monterey Rocks Along Santa Barbara Coast, California

Along the Santa Barbara coast, field characteristics of individual Monterey rock vary greatly, relating to two principal factors: silica phase and bulk chemical composition.

In terms of silica phase, field characteristics are most affected by whether silica is dominantly biogenous (opal-A) or diagenetic (either opal-CT or quartz). Diatomaceous rocks differ from compositionally equivalent rocks bearing abundant diagenetic silica in hardness, density, cohesiveness, surface texture, and resistance to erosion. By contrast, opal-CT rocks differ from compositionally equivalent quartz rocks mainly in bulk density, and differentiation between the two groups is usually impractical in the field.

Monterey rocks contain: biogenous or diagenetic silica (5-90%), detrital minerals (5-70%), carbonate rocks (0-80%), apatite (0-30%), and (carbonaceous) organic matter (1-25%). Field characteristics are affected mainly by the silica/detrital ratio. As this ratio decreases among diatomaceous rocks, bulk density and color saturation (darkness) tend to increase. As the ratio de-