

Figure 10. Gradation of the shallow-marine (transgressive) facies into the outer shelf to slope facies, type section.

fossils were apparently subjected to wave action because the apices of elongate shells such as *Turritella* are bimodally oriented in opposite directions. According to Nagle (1967), wave-oriented *Turritella* shells should be aligned in just such a manner, and the wave propagation information is bidirectional and perpendicular to the shells. The shallow-marine (transgressive) facies specimens were affected, in general, by either a northeast- or southwest-direction of wave propagation. The distance of post-mortem transport was short based on the excellent condition of many fossils. In fact, such fossils constitute "indigenous death assemblages." As defined by Craig and Hallam (1963), this type of an assemblage is transported, but the fossils are in the same environment as the original in situ community. It seems likely that the sediment build up, that formed where the coastal alluvial-fan rivers emptied into the ocean, caused shoaling conditions. The sand which was deposited in such a marginal marine environment would have been subjected to reworking by storm waves. The deeper the water, the less amount of laminated sandstone and the more amount of bioturbated sandstone. Such areas, which were farther below effective wave base, existed 1) where the shallow-marine (transgressive) facies grades into the outer shelf to slope facies and 2) in the shallow-marine (regressive) facies. One of the deepest-water shallow-marine beds was the "Stewart bed." As discussed in Squires (1981, 1983, in press), in the vicinity of Las Lajas Canyon, megafossils in the "Stewart bed" constitute an *Eocernia* - *Turritella* - *Crassatella* - *?Trochocyathus* paleocommunity. The most abundant faunal elements are carnivore naticid gastropods (*Eocernina* and *Pachycrommium*), herbivore gastropods (*Turritella* and *Ectinochilus*), shallow-burrowing suspension-feeding bivalves (*Crassatella* and *Venericardia*), and carnivore solitary scleractinian corals



Figure 11. Megafossils in the lower part of the "Stewart bed", Las Lajas Canyon; pencil is 18 cm long.

(*?Trochocyathus*) (Fig. 13).

The taxonomic composition of the shallow-marine facies indigenous megafaunal assemblages, taken as a whole, is similar to that of the in situ "Stewart bed" assemblages. About one-half of the molluscan genera collected from the "Stewart bed" are extant. Nearly all of these genera most commonly occur today in warm temperate to tropical seas less than 80 m depth (Squires, in press). For example, *Turritella* which is the most abundant megafaunal element of the shallow-marine facies, occurs today most frequently in warm temperate to tropical waters at depths between 26 and 56 m (Merriam, 1941; Kira, 1965; Morris, 1966; Keen, 1971; Keen and Coan, 1974.)

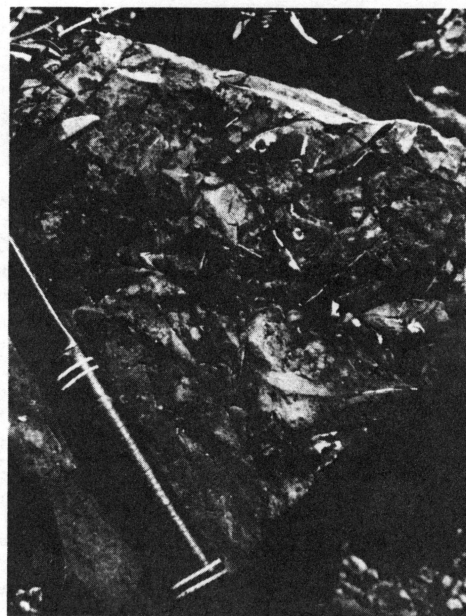


Figure 12. Internal molds of articulated *Pinna lewisi* specimens, shallow-marine (regressive) facies, type section. Hammer handle is 18 cm long.

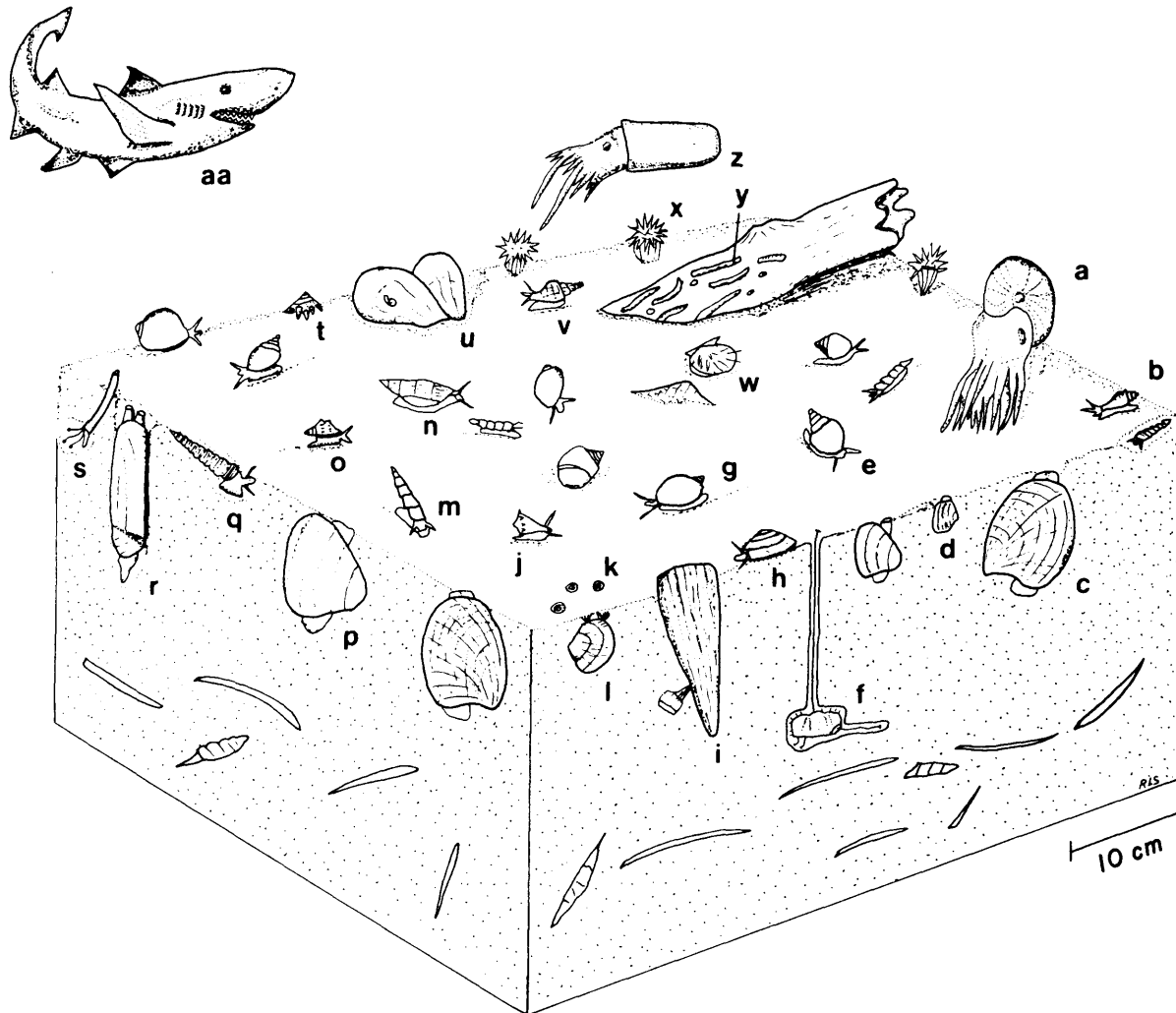


Figure 13. Reconstruction of the "Stewart bed" paleocommunity, located where the shallow-marine (transgressive) glauconitic silty sandstone grades into outer shelf to slope bioturbated siltstone.

- a Aturia myrlae (Mollusca:Cephalopoda:Nautilida)
 b Clavilithes tabulata (Mollusca:Gastropoda:Neogastropoda)
 c Venericardia (Pacifacor) hornii calafia (Mollusca:Bivalvia:Veneroidea)
 d Pitar (Calpitaris) uvasanus (Mollusca:Bivalvia:Veneroidea)
 e Pachycrommium clarki (Mollusca:Gastropoda:Mesogastropoda)
 f Schizaster diabloensis (Echinodermata:Echinoidea:Spatangoida)
 g Eocernina hannibali (Mollusca:Gastropoda:Mesogastropoda)
 h Architectonica (Stellaxis) cognata (Mollusca:Gastropoda:Mesogastropoda)
 i Pinna llajasensis (Mollusca:Bivalvia:Mytiloidea)
 j Lyrischapa lajollaensis (Mollusca:Gastropoda:Neogastropoda)
 k Pseudophragmina clarki (Protista:Foraminiferida)
 l Nemocardium linteum (Mollusca:Bivalvia:Veneroidea)
 m Turritella andersoni lawsoni (Mollusca:Gastropoda:Mesogastropoda)
 n Ectinochilus (Macilentos) macilentus (Mollusca:Gastropoda:Mesogastropoda)
 o Phalium (Semicassis) tuberculiformis (Mollusca:Gastropoda:Mesogastropoda)
 p Crassatella uvasana (Mollusca:Bivalvia:Veneroidea)
 q Turritella uvasana applinae (Mollusca:Gastropoda:Mesogastropoda)
 r Solena (Eosolen) novacularis (Mollusca:Bivalvia:Veneroidea)
 s Dentalium stentor (Mollusca:Scaphopoda)
 t Xenophora stocki (Mollusca:Gastropoda:Mesogastropoda)
 u Ostrea idriaensis (Mollusca:Bivalvia:Pterioidea)
 v Olequahia domenginica (Mollusca:Gastropoda:Mesogastropoda)
 w Spondylus carlosensis (Mollusca:Bivalvia:Pterioidea)
 x ?Trochocyathus striatus (Coelenterata:Anthozoa:Schleractinia)
 y Teredo? sp. (Mollusca:Bivalvia:Myoidea) in wood
 z Spirulimorph sepiid (Mollusca:Cephalopoda:Coleoidea)
 aa Odontaspis sp. (Vertebrata:Chondrichthyes:Lamniformes)