

Occurrence of submerged Pleistocene stony corals and marine molluscs at Vazhakala near Cochin and their significance on sea level changes

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A well preserved, submerged assemblage of Scleractinian corals and marine molluscs was observed from a well cutting at a depth of 8 m from the present MSL and about 8 km inland, at Vazhakala near Cochin (Kerala). Based on the determination of age of a sample of *Goniastrea retiformis*—a reef coral, it is suggested that the deposit is of Pleistocene Era. The sea level circa 40000 y B.P. at this region was about 7-8 m than the present and the coastline extended up to 8 km eastward than the current. The Pleistocene coral and molluscan fauna reported herein do not display much variation from the present faunal elements known from the seas around India. It is suggested that a regression of sea during the Late Pleistocene resulted in the emergence of Cochin and suburbs and the physiography was subsequently modified by alluvial deposits from the rivers.

A few reports on the geologic history and sea level changes along the west coast of Kerala (long. 75°52'E and lat. 8°15' and 12°14'N) are available¹⁻³. The results indicate several transgressions and regressions of the sea along the coast resulting in many standstills during Pleistocene and Holocene periods, corroborating the mythological concept of the emergence of Kerala from the sea. The coastal plains of Kerala are probably of late Pleistocene and Holocene alluvial origin¹⁻³. At present reef coral formation is not found along the near shore areas of Central Kerala, probably due to greater influx of freshwater from many rivers at present. In this communication a collection of stony corals and marine molluscs obtained from a well-cutting at Vazhakala near Cochin at a depth of about 8 m from the present MSL is reported and their significance on the past sea level changes along the coast is discussed.

Vazhakala, an inhabited village (Fig.1) is situated nearly 8 km east of Cochin. The elevation from MSL is 1.58 m. During February 1995, while cutting a well, significant quantities of stony corals and marine molluscs were found at a depth of about 8 m. The deposit has a capping of fine clay to a thickness of 2m which again was overlaid by fine grained sand up to the surface. The diameter of the well cutting was about 1.5 m. The deposit included 11 species of reef corals of 11 genera and one species of a hermatypic coral (Table 1). Forty four species of marine molluscs belonging to 34 genera were also recorded (Table 2). The present record is the first of its kind from the west of Kerala and provides a fairly comprehensive faunal

assemblage of corals and marine molluscs from the Pleistocene era of Kerala coast. The largest coral colony was of a *Goniastrea retiformis* with greater diameter of nearly 0.5m. The *in situ* nature of the corals could not be ascertained. Besides corals and molluscs, an excellently preserved young one of the marine turtle, *Chelonia mydas*, remnants of sponges, crustaceans and calcareous algae were also found. Beyond the site of digging at the east the land steeply rises to a hillock. The shells and corals were in excellent condition without any sign of diagenesis or fossilization. The entire material listed herein is deposited in the reference collection of CMFRI, Cochin indexed as Vazhakala.

A sample of *Goniastrea retiformis* – a hermatypic coral without any apparent sign of calcite formation was sliced into two pieces and each piece was subjected to ¹⁴C assay for determination of age at two different laboratories. The

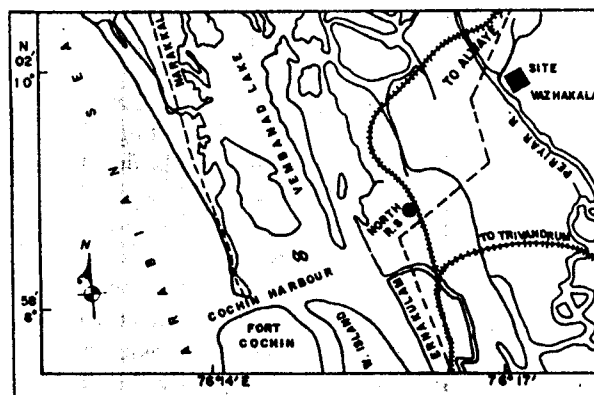


Fig. 1—Location of Vazhakala deposit

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Table 1—List of reef coral from Vazhakala Pleistocene Deposit

Family	Name of species
Pocilloporidae	<i>Pocillopora damicornis</i> <i>P. verrucosa</i>
Acroporidae	<i>Acropora formosa</i> <i>Montipora tuberculosa</i>
Poritidae	<i>Porites sp. (indeterminable)</i>
Favidae	<i>Favia palliada</i> <i>Goniastrea retiformis</i> <i>Leptastrea transversa</i> <i>Platygyra lamellina</i> <i>Leptoria phrygia</i>
Oculidae	<i>Galaxea astreata</i>
Caryophylliidae	<i>Heterocyathus aequicostatus</i>

sample dated at BARC, Mumbai showed the age as >35000y B.P. and the other piece determined at the PRL Ahmedabad yielded a value of >40000 y B.P. Due to unconformity of the BARC value (Dr. A R Nair, per.comm.) the value was not considered herein for further interpretation or discussion. However, it may be noted that both the values obtained for the same coral colony is beyond the limit of carbon dating for age determination. Due to practical difficulties, other methods for age determination were not attempted.

Corals are sensitive indicators of sea level changes. Greater caution has to be exercised in interpreting ^{14}C values in age determination of corals and shells due to possible contamination and diagenesis so also in ascertaining *in situ* nature of the samples⁴. As already stated, the *in situ* nature of the deposit could not be ascertained at Vazhakala. However, such great profusion of samples at such a short area as in a well cutting indicates an accumulation of samples on the surf zone of the paleosea. All the species of corals and molluscs reported in this communication are also found in the extant fauna of the seas around India, indicating a some what stability in marine biodiversity in the last ± 40000 y.B.P. The presence of molluscs such as *Donax*, *Thias*, *Turbo*, which are typical intertidal forms lent credential to the assumption that Vazhakala was part of paleoshore at about 40000 y B.P.

Several authors⁵⁻¹² in the past have established a lower stand of the sea at several parts of the globe during Pleistocene. Chappel *et al.*⁶ assume a level of ~10 m at several places in the Indo-Pacific during 35000 ± 10000 y B.P. Stoddart^{4,5} is of the opinion that at about 30000 y B.P. the eustatic sea level was almost the same as the present indicating a rise in the Late Pleistocene. After the last glaciation at about 20000 y B.P. there was a gradual rise in the sea level and the Holocene the level was of a higher order¹³⁻¹⁷ than the present. Between 3000 to 7000 y B.P. the sea level along the west coast of Kerala was also of a

Table 2—Pleistocene marine molluscs from Vazhakala deposit

Family	Name
Nuculanidae	1. <i>Nuculana sp.</i>
Arcidae	2. <i>Arca fusca</i> 3. <i>Arca sp.</i>
Pectinidae	4. <i>Chlamys lacteus</i> 5. <i>C. leopardus</i> 6. <i>C. gloriosus</i>
Chamidae	7. <i>Chama sp.</i>
Carditidae	8. <i>Cardita bicolor</i> 9. <i>Venericardia sp.</i>
Cardidae	10. <i>Cardium sp.</i>
Veneridae	11. <i>Venus sp.</i>
Mactridae	12. <i>Mactra sp.</i>
Donacidae	13. <i>Donax scortum</i> 14. <i>Donax sp.</i>
Tellinidae	15. <i>Tellinia sp.</i>
Solenidae	16. <i>Solen sp.</i> 17. <i>Siliqua sp.</i>
Dentaliidae	18. <i>Dentalium rectum</i>
Trochidae	19. <i>Calliostoma sp.</i>
Turbinidae	20. <i>Turbo intercostalis</i>
Turritellidae	21. <i>Turritella acutangula</i>
Strombidae	22. <i>Strombus marginatus</i> 23. <i>Strombus spp. (2 species)</i>
Naticidae	25. <i>Natica sp.</i> 26. <i>Polynices sp.</i>
Cypreidae	27. <i>Cyprea coellata</i> 28. <i>C. tigris</i> 29. <i>Cyprea sp.</i>
Cassidae	30. <i>Phalium glaucum</i>
Cymatiidae	31. <i>Cymatium pileare</i>
Muricidae	32. <i>Thais rugosa</i> 33. <i>Murex sp.</i>
Bullidae	34. <i>Bullia sp.</i>
Nasariidae	35. <i>Nasarius sp.</i>
Olividae	36. <i>Olivia spp. (2 species)</i>
Mitridae	38. <i>Mitra sp.</i>
Vasidae	39. <i>Xancus pyrum</i>
Marginellidae	40. <i>Marginella sp.</i>
Turridae	41. <i>Brachitoma crenularis</i> 42. <i>Cochlespira sp.</i>
Conidae	43. <i>Conus figulinus</i> 44. <i>Conus sp.</i>

higher order than the present³. Gleaning from early literature and partly relying on the present age of the coral sample, it may be safely argued that the sea level was 7-8m lower than the present during early Pleistocene along the Kerala coast and it extended nearly 8 km eastward than the

present level. Regression of the sea during Pleistocene caused the emergence of Cochin and nearby areas within 40000 y B.P. Deposition of alluvium by rivers caused the present surface land formation. In nutshell, Cochin and the suburbs have only a history of about half a million years as far as its formation and development of physiographic features are concerned.

It is also to be assumed that the period of Pleistocene was favourable for coral growth along the Kerala coast. During the last glaciation at about 20000 y B.P., due to lowering of temperature and other adverse conditions mass mortality to coral fauna of this area occurred. Greater influx of fresh water from the rivers subsequently made the area unsuitable for any coral growth.

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