

such as malonic acid, acetyl acetone, ethyl acetoacetate, etc.

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## Radiocarbon dates of sediment cores from innercontinental shelf off Karwar, west coast of India

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Two samples of carbonized wood and one of shells from sediment cores off Karwar were dated by  $^{14}\text{C}$  method. Radiometric ages of carbonized wood beds indicate transgression of the sea and submergence of coastal forests around 9000–10000 years before present in the Karwar area. The rate of sedimentation varies between 0.89 mm per year near the coast and 0.44 mm per year away from the coast.

PUBLISHED data on radiometric dates of marine sediments from western Indian continental shelf are far and few. This communication records radiocarbon dates of three samples, two of carbonized wood and one of shells, from three piston cores collected from the inner shelf off Karwar (Figure 1) on board *R V Samudra Shaudhikama*. The samples were dated at the Radiocarbon Dating Laboratory of the Birbal Sahni Institute of Palaeobotany, Lucknow, using the pre-treatment, chemistry and radioactive-counting procedures described elsewhere<sup>1</sup>. The significance of the age data in interpreting the Holocene history of the area is briefly mentioned here.

The carbonized wood dated occurs as a 18-cm-thick bed at a depth of 420 cm below seabed in PC-1464 ( $14^{\circ}25'37.091''\text{N}$   $74^{\circ}12'35.501''\text{E}$ ). In PC-1490 ( $14^{\circ}40'8.631''\text{N}$   $73^{\circ}59'9.568''\text{E}$ ), it occurs as a 2-cm-thick zone at a depth of 578 cm. A shell zone

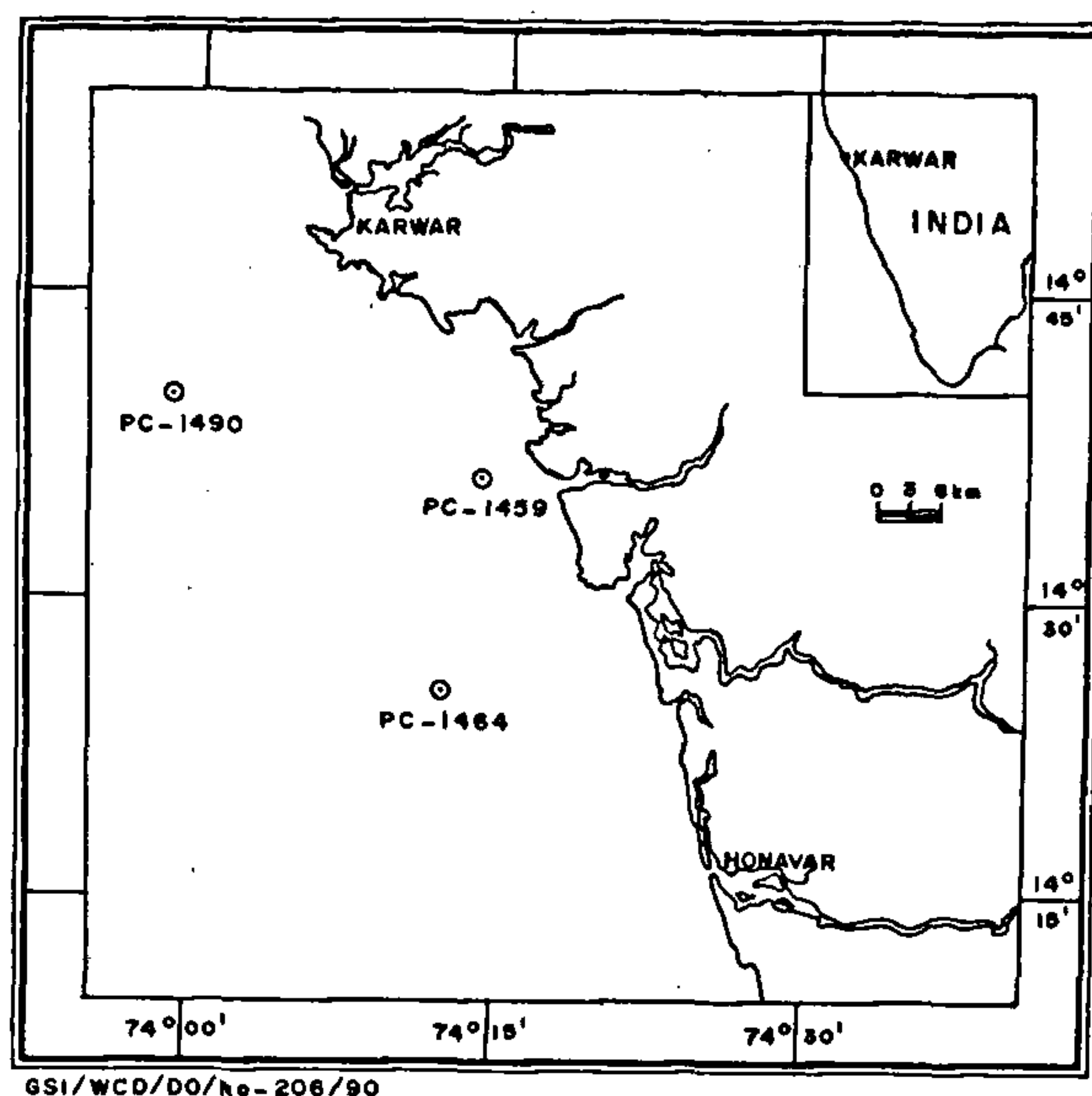


Figure 1. Location of the piston cores collected.

comprising broken and whole shells of lamellibranchs and gastropods occurs at a depth of 302 cm in core PC-1459 ( $14^{\circ}35'59.331''\text{N}$   $74^{\circ}13'49.744''\text{E}$ ) and has been dated (Figure 2).

The radiocarbon dates of the samples are given below.

Sample	Material dated	Depth (cm)	Age (yr BP)
PC-1459/10	Shells	302–310	$3410 \pm 90$
PC-1464/22	Carbonized wood	420–438	$9630 \pm 120$
PC-1490/16	Carbonized wood	578–580	$8620 \pm 300$

Occurrence of carbonized wood/peat beds associated with Recent sediments has been reported from many onshore and offshore areas of the west coast of India.

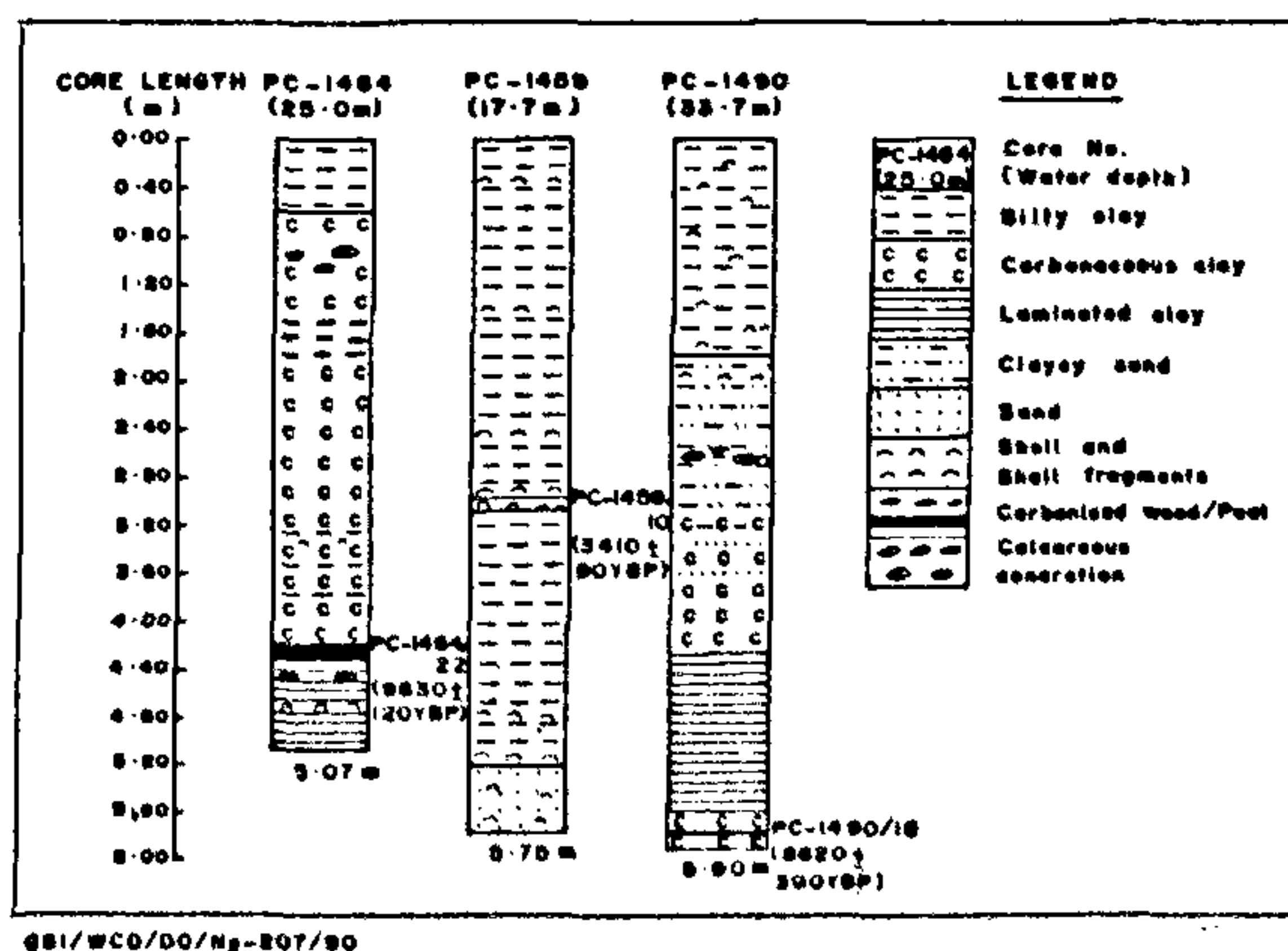


Figure 2. Lithology of the cores, with location of the samples dated.



The ages obtained for the carbonized wood samples from Karwar shelf are comparable to the ages of onshore occurrences of peat from Wellington island, Cochin (8080 yr BP)<sup>2</sup>, Tellicherry (7230 ± 120 yr BP)<sup>3</sup> and Changanacherry (7050 yr BP)<sup>4</sup>. Pollen analysis of core samples from the Arabian Sea indicated a humid climate with maximum mangrove vegetation in the west coast around 10,000 yr BP<sup>5</sup>. Relicts of mangrove vegetation exist even today along the west coast<sup>6</sup>. The transgression of the sea might have resulted in the destruction of coastal vegetation, giving rise to carbonized wood and peat beds. The age data indicate that this transgression was around 9000–10,000 yr BP in the Karwar area. The age of the shell zone correlates with the ages reported for limeshells of Vembanad lake, Kerala (3710 ± 90, 3130 ± 100 yr BP). The deposition of limeshells has been related to an event of retrogression between 3000 and 5000 yr BP<sup>3</sup>.

The rate of accumulation of sediments was computed from the age data, assuming a uniform rate in the sites subsequent to the deposition of dated material. The accumulation rate is 0.89 mm y<sup>-1</sup> at PC-1459, which is 5 km away from the coast. The lowest rate of sedimentation (0.44 mm y<sup>-1</sup>) occurs at PC-1464, located at a distance of 18 km from the present coast. At PC-1490, the rate of accumulation is 0.67 mm y<sup>-1</sup>. This relatively higher rate may be due to the presence of intermittent laminations of fine sand in clayey sediments, which accumulates at a rate faster than that of clay. This indicates that sedimentation rates are highly variable within short distances in the inner-shelf region and the deposition is faster nearer the coast. These sedimentation rates, however, are marginally higher than those reported for sediments off Mulki (0.35 mm y<sup>-1</sup>)<sup>7</sup> and Mangalore (0.33 mm y<sup>-1</sup>)<sup>8</sup> based on <sup>210</sup>Pb activity.

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## On the reproductive phenology and sex ratio of *Mallotus philippensis* Muell. Arg.

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In dioecious plants, i.e. plants in which male and female flowers are borne on different individuals, environmental factors, especially sunlight, may affect male and female individuals differently. We report here that *Mallotus philippensis*, a dioecious undertree species, shows variation in reproductive phenology and sex ratio in two adjacent forest communities with different light-intensity regimes. Sex ratio was always male-biased and more so under the lower-light regime. Number and density of male flowers per inflorescence were much higher under the lower-light regime. Peaks of anthesis and receptive female flowers did not synchronize. In addition to these, early flowering in males and longer span of male flowering suggest that, in this anemophilous species, selection favours males to ensure availability of sufficient pollen to every female flower irrespective of light regime.

*MALLOTUS PHILIPPENSIS* (Euphorbiaceae), well known for its Kamala dye, is a dioecious undertree species that grows abundantly in sal (*Shorea robusta*)-dominated communities. The male and female individuals are difficult to distinguish in the vegetative phase. Resources, especially sunlight, may have differential value to sex functions<sup>1</sup>, and in several cases male and female plants have been found to occupy different habitats, suggesting environmental sex determination<sup>2</sup>. Secondary sex characters and sex ratio<sup>3–5</sup> as well as the adaptive significance of dimorphic flowers and inflorescence<sup>6,7</sup> have been discussed for a number of annual and perennial species. These aspects are little understood in Indian forest communities except for a few general phenological accounts<sup>8,9</sup>. Here we discuss reproductive phenology and sex ratio in *Mallotus philippensis* growing in two adjacent forest communities under different light regimes.

The study was carried out in two adjacent commun-

Table 1. Reproductive phenology and sex ratio data for *Mallotus philippensis* in two forest communities.

		Sal stand (≥ 800 lux)	Mixed forest (≤ 300 lux)	χ <sup>2</sup>
Flowering individuals (f)	Male	192	188	0.04 (NS)
	Female	160	124	3.0 <sup>c</sup>
	χ <sup>2</sup> =	2.9 <sup>a</sup>	13.1 <sup>b</sup>	
Sex ratio (female/male)		0.84	0.66	0.2 (NS)
Non-flowering individuals (nf)		60	84	4.0 <sup>d</sup>
Flowering ratio (f/nf)		5.87	3.71	0.48 (NS)

The χ<sup>2</sup> values are significant at 10% (a, c), 0.1% (b) and 5% (d) level; NS, not significant.