



Figure 2. Higher magnification micrograph of boxed corner in Figure 1, showing the transition region in the  $N^+/N/N^+$  sample.

changes in silicon. The pore size changes in our  $N^+/N$  samples from about  $1\text{ }\mu\text{m}$  to approximately  $5\text{ }\mu\text{m}$ , the corresponding change in resistivity is from 10 milli-ohm cm to 30 ohm cm. The depth of  $N^+$  region on N-type wafer is about  $10\text{ }\mu\text{m}$  as estimated by this technique and roughly agrees with other techniques of junction depth measurement.

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## Radioactive intensities of coastal sediments of Chilka lake, east coast of India

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Radioactive intensity measurements have been made on heavies of the foreshore and backshore sediments of the landward coast of the main channel of Chilka lake. The values range from 117.2 to 234.2 counts per minute and are almost equal to the normal background radiation. A highest intensity of radioactivity was observed in the foreshore in contrast to the backshore. It was found that the intensity of radioactivity was proportional to the average monazite content and the level of radioactive intensity in the region may be because of occurrence of monazite in trace.

**RADIOACTIVITY** of beach sands, ocean bottom sediments,

coastal sediments and sea water has been steadily gaining importance because of its economic exploitation<sup>1</sup> and environmental pollution<sup>2</sup>. Radioactivity is found to be lower in areas of rapid sedimentation compared to non-depositional areas in the continental shelf<sup>3</sup>. The radioactivity in the shelf sediments along the east coast of India<sup>4,5</sup> and the potentiality of deep sea sediments as a source of radioactivity<sup>6</sup> were already reported. As no data on these aspects for the landward coastal sediments of Chilka lake are available, the present investigation has been undertaken to assess the radioactive intensity, its effect on the health of the environment and the possibility of its economic exploitation.

Twenty sediment samples from 20 and 60 cm depths representing foreshore and backshore were collected during August 1988 from five stations located along 10 km length around Sanapatna and Arakhakuda villages ( $19^{\circ}28' - 19^{\circ}54'N$  and  $85^{\circ}5' - 85^{\circ}38'E$ ) at 2.5 km interval along the profiles of the landward coast of the main channel of the Chilka lake (Figure 1). Textural and grainsize parameters of this region is already reported<sup>7</sup>. Optical study of the sample was made to understand the nature of radioactive minerals (allanite, crytolite, zircon, etc.) associated with monazite. The samples after collection were washed, dried, coned, quarted and sieved using ASTM sieves. Heavy minerals

between +60 (0.25 to 0.5 mm) fraction and -60 (0.25 to 0.063 mm) fraction of the sediment samples were separated by using bromoform<sup>8</sup>. The so-called heavy minerals were identified by petrological microscope and the percentage of each individual heavy mineral was computed. About 1 g of the heavy mineral sample of -60 fraction was analysed by gamma ray counter (LKB-CLINI GAMMA, Sweden). Interference from alpha and beta radiation was readily avoided by filtering them with a thin window of aluminium.

Data on heavy mineral analysis reveal that sediments of the study region contain about 10 to 11% of heavy minerals. These are fairly abundant in the finer fraction (-60 fraction) than the coarser fraction (+60 fraction). Microscopic study reveals that the radioactive mineral, monazite occurs only in finer fraction of the sediments.

Analysis of gamma counter (Table 1) reveals that the level of radiation varies from 117.2 to 234.2 counts/min/g. It is observed that the surface samples emit higher radiation than the bottom. Foreshore surface samples of each station recorded the highest value whereas the backshore bottom samples recorded the lowest. The intensity of radiation shows a slightly decreasing order from station 1 to 5. Such observations corresponded to the distribution pattern of monazite in the environment. Monazite is a thorium-cheralite<sup>9</sup> mixture. The percentage of monazite in the coastal

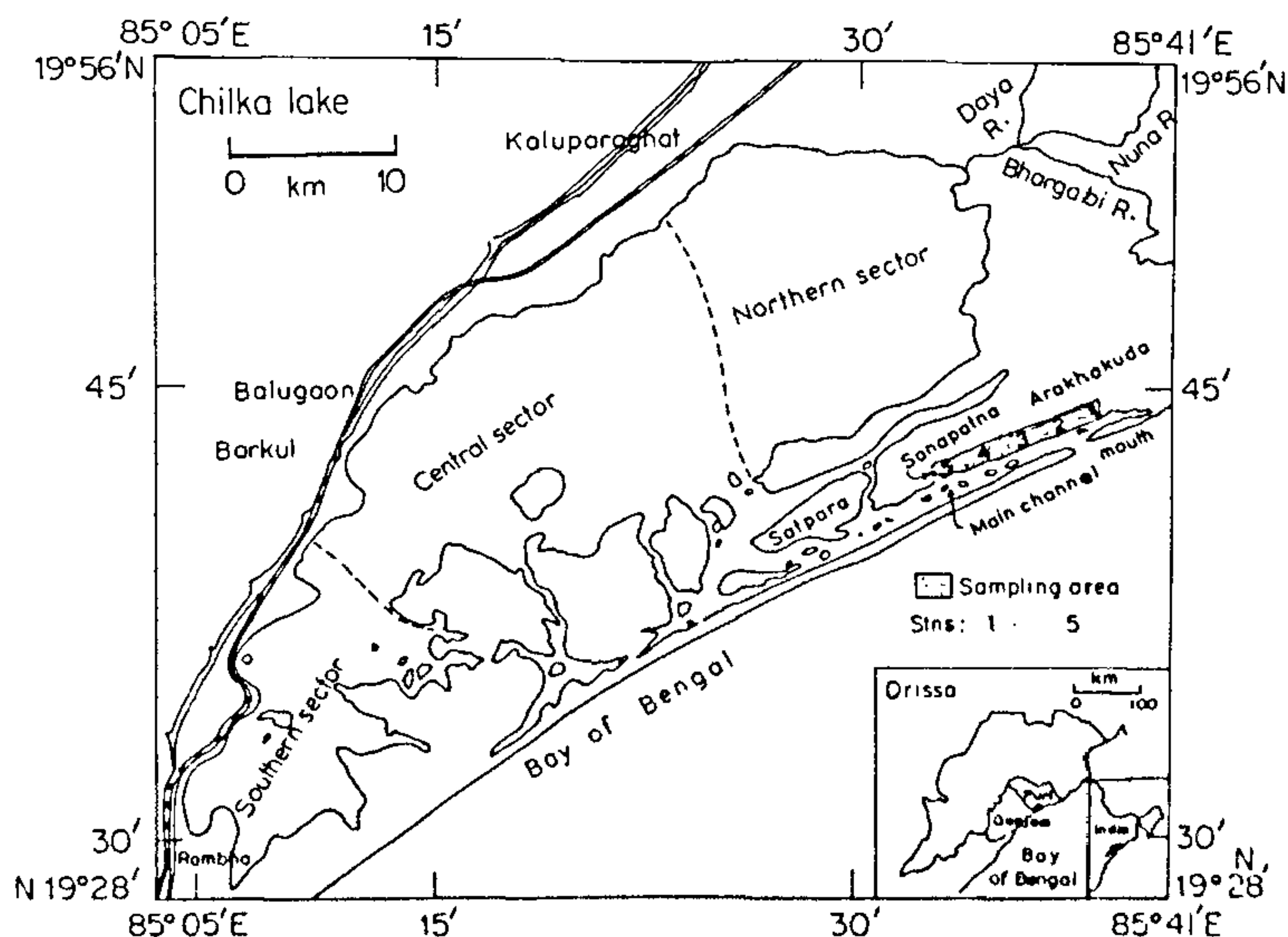


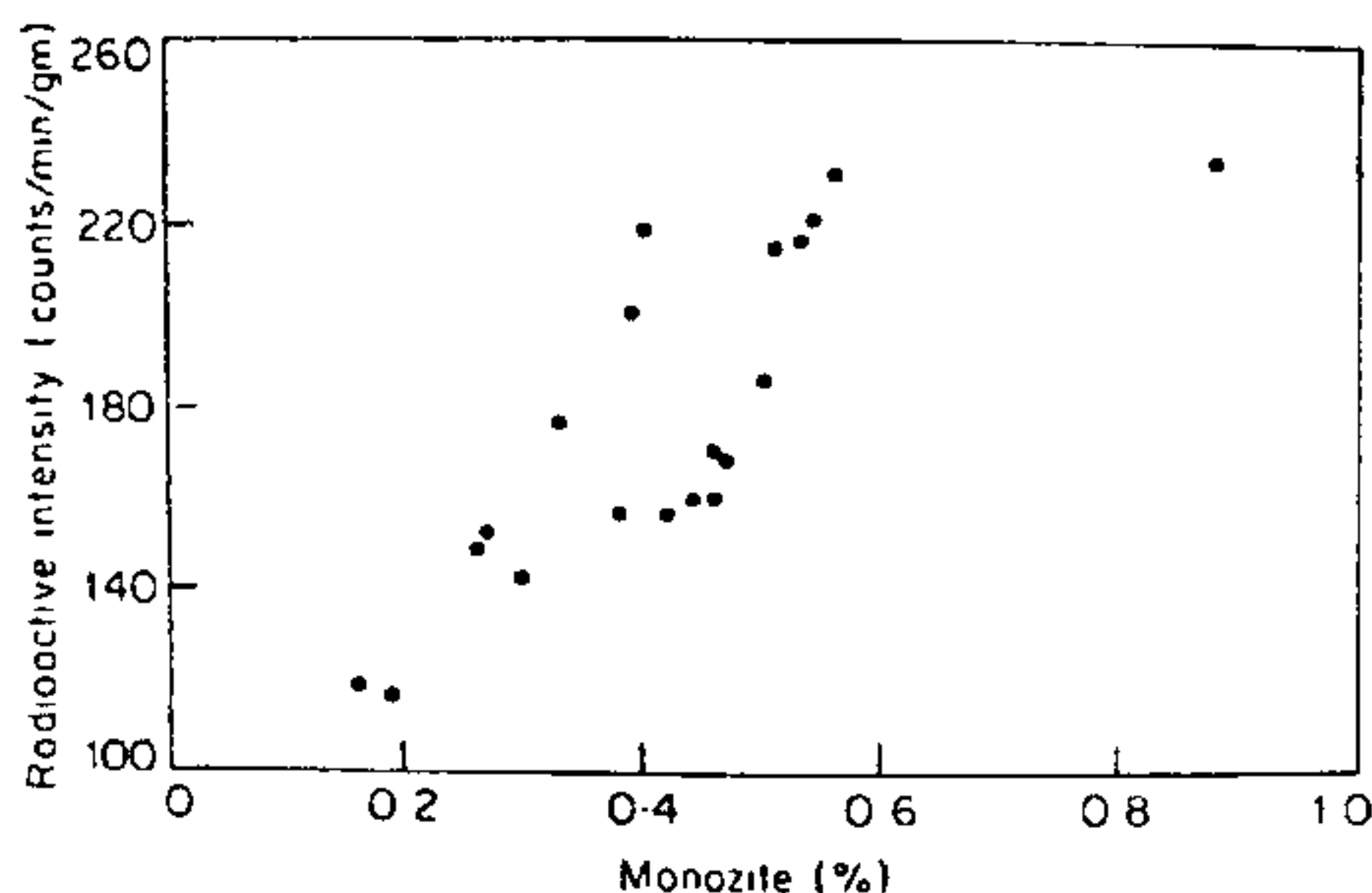
Figure 1. The map of Chilka lake showing the location of sampling stations of main channel area and the position of mouth

**Table 1.** Gamma ray intensity in counts minute g and the monazite content in fine fraction

Station no	Sample no	Number of counts	Percentage of monazite
1	F'	234.2	0.88
	F''	171.2	0.46
	B'	219.2	0.40
	B''	153.2	0.27
2	F'	231.2	0.56
	F''	177.2	0.33
	B'	215.2	0.51
	B''	149.2	0.26
3	F'	221.2	0.54
	F''	186.2	0.50
	B'	157.2	0.38
	B''	143.2	0.30
4	F'	217.2	0.53
	F''	160.2	0.46
	B'	169.2	0.47
	B''	119.2	0.16
5	F'	201.2	0.39
	F''	157.2	0.42
	B'	160.2	0.44
	B''	117.2	0.19

F: Foreshore-surface; F': Foreshore-bottom; B': Backshore-surface; B'': Backshore-bottom.

sediments of east coast was estimated to range from 0.5% to 3%. However, monazite concentration of the nearby beach<sup>10</sup> is found to contain 9.05% of ThO<sub>2</sub> and 0.264% of U<sub>3</sub>O<sub>8</sub>. The plot between percentage of monazite versus radioactive intensity (Figure 2) shows an increase in radioactive intensity with increase of monazite level, indicating a good correlation between them. It is therefore concluded that in the present study the radiation energy obtained by the gamma counter may be attributed to the natural radioactive mineral, monazite, which occurs along the coast, as other sources are not significant in the locality. The average value of radiation found to be 178 counts/min (Table 1) would have been much lower if considered for the bulk sediment samples instead of its heavy mineral fraction

**Figure 2.** Plot of percentage of monazite vs radioactive intensity.

which constitutes only 10–11% of the bulk sediment. This is because the monazite concentration accounting for the radioactivity gets reduced in the bulk sediment samples. Thus it is inferred that the radioactivity of the main channel of coast of Chilka lake is much lower than the normal background radiation of a beach<sup>2</sup>. The level of radiation on this coast is appreciably small compared to the Kerala<sup>1</sup> coast where the level of radiation varies from 250–2000 counts/min.

Thus it can be concluded that the radiation of the main channel coast of Chilka lake is below the normal background radiation of a beach and is not health hazardous and safe for the inhabitants from the point of view of radioactive pollution. Further, it is inferred that occurrence of monazite may be the locus of radioactivity in the study region and the coast is not suitable for mining the natural radioactive elements like thorium, uranium, etc.

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## Characterization of aphthovirus type Asia-1 isolates of Indian origin using monoclonal antibodies

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Two monoclonal antibodies (MAbs) directed against the major antigenic viral polypeptide VP1 of Asia-1 vaccine strain were used to characterize 17 Asia-1 isolates from different regions of India, by neutralization assays. Six of these field isolates were further characterized with polyclonal antibodies as well as MAbs by neutralization assays *in vitro* and passive mouse protection assay (*in*