5. Choubisa, S. L., Technical Report, Ministry of Environment and Forests, Government of India, New Delhi, 1996.
6. Choubisa, S. L., *Vet. Res. Commun*., 1999, **23**, 457–465.
7. Swarup, D. and Dwivedi, S. K., Report, Indian Council of Agricultural Research, New Delhi, 2002.
8. Choubisa, S. L., *Int. J. Environ. Stud*., 2007, **64**, 151–159.
9. Choubisa, S. L., *J. Environ. Biol*., 1998, **19**, 341–352.
10. Shupe, J. L., *J. Anim. Sci*., 1980, **51**, 746–758.

ACKNOWLEDGEMENTS. I thank the Ministry of Environment and Forests, Govt of India for financial assistance. I also thank Drs D. K. Choubisa and Karun Sompura for technical assistance.

Received 26 November 2007; revised accepted 6 November 2008

S. L. CHOUBISA

Department of Zoology,
Government Post Graduate College,
Sirohi 307 001, India
e-mail: choubisasl@yahoo.com

Sinking of ancient Talakad temples on the Kaveri Bank, Mysore Plateau, Karnataka

Devotees and pilgrims periodically notice underneath cover from a mass of riverine sand of the Kaveri river, a temple complex dating back to the times of the Ganga, the Chola, the Hoysala, and the Vijayanagar kingdoms – from the 6th century AD to the later part of the 17th century AD[1,2]. What is remarkable about these structures is that some of the temples built during the Hoysala period (about 1200 AD) are nearly 20 m below the present level of riverine sands[2]. While Srikantia and Anantharamulu[1] attributed their burial under the sand to the lowering of water level in the pointbar deposits of sand near Old Talakad (and the monsoon wind that blew from SW to NE, depositing the sediments over the temples) due to diversion of the Kaveri water through a canal that was constructed in 1336 AD by the Vijayanagar minister Madhavamantri, Ganeshaiah[2] regards the burial of the temple complex as a consequence of 'eco-disaster consequent to development activity (construction of a dam)' following accumulation of sand that began towards the end of the 16th century.

The present author's extensive fieldwork in the Kaveri basin, including the Talakad reach of the river[3–5], shows that the Talakad temple complex of historical antiquity sank as a consequence of subsidence of the ground resulting from movement on an active NNE–SSW oriented fault that passes through the right bank of the Kaveri opposite Talakad (Figure 1).

Talakad, on the left bank of the Kaveri, sits on 5–7 m thick deposit of a lake that stretched tens of kilometres upstream of Kollegal (Figure 2) and had submerged the valleys of the Kaveri, the Kabini, the Shimsha and the Suvarnawati[3,4]. The lake was formed in the Later Quaternary more than 26,500 years ago and lasted until about 4900–5300 yrs BP, as indicated by dating of the lake sediments at Vaddarakuppe, Murugu and Chelukavadi[3–5]. The river blockage followed the uplift of the Biligirirangan Hills (Figure 2) to the east along the active N–S trending Kollegal Fault[4,5].

The palaeolake is represented by flat plains of limited extent in the undulating terrain made up of 5–7 m thick deposits of black carbonaceous clays, characterized by prolific nodules of calcareous concretions. The lacustrine plains are used for intensive cultivation of paddy and sugar. Near the river channels, the lacustrine clays are overlain by and inter-

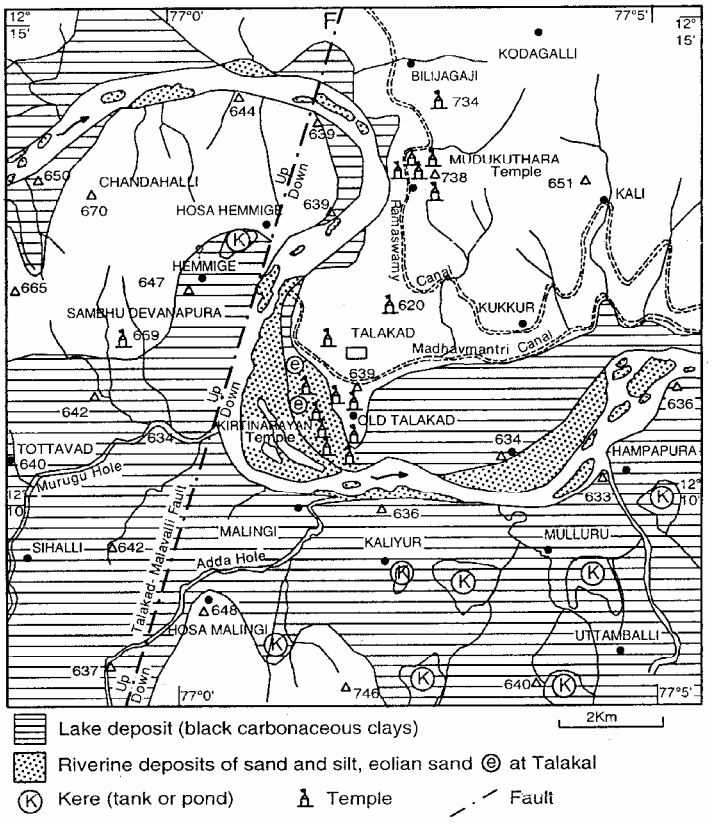

Figure 1. Map of a part of the Kaveri basin showing the abrupt turning south-southwestwards of the Kaveri along a NNE–SSE trending fault, accumulation of large volumes of sand and silt as pointbar deposit at the lower bend of the river, and the eolian sand and silt surrounding and covering the Talakad temples (after Valdiya and Rajagopalan[3], and Valdiya[4]).

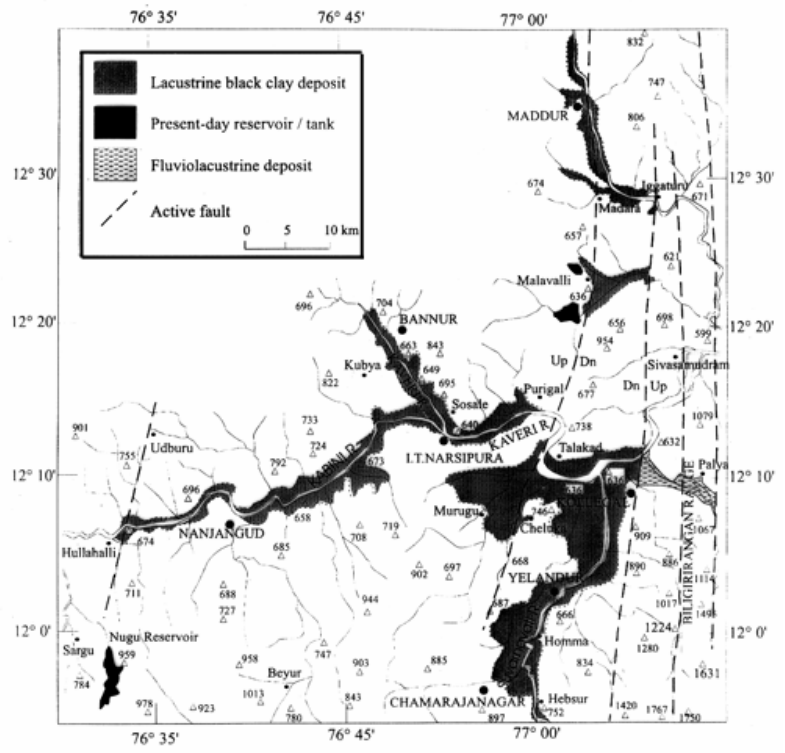

Figure 2. Map of the Kaveri basin in the Mysore Plateau showing the extent of a palaeolake (represented by deposits of black carbonaceous shale) that stretched in the valleys during the period >26,500 yrs BP to about 5300–4900 yrs BP. The Kollegal Fault delimiting the high Biligirirangan Hills was responsible for the evolution of the lakes, and the Talakad–Malavalli Fault vertically cut the palaeolake deposits and caused subsidence of the eastern downstream-block. Note the altitude differences of the flat palaeolake ground on the two sides of the Talakad–Malavalli Fault (after Valdiya[4]).

finger with overbank silt and sand deposits of floodwaters.

Parallel to the Kollegal Fault is the Talakad–Malavalli Fault (T–M Fault) that extends northwards straight into the south-flowing Shimsha river. The T–M Fault presumably developed along with the Kollegal Fault, and caused the Kaveri river flowing persistently for tens of kilometres in the east-northeast direction to deflect abruptly to the south-southwest course, before resuming its original direction south of Old Talakad (Figure 1). Like other faults in the region, the T–M Fault must have been reactivated more than once[4,5]. Revival of faulting along this line resulted in the subsidence of the ground to the east of it. Indeed between the Kollegal Fault and the T–M Fault, the ground has subsided. The subsidence is of the order of 10 m in the Hul Halla plain, Malavalli area (Figure 2) in the north and 5 m in the Chelukavadi–Murugu section in the south. Sinking of the ground was accompanied by slight tilting (2–3°) westward or eastward in the western block[4,5].

In the Talakad site, the Kaveri pointbar deposit is juxtaposed against the laterite-capped gneisses of Hosa Hemmige, immediately southwest of Madukuthara (Figure 1). This is the locality where stone implements of the Neolithic–Chalcolithic time were found[1]. Whirlpools such as those near Malingi and Alamelamma, north of Kaliyur (Figure 1) testify to the depth to which the river bed sank east of the T–M Fault. Recent excavation carried out by archaeologists reveals that drainage pipes constructed in the 1330s under the Kirti Narayana Temple (Figure 1) are far below the level of the river[2], implying that the structure sank subsequent to its construction 650–700 years ago.

The sinking of the ground to the east of the T–M Fault created a pool within the channel of the Kaveri. Floodwaters started depositing their loads of sand and silt with clay in the standing body of that pool. In the absence of sand extraction (mining) in a holy place, the mass of sand and silt piled up and the northeast-ward-blowing winds relocated the finer materials, burying and surrounding the settlement with its temple complex.

It is not without significance that immediately to the west of the Malavalli town, through which the active T–M Fault passes, there is a cluster of seven earthquakes[6] of magnitude *M* 3.7–4.5. The 14 November 1993 earthquake had badly affected nine villages in the area. Evidently, the fault which caused the sinking of Old Talakad and 'brought about collapse of a great civilization'[2], continues to register tectonic movement and generate earthquakes of small and moderate magnitude. The present author regards the sand burial of the Talakad temple complex a consequence of tectonic phenomena. It was not an ecodisaster.

1. Srikantia, S. V. and Anantharamulu, T. R., *J. Geol. Soc. India*, 1997, **50**, 315–321.
2. Ganeshaiah, K. N., *Curr. Sci.*, 2007, **93**, 1495–1500.
3. Valdiya, K. S. and Rajagopalan, G., *Curr. Sci.*, 2000, **78**, 1138–1142.
4. Valdiya, K. S., *Curr. Sci.*, 2001, **81**, 1068–1088.
5. Valdiya, K. S., *J. Geol. Soc. India*, 1998, **51**, 139–166.
6. Subrahmanya, K. R., *J. Geophys.*, 2002, **23**, 69–68.

Received 17 March 2008; revised accepted 6 November 2008

K. S. VALDIYA

Jawaharlal Nehru Centre for Advanced Scientific Research,
Bangalore 560 064, India
e-mail: valdiya@jncasr.ac.in