needs careful investigation employing both mathematical and physical models. However, a positive aspect of our scheme is that all inflows of fresh water into the reservoir not consumptively utilized will cumulatively depress the interface on the reservoir side and increase freshwater storage. Such inputs of fresh water to the Kalpasar lake also include rain (about 0.7 m) falling directly on to the lake and inflows from the minor rivulets, streams, creeks and channels and ground water discharge not accounted for in the 14,000 million m^3 of runoff from major rivers after the proposed dams on the Narmada and other rivers have been completed. We, therefore, intuitively anticipate that this effect involving cumulative lowering of the interface (with no spillage) will more than compensate for the possible mixing of saline and fresh water due to vertical movement of the interface induced by tides/waves. We expect that pressure changes due to the tides and waves can be expected to be communicated from the open sea side to the reservoir side, through the open bottom, rather gently in a piston-flow-like manner due to the damping of the disturbance with depth in the 20 m or more water column on either side of the dam. The dam itself will prevent the transfer of the wave/tide-induced turbulence at the surface from the open sea to the reservoir side.

The other factors influencing the position and thickness as well as movement of the fresh-water–sea-water interface in the reservoir, such as evaporation, consumptive use of water, wind-induced waves in the reservoir itself and the tidal effects within the body of the water stored in the reservoir, are common to both the schemes and, therefore, are not being discussed here. In our view, mixing is an area of major concern that needs a detailed investigation through mathematical models of currents and mixing processes likely to operate in the Kalpasar lake and the extent to which they may affect adversely the quality of water stored in the lake.

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In situ preserved *Vertebraria* axes in Ib River Coalfield, Orissa

The Permian Gondwana form genus *Vertebraria Royle*[1] occurring from Post-glacial time through Late Permian is characterized by elongate, flattened, segmented, cylindrical casts which are simple or branched, often bearing root-like organs at the transverse ridges. In transverse section the *Vertebraria* axes show wedge-like sectors radiating from the centre[2]. According to Mussa[3] *Vertebraria* is a complex form consisting of several genera. Specimens of *Vertebraria* are found preserved in positions both parallel and perpendicular to the bedding plane and the actual nature of these axes was quite controversial for some time[3–9]. Most of the specimens assigned to *Vertebraria* are generally impressions or compressions and very rarely petrified specimens with anatomical details. It consists of a central region of exarch primary xylem with four to seven radiating arms of secondary xylem. The distinct growth rings with septate arrangement is surrounded by a cylindrical periderm with a well-developed cork, leaving spaces between the xylem arms. In longitudinal section the secondary xylem arms are connected at varying intervals by transverse platforms, also composed of secondary xylem tracheids, but generally containing a root trace.

Several specimens of *Vertebraria indica* Royle were collected from the Barakar beds exposed in a nala near Ganga Nagar village near Brijraj Nagar town, District Sambalpur, Orissa. No other element of Glossopteris flora is preserved in this bed. Some 50 specimens were found preserved as casts in the fine-grained, light pink, hard shales in an area of 2–3 m. The surface view showed 5–6 wedges 0.5–2 0 cm in diameter, with very little pith in the centre. The maximum length of these axes was 8 4 cm, lying diagonally along the bedding plane. Growth directions of these axes in the sediment indicate that *Vertebraria* was an underground root system of some plant. The actual plant which bore these underground axes was perhaps drifted to another site. Diagonal and vertical axes (Figure 1 *a*, *b*), preserved in a small area of 2–3 m, probably belonged to a single plant and represent *in situ* preservation. Total absence of horizontal axes and any other plant parts led us to believe this. The presence of such axes in various coal fields[10–14] indicates that some of the species of *Glossopteris* had arborescent habit supported by a well-developed strong root system. Wherever such vertical and diagonal axes were found, other plant organs like leaves were not found in nearby areas. Though horizontal axes along with other plant parts are commonly found in most coalfields, indicating autochthonous nature of coal, in no way are such vertical and diagonal *Vertebraria* axes indicative of autochthonous nature of coal as believed by some. Enormous quantity of vegetal matter which might

Figure 1 ***a*** **and** ***b***. *Vertebraria indica* Royle, longitudinal sections of the specimens to show diagonally and vertically penetrating axes in the sediments, respectively. B S.I.P. Museum specimen numbers 36863 & 36864.

have been required for peat formation of Gondwana coals cannot be sufficiently provided by few *in situ* preserved plants and their root system. It is logical to think that root system already embedded in the palaeosols had better chances of getting preserved *in situ* than other plant parts as found in Ib river and other coalfields of Lower Gondwana of India.

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Role of phospholipase C in the cryptobiotic cysts of the fairy shrimp *Streptocephalus dichotomus*

As our earlier report[1] disclosed the occurrence and functional significance of the enzyme PC-PLC (phosphatidylcholine cholinephosphohydrolase) in the cryptobiotic cysts of the fairy shrimp *Streptocephalus dichotomus*, the involvement of biological catalysts (enzymes) in the hydration-dependent hatching of the cysts becomes quite evident.

Ever since the introduction of term 'cryptobiosis' in biology by Keilin[2], it has fascinated many investigators due to its unique features like maintenance of embryonic viability during thermal stress and the ability to withstand dehydration. *S. dichotomus*, which inhabits the freshwater ponds, undergoes cryptobiosis during dry summer period in order to overcome the adverse conditions Though a detailed study on the egg morphology[3], biochemistry[4] and reproductive biology[5]