

he applied to the hippo-transport were not extended to ships carrying the more usual types of cargo brought by merchants from India to sell at the Hormuz entrepôt.

Today we are beginning to be able to differentiate between pre-modern plank-fastening methods used in India, the Arabian peninsula and elsewhere. Future experimental archaeology will enable their respective strengths and weaknesses to be evaluated, even if we are far from being able to replicate the skill and knowledge of materials possessed by the original builders. John Coates advanced theoretical understanding of sewn ship construction (1985:10). He distinguished different stresses on two different hull forms, but at that stage of research did not consider the performance of fibres with differing elasticity, nor did he dwell on the significant reduction of sheering stresses on his third type of hull. It is to his third type, with “Dominating Members”, that pirogues belong. He noted the geometry of the design of stitching (that used, incidentally, in Indian craft) as nearly doubling the stiffness of the stitching under sheering forces between planks. Coates was of course unaware of the use of *dikh* oil to consolidate both padding and seams of Goan pirogues, which incidentally reduced sheering stresses on the cords still further. An additional factor is varying efficacy of protective coatings against marine organisms and water. In Goan craft the highly caustic build-up of *dikh* dealt effectively with both of these outboard, while the equally thorough application inboard served to seal the timber from exposure to sun and rain, and the cord from stretching. For these reasons it may be suggested that the design and performance of Goan pirogues in historic times was optimal (Fig. 23).

Clifford Hawkins sighted a 45-year-old *odam* 150 miles west of Calicut – sewn and still sound – to him evidence that the sewn ships of some centuries ago were capable of enduring long sea voyages (1977: 105). Likewise Pierre-Yves Manguin