

Rivers, coasts and early navigation

Juan Seguro

Core question

What changed when humans began treating waterways not only as barriers or food sources, but as routes that could be anticipated, crossed and used for planned movement?

Historical and evolutionary context

Watercraft are rarely preserved in deep prehistory, so early navigation must often be inferred from colonisation patterns. The settlement of Sahul, the Pleistocene landmass comprising Australia and New Guinea, required sea crossings through Wallacea because these islands were never joined by exposed land bridges to Sunda or Sahul.

Archaeological and modelling studies therefore provide unusually strong indirect evidence for maritime capability. Occupation at Madjedbebe has been dated to about 65,000 years ago, but that age is contested; analyses arguing for a later arrival around or after 50,000 years ago remain part of the debate. The maritime inference is less sensitive to that dispute: reaching Sahul required sea crossings through Wallacea under either chronology. Modelling studies suggest that successful settlement is difficult to explain by repeated accidental drift alone and is more consistent with at least some planned departure, directional movement and group-level voyaging.

What could communities know before planned navigation?

People could follow rivers, shorelines and visible landmarks without leaving familiar terrestrial reference systems. Open-water crossings require a different knowledge architecture: anticipating unseen destinations, reading currents and winds, coordinating departure, provisioning and maintaining orientation over time.

What changed?

Navigation converts environmental regularities into predictive information. Coastlines, stars, swell patterns, birds, currents and seasonal winds can become cues. Watercraft also create mobile platforms whose construction and use require collective technical knowledge.

The settlement of Sahul is especially important because it implies that human planning extended across gaps in direct terrestrial access. Even when land was visible across some stages, other crossings required movement into open water. The cognitive and social challenge was therefore not merely locomotion but controlled risk under uncertainty.

Why could this capability emerge?

Coastal adaptation, fishing, fibre and woodworking technologies, group coordination and accumulated ecological knowledge could all contribute. The exact form of early watercraft is unknown. PIO should resist projecting later boats backward into the Pleistocene.

What later forms of knowledge did it enable?

Maritime mobility expands exchange networks, colonisation, fishing grounds and contact between previously separated populations. It later supports long-distance trade, astronomical navigation and the systematic mapping of seas.

New limits and risks

Navigation knowledge is locally specific. A route mastered in one current regime may fail elsewhere. Maritime travel also amplifies consequences of error: misjudged weather, insufficient water or failed craft can be fatal.

What changed in the architecture of human knowledge?

Knowledge became increasingly **predictive over space**. Humans could act on models of routes and destinations not continuously visible, integrating environmental cues into planned movement.

Loss, exclusion and uncertainty

Early watercraft were overwhelmingly made from perishable materials, while shorelines themselves moved as sea level changed. The surviving record thus preserves destinations and settlement patterns more readily than the boats, route knowledge and unsuccessful crossings that made dispersal possible.

The lack of preserved early boats means technology is reconstructed indirectly. Claims about intentionality should therefore be probabilistic, not absolute. The later sophistication of Indigenous and Polynesian navigation must not be projected unchanged into the deep past, though it demonstrates the extraordinary potential of non-instrumental environmental knowledge.

Dependency map

- INDIRECT ← PIO-005 Clothing, fibres and environmental adaptation
- PARALLEL → PIO-039 Polynesian and Indigenous wayfinding
- INDIRECT → trade, mapping and global knowledge networks

References

1. Clarkson, C. et al. Human occupation of northern Australia by 65,000 years ago. *Nature* 547, 306–310 (2017). <https://doi.org/10.1038/nature22968>
2. Bird, M. I. et al. Early human settlement of Sahul was not an accident. *Scientific Reports* 9, 8220 (2019). <https://doi.org/10.1038/s41598-019-42946-9>
3. Salles, T. et al. Physiography, foraging mobility, and the first peopling of Sahul. *Nature Communications* 15, 3430 (2024). <https://doi.org/10.1038/s41467-024-47662-1>
4. O'Connell, J. F. et al. When did *Homo sapiens* first reach Southeast Asia and Sahul? *PNAS* 115, 8482–8490 (2018). <https://doi.org/10.1073/pnas.1808385115>