

Plates under the sea

Using sophisticated multibeam imaging equipment aboard a French Navy vessel, Marc Fournier and colleagues mapped the structure of the enigmatic Owen fracture zone underneath the Arabian Sea.

With what objective in mind did you embark on this project?

The region where the Arabian, Indian and Somalian tectonic plates meet — a triple junction — is probably the only such feature in the oceanic domain that had not been surveyed with modern oceanographic instruments. Prior to our expedition, there was very little information regarding its precise location and geometry, although this triple junction can potentially shed light on the history of the break-up of the African plate and the formation of the Arabian plate. We were therefore eager to undertake a comprehensive geophysical survey of this fracture zone.

Did you encounter any scepticism from the community?

It was not easy to convince the scientific community of the interest of this project: it was just one more triple junction! Some researchers even argued that the Arabia–India plate boundary was inactive, and therefore the triple junction did not exist — but we showed that they were incorrect.

What sorts of data or samples were you after?

In this kind of study, the basic datum is the multibeam bathymetric map revealing the principal tectonic features of the triple junction, which is what we were attempting to construct. In addition to that, we collected magnetic data to record a history of the formation of a new oceanic lithosphere and allow us to reconstruct the evolution of the junction. Also, gravimetric and subsurface seismic profiles provided information on the nature and structure of the oceanic floor.

Were there any difficulties in obtaining the data? For example, encounters with dangerous animals?

We faced potential dangers of quite a different type! Numerous pirate attacks are reported off-shore the horn of Africa. To safely overcome this problem, we were accompanied on board



Sport at sunset. Researchers relaxing after a hard day's work on the rear deck of the research vessel *Beautemps-Beaupré*.

by a special unit of the French Navy, which was in charge of defending us against pirate threats. They had regular training with impressive shooting exercises.

What was the highlight of the expedition?

It was the discovery of a major strike-slip fault at the Arabia–India boundary that had never been observed before, only five days into the campaign. That morning, two of my colleagues, who were in charge of the four-hour watch, noticed that a spectacular tectonic structure was progressively appearing on the multibeam monitor. They woke me up and we almost immediately realized that we were sailing just above a major strike-slip fault! And the data recovered were of excellent quality owing to the efficiency of the hydrographic team of the 'Mission Océanographique de l'Atlantique'. As well as our scientific highlights, there was also the fact that the expedition started from the Seychelles and ended at Djibouti, where we had the opportunity to observe the Afar rift's spectacular recent normal faults and volcanoes similar to those observed at sea.

Did you learn anything new about yourself or your team members?

Boarding on a ship of the Navy was a new experience for all of us and we all carry

fond memories of this partnership. We had the chance to cross the equator on September 21 at noon, which corresponds to the autumn equinox, so the sun was exactly above us. A kind of hazing took place aimed at those who had never crossed 'the Line', which is a tradition in the marine community. We were accused of insulting the Roman god of the sea, Neptune. A trial was conducted by the others in costumes (the 'Dignitaries of the Line'), and punishments were given, which included being coated with grease and flour and dipped into a pool of water!

Did the trip give you any ideas for future research projects?

Most definitely! We discovered a new active fault and followed it for only 120 km, but its actual length is probably on the order of 700 km. We want to continue surveying this fault in order to better understand the evolution of the Arabia–India plate boundary after its inception in Jurassic times, about 150 million years ago, during the break-up of the Pangea Supercontinent.

This is the Backstory to the work by Marc Fournier and colleagues, published on page 54 of this issue.

