

3.0 THE GEOLOGICAL SYNTHESIS OF GEOPHYSICAL DATA

The Bass Basin had its origins in the rifting that was propagated around Australia from the northwest in an anti-clockwise direction. In Late Jurassic-Early Cretaceous times, this rifting impinged on the Antarctica-Australia landmass, creating a major basin across what is now the southern margins of the Australian continent. The basin comprised many parts and it is of that part underlying the waters of the Bass Strait, between Australia and Tasmania to the north and south, and the Flinders Island-Kent Island Group and King Island to the east and west, upon which this study will concentrate.

3.1 TECTONIC EVOLUTION

Smith (1986) has drawn attention to the fact that the simple Atlantic tectonic model of a single rifting phase being succeeded by a phase of thermal cooling of the lithosphere, does not apply to the Bass Basin. Two distinct periods of rifting complicate the tectonic history of this region:

- (1) The period of Otway rifting, when Antarctica separated from Australia (110-92 Ma),
- (2) The period of Tasman rifting, when the region of Lord Howe Rise, New Zealand, Chatham Rise, and Campbell Plateau, pulled away from Eastern Australia some 10-30 Ma after Otway rifting.

Since the second phase of rifting coincides with the period of the lithospheric cooling of the first, the effects of both will influence the depositional and tectonic history of the appropriate sediments.

3.2 THE OTWAY RIFT PHASE

A system of crustal fractures caused troughs to develop in an east to west direction within the Antarctica-Australia landmass. These were the sedimentary basins of the Otway, Bass and Gippsland.

Smith (1986) considered that the Bass Basin had been formed by "large, basement-attached, northwest to northeast faults with a rotational (listric) component, and near-vertical basement-attached, northeast to north to south faults which may be strike-slip and represent transfer faults." The deposition of Otway Group sediments was held to have occurred in half-grabens whose elongated trends had been disrupted by wrench movements associated with transfer faults.

This opinion is, in part, the consequence of the misidentification of both the top and bottom of the Otway Group on seismic data. Seismic reflections from sediments of the Otway Group never demonstrate the wedge-shaped patterns so typical of syndepositional beds in a half-graben. These reflections are, in fact, parallel or sub-parallel to each other, and converge at the margins of the depositional basin. It is likely that the deposition of the Otway Group within the Bass Basin occurred in a linear depression with fault-bounded margins (Fig 1; Enclosure 13).

Transfer faults, as proposed by Etheridge et al (1985), cannot be recognised within T/15P. Like the pattern of faults in the Gippsland Basin (Esso, "The 21st Century"), those within this permit are wholly the result of extensional forces in the Otway and Tasman periods of rifting.