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Growth of a Gas-bearing Transtensional Sub-basin Abutting the Bass Failed Rift; Shipwreck Trough, SE Australia

The eastern boundary of the Late Cretaceous Otway Basin rift comprises a large sinistral strike-slip fault system that grows to the south adjacent to western Tasmania. The eastern limit of the Shipwreck Trough forms the northern part and the tip of this fault system, abutting the Bass Strait failed rift. Turonian extension at ~1.5 mm/a created a large halfgraben along south-southwest dipping, listric master faults propagating north by footwall collapse in the south-western part of the Shipwreck Trough. Planar faulting occurred to the north and east. Both fault sets sole into a detachment zone in Early Cretaceous shales. The halfgraben accommodated deposition of Warre Formation reservoir rocks for the Thylacine and Geographe hydrocarbon accumulations. During Coniacian-Santonian extension, a Turonian accommodation zone underlying the eastern Shipwreck Trough was transformed into a sinistral strike-slip zone, the Shipwreck Fault. Extension of ~1.2 km to the west of the Shipwreck Fault contrasts with ~400 m to the east accommodated by ~800 m lateral displacement. Limited slow extension during the Campanian to Early Eocene resulted in a further 300 m strike-slip motion along the Shipwreck Fault. Late Early Eocene break-up in the Otway Basin terminated the extensional faulting along the Shipwreck fault system as the strike-slip motion moved south into the Tasman Fracture zone. The largest lateral offset along the Shipwreck Fault coincides with the deposition of the regional sealing unit, controlling its thickness and facies. Hydrocarbon generation and migration is dependant on a thick Maastrichtian and Tertiary succession for burial of Early Cretaceous source-rocks.