PETROLEUM PROSPECTIVITY

PERTH BASIN

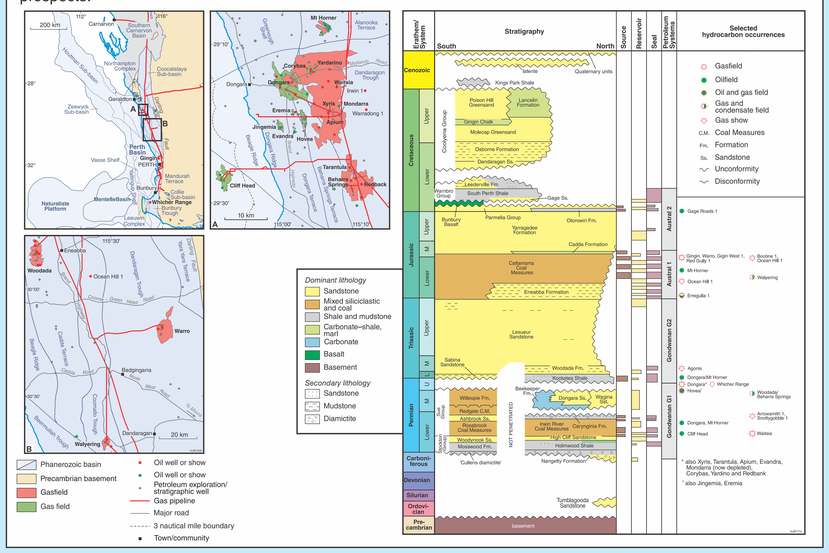
Age: Permian to Cretaceous **Size:** 170 000 km^2

Sediment thickness: up to 12 km

Geological setting: North–south elongate rift trough that culminated in Early Cretaceous continental breakup.

Exploration history: began in 1949; 362 wells onshore, 59 wells offshore; 21 oil and gas-condensate fields onshore and one offshore oilfield; most exploration and all production in northern part of basin.

Petroleum prospectivity: well demonstrated in north by producing fields; main sources Permian Irwin River Coal Measures (gas), Lower Triassic Kockatea Shale (oil); reservoirs in Permian to Jurassic sandstones; many untested prospects.



OFFICER BASIN

Age: Neoproterozoic to lower Paleozoic (in WA)

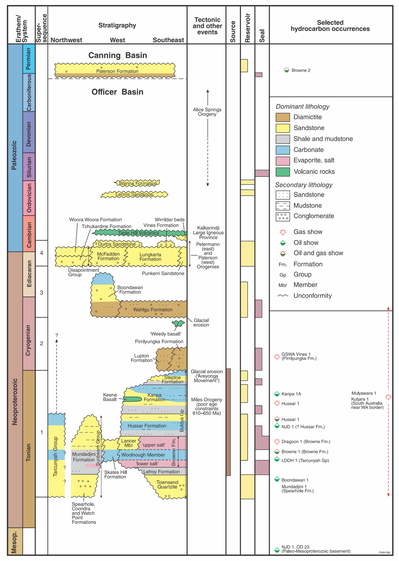
Size: 310 000 km^2 in WA (total 525 000 km^2 incl SA)

Sediment thickness: up to 8 km

Geological setting: intracratonic basin with complex tectonic history dominated by halotectonics.

Exploration history: began in early 1965; 17 exploration and stratigraphic wells; over 6500 km seismic; no commercial discoveries.

Petroleum prospectivity: minor oil and gas shows demonstrate some hydrocarbon migration; identified source rocks are thin and localized, but mature; excellent sandstone reservoirs with seals; halotectonic traps.



CANNING BASIN

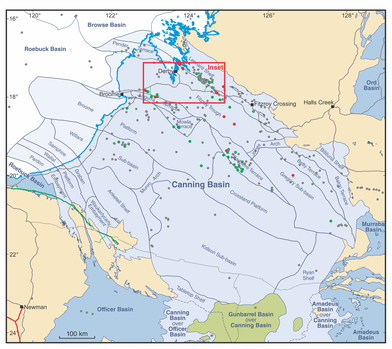
Age: Ordovician to Cretaceous **Size:** 795 000 km^2 (740 000 km^2 onshore)

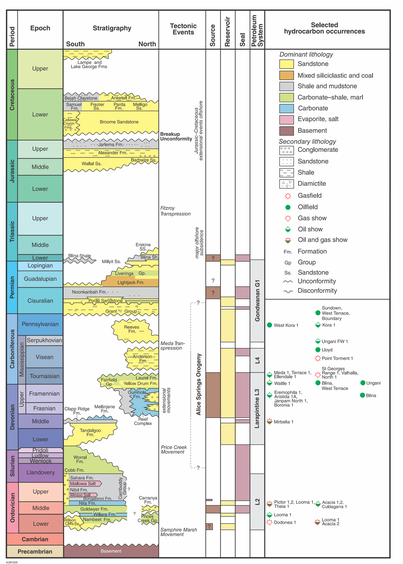
Sediment thickness: at least 15 km in Fitzroy Trough.

Geological setting: basin initiated as northwest-oriented early Paleozoic intracratonic rift; multiphase history of extension, compression and thermal sag.

Exploration history: began in early 1920s; 325 exploration and stratigraphic wells onshore and 16 offshore, over 175 000 km seismic; several small oilfields have been produced on the Lennard Shelf and Fitzroy Trough including the 2011 Ungani oil discovery; most of basin underexplored.

Petroleum prospectivity: demonstrated prospectivity on Lennard Shelf, but discovered fields are small; Lennard Shelf system mainly Upper Devonian marine source and Devonian to Permian carbonate and sandstone reservoirs; Ordovician potential indicated by widespread oil and gas shows, excellent source rocks, and local salt seal.





SOUTHERN CARNARVON BASIN

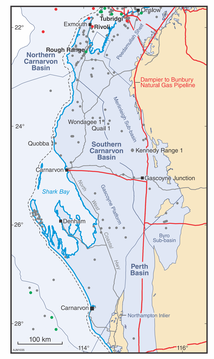
Age: Ordovician to Cretaceous **Size:** 200 000 km^2

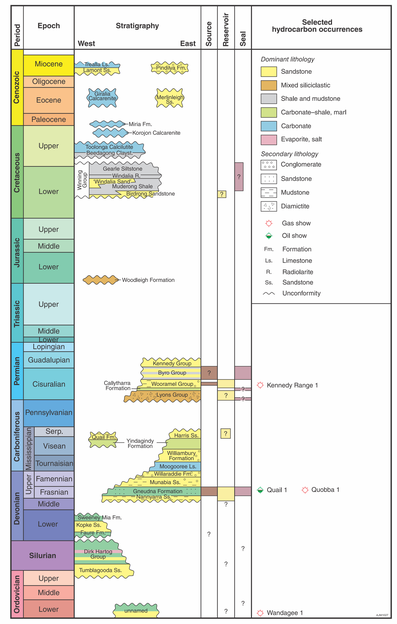
Sediment thickness: up to 7 km of Paleozoic.

Geological setting: North–south elongated basin with two major depocentres extends from west of the Yilgarn Craton to the edge of the continental shelf.

Exploration history: began in 1930s; 105 exploration and stratigraphic wells onshore, 2 wells offshore; no commercial fields discovered; few valid tests of plays.

Petroleum prospectivity: shows indicate the existence of a hydrocarbon system; source rocks in Silurian (thin, oil-prone), Devonian (rich, oil-prone) and Permian (gas-prone); potential reservoirs Ordovician to Cretaceous age.





NORTHERN CARNARVON BASIN

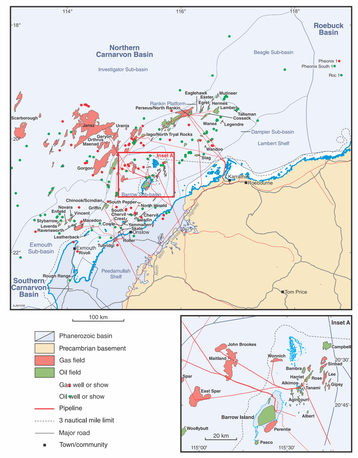
Age: Triassic to Neogene **Size:** 500 000 km^2 (mainly offshore)

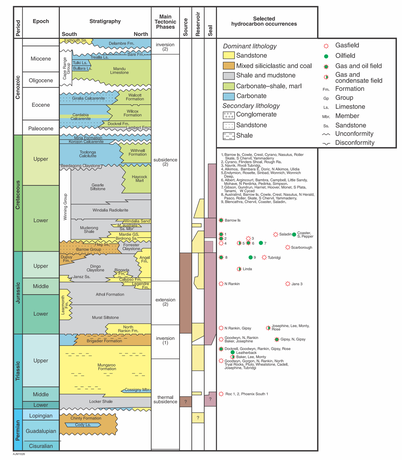
Sediment thickness: up to 15 km Mesozoic section.

Geological setting: series of southwest-trending troughs related to breakup of Gondwana.

Exploration history: oil discovered in first exploration well (Rough Range 1) in 1953; 45 producing fields and numerous undeveloped hydrocarbon accumulations; extensive 2D and 3D seismic grids in northern offshore area; southern area and onshore area underexplored.

Petroleum prospectivity: well demonstrated by numerous producing fields; main source Upper Jurassic Dingo Claystone; reservoirs primarily Upper Jurassic–Lower Cretaceous sandstones; Miocene faulted anticlines provide traps.





AMADEUS BASIN

Age: Neoproterozoic to Devonian; predominantly Neoproterozoic to Cambrian in Western Australia (WA).

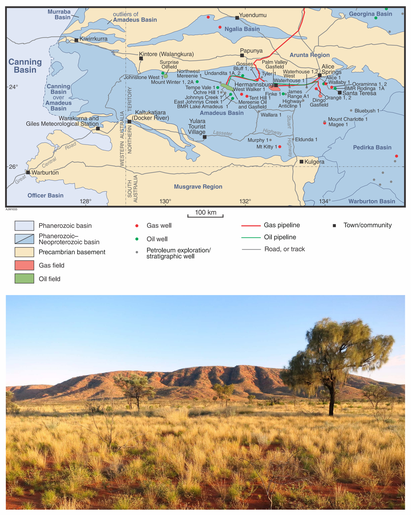
Size: ~46 000 km^2 in WA (total 180 000 km^2 including Northern Territory (NT))

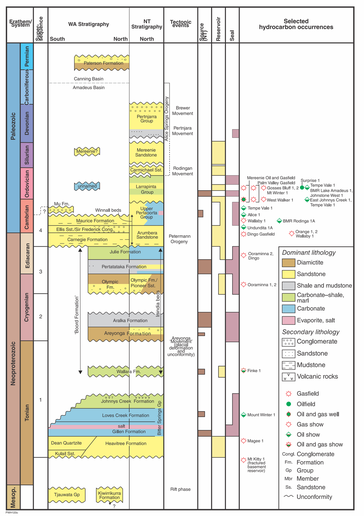
Sediment thickness: up to 14 km in NT; up to 6.5 km in WA.

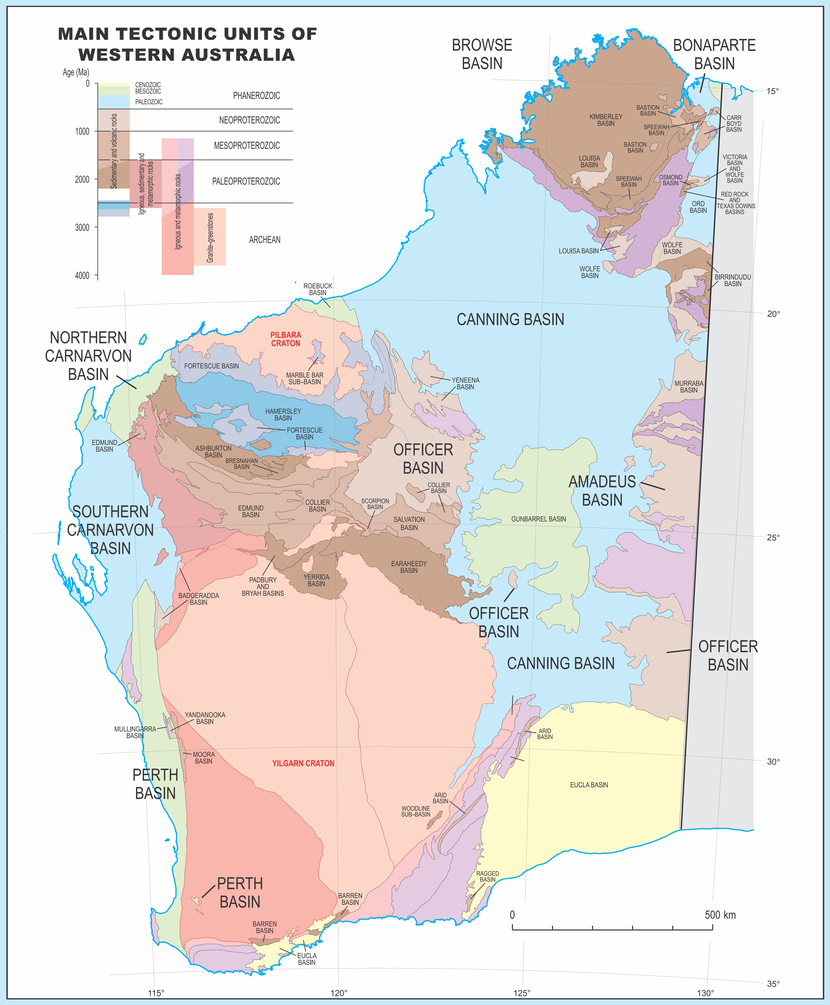
Geological setting: intracratonic basin with complex tectonic history influenced by halotectonics.

Petroleum exploration history: drilling in NT began in early 1960s; 38 exploration wells and numerous development wells; Palm Valley gasfield and Mereenie oil and gasfield producing since 1980s; gas pipeline from Dingo gasfield to Alice Springs recently completed; Surprise oilfield saw recent production, but currently shut in; limited exploration and no exploration drilling in WA.

Petroleum prospectivity: demonstrated Ordovician and Neoproterozoic prospectivity in NT based on producing fields, but Ordovician section likely too thin to be prospective in WA; multiple Neoproterozoic petroleum systems may exist in WA based on similar stratigraphy and facies to NT; local salt seal over oldest system inferred; halotectonic structures may produce a variety of traps.







BONAPARTE BASIN

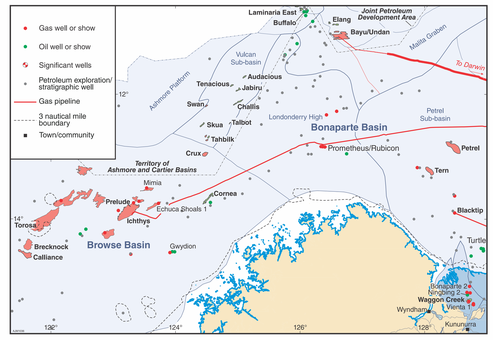
Age: Cambrian to Permian onshore, extends to Neogene in offshore **Size:** 250 000 km^2 (20 000 km^2 onshore)

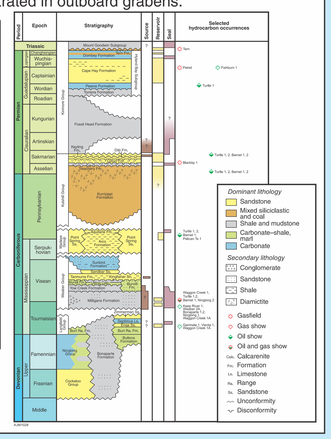
Sediment thickness: up to 17 km

Geological setting: major rifting in Devonian and Mesozoic; basin tilted north such that oldest component exposed in south onshore; joins to Browse and Money Shoal Basins.

Exploration history: since 1940s; 96 wells offshore and 9 wells onshore (WA portion); 2 producing gasfields; 200 000 km of 2D seismic, 19 000 km^2 of 3D seismic offshore, 6650 km onshore; numerous gas and oil accumulations discovered in offshore WA portion.

Petroleum prospectivity: prospectivity demonstrated in offshore area by discovered fields, significant shows onshore; Devonian–Carboniferous source and Devonian–Permian reservoirs in Petrel Sub-basin, including potential onshore; Jurassic source and Triassic–Cretaceous reservoirs demonstrated in outboard grabens.





BROWSE BASIN

Age: Paleozoic to Cenozoic, extends to Neogene in offshore

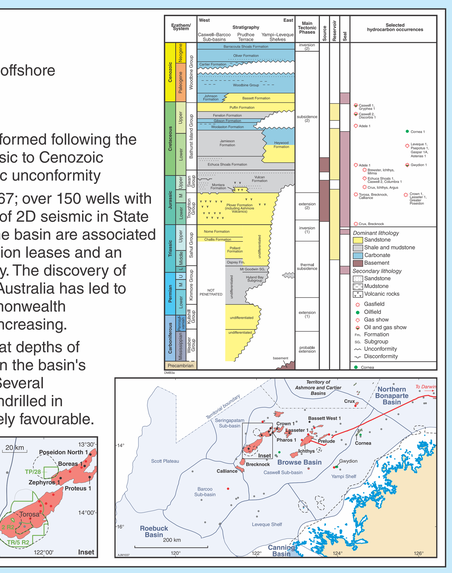
Size: 140 000 km^2

Sediment thickness: up to 15 km

Geological setting: northeast-trending depocentre formed following the breakup of Gondwana; up to 4000 m of Upper Jurassic to Cenozoic marine sediments deposited above the main Jurassic unconformity

Exploration history: Exploration commenced in 1967; over 150 wells with over 25 hydrocarbon discoveries; over 3000 line km of 2D seismic in State waters within the basin. The only State interests in the basin are associated with the Torosa gasfield over Scott Reef within retention leases and an exploration permit near the Zephyros 1 gas discovery. The discovery of small islands in the Scott Reef area by Geoscience Australia has led to a revision of the boundaries between WA and Commonwealth jurisdictions, resulting in the WA administered area increasing.

Petroleum prospectivity: Reservoirs are identified at depths of between 4000–5000 m, or between 3000–3500 m on the basin's margin, where stratigraphic plays may be valuable. Several structures and potential stratigraphic plays remain undrilled in the basin. The hydrocarbon discovery rate is extremely favourable.



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Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**
Petroleum Division

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