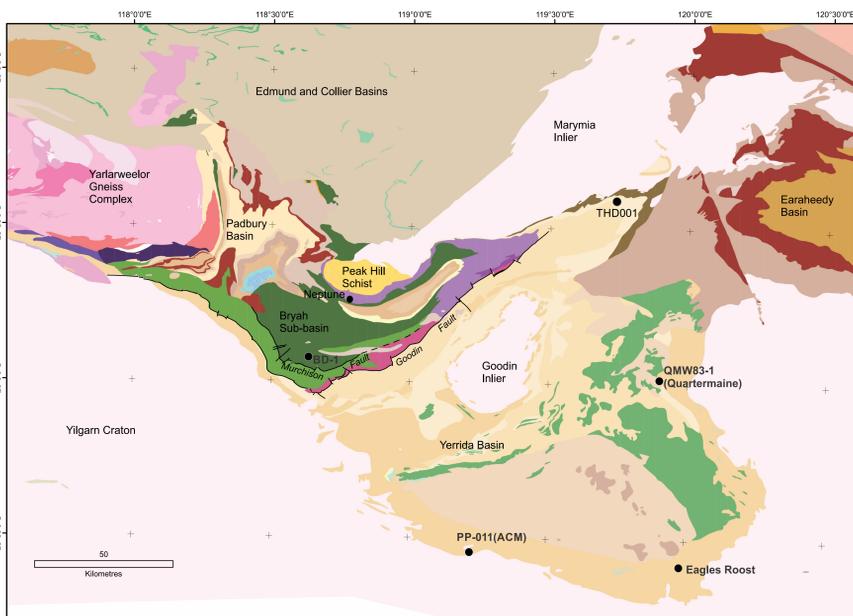


# EASTERN CAPRICORN BASINS

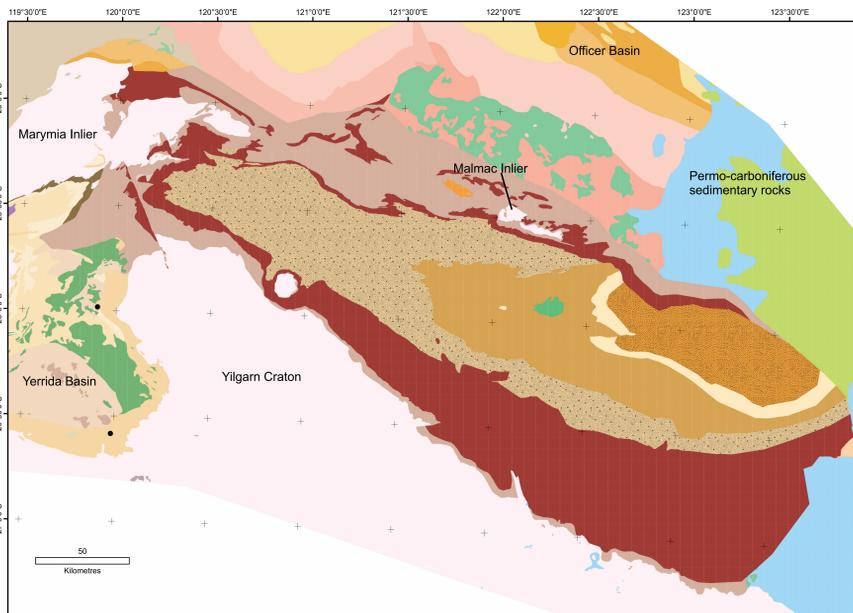
## PROTEROZOIC YERRIDA, BRYAH, PADBURY and EARAHEEDY BASINS

### THE PROJECT

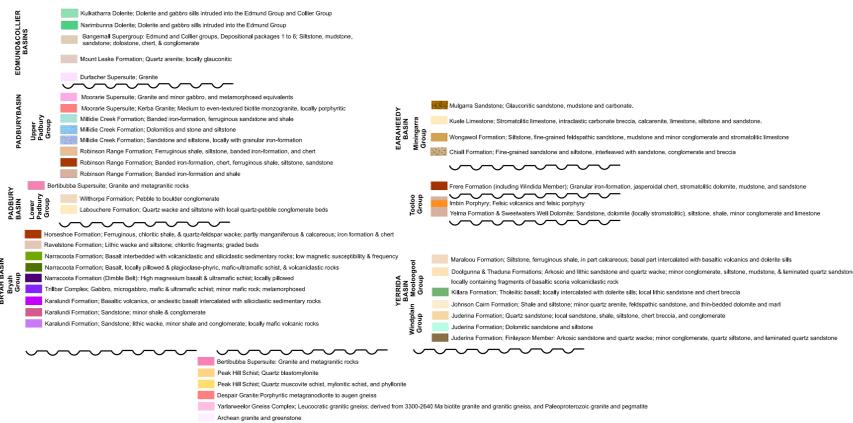
Following completion of field mapping and publication of the Proterozoic Edmund and Collier Basins project the focus of investigation has moved to the older Eastern Capricorn Basins: the Yerrida, Bryah, Padbury and Earahedy Basins. The basins extend about 700 km along the south-eastern margin of the Capricorn Orogen and northern margin of the Yilgarn Craton. The basins cover an area over 70 000 km<sup>2</sup> and have a cumulative thickness of 20 km. Most of these basins were mapped and published as printed paper maps just over a decade ago at 1:100 000 scale. The current project will be published as a seamless digital coverage in the Eastern Capricorn Basins Geological Information Series including accompanying Explanatory Notes. This will cover the 1:250 000 map sheets **PEAK HILL, NABBERU, STANLEY, KINGSTON, GLENGARRY**, and parts of adjacent sheets **ROBINSON RANGE, WILUNA, ROBERT** and **DUKETON**. The project will use new geophysical, remote sensing, geochemical, geochronological, and stratigraphic data to assemble the bedrock and regolith geology. Initial work involves compiling legacy geological field observations into WAROX.



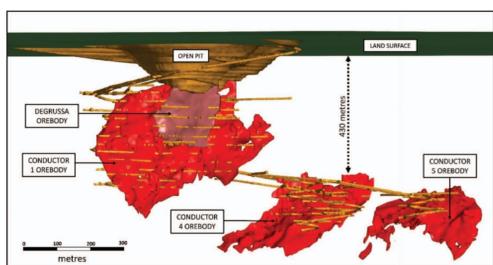
Simplified geological map of the Bryah, Padbury and Yerrida Basins



Simplified geological map of the Earahedy Basin



DeGrussa open pit

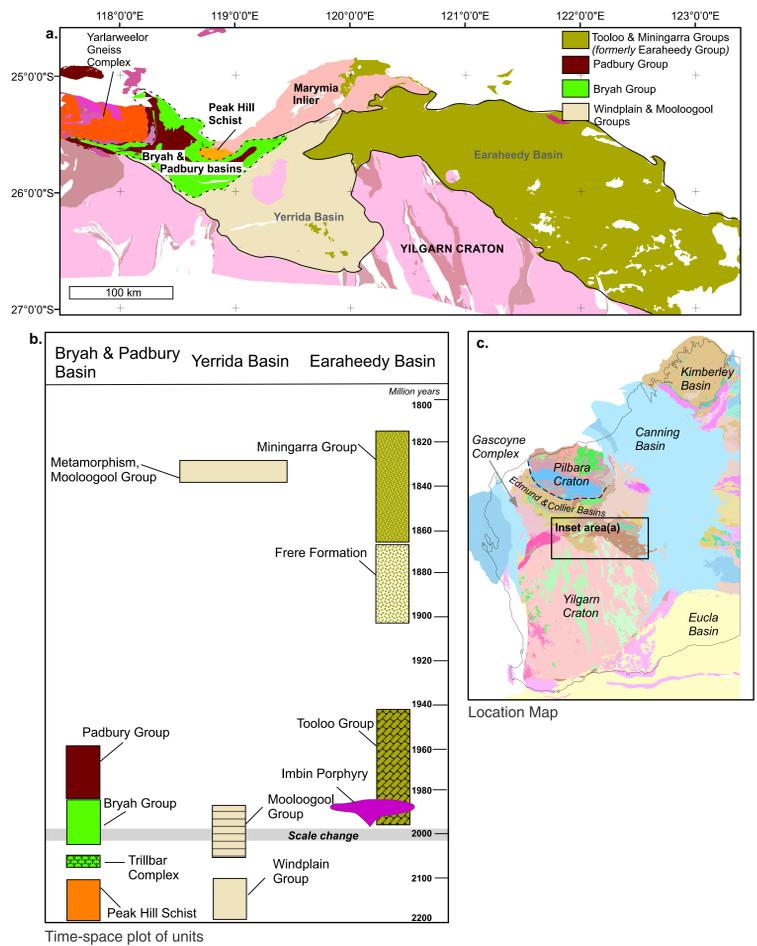


DeGrussa underground

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Images from Occhipinti et al., Precambrian Research  
300 (2017), 121-140



### TECTONIC SETTING

The tectonic setting of these basins is still poorly understood but they are thought to have developed in a variety of settings associated with rifting, accretion, and passive-margin tectonics. The age of the basins are poorly constrained but appear to have developed between c. 2170 and 1800 Ma and were deformed and metamorphosed at low metamorphic grade during the 1820–1770 Ma Capricorn Orogeny.

### STRATIGRAPHY

#### Yerrida Basin

The 2170–1800 Ma Yerrida Basin includes the basal Windplain Group, the Juderina and Johnson Cairn Formations comprising quartz sandstones, pebble conglomerate, siltstone, stromatolitic chert, evaporative carbonates and thin bedded dolomite. The overlying Mooloolool Group includes lithic sandstone and siltstone, thin volcanic lenses, ferruginous shale, tholeiitic basalts and dolerites sills of the Thaduna, Doolgunna and Maraloo Formations.

#### Bryah Basin

The lowermost part of the 2080–1800 Ma Bryah Basin includes a succession of mafic and ultramafic rocks of the c. 2080 Ma Trillbar Complex. This is tectonically overlain by siliciclastic sedimentary rocks and mafic, ultramafic and felsic volcanic rocks of the Karalundi and Narracoota Formations. The upper part of the Bryah Group, consists of turbiditic sandstone and siltstone with minor iron-formations of the Horseshoe and Ravelstone Formations.

#### Padbury Basin

The 2000–1800 Ma Padbury Basin is predominantly turbiditic in nature, consisting of quartz wacke, and siltstone with minor conglomerate of the Labouchere Formation, and pebble to boulder conglomerate, siltstone and dolomitic sandstone of the overlying Wilthorpe Formation. This succession is overlain by ferruginous shale, siltstone, banded iron-formation, and chert of the Robinson Range Formation and by sandstone and shale of the Millidie Creek Formation.

#### Earahedy Basin

The 1990–1648 Ma Earahedy Basin has a broad asymmetrical synclinal structure, virtually flat-lying in the south, but tightly folded and sheared in the north. It contains the older Tooloo Group and younger Miningarra Group separated by the Frere Formation and Windidda Member. The 1990–1946 Ma Tooloo Group includes the Yelma Formation of sandstone and siltstone recording a marine transgression, with a basal conglomeratic alluvial fan deposit, the Yadgimurrin Member, overlain by the stromatolitic Sweetwaters Well Dolomite. The 1891–1808 Ma Frere Formation comprises granular iron-formation, jasperoidal chert, granular siliceous-formations, iron-rich siltstone and mudstone, and sandstone, with minor tuffaceous lenses. The Windidda Member comprises stromatolitic carbonate, siltstone and jasper. The unconformably overlying 1808–1648 Ma Miningarra Group consists of fine-grained sandstone and siltstone interbedded with conglomerate and intraclastic breccia of the Chiall Formation at its base. This is overlain by siltstone, fine-grained and locally glauconitic feldspathic sandstone, and mudstone, locally with intraclastic conglomerate and stromatolitic limestone of the Wongawol Formation. These in turn are overlain by interbedded stromatolitic limestone, with carbonate breccia, siltstone and sandstone of the Kulele Limestone, and in turn by glauconitic sandstone, shale and carbonate of the Mulgarra Sandstone.

### MINERAL ENDOWMENT

Operating mines in the Eastern Capricorn Basins include DeGrussa (Cu Au), Fortnum (Au Ag) and Horseshoe Lights (Cu Au) in the Bryah Basin. Nearby operating mines in basement rocks of the Archeon Yilgarn Craton include Plutonic (Au) in greenstones of the Marymia Inlier, and Plutonic Dome (Au) in granitic basement rocks.

#### DeGrussa

DeGrussa, which is operated by Sandfire Resource NL, is a high-grade Cu–Au Besshi-type volcanic massive sulfide deposit hosted in extensive mafic volcanic rocks of the Karalundi Formation in the Bryah Basin. As of Dec 2016, 301 313 t Cu and 175 959 oz Au had been produced and remaining reserves totalled 8.9 Mt at 3.6% Cu and 1.4 g/t Au. Total endowment (Production plus Reserves) at the deposit is 14.5 Mt at 4.3% Cu and 1.2 g/t Au. The deposit is interpreted as a massive sulfide accumulation that formed by subsea floor replacement, of turbiditic sedimentary facies and basalt sills, by hydrothermal fluids.

#### Fortnum

Fortnum is hosted in the upper part of the Bryah Group in turbiditic sandstone, siltstone and iron-formation. The deposit has a historical production of 1.7 M ounces Au. Measured, Indicated and Inferred Resource is 29.7 M tonnes at 1.84 g/t Au, containing 1.75 M ounces Au. Previous activity ceased in 2007 but the mine was acquired by Westgold Resources in 2015. The company has refurbished an existing 1.0 Mtpa processing plant and is operating existing low grade ore stockpiles. Open pit mining is planned in Phase 2 of the operation.

#### Horseshoe Lights

Horseshoe Lights is hosted in felsic volcanic and volcanoclastic rocks of the Narracoota Formation, towards the base of the Bryah Group. To 1994, 300 000 oz Au and 54 000 tonnes Cu have been recovered.