

CAPRICORN OROGEN PROJECT OVERVIEW

Capricorn Orogen

The Capricorn Orogen is a major zone of Proterozoic sedimentation, deformation, metamorphism, and magmatism between the Archean Yilgarn and Pilbara Cratons. The orogen includes metamorphic and igneous rocks of the Gascoyne Province, a number of sedimentary basins, including the Ashburton, Earraheedy, Edmund, and Collier Basins, as well as the deformed margins of the Pilbara and Yilgarn Cratons (Fig. 1).

Recent work in the Capricorn Orogen

Work for the Edmund and Collier Basins has focussed on the compilation of the WONYULGUNNA 1:100 000 map sheet in the eastern part of the Capricorn Orogen (PANEL 2), completing the mapping of the COLLIER 1:250 000 sheet and the Edmund and Collier Basins. The WONYULGUNNA map was compiled from digital data including aerial photographs, LANDSAT, ASTER, aeromagnetic and gravity data, as well as from legacy field observations held in the WAROX database. The map sheet area contains mostly Mesoproterozoic sedimentary rocks of the Collier Basin that are dominated by ferruginous sandstone and siltstone of the Backdoor and Calyie Formations; however, Archean granitic rocks and banded iron formation of the Marymia Inlier are present in the southeastern corner of the sheet.

Gascoyne Province mapping continued on the UAROO 1:100 000 map sheet (PANEL 3). This sheet contains extensive siliciclastic rocks of the 1679–1455 Ma Edmund Group as well as older siliciclastic rocks of the 2008–1796 Ma Wyloo Group and abundant granitic rocks of the 1820–1775 Ma Moorarie and 1680–1620 Ma Durlacher Supersuites. All of the rocks have been strongly folded and faulted, with the oldest rocks of the Wyloo Group showing features of having been strongly deformed at least two times. On the eastern margin of the sheet, mafic volcanic, volcanoclastic and intrusive rocks of the June Hill Volcanics have been identified.

Over the past eight years the GSWA has routinely collected in situ Lu–Hf isotopic data from magmatic and inherited zircons from across the State. This has been complimented in some areas, particularly the Gascoyne Province, with additional in situ oxygen isotope data. PANEL 4 presents a summary of this isotopic data for the Gascoyne Province. The long-lived magmatic history of the province records a progressive evolution from subduction and continental convergence to intracontinental reworking and finally cratonization. The isotopic evolution of these magmatic rocks provides a unique insight into the processes that drive cratonization and stabilization of continental crust.

The northern part of the Capricorn Orogen is host to numerous gold and base metal deposits including Paulsens and Mount Olympus. A collaborative GSWA — Curtin University project, funded by an ARC Linkage grant (LP130100922) has been developed to investigate the tectonothermal history of this part of the orogen and the timing of associated mineralization. PANEL 5 shows the results of in situ U–Th–Pb SHRIMP dating of monazite and xenotime from the Paulsens deposit, precisely defining not only the age of the host rocks, but the precise timing of hydrothermal alteration and gold mineralization. With this knowledge the exploration search area can be effectively targeted on host rocks and structures of the appropriate age.

In order to resolve the tectonothermal history of a region, knowing the precise age and range of granite magmatism is critical. Zircon is the most widely used geochronometer to determine the crystallization ages of granites. However, despite the utility of zircon in most circumstances, it can be unreliable for low-temperature leucocratic crustal melts, because these melts may not crystallize zircon. PANEL 6 investigates the use of U–Th–Pb SHRIMP dating of magmatic monazite to resolve the crystallization history of the Thirty Three Supersuite in the Gascoyne Province, a key resource for Lithium in the State.

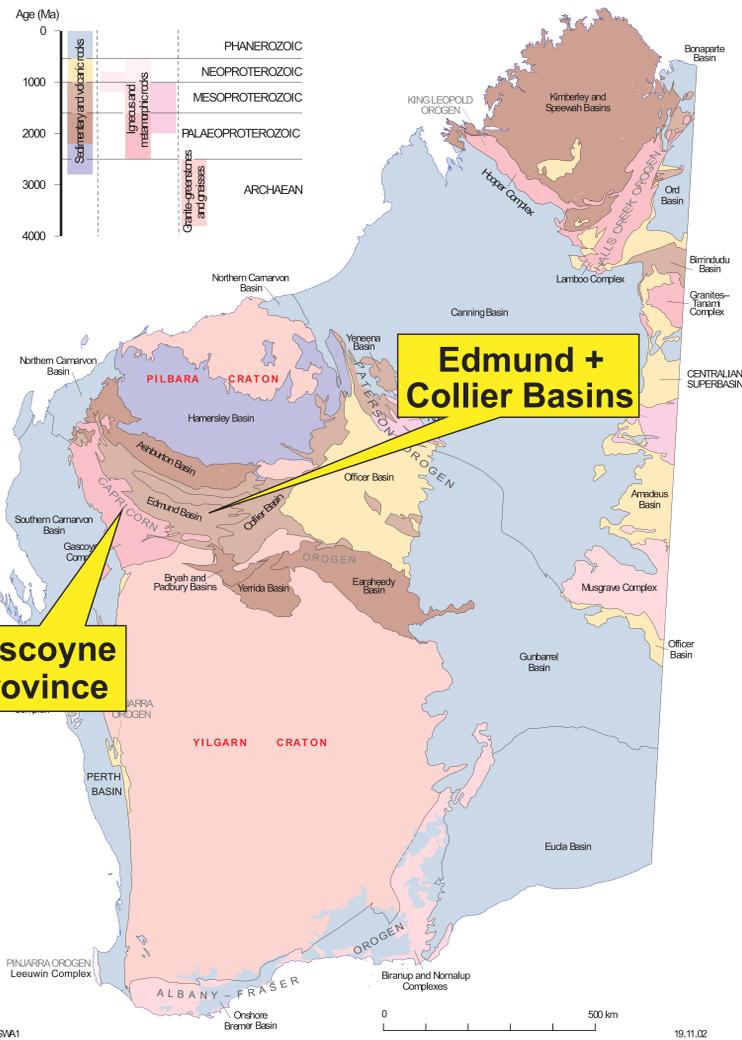


Figure 1. Tectonic map of Western Australia

Gascoyne Province and Edmund and Collier Basins Mapping Program

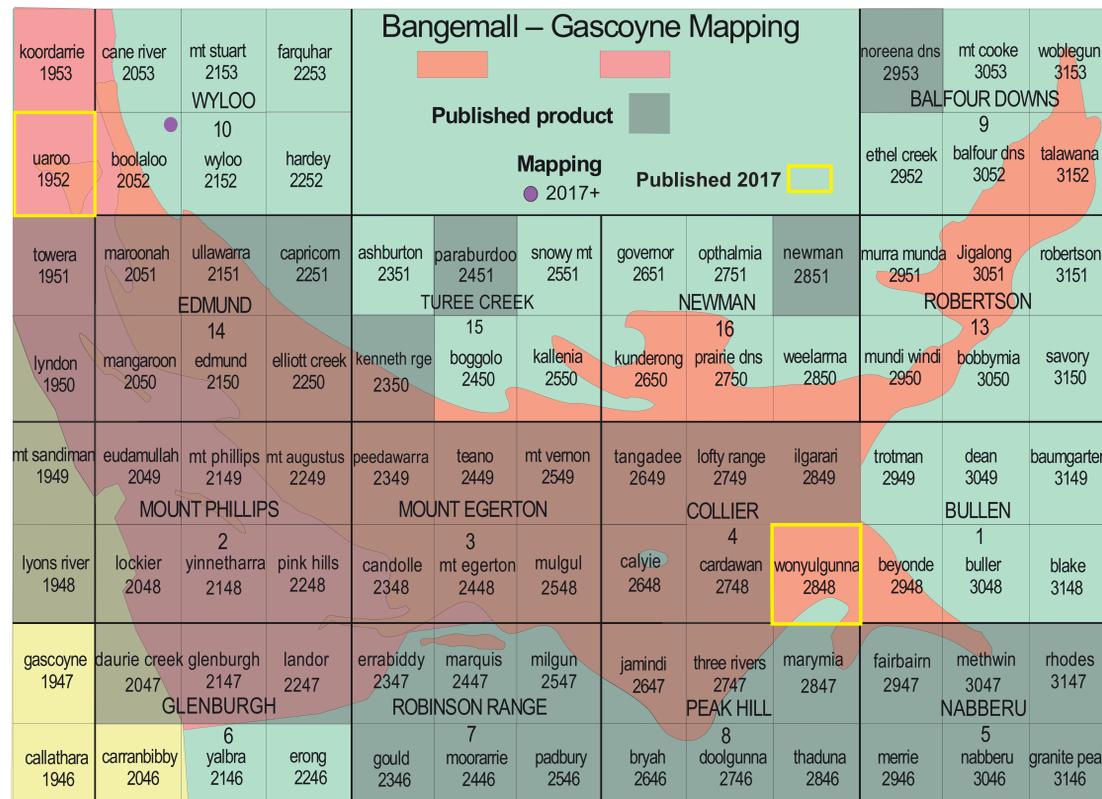


Figure 2. 1:100 000 map sheet index

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Products for 2016/2017

WONYULGUNNA and UAROO 1:100 000 maps (first editions)

West Capricorn Geological information Series update 2017, including: WONYULGUNNA and UAROO 1:100 000 map sheets

GSWA Report on K–Ar dating of fault gouges in the Edmund and Collier Basins

GSWA Record defining the age, composition and petrography of the 1515–1505 Ma Waldburg Dolerite

GSWA Report on the oxygen and hafnium isotopic evolution of magmatic and inherited zircons from the Moorarie and Durlacher Supersuites of the Gascoyne Province

Compilation of legacy data – aerial photographs, field notebooks and samples – for the Earraheedy Basin (Fig. 1). In 2017/2018 a seamless digital data package (East Capricorn Geological information series) with explanatory notes will be published

