Lambina Opalfield

— a gem in South Australia's Far North

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Introduction

Lambina Opalfield, 100 km south of the Northern Territory border in South Australia's remote Far North, is Australia's most recently worked source of precious opal. Although diggings on this field have been worked intermittently for at least 30 years, it has only been in the last decade that production of precious opal has become significant. This update of Lambina includes information on the opalfield's history, geology, production, and characteristics of the opal. When hypothesising the formation of opal at Lambina, the author emphasises the possible influence of Tertiary palaeochannels as conduits for water movement, and hence silica movement, and the deposition of opal in immediately adjacent areas.

Location

Lambina Opalfield is 58 km northeast of the town of Marla, 90 km northeast of Mintabie Opalfield, and 10 km south of Lambina Homestead (Fig. 1). Access to this remote area is either from the Stuart Highway eastwards along the road to Granite Downs and Lambina, and then along the old Oodnadatta Road that leaves this road ~60 km east of Granite Downs and 5 km south of Lambina Homestead, or east from Marla 11 km then northeast to Broken Leg diggings and generally northwards to Lambina Opalfield. The latter access is the preferred route taken by miners. Tracks from the Seven Waterholes area lead to various 'diggings' around Lambina (Barnes et al., 1992). Figure 2 locates the opalfield and its surrounding 'diggings'.

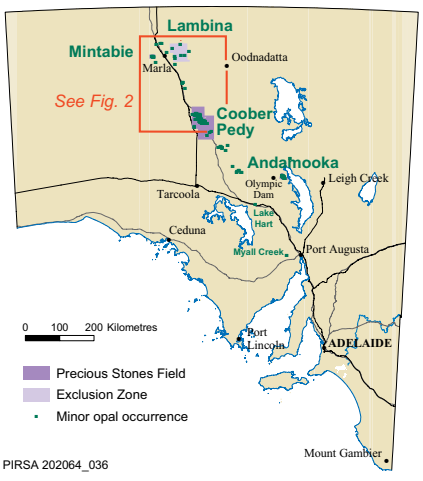


Fig. 1 Location of South Australia's opalfields.

Background

Lambina Opalfield was probably discovered in the 1930s but was not reported on until 1956. It was visited and worked only intermittently in the 1950s, 1964, 1978 (Flint, 1980; Hiern, 1967), and then worked seriously from 1989 to the mid-1990s when available opaliferous 'ground' at Mintabie appeared to be diminishing. A few miners tried their luck at the Seven Waterholes diggings (at the western end of the opalfield) and, when word spread of their success, many others attempted to take out opal claims over this occurrence which appeared to spread eastwards. As Lambina Opalfield was located on a pastoral lease, the legislation required to take out a mineral claim for opal was cumbersome and gaining access was not easy.

Barry Lindner, President of the Mintabie Progress Association, and later the South Australia Opal Miners Association (SAOMA) and former

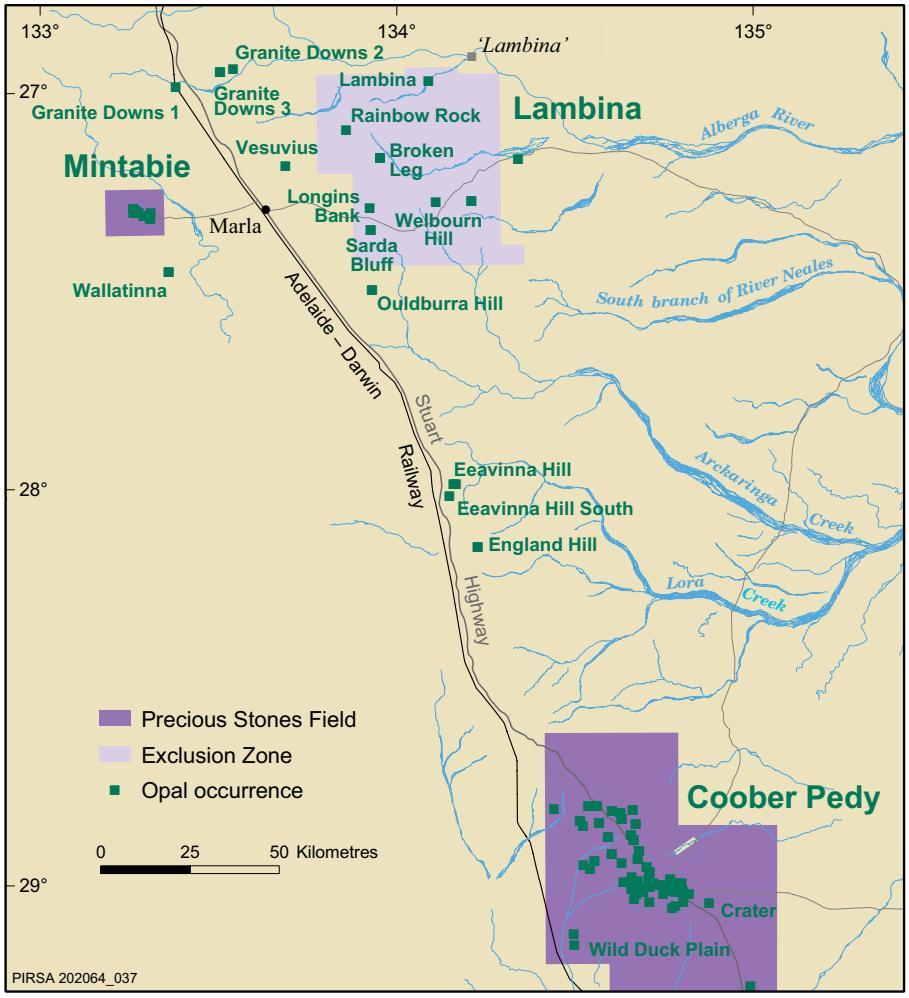


Fig. 2 Map of the Lambina opalfield and its surrounding 'diggings' in relationship to Mintabie and Coober Pedy.

Department of Minerals and Energy Resources, became guarantors for rehabilitation of 'diggings', with funds collected from a bond levied on each miner taking out a lease near Lambina. This streamlined the process, but there was still much paperwork involved. Native title issues were solved by having the appropriate Aboriginal community make a native title claim, providing a group with whom the miners could negotiate. The Lambina Native Title Agreement between SAOMA and the traditional owners — the Antakirinja and Yunkuntjatjara people — was signed on 1 June 1998. Lambina and its surrounds therefore became more accessible to opal miners, and over 200 claims were registered in the next four months (see MESA Journal 11, pp.28-29 for further information).

The Aboriginal people negotiated first rights to noodle (fossick) for opal on the bulldozed dumps from open-cut operations, and miners were allowed to camp on an area set aside for camping. But it was agreed that no permanent residences would be allowed on the opalfield.

As Lambina was not to be proclaimed a Precious Stones Field, no officer from PIRSA was stationed on site, and miners had to travel to Marla to register claims. Operations at Lambina and Mintabie are now coordinated from Coober Pedy.

An exclusion zone was proclaimed over Lambina in the mid-1990s to allow miners access to potential opal-bearing areas. Mineral exploration licence holders cannot include exploration for opal in the terms of the licence (Figs 1, 2).

Opal

Opal from Lambina is hard by opal standards, and occurs as seams and infilling cracks around nodules, and by filling moulds or replacing fossils. The high-quality gems include white (light) and crystal opal displaying a good play of colour. Up to 50% of Lambina opal does not fluoresce under long-wave ultraviolet light (Stuart Jackson, Coober Pedy TAFE, pers. comm., 2001). However, much of the opal is covered by clay and soil, which tends to dull the fluorescence, and further work is required to determine if all Lambina opal does fluoresce after it is cleaned up.

Production

Opal production from fields throughout Australia is difficult to estimate, but by using a formula determining the amount of mining activity via the number of active claims, and documenting the amount of equipment on particular opalfields, an estimate of production is made in South Australia every six-months and then combined into either a calendar or financial year total. Table 1 provides annual estimates of Lambina opal production taken from the PIRSA Division of Minerals and Energy records.

Estimates from 1989 to 1998 are unknown, as all estimates to 1998 were included in the Mintabie figures. However, since 1999 Lambina and other Far North opal diggings have been treated as a separate entity. Note that the estimates from 1995 to 1998 are deduced only from discussions with PIRSA's Coober Pedy Area Officers.

Production increased through the late 1990s and peaked in 2001, with a slight decrease in 2002. Total production from Lambina and near surrounds has been estimated to exceed A$43 million. Production prior to 1989 is assumed to be minor in comparison to that of recent years, when large mining equipment was introduced.

Geology and formation of opal

Opal at Lambina and other Far North opal 'diggings' is hosted mainly in rocks of Cretaceous age. The age of the opal throughout the Great Artesian Basin

Table 1 *Estimates of Lambina opal production.*

Year	Value (A$)
1989	no data
1995	50 000
1996	1 000 000
1997	3 900 000
1998	5 100 000
1999	7 500 000
2000	8 250 000
2001	10 211 000
2002	7 322 000
Total	43 333 000

Investigator Mark 10 auger drill. (Photo 049376)

Trench digger in a bulldozer cut. (Photo 049377)

Bulldozer in an open cut. (Photo 049378)

Tracked drilling rig. (Photo 049379)

(GAB) has been a point of speculation, and claimed ages range from Cretaceous through to Recent. This has led to a variety of geological models being proposed for opal formation because, if the age of the formation cannot be dated, then the models for formation are likewise many and varied. It is generally thought that Lambina opal formed during Tertiary times.

The factors common to most South Australian deposits (and the same appear to apply to other opalfields in Australia) are that opal is associated with weathered sediments of the GAB, and generally with host rocks of Cretaceous age. Mintabie is the exception, in that the opal-hosting rocks are much older; but they are also weathered and do have onlapping Cretaceous sediments (Townsend, 1981), although much of these sediments has been eroded away leaving only remnants around Mintabie, and outliers further west.

Most of the South Australian GAB sediments are marine (Bulldog Shale), whereas in Lightning Ridge and parts of the Winton Formation in Queensland, the GAB sediments are terrestrial (Horton, 2002). Horton also suggested that there was gentle warping of the GAB sediments at ~24 Ma, and that the opalisation and silcrete formation occurred at or after this, approaching the 20–18 Ma age (Tertiary times) suggested for much of the South Australian opal.

All Australian opalfields have silcrete (silicified claystone, siltstone or sandstone) capping the Cretaceous and/or Tertiary sediments; this is also interpreted as having developed during Tertiary times. However, the timing of opalisation is not necessarily identical to that of the silicification, despite there being a strong association in geographic locality between the two.

Lambina opal, 20–30 mm thick. (Photo 049380)

At Lambina, opalised sandstone occurs as well as opal introduced into cracks, nodules and replacing fossils such as marine snails, belemnites and bivalves.

Influence of palaeochannels

Tertiary palaeochannels (ancient river channels) have been found on many opalfields, and these are considered important factors in opal genesis. They are generally coarse-grained sand bodies with good porosity that could have acted as channels or conduits for water movement, and hence silica movement and deposition of opal in adjacent areas. Similarly, faulting or fault zones are associated with opal formation, and are therefore also considered to be conduits for silica-rich groundwater.

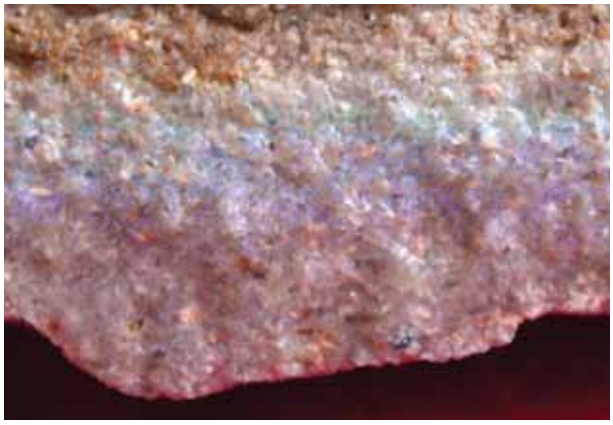
The digital elevation model (DEM) of Lambina (Fig. 3) indicates the possibility of remnant channels trending east to west, and opal occurrences in the area extending from Lambina through to Todmorden Outstation and south to Eeavinna Hill and England Hill occur in 'breakaway' country of mesas and eroded plains that cut into the Early Cretaceous Bulldog Shale.

As plotted on the DEM, many known occurrences of opal are associated with these mesas (topographic

A parcel of Lambina opal. (Photo 049381)

Lambina opal. (Photo 049382)

Sorting Lambina opal; the left dish contains opal stained with iron. (Photo 049383)



Opalised sandstone from Rainbow Rock, southeast of Lambina. Note that opal fills the pore spaces between quartz grains in Cretaceous or Tertiary sandstone. The seam is 30 mm thick. (Photo 049384)

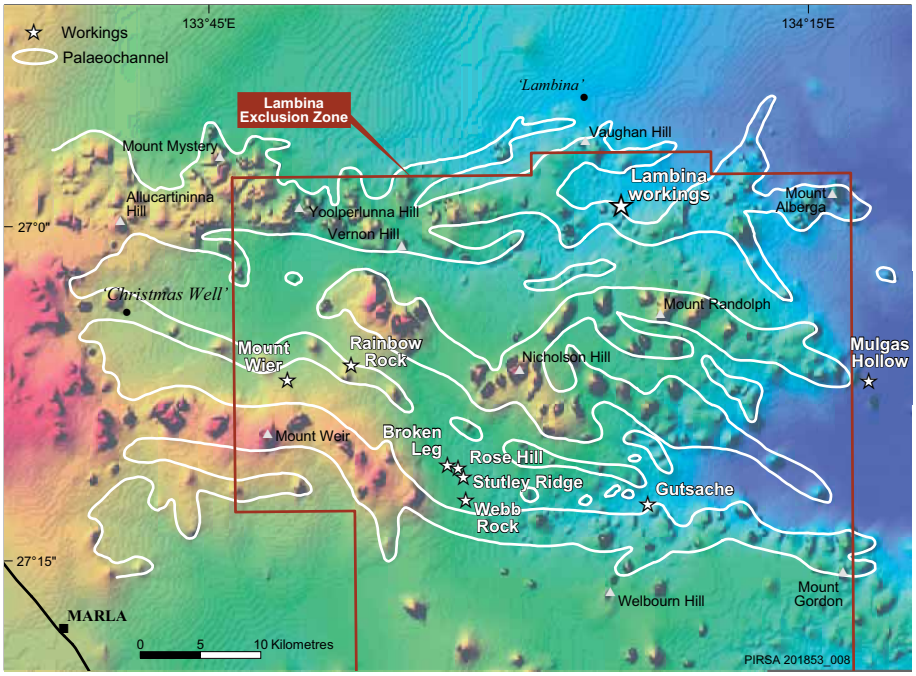


Fig. 3 *Digital elevation model of Lambina and other Far North opal diggings. A number of east–west-trending mesas interpreted as remnant palaeochannels are outlined in white.*

highs, shown in red); the interpreted palaeochannels are shown in white (Fig. 3). The palaeochannels are interpreted as having originally been topographic lows — stream channels that were later silicified during the Tertiary and now remain as highs caused by a reversal in topography resulting from erosion of the softer surrounding Tertiary and weathered Cretaceous sediments since late Tertiary times.

Potential future sources of opal

As the occurrence of opal in northern South Australia is so widespread — several hundred kilometres north of Coober Pedy on 1:250 000 map areas such as WINTINNA, ABMINGA and through to Mintabie opalfield on EVERARD — there appears to be much potential ranging from England Hill (Townsend and Scott, 1981) in the south and Lambina (Flint, 1980) to the north, Todmorden to the east and Mintabie to the west. This area of at least 10 000 km^2 includes sporadic occurrences of opal adjacent to mesas and, more importantly, contains remnants of palaeochannels.

Precious Lambina opal. *(Photo 039443)*

Interpretation of remote sensing data will almost certainly assist in further discoveries of opal, as has been shown using DEM pseudocolour images of Coober Pedy, Andamooka, and now Lambina and its surrounds. At Mintabie, Andamooka and Coober Pedy, the DEM images were made after most of the diggings were already known, but in northern South Australia there are only a sprinkling of known opal occurrences over a very large area of 'breakaway' landscape. Closer-spaced airborne surveys to produce more detailed DEM images in selected areas should assist in this exploration.

Even at the much wider spacing for the current DEM illustrated in Figure 3, several palaeochannels have been outlined and this approach can be used to investigate areas where palaeochannels have yet to be delineated.

Acknowledgements

The author thanks the PIRSA Division of Minerals and Energy for assistance with the photographs generated from the Coober Pedy office, and provision of map images from PIRSA Spatial Information Services and Publishing Services.

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