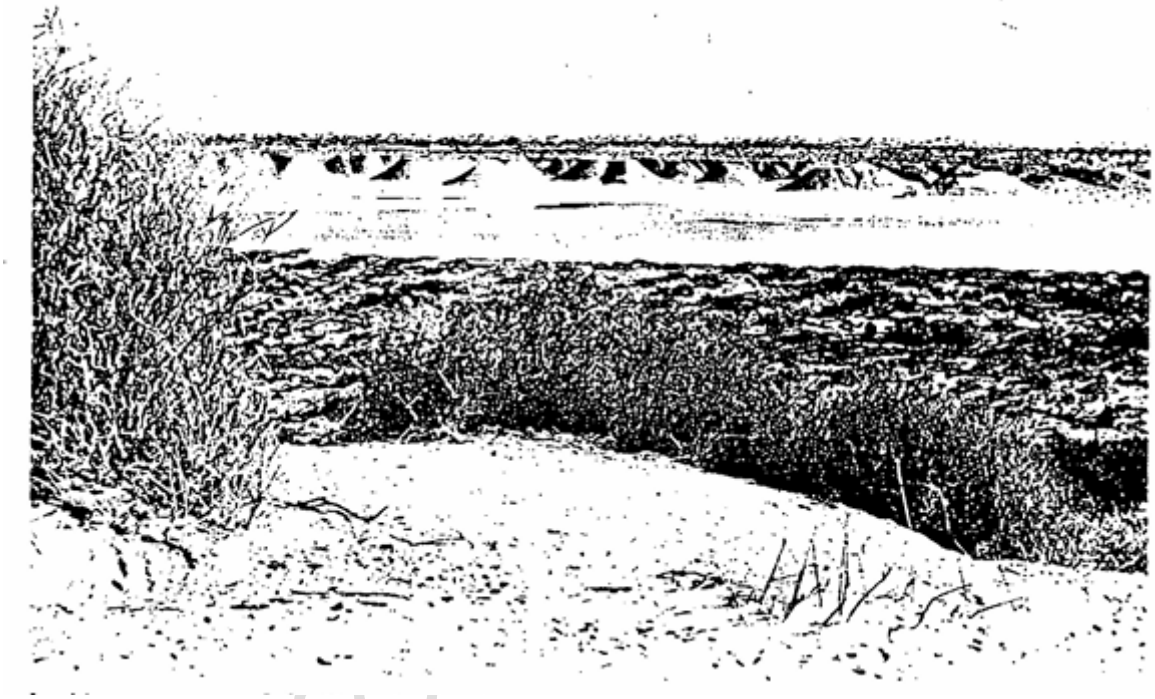
South Australian
HERITAGE COUNCIL

BETTER HERITAGE INFORMATION
SUMMARY OF STATE HERITAGE PLACE

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites)



Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) SHP 14418 , 1957.

Source: DEW Files

ENTRY IN THE REGISTER

Description or notes with respect to a place entered in the South Australian Heritage Register in accordance with either the *South Australian Heritage Act 1978* or the *Heritage Places Act 1993.*

The South Australian Heritage Council may correct errors or inaccuracies in the Entry in the Register in accordance with s21 of the *Heritage Places Act 1993.*

NAME: Lakes Kanunka, Pitikanta and Ngapakaldi **PLACE NO.:** 14418 (Cenozoic Vertebrate Fossil Sites)

ADDRESS: Dieri Country
Kati Thanda-Lake Eyre National Park
Birdsville Track
Mulka 5733

CR 5771/691 H832300 B422;
CR 5772/920 H833000 S1468;
CL 6175/774 D35807 A104
Outside of Hundreds

CONFIRMED IN THE SOUTH AUSTRALIAN HERITAGE REGISTER:

11 December 1997

DESIGNATED AS A PLACE OF PALAETOLOGICAL SIGNIFICANCE:

12 December 1996

S16 CRITERIA SATISFIED UNDER *HERTIAGE PLACES ACT 1993*

(c) it may yield in formation that will contribute to an understanding of the State's history, including its natural history

COMMENTARY ON THE LISTING

Additional information provided as a part of the content of the South Australian Heritage Register in accordance with s14(6) of the *Heritage Places Act* 1993 'hold information in association with the Register'.

KNOWN AS: Lakes Kanunka, Pitikanta and Ngapakaldi (Lake Ngapakaldi partly located within Kati Thanda-Lake Eyre National Park) Cenozoic Vertebrate Fossil Sites [Designated as a place of palaeontological significance]

STATEMENT OF HERITAGE SIGNIFICANCE

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) contain Cenozoic-aged vertebrate fossils which are vital to understanding Australian mammal and vertebrate evolution. The fossil sites and associated materials include megafauna and other vertebrates and are of international significance due to their diversity and time range, providing a rare and complete geological succession. The Lakes constitute one of the rare areas where abundant and highly preserved Cenozoic vertebrate fossils have been recovered in Australia.

STATEMENT OF DESIGNATION

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) contain numerous fossil vertebrate sites of great palaeontological significance. The sites spread throughout the three lakes contain diverse and abundant fossil specimens that are Oligocene-Pliocene in age, contributing to a timeline of vertebrate life and evolution throughout South Australia. Each of the three lakes are highly significant in the quality of their specimens and are likely to continue to yield fossil fauna that will contribute to an understanding of vertebrate and megafaunal biology, habits and evolution in the State.

Elements of Significance

Elements of heritage significance include:

- Fossil sites present within the State Heritage Place,
- Fossil remains preserved at the place,
- Fossiliferous geological formations.

Elements not considered to contribute to significance of place include:

- Human-made structures including fencing and signage, trails and roads, and vegetation.

CRITERIA (under section 16 of the Heritage Places Act 1993)

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) present abundant and diverse vertebrate fossil sites spread across three separate dry lakes. Fossils recovered from these sites over more than 70 years have proven instrumental in developing an understanding of prehistoric Australian fauna spanning much of the Cenozoic Era.

Chronologically situated between other notable Australian fossil sites such as the older Riversleigh, QLD (Oligocene-Miocene) and younger Naracoorte Caves Complex, SA (SHP 26459) (Predominantly Pleistocene) sites, and contemporaneous with the nearby Lake Palankarinna (SHP 14392) (Oligocene-Pleistocene) and Keekalanna East (Pliocene) sites, Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites), has contributed substantially to the creation of a bio-chronological framework for Australia. Notably through the presence of unique and extensive local faunas such as the Ngapakaldi, Kutjamarpu and Kanunka Local Faunas. The vertebrate assemblage from Lake Kanunka is also regarded as one of Australia's most diverse.

The extent and diversity of fossil material from Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) has been acclaimed in scientific literature. The quality and abundance of fossil specimens available from Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) present considerable potential for research into the future. Such research at the Lakes is likely to contribute to an understanding of the State's natural history, in particular vertebrate (including megafauna) biology, habits and evolution.

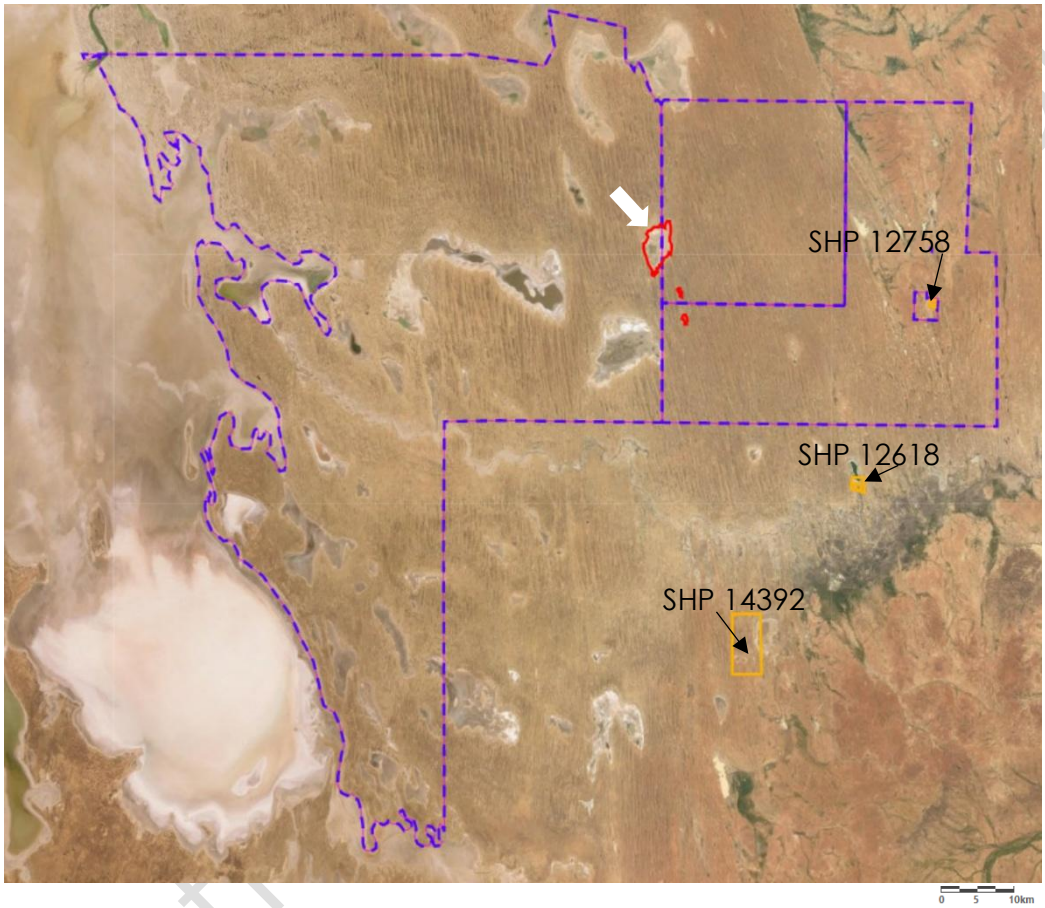
NOTE: The significance of the three lakes, along with Lake Palankarinna (SHP 14392) was recognised by the CSIRO and Australian Heritage Council in 2012 and included in *Australia's Fossil Heritage: A Catalogue of Important Australian Fossil Sites*. Site V-6213 (Leaf Locality) at Lake Ngapakaldi was also recognised in *Australia's Fossil Heritage* as a 'keystone' linking younger and older mammal sites in South Australia.

While the presence of fossilised leaf specimens was known at the time of listing of Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites), little research has been conducted on the leaf fossils at V-6213 (Leaf Locality) at Lake Ngapakaldi. Due to the limited research and uncommon age and location of the leaf fossil site, it is highly likely that research into the fossilised vegetation will also yield significant insight into the State's natural history.

SITE PLAN

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) **PLACE NO.: 14418**

Mulka SA



Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites), Dieri Country, Birdsville Track, Mulka 5733,
CR 5771/691 H832300 B422, CR 5772/920 H833000 S1468, CL 6175/774 D35807 A104 Outside of Hundreds

*SHP 14418 indicated by white arrow. Map also depicts Lake Palankarinna Fossil Reserve (SHP 14392), Mulka Store Ruins (SHP 12758) and Killalpaninna Mission Historic Site (SHP 12618)

N ↑

LEGEND

Outline of Elements of Significance for State Heritage Place

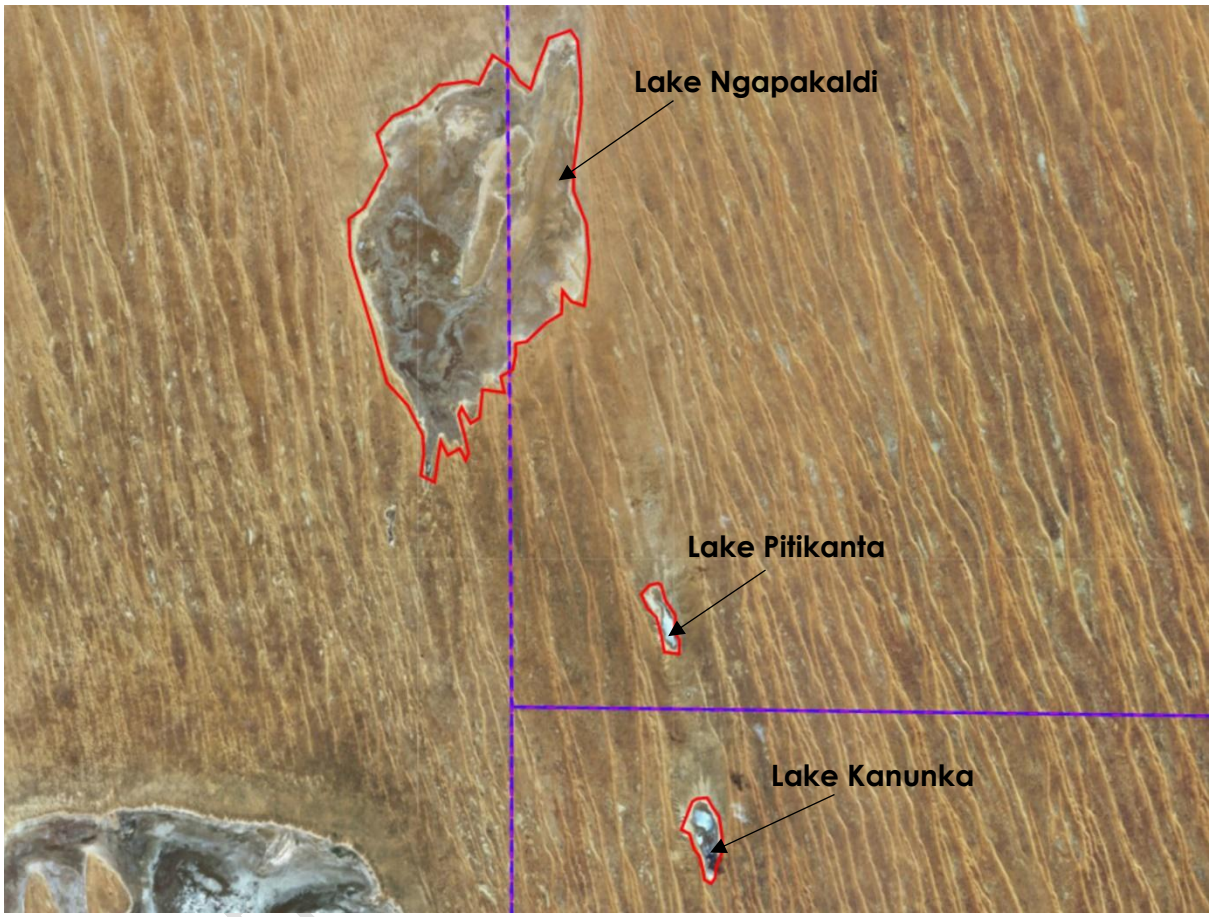
Parcel boundaries (Indicates extent of Listing)

Existing State Heritage Place(s)

SITE PLAN - DETAIL

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) **PLACE NO.: 14418**

Mulka SA



Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites), Dieri Country,Birdsville Track, Mulka 5733,
CR 5771/691 H832300 B422, CR 5772/920 H833000 S1468, CL 6175/774 D35807 A104 Outside of Hundreds

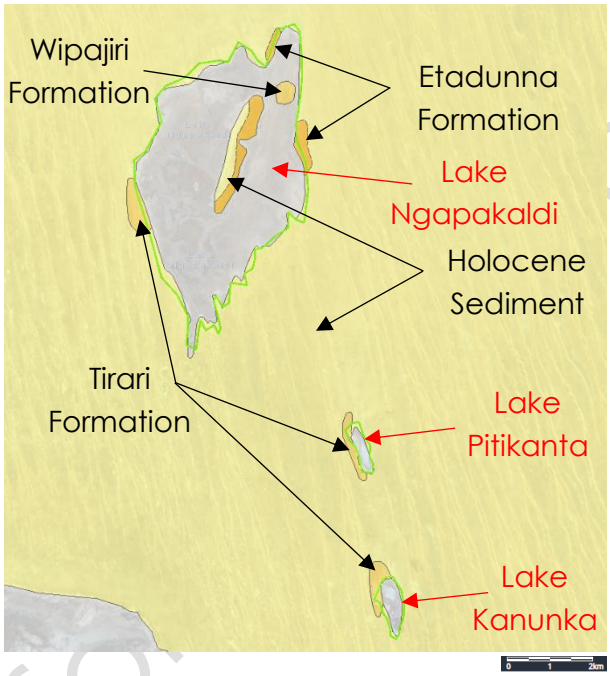
N ↑

LEGEND

Outline of Elements of Significance for State Heritage Place

PHYSICAL DESCRIPTION

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) are located in the Tirari Desert to the east of Kati Thanda-Lake Eyre, in the eastern Lake Eyre Basin. The lakes, which are dry saltpans, measure ~18km^2, ~0.4km^2 and ~0.6km^2 in area respectively and are known as the Northern Lakes of the Lake Eyre Basin. Three rock formations containing fossil vertebrates are found within the State Heritage Place: the Etadunna Formation, the Wipajiri Formation and the Tirari Formation. These fossiliferous rocks are exposed around lake margins and in extinct stream channels. A table of geological formations present at the lakes is provided in Table 1.



Geological Formations exposed at Lakes Kanunka, Pitikanta and Ngapakaldi.

Source: NatureMaps, 2025

The late Oligocene-Miocene Etadunna Formation (~25.7-12.5 Ma)[1] contains the oldest fossils to be found at the site and is made up of lacustrine (associated with deposition within a lake) clays, sandstones, mudstones and limestones with some dolomite nodules. It is also partly fluviate (associated with deposition by a river or stream) and highly fossiliferous. In some places, the Etadunna Formation is dissected by the Miocene-Pliocene Mampuwordu Sand, a geological formation which is also fossiliferous but is not present at the State Heritage Place. In some places, the Etadunna Formation is also cut by the Tirari Formation.[2] At Lake Ngapakaldi the Etadunna Formation is Oligocene-Miocene in age[3] and is highly fossiliferous.

The Wipajiri Formation is an early to middle Miocene[4] geological formation (~24 Ma-22 Ma)[5] which overlies the Etadunna Formation unconformably at Lake Ngapakaldi.[6] The Wipajiri Formation is lacustrine, aeolian (associated with deposition by wind

movement) and evaporitic (associated with the evaporation of, most often, salt water), comprising fine-grained sediments.[7]

Outcroppings of the Pliocene-Pleistocene Tirari Formation (~3.5-1.5 Ma[8]), the youngest formation of the three, are located on the western side of each of the lakes.[9] The Tirari Formation lies unconformably on the Etadunna Formation,[10] though in some places, the Tirari Formation cuts the Etadunna Formation.[11] The Tirari Formation is predominantly fine-grained, sandy and silty, containing gypsum. In some places gypsum forms a 'cap' overlying the formation.[12] The Tirari Formation was formed from aeolian sedimentation and a fluvial redbed system. Where redbeds refer to the often red colour of the sediments deposited.[13] The Tirari Formation, in turn, comprises the Mampuwordu Sand, the Pompapillina Member and the 'main body' of the Tirari Formation.[14] At Lake Kanunka, the Tirari Formation sediment is highly fossiliferous. Two highly informative fossil sites are from the Pompapillina Member of the Tirari Formation.[15]

Fossiliferous rocks within the State Heritage Place contain Oligocene-Quaternary fossil vertebrates including mammals, marsupials, birds, turtles, fish and megafauna among others. Some fossil specimens are articulated and appear to have been trapped in boggy clays[16] in a manner not dissimilar to those found at Lake Callabonna (SHP 14268).

Several naming conventions have been used to identify individual fossil sites creating confusion. For example, alpha (V) numeric identification by the University of California, Museum of Palaeontology (UCMP) and alpha (RV) numeric identification by the Department of Earth Sciences, University of California, Riverside (UCR).[17] Some sites have been assigned multiple names and/or numbers, while others also have informal names. For example, Stirton Quarry is also referred to as Lake Kanunka Site 1 and UCMP V-5772.

Each lake also shares fossil assemblages between individual sites. To facilitate correlation and comparison between individual fossil sites, the respective fossil assemblages found at each site are categorised into 'faunal zones' with 'local faunas'. Local faunas are layered sequences of rock containing fossilised biological material that can be dated with high precision and accuracy.[18] Local faunas allow for correlation between areas like Lake Palankarinna (SHP 14392) and the Lakes Ngapakaldi, Pitikanta and Kanunka and 'stratigraphically isolated' areas, where it is difficult to date specimens using rock layers, such as Lake Namba (SA) and Riversleigh (QLD).

Table 1: Geological formations at Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites).

Locality	Formation	Age	Fauna
Lake Ngapakaldi	Etadunna Formation	Late Oligocene[a, b]-Miocene	Ngapakaldi Local Fauna[a]
	Wipajiri Formation	Early-middle Miocene[a, f, j]	Kutjamarpu Local Fauna[a]
			Leaf Locality (Including Kutjamarpu Local Fauna)[d]
Lake Pitikanta	Etadunna Formation[e]	Late Oligocene[g]-Miocene	Similar to Mirimiri Local Fauna (Renamed from 'Treasure/Lungfish'Local Fauna)[g] found at Lake Palankarinna[e]
			Ngapakaldi Local Fauna[e]
Lake Kanunka	Tirari Formation[a, c]	Pliocene-Pleistocene[a, k]	Kanunka Local Fauna[a]
	Etadunna Formation[e]	Late Oligocene[g]--Miocene	Ngapakaldi Local Fauna[e]
		Late Oligocene[h]	Mirimiri Local Fauna[19] (Renamed from 'Treasure/Lungfish'Local faunaF)[g] found at Lake Palankarinna[e]
			Kanunka North Local Fauna[h]

a) Rich, TH *et al.* (2019), b) Macphail, MK *et al.* (2017), c) Tedford, RH, Wells, RF and Barghoorn, SF (1992), d) Boles, WE (2001), e) Woodburne, MO *et al*. (1993), f) Chrichton AI *et al*. (2023), g) Wheat TC (2023), h) Louys, J et al. (2007), i) Megirian, D *et al.* (2010), j) Lopez De Pietri, V *et al.* (2016), k) Australian Government (N.D.). Note that in Tedford, RH, Wells, RF and Barghoorn, SF (1992) the Tirari Formation is referred to as Katipiri Sand.

Elements of Significance:

Elements of heritage significance include:

- Fossil sites within the State Heritage Place,
- Fossil remains preserved at the place,
- Fossiliferous geological formations.

Elements not considered to contribute to significance of place include:

- Human-made objects, trails and roads, vegetation, fencing and signage.

HISTORY OF THE PLACE

Geological History

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) are located within the eastern part of the Lake Eyre Basin, a sedimentary basin that formed above the Great Artesian Basin during the Miocene (23-5.3 Ma). Deposition of the basin occurred in three phases. First, the Lake Eyre Formation was deposited between the late Paleocene and middle Eocene. Next, the Etadunna Formation was deposited in the late Oligocene-Miocene (~25.7-12.5 Ma), and quickly followed by, and perhaps synchronously with, the Namba, Doonbarra Formations and the Cadelga Limestone formed during the early-late Miocene[20]. Finally, sediments such as the Wipajiri, Tirari, Katipiri and Kujitara formations, and others, were deposited from the Miocene (23-5.3 Ma) into the Quaternary (which continues today).[21] Only three of these formations are exposed within the State Heritage Place, namely the Etadunna Formation, Wipajiri Formation and the Tirari Formation.

The Etadunna Formation was deposited during the late Oligocene[22]-Miocene,[23] and may be found exposed at all three of the lakes, therefore forming a succession between the three lakes Kanunka, Pitikanta and Ngapakaldi. Of the three lakes, Lake Ngapakaldi displays the oldest exposures of the Etadunna Formation. Lake Pitikanta displays intermediate age exposures and Lake Kanunka, the youngest exposures. Comparatively, the Etadunna Formation exposure at the nearby Lake Palankarinna is the oldest of the four localities.[24]

When listed, the Wipajiri Formation was recognised as being highly significant due to the Kutjamarpu Fauna included within.

The Tirari Formation, is the youngest formation of the three and is a Pliocene-Pleistocene aged sediment, ranging from approximately 3.5-1.5 Ma and is found at all three lakes.

Lake Kanunka

Lake Kanunka was once large and deep, and likely filled with salt water. Water levels within the lake likely fluctuated, limiting colonisation by aquatic flora and fauna, however, the available water could support species such as lungfish during the Pliocene, 5.3 – 2.5 Ma (Previously believed to be Pleistocene, 2.5 Ma- 11.7 ka).[25]

Lake Kanunka contains the youngest areas of the previously discussed late Oligocene-Miocene Etadunna Formation which includes the Mirimiri Local Fauna, the Ngapakaldi Local Fauna[26] and the Kanunka North Local Fauna.[27] It also contains the much younger Pliocene-Pleistocene Tirari Formation and the associated Kanunka Local Fauna.[28]

There are several important sites at Lake Kanunka. Two highly informative fossil sites are from the Pompapillina Member of the Tirari Formation, lying unconformably on the Etadunna Formation.[29] At Lake Kanunka, the Oligocene (~33 – 23 Ma)[30] localities UCR RV-8453 (Mark's Micro Site, potentially also referred to as the Lake Kanunka Microsite[31]) and UCR RV-8452 (Janice's Bonanza),[32] are recognised as the most important fossil sites at the Lake.[33] UCR RV-8452 (Janice's Bonanza) is part of the Mirimiri Local Fauna found in the Etadunna Formation at Lake Kanunka, which can be correlated with Mirimiri Local Fauna at Lake Palankarinna (SHP 14392), including fossil sites present there such as Theresa's Treasure, known more simply as Treasure, and Lungfish localities of Lake Palankarinna.[34] UCR RV-8453 (Mark's Micro Site)[35] is recognised as part of the late Oligocene aged Kanunka North Local Fauna.[36]

Two other notable and highly successful fossil sites at Lake Kanunka include Stirton Quarry (Lake Kanunka Site 1, UCMP V-5772), the most productive site at the Lake, and SAM Hill (Lake Kanunka Site 2, UCMP V-5773), both of which contain Kanunka Local Fauna. Stirton Quarry (Lake Kanunka Site 1, UCMP V-5772) is also the type locality from which the Kanunka Local Fauna is described.[37] The Kanunka Local Fauna is exclusively known from Lake Kanunka and is 'one of Australia's two most diverse Pliocene vertebrate assemblages,' along with the Chinchilla Local Fauna[38] found in Queensland.[39] The Kanunka Fauna, while diverse, demonstrates fragmentary preservation.[40]

Lake Kanunka also contains one of four Pliocene fossil assemblages that have included the genus *Bohra*, similar to modern tree kangaroos and the only assemblage in South Australia to have yielded this genus.[41] Other fossil sites at Lake Kanunka include UCR RV-8454 and UCMP V-71167.[42]

Lake Pitikanta

Lake Pitikanta does not have its own unique faunal assemblage but demonstrates the Ngapakaldi Local Fauna[43] and the younger Mirimiri Local Fauna. The Etadunna formation here has been described as middle Miocene,[44] though some specimens have been recorded as old as the late Oligocene.[45] Other geological formations and fossils have also been described including those reminiscent of the Mirimiri Local Fauna at Lake Palankarinna.[46]

Like the other lakes, Lake Pitikanta has yielded abundant fossil material enabling the description of new genus and species,[47] including the 1961 description[48] of an extinct cat-sized marsupial predator[49] now named *Wakaleo pitikantensis.*[50]

Sites at Lake Pitikanta include UCMP V-71170 (Discovery Basin),[51] UCMP V-5774 (west side of Lake Pitikanta, also recognised as UCR RV-7239)[52], UCMP V-5856, UCMP V-5857, UCMP V-6150, UCMP V-6152, UCMP V-6153, UCMP V-71164 and UCMP V-71169.[53]

Lake Ngapakaldi

At Lake Ngapakaldi, are exposures of the Etadunna and Wipajiri Formations.[54] The Ngapakaldi Local Fauna 26-24 Ma (late Oligocene)[55] and the Kutjamarpu Local Fauna (early Miocene)[56] are found within these formations. The Kutjamarpu Local Fauna is understood to be of particular importance,[57] containing diverse fossil fauna. Another fossil flora site forms part of the Wipajiri Formation at Lake Ngapakaldi.

At Lake Ngapakaldi the Wipajiri Formation, containing the Kutjamarpu Local Fauna, unconformably overlies the highly fossiliferous Etadunna Formation.[58] Vertebrate fossils yielded from Lake Ngapakaldi have included articulated remains, though the level of preservation is variable.[59] UCMP V-5858 (Ngapakaldi Quarry), on the eastern shore of the lake, is the type locality of the Ngapakaldi Local Fauna. Fossils here are abundant, particularly of marsupial material.[60]

The fossil flora at UCMP V-6213 (Leaf Locality) has not been studied in detail but is believed to be early to middle Miocene in age[61] and part of the Wipijari Formation.[62] A fossil fauna assemblage (approximately 24 Ma) from UCMP V-6213 (Leaf Locality) is identified as being as a part of the Kutjamarpu Local Fauna.[63]

UCMP V-5879 is also located at Lake Ngapakaldi. [64]

European History and palaeontological investigation

Lake Ngapakaldi was recorded on European maps as early as 1906, when it was known as Lake Gnappakaldi.[65] The smaller Lakes Kanunka and Pitikanta are believed to have been named later, around 1957.[66] The origins of the names of the lakes are currently unknown.

In 1953,[67] spurred by a suggestion from geologists Sir Douglas Mawson and F.W. Whitehouse and conservationist C.W. Bonython[68] to investigate the eastern Lake Eyre Basin some years earlier,[69] American Palaeontologist Ruben Arthur Stirton, his wife Lilllian, and his then graduate student Richard Tedford, associated with the Museum of Palaeontology, University of California, visited Australia to begin researching Etadunna formation vertebrate fossils in the vicinity of Lake Eyre.[70] The South Australian Museum was used as a base of operations for Stirton's research which focused on locating concentrations of Australia's Cenozoic vertebrates, focusing on the nearby Lakes Callabonna[71] and Palankarinna (SHP 14268 and SHP 14392).[72] Stirton's visit to Australia and subsequent work is said to mark 'the beginning of modern mammalian palaeontology in Australia.'[73]

In 1955, Stirton and Tedford described the Etadunna Formation at nearby Lake Palankarinna (SHP 14392).[74] Later in 1957, Tedford and other researchers including South Australian geologist and palaeontologist Brian Daily identified fossil material at Lakes Pitikanta and Kanunka, as well as several other locations.[75] During that year the research team conducted an excavation at Lake Kanunka, yeilding fossil

assemblages believed to be the youngest yet recovered from any of the three lakes, approximately Pliocene-Pleistocene in age (between 5.3 Ma – 11.7 ka). The team hoped to investigate Lake Ngapakaldi, however, limited rations and difficult weather conditions prevented them from doing so at that time.[76]

Tedford and Daily's team returned in 1958 to finally explore Lake Ngapakaldi, and to collect from the three northern lakes as well as the nearby Lake Palankarinna (SHP 14392).[77] At Lakes Kanunka, Pitikanta and Ngapakaldi, the team identified marsupial fossils that, at the time, were recognised as the oldest Cenozoic fauna identified from the Lake Eyre Basin.[78] At Lake Kanunka, the team excavated a Pleistocene-aged site known as the Stirton Quarry (Lake Kanunka Site 1, UCMP V5772) from the Katipiri Formation.[79] This excavation resulted in the identification of the Kanunka Local Fauna, known solely from Lake Kanunka.[80] This expedition also resulted in the identification of the Ngapakaldi Fauna, spread across localities at Lakes Kanunka, Pitikanta, Ngapakaldi and Palankarinna (SHP 14392).

Tedford and Daily's team returned again in 1961 to further excavate Stirton Quarry (Lake Kanunka Site 1, UCMP V-5772) at Lake Kanunka, using a scoop to remove rock overburden. They also conducted an excavation at Ngapakaldi Quarry, Lake Ngapakaldi. During this expedition the team identified what was believed to be a diprotodontid, calling the genus *Ngapakaldia*,[81] a name still recognised today. Also in 1961, two of the earliest publications on the Ngapakaldi fauna were published by Stirton[82] in his publication *Cenozoic stratigraphy and Vertebrate Paleontology of the Tirari Desert, South Australia.*

In 1962, Tedford and Stirton returned to the Lake Ngapakaldi with another group of researchers. South Australian Museum researcher and taxidermist Paul F. Lawson investigated northwards from the east margin of the lake, uncovering fossil turtle shells in an ancient stream. Afterwards the team's efforts focused on this stream, resulting in the collection of fossilised fish, mammals, marsupials, turtles, birds and fossil leaf impressions.[83] This area became known as V-6213 (Leaf Locality) due to the profusion of the latter. The geological formation associated with the stream was identified as the Wipajiri Formation and its late Miocene-aged fossil specimens collected became known as the Kutjamarpu Fauna.[84] Fossils recovered from V-6213 (Leaf Locality) included the first teeth identified from Ektopodon as well as evidence of Diprotodon, kangaroos, koalas, wombats and possums.

In 1967, a publication described the type locality of the diprotodon *Neohelos tirarensis* from the Kutjamarpu Fauna at Lake Ngapakaldi.[85]

In 1986, the definition of the Ngapakaldi Fauna, a name originally applied to vertebrate material from both the Northern Lakes and Lake Palankarinna sites, was redefined to mean only material at the Northern Lakes. It is believed that the

Ngapakaldi Fauna is younger than Lake Palankarinna's Ditjimanka Fauna but older than much of Lake Palankarinna's (SHP 14392) Ngama Fauna.[86]

On 31 October 1985, the Lake Eyre National Park was gazetted, encompassing part of Lake Ngapakaldi as well as all of Lake Eyre North. At the time, Lake Eyre South was not gazetted and Elliot Price Conservation Park, well removed from the State Heritage Place but now within the Kati Thanda-Lake Eyre National Park, had been gazetted in 1967 and reconstituted in 1972. Lake Eyre South was added to what was then known as the Lake Eyre National Park on 19 December 1991.

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) were nominated on 12 January 1991, provisionally listed and designated as a place of palaeontological significance on 12 December 1996, and confirmed as Lakes Kanunka, Pitikanta and Ngapakaldi (Tertiary Vertebrate Fossil Sites) on 11 December 1997.

In 2012, following a Native Title Determination for the western portion of the Kati Thanda-Lake Eyre National Park, the Arabana People were recognised as Native Title Holders. Subsequently, following a request through the Arabana Parks Advisory Committee, a partnership to co-manage the park by the Arabana Aboriginal Corporation and the then Department of Environment, Water and Natural Resources,[87] formed creating the Arabana Parks Advisory Committee.[88] Also in 2012, the Dieri People were recognised as Native Title Holders over the eastern portion of the National Park, including the area encompassing the Northern Lakes. The Dieri People became Native Title Holders of an area to the west of the lakes in 2017.[89]

Lakes Ngapakaldi, Pitikanta and Kanunka, along with Lake Palankarinna, were recognised in the CSIRO and Australian Heritage Council's 2012 publication, *Australia's Fossil Heritage: A Catalogue of Important Australian Fossil Sites*. In addition, the Lake Ngapakaldi V-6213 (Leaf Locality) site was recognised in the same publication as its own unique and highly significant site. V-6213 (Leaf Locality) is described in the CSIRO's document as a 'keystone' linking younger and older mammal sites in the State.

In November 2013, the National Park was renamed Kati Thanda-Lake Eyre National Park.[90] Today, Lakes Ngapakaldi, Pitikanta and Kanunka are considered 'the most complete stratal succession' of Cenozoic aged mammals and vertebrates on the Australian continent.[91]

Aboriginal Cultural Considerations

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance. The protection and preservation of Aboriginal heritage is provided for under the *Aboriginal Heritage Act 1988*. Contact the Aboriginal Heritage Unit for listings.

CHRONOLOGY

Year	Event
~33.9-23 Ma	Oligocene Epoch. Late Oligocene-Miocene (23.7-12.5 Ma), deposition of the Etadunna Formation.[92]
23-5.3 Ma	Miocene Epoch. ~22-24 Ma Deposition of the Wipajiri Formation.[93]
5.3-2.6 Ma	Pliocene Epoch.
3.5-1.5 Ma	Deposition of the Tirari Formation.[94]
2.6 Ma-11.7 ka	Pleistocene Epoch
1 Ma	Latest age for fossils associated with Lakes Ngapakaldi, Pitikanta and Kanunka.
1953	American Palaeontologist Ruben A. Stirton, in association with the Museum of Palaeontology, and University of California, begins researching Etadunna formation vertebrate fossils near Lake Eyre.
1955	Stirton and fellow American palaeontologist Richard H. Tedford describe the Etadunna Formation at nearby Lake Palankarinna.
1957	**Tedford and other researchers including South Australian geologist and palaeontologist Brian Daily identify fossil material at Lakes Pitikanta and Kanunka, as well as the Etadunna formation.[95]**
1958	Tedford, Stirton and taxidermist Paul Lawson return to the lakes to explore Lake Ngapakaldi and excavate the Stirton Quarry (Lake Kanunka Site 1, UCMP V-5772) at Lake Kanunka. Identification of the Kanunka Local Fauna.
1961	Tedford and Stirton's team return to undertake further excavation at the Ngapakaldi Quarry and Stirton Quarry (Lake Kanunka Site 1, UCMP V-5772), breaking of gypsum capping at the Daily-Lawson Quarry.
1962	Further quarrying at Lake Ngapakaldi and identification of V-6213 (Leaf Locality).
1967	9 November, 'Elliot Price Wilderness National Park' gazetted.
1971	Development of screen-washing techniques, facilitating research on many of the Cenozoic faunas near Lake Eyre.
1972	27 April, Elliot Price Wilderness National Park' constituted as 'Elliot Price Conservation Park' under the *National Parks and Wildlife Act 1972*.
1985	31 October, Lake Eyre National Park gazetted.

1991	12 January, nomination received. 19 December, Lake Eyre South added to 'Lake Eyre National Park'.
1996	**12 December, provisionally entered in the South Australian Heritage Register and designated a place of palaeontological significance.***
1997	11 December, confirmed in the South Australian Heritage Register as Lakes Kanunka, Pitikanta and Ngapakaldi (Tertiary Vertebrate Fossil Sites).
2012	Native Title Determination for the Dieri People for eastern portion of Kati Thanda-Lake Eyre National Park, encompassing the Lakes Kanunka, Pitikanta and Ngapakaldi. Native Title Determination for the Arabana People for part of Kati Thanda-Lake Eyre National Park (not encompassing State Heritage Place).
2013	**Lake Eyre National Park name change to Kati Thanda-Lake Eyre National Park.**
2017	Further Native Title Determination for the Dieri People at Kati Thanda-Lake Eyre National Park.

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SITE DETAILS

Lakes Kanunka, Pitikanta and Ngapakaldi (Cenozoic Vertebrate Fossil Sites) **PLACE NO.: 14418**

Mulka SA

DESCRIPTION OF PLACE:	Three dry salt lakes with abundant fossil fauna	
HISTORIC THEME/S	Theme 1 Natural Environment 1.2 Tracing the evolution of plants and animals	
AGE OF FORMATION:	Oligocene, likely 33.9 Ma at the oldest	
REGISTER STATUS:	Nominated: 12 January 1991 Provisionally entered: 12 December 1996 Designated: 12 December 1996 Confirmed: 11 December 1997	
CURRENT USE:	Kati Thanda-Lake Eyre National Park, Pastoral Land and Unalienated Crown Land	
LOCAL GOVERNMENT AREA:	Pastoral Unincorporated Area	
LOCATION:	**Street No.:**	NA
	Street Name:	Birdsville Track
	Town/Suburb:	Mulka
	Post Code:	5733
LAND DESCRIPTION:	**Title Reference:**	CR 5771/691 H832300 B422; CR 5772/920 H833000 S1468; CL 6175/774 D35807 A104
	Hundred:	Outside of Hundreds

REVISIONS

Date	Changes
13 February 2026	SAHC modified template to include an image at the beginning of the document.

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