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Authors: Curran, Georgia, Barwick, Linda, Turpin, Myfany, Walsh, Fiona, and Laughren, Mary

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Central Australian Aboriginal Songs and Biocultural Knowledge: Evidence from Women's Ceremonies Relating to Edible Seeds

Georgia Curran[1*], Linda Barwick[1], Myfany Turpin[1], Fiona Walsh[2], and Mary Laughren[3]

Abstract. Songs encode rich knowledge of the social and ecological worlds of Aboriginal people living in the arid interior of the Australian continent, a desert with one of the most variable rainfalls in the world. People have shaped the ecology of this region in continuous feedback loops over many generations such that there is nowadays a complex system of interdependence between cultural practices and the local ecosystems. Singing traditions are an integral part of the spiritual health of the ecosystem and the means by which biocultural knowledge is carried on over many generations and through shifting social and ecological contexts. To illustrate this, we draw on traditional women's totemic songs relating to edible seeds from the Warlpiri and Anmatyerr Aboriginal groups in Central Australia. Edible seeds, predominantly acacias and grasses, once played a major role in sustaining the populations of these desert regions. They are one of five locally named food classes. We show how songs and their performance practices interact with techniques of seed production and knowledge systems connecting people to biota, the land, and their totemic religion. Traditional songs carry forward biocultural knowledge; yet, these songs and knowledge are under increasing threat because few contexts exist for their continued performance as mass media and new musical genres (e.g., country, pop, gospel) take center stage across Central Australia.

Keywords: Australian Aboriginal song, Aboriginal women's ceremony, ethno-ecology, Indigenous seed use, human environments

Introduction

For many Australian Aboriginal people, ethnobiological knowledge is interpreted on multiple levels in song, as is also the case elsewhere in the world (Challe 2015; Mathur 2008; Roseman 1998; Sakakibara 2009; Sato et al. 2018; Silvers 2015; Simonett 2014, 2015). Central Australian Aboriginal societies are complex systems (Milne 1998) that reproduce across generations the knowledge and practices of a deeply integrated biocultural world. Ceremonial songs are tools to do this because their performance fosters and supports long-term, interdependent relationships between the environment, biota, social groups, technologies, and associated human practices (Koch 2013; Marett and Barwick 2003; Turpin et al. 2013; Walsh et al. 2013). Conceptual understandings of how such cultural practices are linked to biocultural systems are critical to deeper ethnobiology studies, yet the role of music in transmitting ethnobiological information is still vastly understudied. With this in mind, this article examines the totemic songs of Aboriginal people in the arid interior of Australia to understand how cultural practices are linked to social and ecological systems and the transmission of biocultural heritage. The songs presented are performed and owned by Warlpiri and Anmatyerr people, whose lands span the Tanami Desert, a region dominated by acacia shrublands and spinifex grasslands (Latz 1995).

[1] Sydney Conservatorium of Music, University of Sydney, 1 Conservatorium Road, Sydney, NSW 2000, Australia.
[2] School of Environmental and Life Sciences, Charles Darwin University, Alice Springs, NT, Australia.
[3] School of Languages and Cultures, Faculty of Humanities and Social Sciences, The University of Queensland, Brisbane, QLD, Australia.
[*] Corresponding author (georgia.curran@sydney.edu.au)

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Aboriginal people have been in Australia since at least 50,000 years ago and in central Australia since at least 30,000 years ago (McDonald et al. 2018). Australian desert environments include extreme rainfall variability, with extended droughts and occasional flooding rains contributing to widespread nutrient poverty (Morton et al. 2011). Consequently, boom-bust production and patchiness in space and time are key characteristics of this environment (Smith and Morton 1990). The ecology, including human ecology, of Central Australia has undergone rapid and comprehensive changes since colonization of Australia by Europeans 230 years ago (Crabtree et al. 2019; Griffin and Friedel 1985).

Prior to colonization, Central Australian Aboriginal people in this region had a seed-based economy (Smith 1986:29, 2013). Seeds were a high-cost resource, with an estimated five to eight hours of women's labor required per kilogram of flour (O'Connell and Hawkes 1981). They were used in resource-scarce periods (both annual and across years), when more cost-efficient foods were scant, or when groups wished to reduce their mobility for economic, social, or physical reasons (Smith 1986:29). Aboriginal people have used seed foods for millennia. Between 3000 to 4000 years ago, there was an intensification in seed food economies, especially in the recent 1500 years (Smith 1986:36, 2013:197–202). This intensification has been linked to population increase; to the expansion of the Pama Nyungan language family, to which Anmatyerr and Warlpiri belong; and to the advent of large-scale ceremonies (Evans and McConvell 1998; Smith 1986). Seasonal surpluses of seeds would have supported these large ceremonial events and been central to the systems of reciprocity which reinforced the social and mythological ties between groups (Smith 1986:29). It is likely that the duration and scale of these ceremonial events would have been strongly influenced the availability and proximity of seed resources (Tindale 1972:245). Compared to other hunter-gatherer groups internationally, Australian desert people were relatively unique in their reliance upon seeds without the intensive domestication of them (Zeanah et al. 2017). With colonization came radical changes to land management practices in the Central Australian region, with cattle stations taking over large areas and Aboriginal people gradually moving in to centralized settlements with decreased access to parts of their country and its food resources. Decline of seed use and other traditional foods is one feature of these radical changes.

The songs discussed in this paper are sung by Warlpiri and Anmatyerr people of Central Australia, terms that also refer to their traditional lands and languages. Warlpiri and Anmatyerr are not mutually intelligible languages, though many words have been borrowed between these neighboring languages, and there is frequent intermarriage and bilingualism. Warlpiri, a Pama-Nyungan language of the Ngumpin-Yapa subgroup, has some 5000 speakers, while Anmatyerr, with some 1000 speakers, belongs to the Arandic linguistic subgroup. In this article, the spelling of Warlpiri words follows the orthography in Hoogenraad and Laughren (2012), while that for Anmatyerr follows Green (2010:ix).

Before the twentieth-century establishment of settlements, Aboriginal people from this region lived in smaller family groups and moved often around their lands for various reasons, including seasonal interests in particular regions to hunt, gather, and manage food production and requirements to participate in rituals (Meggitt 1962:49–50). One primary change since settlement has been a shift from a self- and socially-reliant production system to a state welfare-based system (O'Connell and Hawkes 1981). Food and goods are now primarily accessed through monetary economy from stores, rather than from bush resources. Despite this, over the past forty years, Aboriginal women of the region

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have developed a small but vigorous hybrid economy through harvest and cash sale of seeds and specific bush foods to national markets (Holcombe et al. 2011; Holmes 2010; Walsh and Douglas 2011). This activity has helped sustain some knowledge and practices associated with seeds and the songs related to them.

In the next section, we outline the role of songs in Aboriginal societies. We describe the particular songs drawn on throughout the article to demonstrate how biocultural knowledge is enshrined in music and how ceremonial performance creates and sustains people's connections to biota and their worldviews. Aboriginal peoples across Australia share beliefs in a period of creation called, in Warlpiri, *Jukurrpa* and, in Anmatyerr, *Anengkerr*. Songs, in this belief, were given to people by ancestral beings who traveled through the country creating the geographical features, animals and plants, as well as the human relationships with them. Koch (2013:5) explains that "When people sing these songs, they activate the force that enables ceremonies. These in turn generate power that nurtures the land and its people." As they sang, these ancestral beings established the laws and rules of Aboriginal societies and modes for nurturing land and people. The essence of a particular Dreaming ancestor is said to be represented in the melody of the songs they created (Ellis et al. 1978), as we discuss further. There is a strong belief in the continual presence and influence of these ancestors. All biota of the contemporary world have ancestral origins, hence "totem" is used to refer to certain species and the songs that pertain to them (Strehlow 1970). By performing totemic songs, people can tap into the ever-present power of the ancestors to influence their day to day lives, typically to maintain the health of the specific biota. As in some other Indigenous societies, new songs can be revealed to people, yet composition is "deflected from the human dreamer-singer onto the spirit source" (Roseman 1998:110).

Methodology

In this article, we take seven different song sets belonging to edible seed totems to illustrate how ceremonies sustain ecological knowledge and belief. The songs reference the journeys of seed ancestors, the identification of seeds, and the harvest, cleaning, and production methods that turn these seeds into food, as well as ceremonial performance itself. That songs are about ceremony authenticates the belief systems and laws that underpin the very existence of these songs. Four of the seven song sets are associated with the totem referred to, in Warlpiri, as Ngurlu, a generic word for edible seed. A further two song sets are associated with the totem Watiyawarnu, "broom wattle" (*Acacia tenuissima*), a term that can also be used as a generic for a broad range of wattles (*Acacia* spp.) that have edible seeds. The seventh song set, *Kiirnpa*, is the name of an ancestral woman known for her seed-harvesting abilities. Figure 1 sets out the regions to which the song sets relate.

Recordings of the seven song sets were made by the authors in collaboration with senior female Warlpiri and Anmatyerr owners and managers, with whom the authors have worked over the past five decades. Further information on these song sets, including the locations of archival deposits and the recording dates, is given in Appendix 1. We take an "applied ethnomusicology" approach, which is "almost ubiquitous in research on Aboriginal song traditions in Australia" (Treloyn 2016:24). Our methods involved transcribing the songs during fieldwork and working with singers to identify the words, meanings, and associated stories. Laughren is a Warlpiri speaker and several trained Warlpiri interpreters have worked closely with senior owners and managers of the song sets to produce the transcriptions and translations in accordance with community protocols. Through these in-situ methods, the singers have had control over the ways in which the songs are presented and disseminated.

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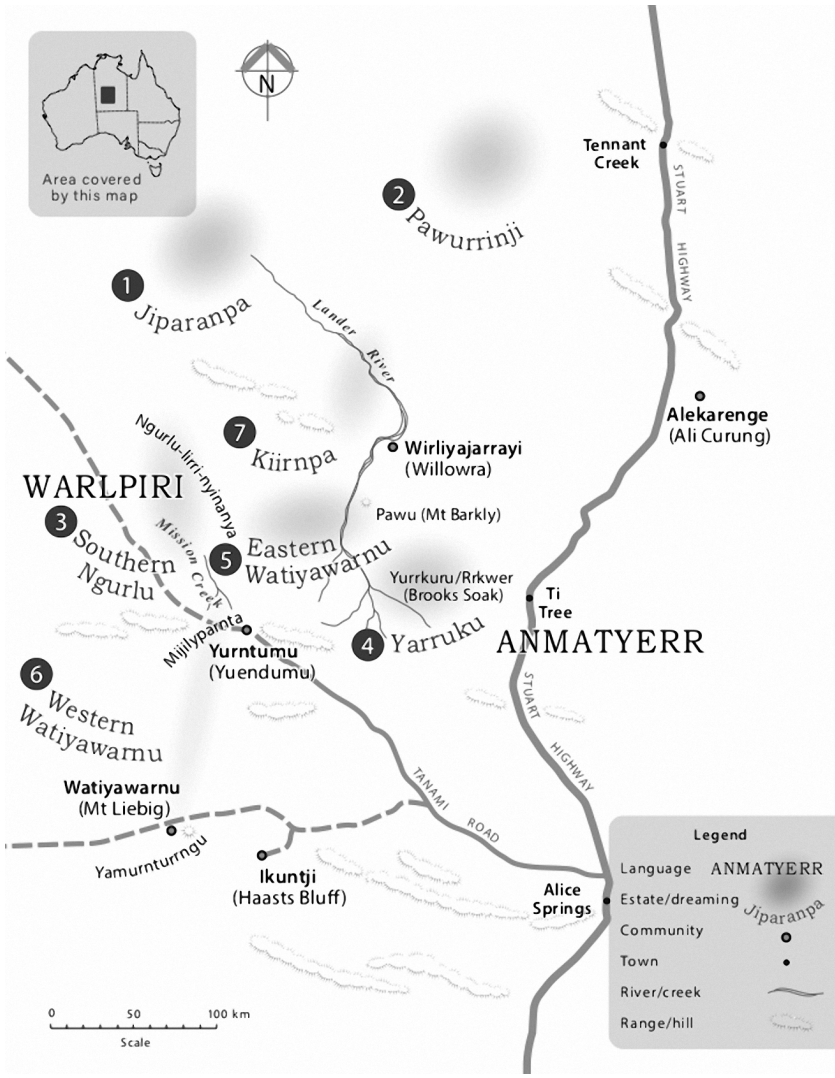


Figure 1. Areas to which the seven song sets relate. Four ngurlu "edible seed" song sets relate to areas around 1) Jiparanpa to the north-west; 2) Pawurrinji to the north; 3) "Southern Ngurlu" north-west of Yuendumu; and 4) Yarruku (Arrwek). Two Watiyawarnu "Broom Wattle" song sets relate to areas (5) north-east of Yuendumu; and (6) north-west of Mt Liebig (Watiyawarnu), a community named after the nearby site. Finally, (7) Kiirnpa comes from the area around Pawu (Mount Barkly). Map: Brenda Thornley.

The research in this article was conducted as part of formal projects through Australian universities (the University of Sydney and the Australian National University). These projects required University ethical clearances, permits from Aboriginal organizations to conduct the research, and informed consent from individuals. Our research is informed by the Guidelines for Ethical Research in Aboriginal and Indigenous Studies (GERAIS), produced by the Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS). Underpinning GERAIS is the recognition that Indigenous peoples have rights to determine how their cultural practices and knowledges are researched and to participate in that research (Barney 2015) and that research must have positive impact on the participants and their communities

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(Swijghuisen Reigersberg 2011; Treloyn 2016). We take a collaborative approach to research between Aboriginal knowledge holders and researchers and have facilitated the production of co-authored song books and audio-visual resources to assist communities in sustaining their endangered singing traditions (e.g., Curran 2017; Gallagher et al. 2014; Laughren et al. 2011). These song publications assert on their imprint page the legal and moral rights of the relevant song-owning groups and authors have reflected on the issues of representing Aboriginal cultural knowledge in these published texts (Curran et al. 2019). The current senior owners of these groups have given permission to publish the verses and associated cultural knowledge in this article.

Yawulyu "Women's Ceremonies"

The song sets described are of the *yawulyu* ceremonial genre. *Yawulyu* is the Warlpiri word for a ceremonial genre performed by Aboriginal women across a broad area of Central Australia. *Yawulyu* is a complex form of art, blending song, dance, and visual designs that relate to ancestral journeys and a specific worldview and ontology. *Yawulyu* songs celebrate the activities of specific ancestors and each estate group has its own *yawulyu* song set. Rights to totemic songs, like rights for land, are inherited patrilineally, i.e., passed down through the father's line. Women learn *yawulyu* from participation in ceremonies alongside their paternal aunts, who, as a patricouple, share ownership of the same totem, land, and associated songs. For singing of a song set to take place, the female owners (*kirda*) for the related totem must be present, alongside women in managerial roles (*kurdungurlu*) who inherit rights through their mother's line. While these rights and responsibilities are defined by inheritance, learning the songs and associated dances must continue throughout a woman's lifetime. Performance events draw together members from multiple groups to assist in cross-generational and cross-societal learning and sharing of knowledge.

Each song set consists of many short verses, most of which have an accompanying action, such as body painting or dance (see Figure 2). A verse typically consists of a couplet of two short lines (labeled here A and B), usually of two to four words each. The couplet has a strict repetition sequence which is often a quatrain (AABB). A verse is performed with strict syllabic rhythm and tempo, which facilitates remarkable stability in oral transmission over time (Sutton 1987). A "song," thus, refers to an unbroken stretch of singing, typically lasting about 30 seconds, during which the verse repeats some three or more times until the completion of the longer melody. The aim is a unison group performance, enabled by experienced song leaders, who know how to fit the verse with the melody and lead the rest of the group, who join in after an initial solo section of the melody. In addition to the repetition of the verse within a song, multiple renditions of a song are required before moving on to a different verse. Each verse typically refers to a particular place and to actions that occurred there. Performing these ceremonies cultivates an emotional connection to the land and biota (Bell 1993; Koch 2013). Once a regular evening activity, *Yawulyu* performance nowadays typically forms part of community events, inter-cultural festivals, family camp-outs, site visits, and, in some regions, initiation ceremonies (Barwick and Turpin 2016).

In the ancient past, ancestors created the world through ceremonial performance, which was as an act of naming through words and actions (Tamisari 2002). In some Arandic languages, the word for "song," *arritne* (Turpin and Ross 2012:201), is a derivation of the word for "name" (*arre*+*etne* "mouth+name"). The power of ancestral naming is evoked when singers use a line of song as a proper noun to refer to the associated place or when it serves as a person's ceremonial name. The power of names can be seen in the widespread

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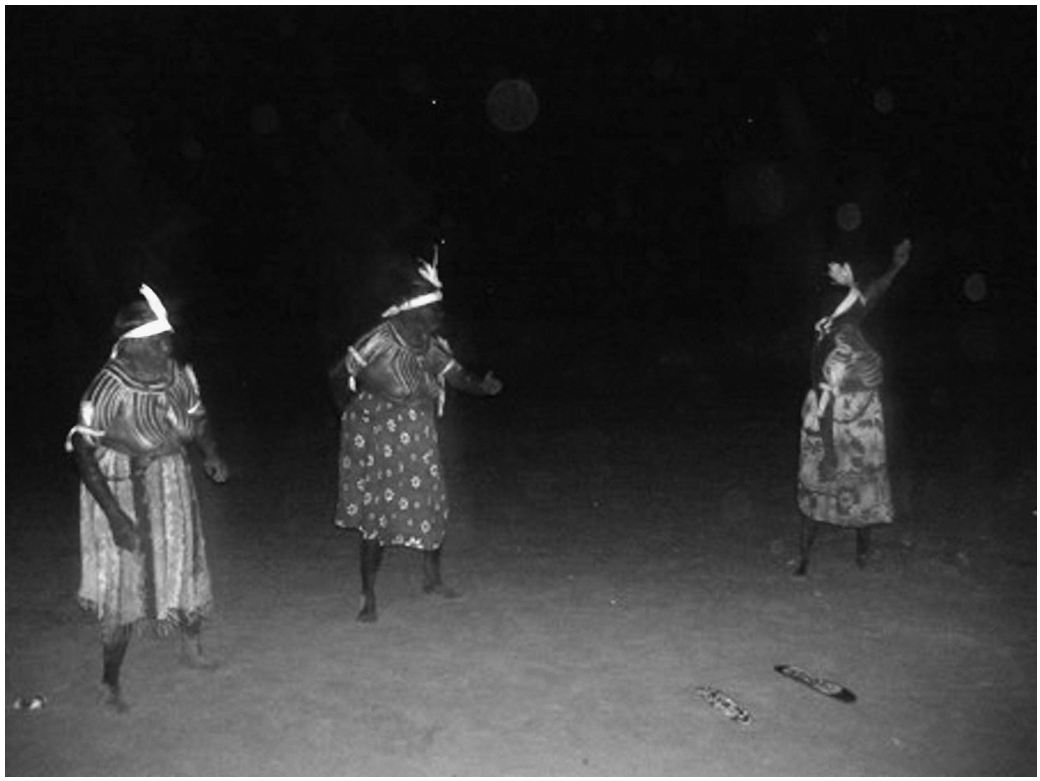


Figure 2. Leah Nampijinpa, Dora Nampijinp, and Kathy Sampson Nangala dancing *yawulyu* at Willowra. Picture by M. Turpin, 2009.

taboo on uttering the name of the deceased and the places, totems, and verses associated with them.

Yawulyu songs are perceived to be in the language of ancestral beings. In addition to words in the singers' own languages, words from a special song register that does not otherwise occur in everyday spoken language can be used (Turpin and Green 2010). For Aboriginal people, such words are evidence of the supernatural origins of song and the power of song to influence the world when performed. Songs frequently avoid everyday words for the plants, animals, and tools that are the subject of the songs. It is as if these mundane words do not fit with a concept of song as "words of sacred beginnings" (Hill 2002:6).

In some cases, it is difficult to distinguish between poetic and everyday words. As an example, let us consider the word *watiyawarnu*, "broom wattle," which is used to refer to two song sets and also occurs in a number of verses. *Watiya-warnu* is a multi-morphemic word literally meaning "tree-associated with." Such obliqueness is typical of poetic vocabulary. While the term *watiyawarnu* is also used in everyday speech, two other monomorphemic words for this plant, *minyana* and *nyintirriyilpi*, are also used perhaps due to a speech taboo. In Example 1, *Acacia tenuissima* is referred to directly with *watiyawarnu* in Line A of this verse and indirectly through the use of a similarly derived poetic word *watiya-jirri* (possibly "tree-together") in Line B. This word is set to the same rhythmic pattern as *watiya-warnu,* as if echoing its meaning. In addition, both words connote places, as the suffix *-rla* on these words has two meanings, leading to two possible interpretations of each line, an action (1) and a location (2). Line A evokes activities of the seed ancestor at a place east of Pawu (Mt. Barkly), while Line B evokes the same at a place west of Pawu. Pawu is a prominent feature which

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Line A	*Watiya-warnu-rla*	*pakarni-nya* (x2)
	acacia.ten.-3SG.DAT/(-LOC?)	hit- PTT
i)	"Threshing the Broom Wattle seeds for her"	
ii)	"Threshing where the Broom Wattles (grow)"	
Line B	*Watiya-jirri-rla*	*kijirni-nya* (x2)
	acacia.sp.-3SG.DAT/(-LOC?)	throw- PTT
i)	"Tossing (winnowing) the Broom Wattle seeds for her"	
ii)	"Tossing (winnowing) where the Broom Wattles (grow)"	

Example 1. This verse refers to the threshing and winnowing of *Acacia tenuissima* seeds and two places where these actions occurred in the ancestral past (Eastern Watiyawarnu song set).

marks the heartland of the owners of this song set.

Translations by the singers show that the verbs are used obliquely in this and other songs; *kijirni* "throw, toss" is here used to mean "winnow" (rather than the more precise word *yarrara-marda-rni*) and *pakarni* "hit" to mean "thresh." Such seed-processing activities are also referenced by particular dance actions, as shown.

Seed Identification, Harvest, and Production as Reflected in Song

The ethno-taxonomic group *ngurlu*, "edible seed," is split into finer ethnotaxa defined by end-products from grasses and wattles (*Acacia* spp.) respectively. A diversity of herbs, trees, and other plants also had edible seeds, but grasses and wattles were dominant. Grass seeds were ground to a paste and then baked into an edible damper, and wattle seeds were made into an edible paste (like peanut butter) and eaten raw. Wattle seeds could be roasted (like coffee beans) before eating; roasting made them tastier and more nutritious.

According to central Australian ethnobotanist Peter Latz, of the 140 plant food species in this region, more than 70 were exploited for seeds, with wattle and grass seeds being the most often consumed (Latz 1995:49). Warlpiri and Anmatyerr people identify some 20 different edible wattle seeds, a dozen grass seeds, and about ten other species with edible seeds. The harvest and preparation of seeds requires detailed cultural knowledge and experience built up from generation to generation. Although songs are rarely procedural or narrative, they nevertheless assist in the transmission of biocultural knowledge by functioning as an epithet consisting of only a few key words (Smith 2017). Deeper interpretations of the songs are made from these meaning-laden words, aided by knowledge of the ecology of plants, seed preparation from harvest to consumption, and the mythological origins of species. We will now illustrate with examples from a selection of the 100+ edible seed verses.

Example 2 features a verse referring indirectly to seed paste and, for the knowledgeable person, this may connote the binary distinction in edible seed taxonomy and be taken to refer to acacia seeds. The totemic story of an ancestral child who cried, in hunger, for unbaked seed paste is connoted through a poetic and onomatopoeic reference to the Diamond Dove (*Geopelia cuneata*), whose soft, cooing call and desire for pre-masticated seeds resembles that of a child crying, in hunger, for seed paste. As children are wont to do, this one tries to dip its finger into the *coolamon* (wooden dish) to bring back a morsel to its mouth. The accompanying dance involves an iconic representation of crying and trying to get to a dish of seed paste (Figure 3).

Portulaca is another genus whose seeds (*P. filifolia* and *P. oleracea*) were made into paste and cooked into damper. One of

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Line A	*Piji-ngka*	*kanpala*	yulanja-rra-nyina
	finger_licking- LOC	PRS=2DU	cry-INF-THITH-sit
	"You two are sitting crying while dipping your fingers in (the seed batter) and licking them"		
Line B	*Kuluru-kuluru*	*-ku=rla*	*yulanja-rra-nyina*
	diamond.dove	-DAT=3SG	cry-INF-THITH-sit
	"Crying like a diamond dove"		

Example 2. Indirect reference to acacia seed paste, which is the prototypical food consumed by the method of "finger licking," illustrated with a verse from the Southern Ngurlu song set.

these, *munyeroo (Portulaca oleracea),* is referred to directly in song with two synonymous words: *wakati* and its poetic equivalent *lurlupujupuju*, illustrated in Example 3. The other word in the verse, *larrarna,* is a poetic word "put," which, in song, can also mean "create" (the everyday word is *yirrarni*; cf. Turpin 2011:24). Like many other verses that name an ethnospecies, this verse refers to the totemic ancestor bringing the biota into being through the act of singing. Likewise, the actual owners of the songs ensure the health and abundance of the species through ceremonial performance of such potent verses, a process often referred to in Aboriginal English as "singing up."

Line A	*Wakati-wakati*	*larrarna*
	Portulaca sp.	put/create
Line B	*Lurlupujupuju*	*larrarna*
	Portulaca sp.	put/create
	"Putting/creating *Portulaca* seeds"	

Example 3. Direct reference to an ethnospecies (*Portulaca*), illustrated with a verse from the Jiparanpa Ngurlu song set.

Different harvesting techniques are used for particular types of edible seed due to the ecological differences in the wattles and grasses. Grass seeds are harvested off specific grasses or, occasionally, from seed piles accumulated by insects or birds (see Gallagher et al. 2014:73). Ripe wattle pods, however, are pulled or hit off the larger shrubs onto cleared ground or a ground



Figure 3. Coral Napangardi Gallagher and Tess Napaljarri Ross enact how the child attempts to take the seed paste from the *coolamon* and is fought off by the woman grinding the seeds. Picture by M. Carew.

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sheet, as referenced in Example 4. Verses allude to such differences through compact imagery rather than explicit statements. Such structural features suggest the ancestral origin and, thus, the power of song.

Line A *Ngurlu-lirri-nyinanya*
edible.seed- INCH-swarm- PTT
"(There at) *Ngurlu-lirri-nyina*"

Line B *Watiyawarnu panja-panja* kuju-rnu
Broom Wattle flat.cover spread-PST
"The Broom Wattle was spread over the ground"

Example 4. A verse from the Eastern and Western Watiyawarnu song sets that refers to the harvest method whereby branches are laid out over flat hard ground for threshing.

Women thresh the seeds to reduce bulk chaff by either hitting or crushing them with a crafted stick or stone against hard or cemented flat surface, or by stamping and rubbing with their feet in a dug-out hollow in the ground. The latter is done for bulk seed quantities of *Eragrostis eriopoda* (native woollybutt) and other species, and is an action in some dances. Figure 4 shows the iconic dance movement of threshing with a stick against the ground, featured here in the Watiyawarnu song set. Finer seed chaff is rubbed in a pile using hands. Women then separate the chaff from the seeds by raising and dropping handfuls of chaff and seeds on to concreted ground, into a *coolamon*, or onto a groundsheet, as illustrated in Figure 4. Wind blew away the finer chaff, thus separating it from the heavier seed. An Anmatyerr verb, *iylker-anthem* (literally, "give to the wind"), describes this action. The term is also used to describe the action of using an electric fan to separate the chaff from seeds.

Further cleaning through yandying, involves shaking the seeds in a *coolamon* such that gravity assists in separating the seeds from finer chaff or pods, a process featured in the verse in Example 5.

Example 6 depicts how seeds could be yandied with hot coals as a method of roasting. This is an optional, but preferred, stage,

Line A *Kumururntu-rlu=rna* kipirni-nja-ya-nu
coolamon-ERG=1SG yandy-INF-go-PST
"I'm yandying (the seeds) with a *coolamon*"

Line B *Warilyirrilyirri* *kipirni-nja-ya-nu*
unknown seed sp. yandy-INF-go-PST
"(I'm) yandying the *warilyirrilyirri* seeds"

Example 5. A verse that refers to yandying, from the Jiparanpa Ngurlu song set.

as it yields tastier and more nutritious food. After the hot fine coals are mixed amongst acacia seeds, the mix is then yandied again to remove the coals.

Line A *Puna-ngka=rna* yarrara-marda-rnu
ash-LOC=1SG winnow-PST
"I winnowed it on the hot ashes"

Line B *Puna-njarlu puna-njarlu yarrara-marda-rnu*
ash-very ash-very winnow-PST
"I winnowed it with lots of hot coals"

Example 6. A verse that refers to winnowing seeds through hot coals as a method of roasting, from the Jiparanpa Ngurlu song set.

The cleaned seeds are then ground into a fine dough paste. Small quantities of water are used on a mortar base and upper pestle to make a dough. A finer dough resulted from a harder mortar and the skill and duration of grinding. Lithic sources suitable for grinding stones were highly sought-after and obtained through long-distance trade or matrilineal inheritance (Smith 1986:30). In some areas, grinding stones were broken and scattered when the owner died, signaling their importance in traditional society (Smith 1986:30). Example 7 references a prized grindstone.

Line A *Pirli ka=rna* kanyi
stone PRS=1SG take
"I will steal this grinding stone"

Line B *Waku-kurlu* *kanyi*
arm-COM take
"(I will) steal it away under my arm"

Example 7. A verse about a coveted grinding stone, from the Eastern Ngurlu song set.

Grass seed pastes were poured onto a bed of hot, clean fine ashes to bake unleavened cooked seed cakes, as referenced in Example 8. A small bower of twigs was

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Figure 4. (left) Violet Nampijinpa Marshall dancing as the Watiyawarnu ancestor in a movement that typifies the posture and mode of threshing Acacia seeds with hands and a hitting stick (see Example 3). Picture by A. Cadden. (right) Alyawarr women, Edie Holmes (left) and Angelina Luck (right), winnow *Acacia tenuissima* (Alyawarr is a neighbor of the Warlpiri and Anmatyerr groups). Picture by F. Walsh.

burnt over the top to create a top crust. The crusted seed cake was then covered in hot ashes and coals to bake it. Baked seed cakes were later dusted with a twig brush to remove the ashes. The first person and interrogative structure of the verse captures a moment in the life of the ancestral being's journey, bringing an immediacy of the past to the present-day performers.

Line A *Ngaju japa ka=rna* yilpirrki-yirra-rni
1SG INT PRS=1SG hot ashes-put-PRS
"Am I putting (it) in the hot ashes?"

Line B *Pirdijirri japa=rna* *yilpirrki-yirra-rni*
seed.cake INT=1SG hot ashes-put-PRS
"Will I cook the seed cake in the hot ashes?"

Example 8. A verse that refers to seed cakes as they are cooked in hot ashes, from the Jiparanpa Ngurlu song set.

While seeds are no longer part of the staple diet, some, such as dogwood seeds (*Acacia coriacea*), are still consumed when abundant. These and other seeds are also sold to the bush foods industry or for rehabilitation of mined areas (Walsh and Douglas 2011). Knowledge about edible seeds, including their ecology and mythology, as well as how to collect and process them, forms part of the contemporary cultural identity of the descendants of seed Dreamings.

The verses seen in the previous examples, as well as Example 9, illustrate the widespread tendency for song to be in the first person (e.g., I/we). This is the voice of the ancestral beings, however, through performance of these same words, contemporary owners (and managers) are the contemporary embodiment of the ancestral "we" of the song. In this way, performance reinforces the validity of a way of life and belief in totemic ancestors (Gell 1992).

Line A *Yukarrija ka=rli* nyina
grass sp. PRS=12DU sit
"We (you and I) are Bunch Panic (*Yakirra australiensis*)"

Line B *Karlampurrpa ka=rli* *nyina*
portulaca PRS=12DU sit
"We (you and I) are (at) Karlampurrpa"

Example 9. A verse illustrating multiple references through the use of first-person pronouns which denote both the performers and ancestral characters, from the Jiparanpa Ngurlu song set.

Many verses indicate complex webs of relationality between species, such as kin relationships between species or the taxonomies relating to human consumption. For example, in relation to the *Kiirnpa* song in Example 10, one singer explains how, in the *Jukurrpa*, the Magpie-lark (*Grallina cyanoleuca*) called

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out about the seeds it had seen. Another singer explains that a Magpie-lark, with its black and white plumage, resembles the dark and light seeds of the desert sedge (*Fimbristylis oxystachya*). The seeds of the sedge change from light to dark ("white" to "black") as they ripen. Yet another singer compares *lukarrara*, "desert sedge," seeds to *warripinyi* (*Yakirra australiensis*) seeds, saying "*Warripinyi munjupurru, lukarrara kirrirdi-kirridi,*" translated as "The *yakirra* seeds are short/not elongated, whereas the desert sedge seeds are long and skinny" (Peggy Nampjinpa, personal communication, 2010). It is common for Warlpiri people to form these kinds of "oppositions" through drawing on the close similarities between species, as set out in Hale's (1971) discussion of *jiliwirri,* a Warlpiri ritual language based on a culturally specific principle of antonymy.

Line A	*Lukarrara-ku=rla*	wangka-ja
	desert sedge-DAT=3SG.DAT	talk-PST
	"Having spoken to the desert sedge"	
Line B	Tiyatiya-ku=rla	wangka-ja
	Magpie-lark-DAT=3SG.DAT	talk-PST
	"Having spoken to the black and white one"	

Example 10. A verse illustrating figurative language, from the *Kiirnpa* song set.

Such examples suggest that the verse is like an index that a knowledgeable person can then interpret in various ways. For example, a singer may interpret the above song in terms of how people use the desert sedge, where it is found, and/or its relationship to the Magpie-lark; and each of these interpretations blend elements from the mythological and physical realms. Words in song are often widely known metaphors: for example, *tiyatiya*, "Magpie-lark," is a metaphor for women in mourning and, thus, another whole range of meanings can be derived. In this way, songs act as a mnemonic basis from which a person with the appropriate kinship relation to the songs can expound. We now discuss the ways in which biocultural systems are referenced in songs.

Social and Ecological Connections to Places

Through performance of songs, the singers collectively engage to affirm and reassert the connections of particular Warlpiri and Anmatyerr people to their Dreamings and to the places where particular related species have their spiritual genesis and/or grow. The four Ngurlu song sets focus on the parallel travels from south to north of two different but related ancestral seeds. Warlpiri women today consider them to be "the same Dreaming but belonging to different family groups" (Janet Nakamarra Long, personal communication, 2018). These Dreamings and associated song sets are owned by women of the same patricouple group (Nakamarra/Napurrurla). Long (personal communication, 2018) further explains that a more western Ngurlu travels from sites to the west of Yuendumu northwards to Jiparanpa, and focuses on *lukarrara*, "Desert fringe rush," whereas the more eastern Ngurlu travels from the area of the Arrwek estate (Brook's Soak) to Pawurrinji, and is concerned with *yukarrija/warripinyi* (*Yakirra australiensis*). Whether there is a correlation of the presence of these two ethnospecies with their respective geographic regions remains an elusive question. Throughout these song sets, various other grass seeds are referred to either directly or indirectly. Other related biota are also referred to in these songs (e.g., trees whose wood is used to make *coolamons* or whose leaves provide shade for women while processing seed).

The melody of the songs also connects Warlpiri people to their Dreamings and places. In some Aboriginal languages, the word for "melody" identifies the ancestor whose words and actions brought the land, its laws, and characteristics into being (Ellis et al. 1978; Turpin 2015:70). Different features of melodies—such as melodic range, focal pitches, and composition into sections—distinguish one song set from another. For example, the Ngurlu Jiparanpa are distinguished from the Ngurlu Pawur-

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rinji songs by their melodies, diagrammed in Figure 5. Here, it can be seen that each has three melodic sections (MS) defined by discontinuous ascents. While the Jiparanpa melody has identical first and third sections, Pawurrinji has identical second and third sections. The first melodic section of Jiparanpa has an undulating contour, while Pawurrinji's consists of an ornamented stepwise descent. Jiparanpa melody uses a minor third and an unstable minor second, while the Pawurrinji melody uses a major third and major second. These differences are summarized in Table 1.

The melodic differences that distinguish song sets from one another serve as identifiers of the totem, estate, and the people who have inherited responsibility for this land, associated knowledge, and ceremonial practices. In addition to music being a mnemonic aid, the repetitive structures within *yawulyu* facilitate learning of this knowledge.

The two song sets relating to Watiyawarnu belong to two distinct groups of Warlpiri women, both affiliating to Nampijinpa/Nangala patricouple, who identify specifically with the lands associated with two sections of the journey of the Watiyawarnu seed ancestor. The eastern Watiyawarnu, sung by Warlpiri women from Willowra, centers on the westward journey of the acacia seed ancestor from Pawu (Mt. Barkly), through to the site of Ngurlu-lirri-nyinanya, north of Yuendumu (see Figure 1). The Western Watiyawarnu, sung by Warlpiri women from Yuendumu, takes over the songs from this place and sings about the journey of this same ancestor southwards towards Yamurntunngu, just east of Mt. Liebig. The song presented in Example 3 is sung by both groups, identifying the place Ngurlu-lirri-nyinanya (literally "seeds are swarming") as a significant site for passing over this song set to another distinct, but related, Warlpiri group. It may be that this was once an important meeting site for different groups of women to clean and prepare these acacia seeds.

While the songs from the two Watiyawarnu song sets center on the same acacia species, which is widespread across this landscape, words in the songs indicate the different socio-geographic affiliations of the singers. Vocabulary from the socially distinct but mutually comprehensible Warlpiri dialects of Yarlpiri (spoken in Willowra) and Ngaliya (spoken in Yuendumu) is found in these songs. In the western Watiyawarnu song set, sung by women from Yuendumu, the Ngaliya word *nguyanguya* is used to denote the piles of harvested branches as they are threshed over a ground cover, as in Example 11. This word is not found in the verses of the more eastern group.

Line A	Nguyanguya=rna	paka-rnu (x 2)
	piles.of.branches=1SG	thresh-PST
	"I threshed the piles of branches"	
Line B	*Watiyawarnu panja-panja*	*kuju-rnu (x 2)*
	Broom Wattle flat.cover	spread-PST
	"The acacia seeds were spread over the ground"	

Example 11. Use of the Ngaliya dialect word *nguyanguya* "piles of branches" (in the Western Watiyawarnu song set).

Likewise, linguistic markers of the Yarlpiri dialect of Warlpiri, spoken in Willowra, are evident in the Eastern Watiyawarnu song set. In Example 12, the distinctively eastern Yarlpiri Warlpiri preverb *kangkurr-* is used to refer to the heavy liquid inside the juicy green seed-pods weighing heavily on the branches of *Acacia tenuissima*.

Line A	Watiyawarnu	kangkurr-katu-rnu (x 2)
	Acacia ten.	water-weigh.down-PST
	"The Broom Wattles were weighed down by the liquid"	
Line B	*Minyura-rlu*	*kangkurr-katu-rnu (x 2)*
	moisture-ERG	water-weigh.down-PST
	"The moisture (in the green pods) weighed it down"	

Example 12. Use of the Yarlpiri dialect preverb *kangkurr-* to denote heavy seed pods in a verse of the Eastern Watiyawarnu song set.

Because songs within a song set denote places along a totemic ancestor's

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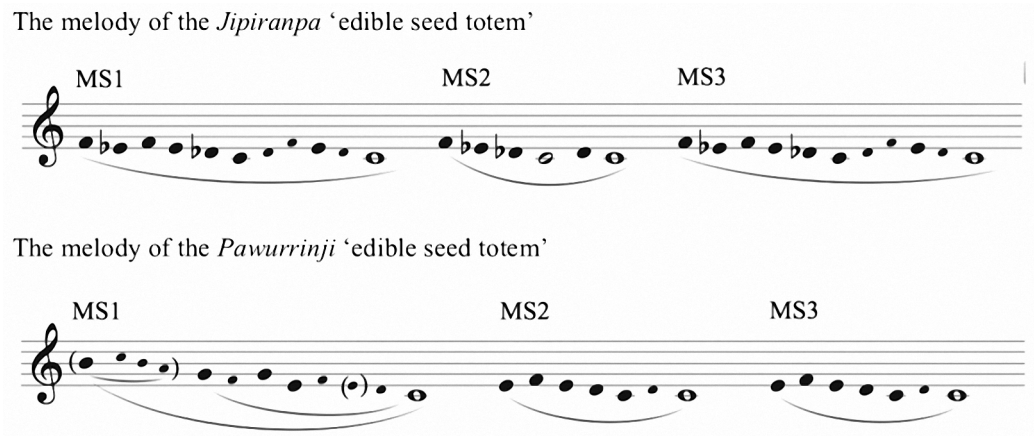


Figure 5. The distinct melodies of Ngurlu from Jiparanpa and from Pawurrinji.

Table 1. Comparison of some melodic features of the Jiparanpa and Pawurrinji Ngurlu song sets.

	Jiparanpa	Pawurrinji
Section structure	ABA	ABB
Melodic range	Perfect fourth	Perfect fifth with optional upper octave extension to start
Melodic scale	Minor third and flat second	Major third

journey, at some places, they encounter other totemic beings, thus, some songs connect to other totems and song sets. For example, the journey of the Jardiwanpa ancestor Yarripiri ("inland taipan," *Oxyuranus microlepidotus*) crosses paths with Warlukurlangu "belonging to fire" and Ngapa "rain" Dreamings, incorporating the Yankirri "emu" Dreaming before morphing into the seed ancestor featured in the Southern Ngurlu song set (Gallagher et al. 2014). Songs that reference these biota draw links between Warlpiri people associated with geographically distant places, who rarely sing together but are linked by virtue of where their respective ancestors crossed. The Diamond Dove, for example, links Ngurlu with associated sites across some 800 km (see Figure 1; Examples 1, 3, and 4).

Conclusions

Collectively, Aboriginal people living in the Central Australian deserts have known and performed thousands of songs which variously refer to hundreds of plants and animals (Strehlow 1971). Traditionally, detailed knowledge of these species was crucial to sustenance and survival through long periods, sometimes years, when certain species were dormant, scarce, or absent. Everyday activities may not have provided people with the experience needed to know about certain species, so knowledge of them may have lain dormant. We suggest that the vast corpus of totemic songs may have acted as an inventory of species to aid the recall of ecological, cultural, and mythological information. The songs described here highlight the link between species and their spiritual genesis, which underpins central Australian Aboriginal worldviews. Whether there is a correlation between the places of spiritual genesis and the marked presence of the various species in these places remains to be investigated and requires further comprehensive work to compile a list of species that are referenced in songs.

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As many ethnographers have noted, performance of traditional Aboriginal songs concerns replicating what happened in the past "when the foundations of human life were established once and for all" (Berndt and Berndt 1999:229; Strehlow 1971). Performance of *yawulyu* maintains the order of things, such as the health of species, the contentment of ancestors, and relationships between people. Conversely, observations of the world following a performance reinforce people's worldviews; for example, whether or not acacia trees become laden with seeds or whether or not disharmony exists in the community may be attributed to aspects of a performance that were successful or lacking. *Yawulyu*, like other traditional Aboriginal songs, can be considered "a mode of action—a means of intervening in the world" (Morphy 2009:6). Senior performers who have connections to these songs are able to expound upon their mythological and biocultural significances, as well as on how they are used. Empowered by people's holistic understandings of song's ancestral origins and powers, performance solidifies social relations, including the authority of elders, reinforces the ontology and structure of society, and cultivates emotional connections with land and biota.

The worldviews and knowledge systems we have described are increasingly under threat from the pressures of the modern world. Harvesting, processing, and cooking of seeds are nowadays far less frequent activities than in the past. Ceremonial forms, like *yawulyu,* too, are no longer performed with the frequency that they once were. In Australia, Aboriginal groups have an avenue for maintaining their biocultural knowledge and practices through the availability of cultural and natural resource management funding; yet, rarely has this extended to encompass the performance traditions that sustain this knowledge and traditional practices (as just one example, threshing actions depicted in dances may assist in the learning of this process). As we have demonstrated in this article, totemic songs are rich with detailed observations of the natural world and have been used to maintain knowledge for generations, yet their status in the modern world is vulnerable.

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