17

Murujuga Thatharruga: A Stylistic Analysis of Turtle Motifs

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This chapter discusses the ubiquitous turtle motifs of the Dampier Archipelago and shows how Murujuga artists have depicted known turtle species in this region. Thatharruga is the coastal Pilbara name for turtle (Von Brandenstein 1970). Species identification was approached first using a zoological perspective. Western science distinguishes different turtle species primarily through carapace pattern. On Murujuga, however, part of the extreme stylistic heterogeneity in this motif type results from the variability of carapace decoration used.

Green's analysis (1982) of 62 turtle engravings in the King Bay catchment provided 12 turtle types. Gunn and Mulvaney (2008) recorded 175 turtle motifs and catalogued 23 classes based on carapace pattern. Of these 23 classes, only 48% were multiple representations (i.e. more than half were unique designs). This stylistic diversity in 'one-off' designs was interpreted as likely evidence of individuals or certain groups, and Gunn and Mulvaney suggested that many turtle motifs are located at sites where particular species nest. While identifying some variability at Parker Point in turtle species (body shape and relative size of head), they observed that no 'species-diagnostic features were apparent' (Gunn and Mulvaney 2008: 16). The 2006 National Heritage listing values assessment of the archipelago involved the analysis of 464 engraving sites. From the 9,283 motifs analysed, a total of 421 turtle motifs (including those with eggs) were counted. McDonald and Veth (2006) identified 68 different turtle types, noting that gross morphological differences between known turtle species appeared to account for some of this variability. The extreme stylistic variability within turtle motifs across the archipelago was interpreted as local stylistic signalling across this art province (McDonald and Veth 2005, 2006).

Carapace designs appear to represent either narrative intent or individual stylistic signalling choices being made by Murujuga artists. Research done as an Honours dissertation (de Koning 2014) identified specific zoological traits in the six relevant marine turtle species known to inhabit this region and investigated whether these traits were recognisable in the archaeological assemblage. The depiction of zoological turtle traits was analysed to interrogate variability observed and then contrast state (motif weathering) was used to determine whether there had been species and/or stylistic change through time.

Species Identification in Rock Art

Species identification in Australian engravings has been successfully undertaken before. McDonald (1993) showed that different tracks of macropod species can be recognised in the Panaramitee-style engravings at Sturt's Meadows, New South Wales. Extinct fauna such as the Tasmanian Devil (Akerman 1998, 2009; Brandl 1972: 37–38; Lewis 1977; Mulvaney 2010), Marsupial Lion (Akerman and Willing 2009), Sthenurus and Zaglossus (Murray and Chaloupka 1984) have all been identified in Australian rock art. It has also been suggested that a painting of a large emu-like bird depicts *Genyornis newtoni* (Gunn et al. 2011) with palaeontologist confirmation that it had the physical attributes of the now extinct bird (although see Cobden et al. 2017). Several research projects have explored how artists in different art provinces have identified the species of macropod motifs in the Pilbara (Raynor 2012) and across Murujuga (Stewart 2016) and in Kakadu (Jones et al. 2020).

Schematisation is the 'process of abstraction … [that] … is not concerned solely with graphic or plastic forms but is constrained by some … reference outside the system of form and colour' (Forge 1977: 28). Clegg (1977: 26–27) states that schematisation refers to 'representations … which bear some resemblance to objects from the real world'. The term 'schema' is used here to refer to those attributes of the motifs that go beyond the standard anatomical definitions that define turtles, that is, circular body, curved flippers and smaller pointed heads. The Murujuga schema is what distinguishes these turtles from those produced by other cultural groups in different rock art provinces. One of the aims of this research was to distinguish what anatomical traits are being specifically depicted here and which contribute to the overall Murujuga schema through time.

The Turtle Species of Murujuga

Turtles are an important food resource for Indigenous sea-country people. The oldest dated evidence of human predation of turtles comes from Sibudu Cave, KwaZulu-Natal at 49,000 to 50,000 years BP (Plug 2004). In the north-west of Australia, turtle remains have been found in early human deposits on Barrow and the Montebello islands pre-8,000 years cal. BP (Veth et al. 2017), while in the middle of Enderby Island turtle bones are found throughout the entire Holocene occupation sequence (see Chapter 6). Ethnohistoric observations all indicate that turtles were a mainstay of the Murujuga marine diet (see Chapter 16) and the dominance of this motif throughout the Murujuga style sequence indicates that ever since people have produced art in this place, turtles have been considered important enough to include in their engraving repertoire.

While this research primarily focused on the six marine turtle species known to the Dampier Archipelago region (Australian Flatback, Green, Hawksbill, Leatherback, Loggerhead and Olive Ridley), engravings of freshwater turtles were noted and will also be discussed.

Marine turtle anatomy

In almost all turtle species the shell is made of scutes: pieces of keratin that cover the underlying bone structure. The carapace is the top part of the shell, and the plastron is the bottom bone structure covering the underside of the turtle's body (Perrine 2003). The Leatherback turtle is unique among turtle species as it has a leathery skin that covers a mixture of bony plates and soft cartilage (Spotila 2004). Further distinguishing the Leatherback turtle are seven bony ridges running from the neck to tail along the back.

Attributes like the number and arrangement of scutes and the scales on the head are used to distinguish turtle species (Kowarsky 1978; Jamie Tedeschi pers. comm. 2014). The scutes in the centre of the carapace are referred to as central or vertebral scutes. Those running along the outside of the carapace are lateral (also pleural or costal), while the scutes around the edges of the carapace are known as peripheral (also marginal) scutes. Here, we refer to the scutes as central, lateral and peripheral respectively (see Figure 17.1).

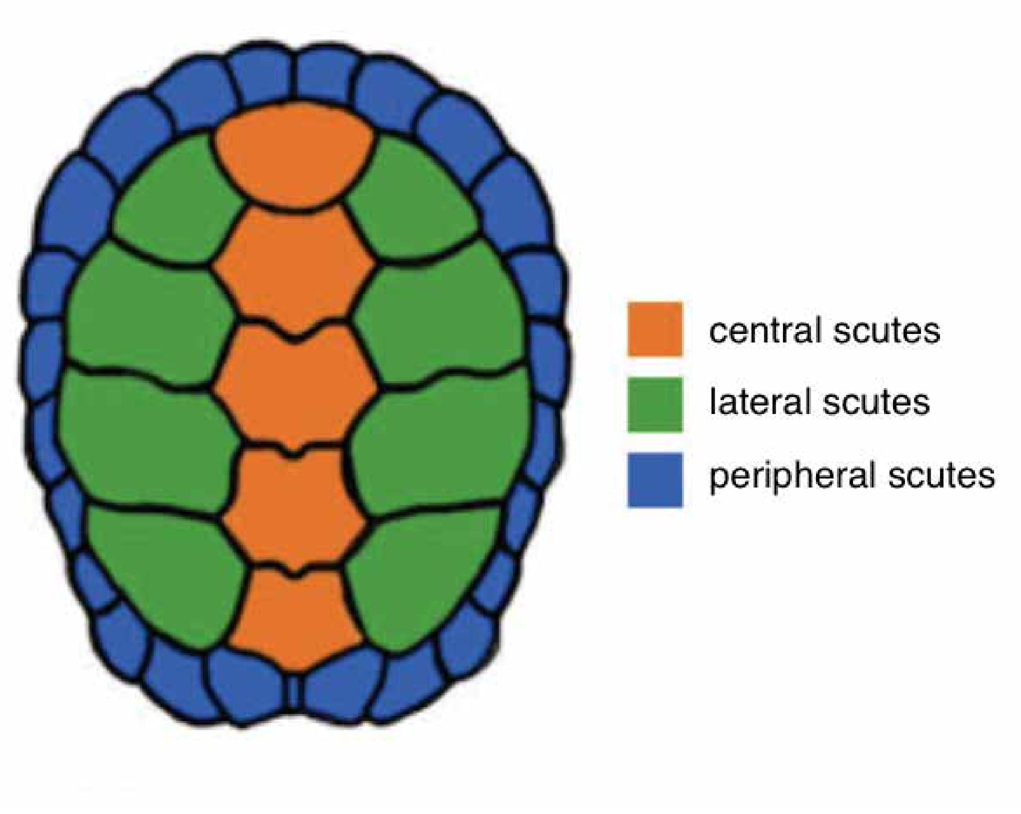


Figure 17.1. Arrangement of scutes within the turtle carapace.

Rather than teeth, marine turtles grow horny beaks made of keratin. The shape of this beak reflects diet and varies by species (e.g. Hawksbills have a pointed beak while Green turtles have a serrated beak). Both the front and hind limbs of marine turtles are specialised flippers which allow them to travel at faster speeds through water. There are six species of marine turtles known to nest around the Dampier Archipelago (Perrine 2003; Spotila 2004). These species of turtles can be identified by the attributes shown in Figure 17.2.

For this analysis, attributes of each of the six marine and one freshwater turtle species were measured from physical representations of each species to see what the differences were. Because many of the motifs were not photographed with scales, and ratios of attributes were used, similar ratios were calculated for the zoological specimens to enable the qualitative assessment of the engraved assemblage (de Koning 2014: Table 5.2).

To understand which traits were significant in distinguishing between these qualitative measurements, this data was subject to a principal component analysis (PCA). This revealed that the strongest determinants for species distinction in the zoological analysis are carapace width and head length, and flipper length and head width (Figure 17.2).

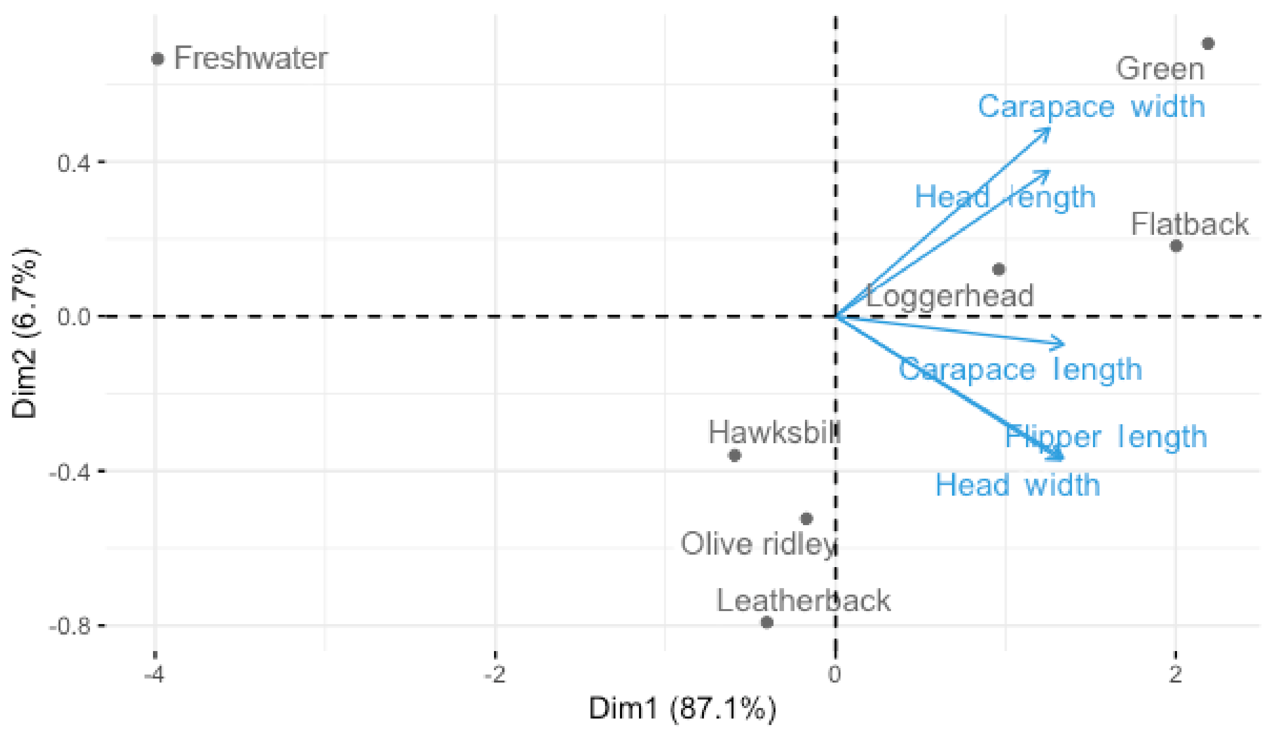


Figure 17.2. PCA plot of turtle attributes showing separation of species based on these traits.

The freshwater species is strongly differentiated from all the marine turtles by this analysis. The marine turtles can also be distinguished by these measurements; for example, the Green turtle and Leatherback are the most different in this analysis (i.e. those clustered around the 0,0 axis are the most similar), while the Loggerhead and Hawksbill are the most similar. This analysis gave confidence for the quantitative and qualitative approaches taken to investigating the engraved turtle assemblage.

Murujuga's Thatharruga: The Turtle Motifs

turtles have patterns which suggest differentiation between species on the part of the artists (Dix and Virili 1977: 95)

The Dynamics of the Dreaming project has recorded almost 630 turtles, while the CRAR+M database now houses records for 1,218 turtle motifs across the archipelago (CRAR+M Database, 7 February 2023). The analysis reported here was based on 823 turtle motifs which were audited from legacy and field school data in the CRAR+M database (de Koning 2014).

Engraved motifs that look like turtles (i.e. to the etic observer) and are interpreted by Ngarda-Ngarli (contemporary local Aboriginal people) are common across the Dampier Archipelago. Gunn and Mulvaney (2008: 12) defined a turtle motif as having 'an oval body with protruding, downward-turned fins, short head and tail'. This analysis defines the core motif attributes which are identifiable and measurable:

- an oval or square-shaped large central body (shape can be incomplete);
- short vertical extension on the top and bottom of the long axis of the body shape (head and tail);
- symmetrical, short, angled extensions on either side of and between the 'head' and 'tail' (flippers and hind legs).

The minimum requirements for a turtle motif to be included in quantitative analyses were that it had a 'head', two front 'flippers', a 'tail' and two 'hind legs'. For a motif to be included in the qualitative analysis, the minimum requirements were that it could only be missing two of the six attributes.

Head shapes were ranked with a numeric value. The most prevalent head shape was pointed and then rounded (Figure 17.3). Very few motifs have no head, and long necks are relatively rare.

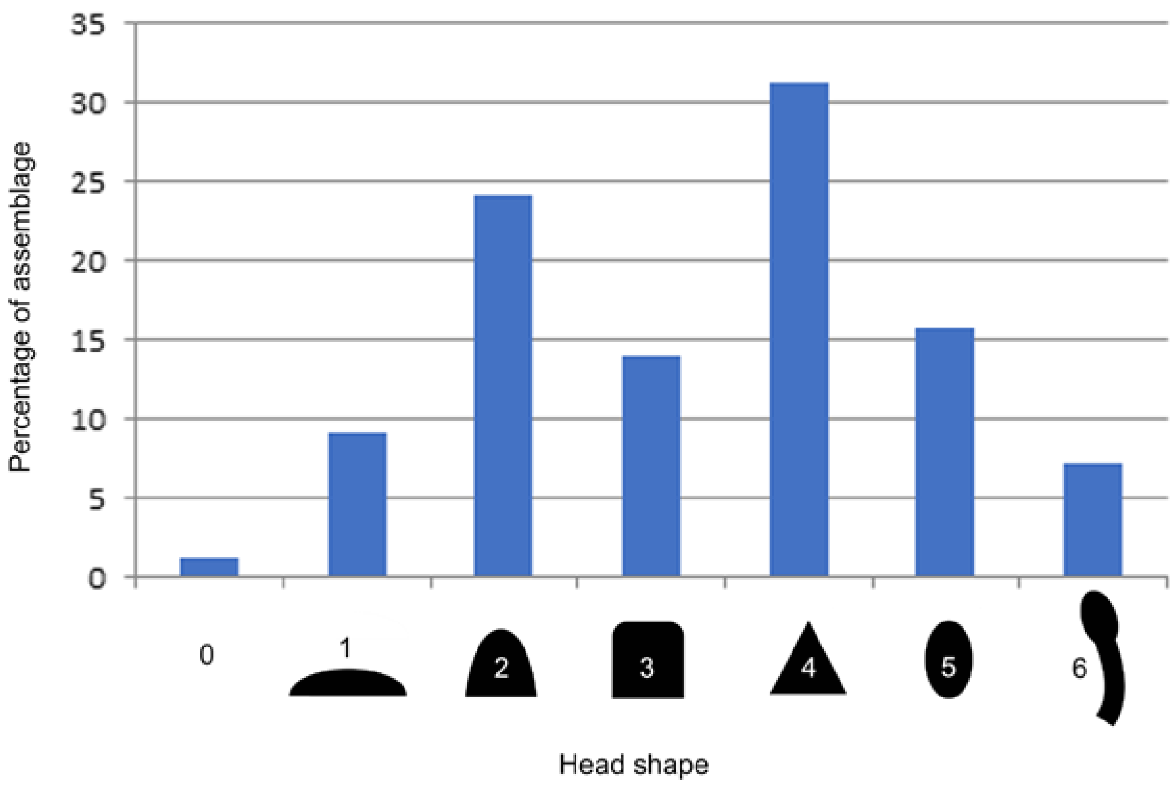


Figure 17.3. Head shape types recorded in turtle motifs.

For the quantitative analysis, head length was measured from the edge of the carapace to the maximum distance from this, with width being the widest measurement perpendicular to the length (see Figure 17.5).

Carapace shapes were given an alphanumeric value within three major shape categories: curved (C), teardrop (T) and straight edged (S).

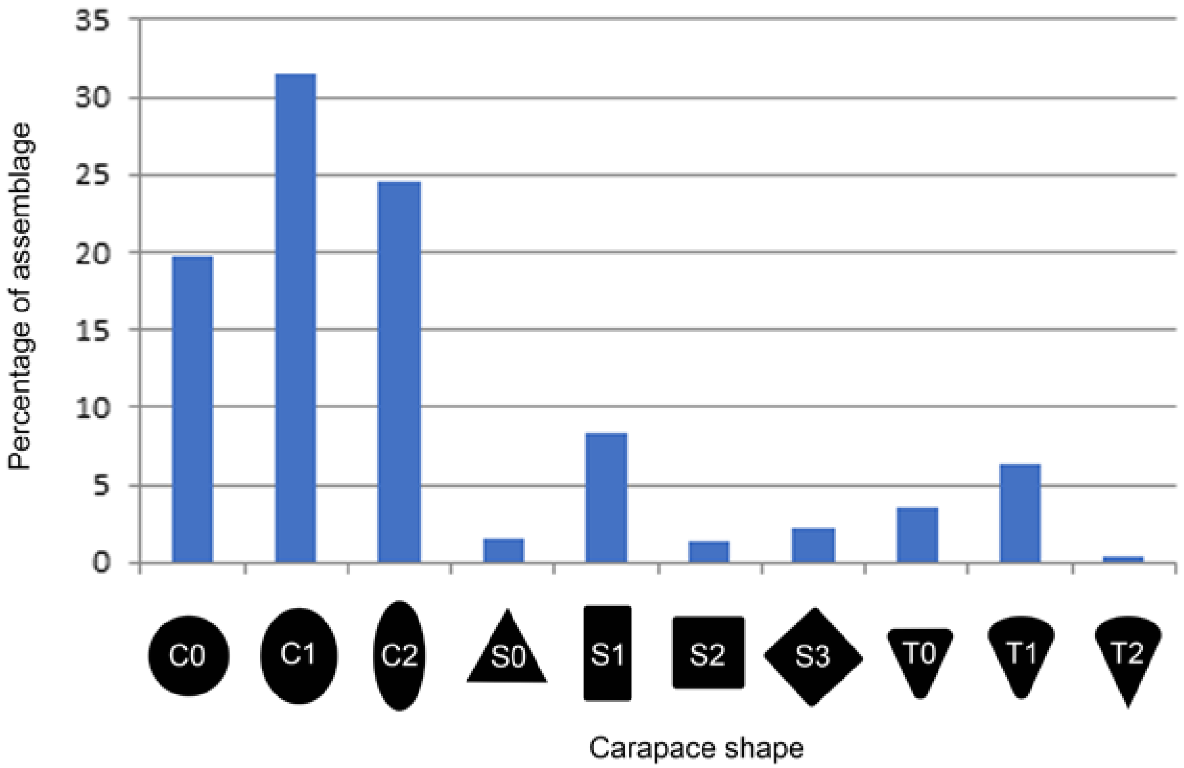


Figure 17.4. Carapace shape types recorded in turtle motifs.

These divisions were used to investigate variation within carapace shape and identify potential speciation types. While attributes T1, T2 and C0 appeared to be the most useful for determining species, each carapace shape was given a designated shape type to maintain consistency.

Most carapaces were circular in shape, yet there was a variety of straight-edged shaped carapaces in the sample that were unique. Mating turtles were omitted from this analysis as carapace shape usually could not be accurately described.

Quantitative measurements (see Figure 17.5) were taken from the longest and then the perpendicularly widest part of the carapace, including the thickness of the shape (e.g. measurement was taken from the outside of the carapace, not the inside).

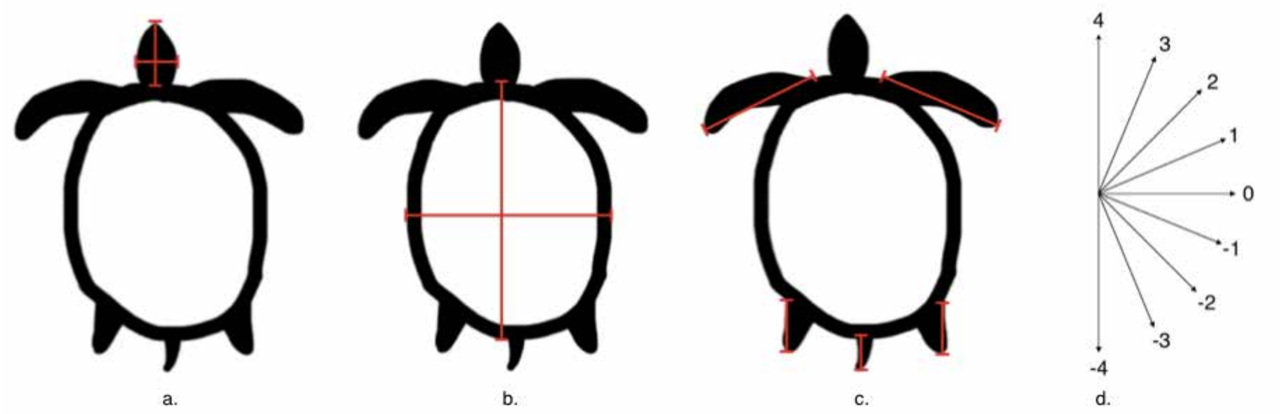


Figure 17.5. Quantitative measurements of turtle motifs: (a) head dimensions; (b) carapace dimensions; (c) flipper, hind legs and tail dimensions; (d) flipper angles.

A large number of carapace classes have been identified by previous research (e.g. 23 in Gunn and Mulvaney 2008; 68 in McDonald and Veth 2005). For this analysis a set of six major classes and 12 sub-classes was created. There is significant stylistic variability amongst motifs across the archipelago: of the 823 turtle motifs recorded, every motif was individual and an attempt to create more specific classes could have resulted in hundreds of different designs (see also Bednarik 2002). As carapace design is part of the stylistic character of the region's turtle motifs, it could not be used to distinguish species in the same way as zoological scute pattern identification works.

Analysis

The quantitative species identification process led to the development of species flowcharts using a combination of the variables discussed. Using the qualitative attributes on the recorded sample allowed for slightly more than half of the assemblage to be designated as one of the seven known turtle species (Table 17.1). By far the most common variety depicted was the Green turtle, followed by the Flatback and then similar numbers of the other more commonly found species, except for the Olive Ridley turtle, which was relatively rare.

SPECIES	COUNT
Freshwater	51
Flatback	93
Green	107
Hawksbill	40
Leatherback	52
Loggerhead	63
Olive Ridley	7
Total	*413*

Table 17.1. Count of turtle motifs identified to species level by qualitative means.

Not all 823 motifs counted (Table 17.2) had all attributes, and this defined whether they were analysed qualitatively or quantitatively. Excluded motifs included those that were either too small or, in the case of motifs identified as mating turtles, could not be accurately measured.

	COUNT	PERCENTAGE OF ASSEMBLAGE (%)
Qualitative variables	771	93.7
Quantitative variables	652	79.2
Mating turtles	51	6.2
Total motifs	*823*	*100*

Table 17.2. Total count of turtle motifs with variables.

Using the qualitative variables, motifs were subject to the speciation flow charts. If species could be identified, then each motif was labelled with a species-specific label. Those motifs that did not conform to this type of species identification were labelled as 'indeterminate' for further quantitative analysis.

Australian Flatback turtle (Natator depressus)

The Australian Flatback turtle is one of the least documented of all the marine turtles. It has a medium-sized carapace (average length 75–99 cm) with five central scutes and four pairs of lateral scutes with a distinctly upturned rim, thought to be useful when a female builds her nest. The front flippers are short and substantially smaller than those of similar-sized turtles of other species. Flatback habitat is limited to tropical and sub-tropical portions of Australia's continental shelf (Perrine 2003) and north to the islands of Indonesia (Spotila 2004).

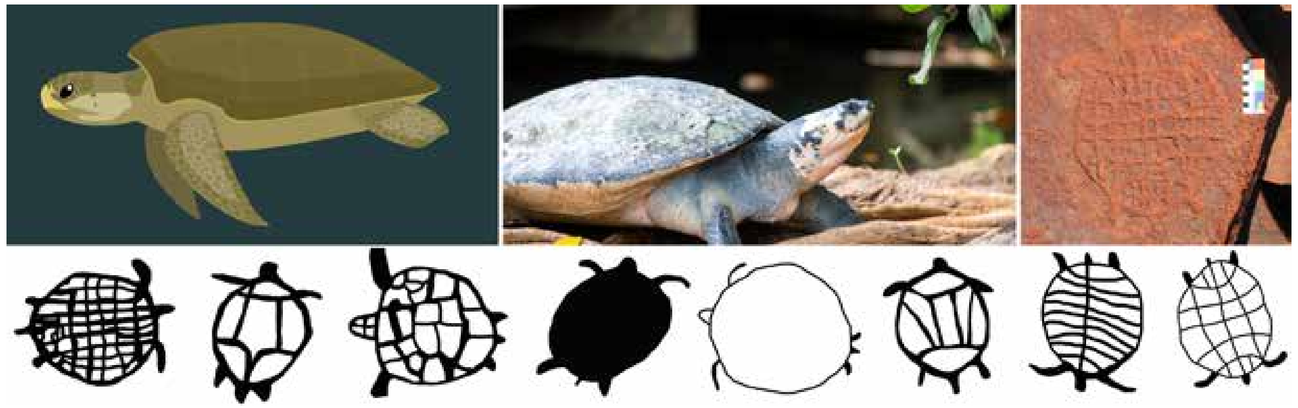


Figure 17.6. Australian Flatback turtle: (top left) illustration of species; (top middle) photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Green turtle (Chelonia mydas)

The Green turtle is the one that most people think of when marine turtles are mentioned. Also known as the 'edible turtle' (Perrine 2003: 96), its name is thought to derive from its green-coloured body fat and muscles which are considered a delicacy in soup or as a steak (Spotila 2004). Its desirability as a food has led to this species being threatened. While the carapace pattern is often beautiful (with bold streaks), these scutes are too thin to be fashioned into jewellery. This is the second-largest marine turtle with an average carapace length of 80–122 cm. The Green turtle has a short snout and an unhooked beak. It is the only species with tooth-like serrations on the lower jaw (Perrine 2003). The carapace has four lateral scutes, five central scutes and a relatively smooth margin.

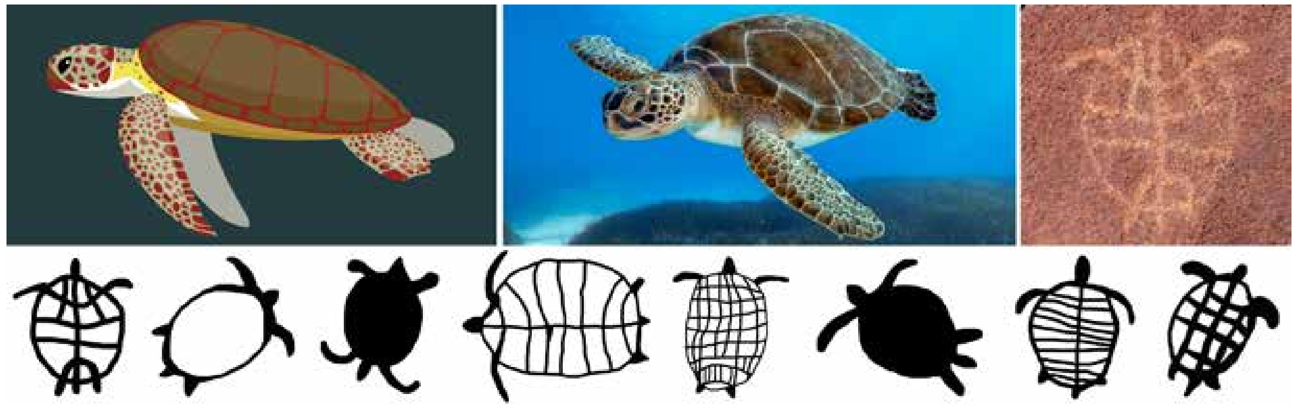


Figure 17.7. Green turtle: (top left) illustration of species; (top middle) photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Hawksbill turtle (Eretmochelys imbricata)

With a carapace considered 'more lovely than ivory' (Spotila 2004), the Hawksbill turtle population is now greatly diminished from coral reefs around the world. Tortoiseshell has been traded worldwide for millennia and the radiating streaks on this species' carapace is central to this trade. While their eggs are consumed, the Hawksbill turtle's flesh is inedible due to its diet of sponges (Perrine 2003). Hawksbill carapaces have an average shell length of 75–88 cm, distinguished by the sharp points of their scutes, defining a jagged rear margin. These carapace scutes – five central scutes and four pairs of lateral scutes – are 'imbricated, with each scute overlapping the one behind it' (Perrine 2003). The Dampier Archipelago is one of their major nesting colonies in Australia (Limpus 1995; Perrine 2003; Spotila 2004).

Figure 17.8. Hawksbill turtle: (top left) illustration of species; (top middle): photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Leatherback turtle (Dermochelys coriacea)

The Leatherback turtle is one of the world's largest living reptiles. The Leatherback does not have the same keratinised carapace as other marine turtles; rather, it has a layer of oily skin that is accented by seven longitudinal ridges and irregular white splotches (Perrine 2003). Their carapace length reaches up to 256 cm and flippers span up to 2.7 m. There are no known nesting colonies for Leatherbacks on the Australian continent: the closest is on Papua New Guinea in the west Pacific (Hirth et al. 1993; Perrine 2003; Spotila 2004).

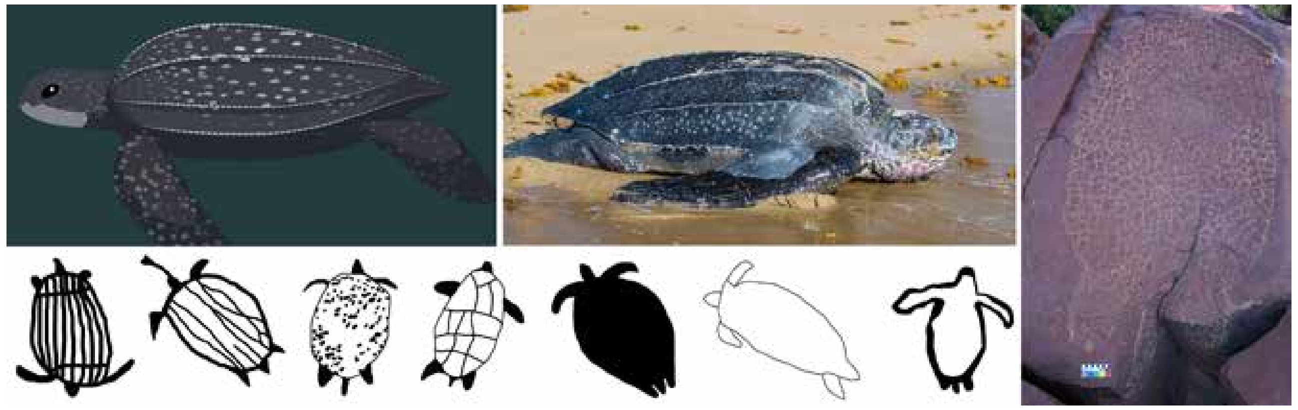


Figure 17.9. Leatherback turtle: (top left) illustration of species; (top middle) photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Loggerhead turtle (Caretta caretta)

The orange-brown colour of the Loggerhead turtle's 'spindle-shaped' carapace is one of its most distinctive features, as are the five central and five lateral scutes (Perrine 2003: 102). The average carapace length is 90 cm, making it the third-largest marine turtle. The Loggerhead is the only marine turtle to nest in the temperate zone (Perrine 2003). Of the three nesting colonies in Australia, two are in the Pilbara region (Hirth et al. 1993; Perrine 2003; Spotila 2004; Whittier et al. 1997).

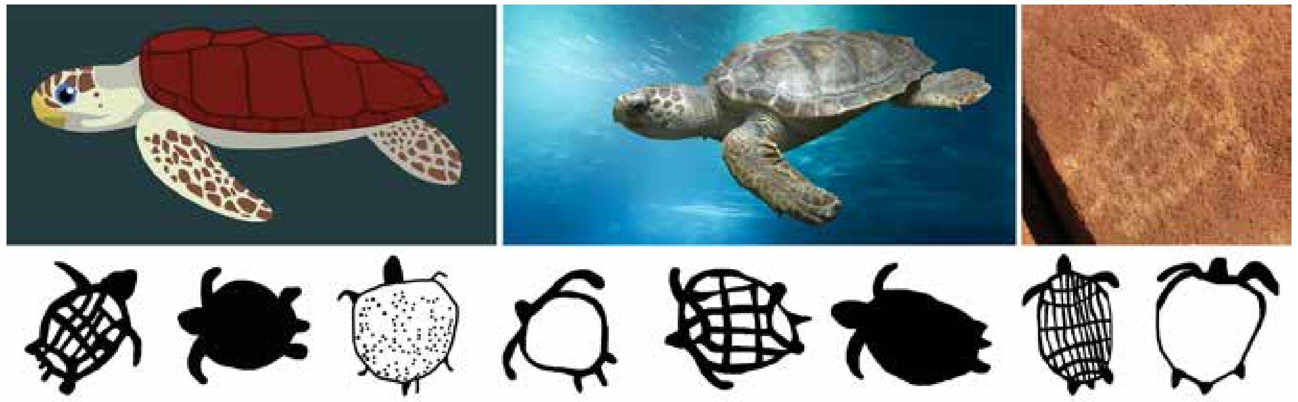


Figure 17.10. Loggerhead turtle: (top left) illustration of species; (top middle) photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Olive Ridley turtle (Lepidochelys olivacea)

The Olive Ridley is the smallest of the marine turtles with a maximum carapace length of 78 cm. They have a nearly round carapace with a unique scute pattern of five to nine lateral scutes and often unbalanced lateral scute pairs (Perrine 2003). The scutes themselves have no obvious streaks or markings. This species is not known to nest in the archipelago today.

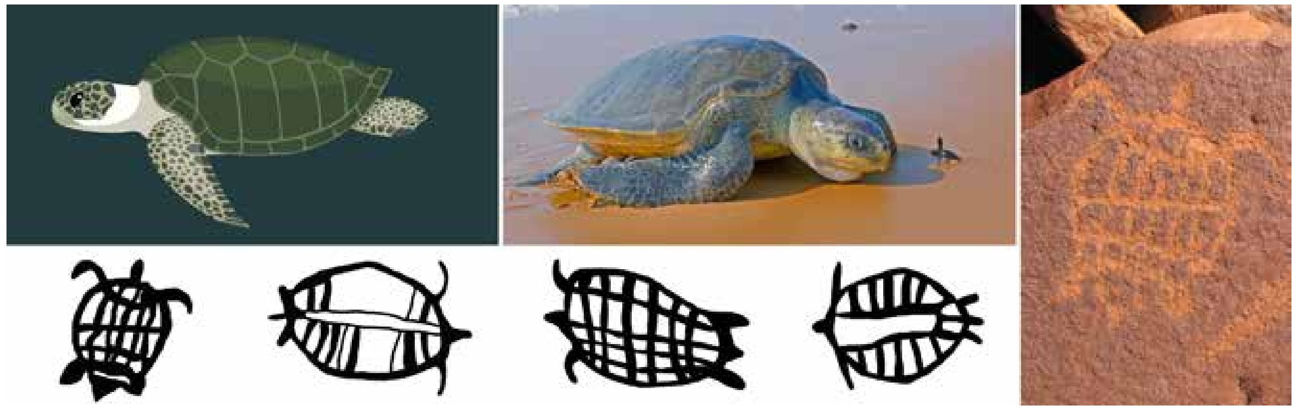


Figure 17.11. Olive Ridley turtle: (top left) illustration of species; (top middle) photo of species; (top right) engraving of species; (bottom) line drawings showing species-identified motifs.

Freshwater turtle species

The anatomy of freshwater turtles is like that of marine turtles with the major difference being their much smaller size. Freshwater turtles typically have long and narrow necks, and toe-like appendages with clawed feet (not flippers) and webbing. Unlike the movement of their marine cousins, freshwater turtles swim by alternating their limbs in a diagonal sequence (Spotila 2004: 46). As there are eight species of freshwater turtles found in Western Australia (Georges and Merrin 2008), motifs with freshwater turtle features were simply identified as not being marine and species identification was not conducted on this group of engravings.

Mating turtles

Within the original sample were 51 motifs interpreted as mating turtles (Gunn and Mulvaney 2008; McDonald and Veth 2005, 2006). While these were counted, they were not included in the quantitative or qualitative analyses due to the difference in available attributes.

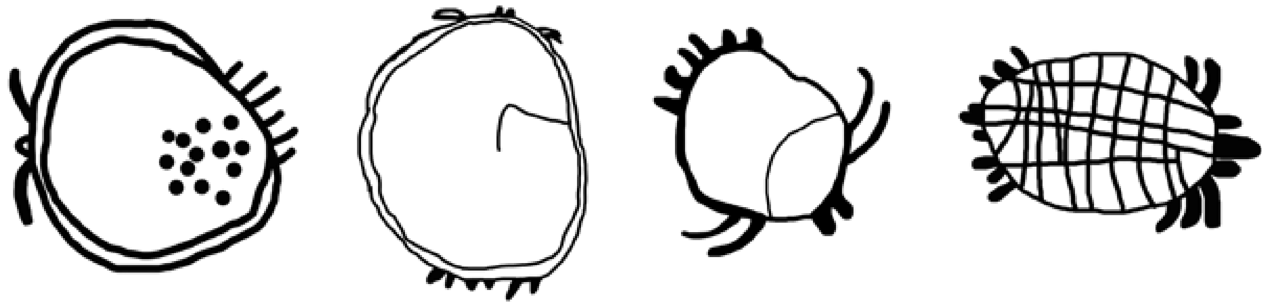


Figure 17.12. Examples of mating turtles from the Murujuga assemblage.

Discussion

This analysis showed that turtle species-specific traits could be assigned to many turtle motifs, creating species types for identification in the rock art. Our analysis showed that artists on the Dampier Archipelago did not rely on the same knowledge about carapace patterns relied on by Western science, but understood the subtler differences between the different turtle species in carapace shape and limb ratios.

Each of the six marine turtle species known to have inhabited the archipelago can be identified in the rock art of the Murujuga. Freshwater species are infrequently represented but do occur. The method of species identification deployed in this research focused on ratios of carapace length and width and head length and width as well as variables of head shape and carapace pattern. This approach is not used by zoologists because Linnean carapace pattern identification is efficient on live samples. Because Murujuga's engraved turtles exhibit extreme variability in carapace design, this stylistic innovation hinders species identification. Thus, it was necessary to determine other species-specific attributes to explore speciation in the engraved assemblage.

High levels of stylistic heterogeneity have been argued as demonstrating larger-scale group diversity, and increased group-bounding behaviour (Harper 2010; McDonald 2008 following Wobst 1977). The turtle motifs on the Dampier Archipelago demonstrate extreme variability in carapace shape, head shape and carapace pattern; however, these variables do not influence the clustering of the species groups (as shown by the dimensions used in the PCA: see Figure 17.2). These attributes (which cluster around the origin on the bivariate plot) do not distinguish between species but provide evidence about the common 'style' markers of the Murujuga turtles; that is, the defining schematic characteristics of what makes a turtle in this style province. The stylistic characteristics of Murujuga turtles are defined by carapace shape and head shape as well as carapace pattern. Conversely, different species of Murujuga turtles can be distinguished by head shape and the ratios of head length/width, carapace length/flipper length and carapace length/width.

It is evident that different groups of people have depicted Murujuga turtles differently through time. Dramatic changes in carapace pattern categories appear to reflect changing social, geographical and economic strategies. As sea levels rose – forming the Dampier Archipelago – this increasingly became a place of stylistic heterogeneity, with a shift from simpler solid and outline forms to the complex geometric dots, scute patterns, lines and combination carapace patterns.

During the older art production phases (defined by weathering CS1, CS2 and CS3), emblematic style (following Wiessner 1982, 1983, 1984, 1985, 1990) best describes the variability evident in the engravings of the archipelago. Broad-scaled cohesive style was used to negotiate more open social systems. Assertive style was likely present but not dominant enough to alter the form of the engravings to the extent witnessed in more recent phases.

During the later art production phases (particularly defined by CS4), a dramatic change occurred in turtle depictions of rock art across the archipelago. This assemblage demonstrates that style is being used both emblematically and assertively, with individual artists demonstrating their individuality in an environment of strong competition, as well as group values being asserted to signal territoriality.

It has been argued that Murujuga's style sequence for figurative elements includes increasingly detailed schemata during the most recent phases, including species-specific and diagnostically accurate motif forms (McDonald 2005b, 2015; McDonald and Veth 2013). This is supported by Wade's detailed analysis of marine fauna (Chapter 16). Rebecca Stewart's (2016) analysis of macropod motifs through the Murujuga sequence, however, showed macropod species depictions through time reflected the broad environmental change from inland range species to those of the current coastal desert islands. This trend, of increasing detail and embellishment of zoomorphic motifs, contrasts with the pattern identified by Mulvaney in the geometric repertoire (2015), where highly complex geometric forms are prevalent in the earliest art styles and these become less complex through time (despite geometric forms persisting throughout the sequence).

This research has demonstrated that Murujuga turtles – thatharruga – were initially depicted quite simply but that this motif form changed through time (see Table 17.3):

- During its earliest phases (predominantly CS1 and CS2), the Murujuga thatharruga is characterised by a dominance of solid and outline carapace patterns, curved heads (i.e. head shape 2 and 5) and a dominance of circular carapaces (i.e. C0, C1 and C2).
- During the middle phases of art production (predominantly CS3), turtle forms begin to show a higher frequency of scute-patterned carapaces, with pointed heads (i.e. head shape 4) and a more oval-shaped carapace (i.e. C1).
- In the most recent Murujuga art phases (predominantly CS4 and CS5), turtles have more oval carapaces with scute and combination carapace patterns (particularly unpaired scutes), a dominance of pointed heads (i.e. head shape 4) and an increasing number of square heads (i.e. head shape 3).

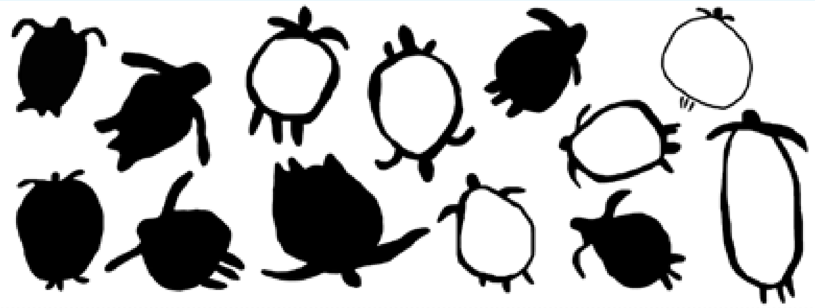
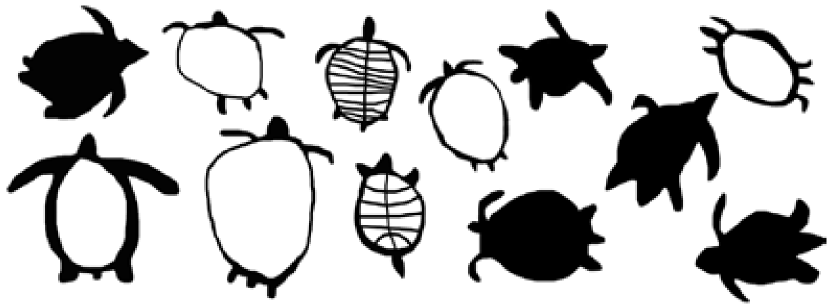
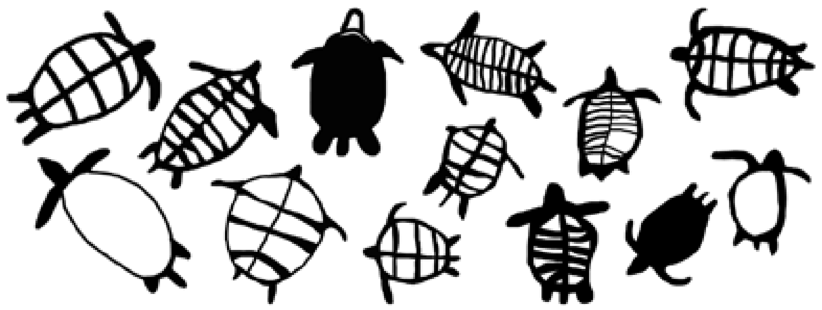
PHASE		CHARACTERISED BY
Early phase		Circular head Circular carapace Solid or outline pattern
Middle phase		Pointed head Oval-shaped carapace Solid, outline or scutes with single paired pattern
Recent phase		Pointed head Oval-shaped carapaces Predominance of scute pattern; some solid and some outline

Table 17.13. Schematic change in the Murujuga Thatharruga through time.

Dotted carapace pattern designs are minimal in all phases. This pattern (suggested by etic observers to be eggs) along with the presence of mating turtles in the art assemblage through all contrast state phases demonstrate an intimate knowledge of the reproductive cycle of Murujuga thatharruga. As with many motifs of Murujuga sea country, the turtle provides insights into not only people's asserted connections to Country through their stylistic behaviours but also their deep knowledge of the creatures of this sea country upon which their ongoing survival and marine economies depended.

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