Wudjari Country Bush Blitz
Marine and freshwater Crustacea and worms

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Andrew Hosie
Ana Hara
Michael Klunzinger

Nomenclature and taxonomy used in this report is consistent with:
Australian Faunal Directory (AFD)

World Register of Marine Species (WoRMS)

Contents

List of contributors

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Name	**Institution/affiliation**	**Qualifications/area of expertise**	**Level/form of contribution**
Dr. Andrew Hosie	***WA Museum***	***Crustaceans***	***Survey participant, identifications, principal author***
Ms. Ana Hara	***WA Museum***	***Crustaceans***	***Survey participant, identifications, principal author***
Dr. Michael W. Klunzinger	***Australian Rivers Institute, Griffith University & WA Museum***	***Inland Aquatic Molluscs & freshwater crayfishes***	***Survey participant, report author***

Abstract

This survey resulted in the collection of 210 specimen lots of aquatic crustaceans from the Recherche Archipelago and coastal Wudjari region east of Esperance. So far 107 species have been identified from a diverse range of crustacean groups: Amphipoda (beach hoppers), Anostraca (brine shrimp), Decapoda (shrimps, crabs and crayfishes), Isopoda (slaters), Thecostraca (barnacles) and Ostracoda (seed shrimp), seven of which are considered to be new to science. A small collection of worms, 10 specimen lots, representing six morphospecies of polychaete (bristle worms) and unidentified nematodes (round worm). A total of 27 sites were sampled in the Recherche Archipelago from Daw Island in the east to Mondrain Island in the west, using a variety of methods including scuba diving, hand collection, scoop nets and baited traps. On land, specimens were collected from 17 inland aquatic and 5 marine sites between Kepa Kurl (Esperance) and Gauroojeninya (Cape Arid National Park), using scoop and seine nets and sieves.

The introduced freshwater crayfishes yabby, *Cherax destructor* and smooth marron, *C. cainii* were seen at 4 sites. A single specimen of the exotic barnacle *Amphibalanus amphitrite*, was collected from Goose Island. Range extensions or significant in-filling of records were documented for 39 species identified on this survey. The identification of seven putative new species (2 barnacles, 3 amphipods and 2 isopods) is substantial given the short timeframe for reporting and it is expected that further new species will be determined upon examination by relevant specialists.

1. Introduction

Much of the Esperance Coast Basin (as defined by AWRC 1976) was cleared of its native vegetation for conversion to agricultural cropping since the 1950s. The loss of deeper-rooted native vegetation has led to a rising of naturally saline groundwater and coupled with low annual rainfall, flat topography and relatively impermeable Tertiary sediments, rivers and wetlands of the region have become unnaturally salinised (Mayer et al., 2005). Salinisation of formerly freshwater habitats, coupled with reductions in mean annual rainfall due to climate change, has led to a significant conservation threat to freshwater fauna. Nevertheless, there are pockets of relatively fresh water remaining in the survey region (Mayer et al., 2005).

The south-west corner of Western Australia is recognised as a hot-spot of biodiversity, with high levels of endemism. Faunal surveys of freshwater invertebrates in the region have been conducted previously (e.g. Pinder et al., 2004). However, most efforts in describing occurrence and distribution, as well as taxonomy, have concentrated on groups of crustaceans such as decapods and anostracans (Riek, 1967; Austin & Knott, 1996; Horwitz & Adams, 2000; Timms et al., 2009). The same effort is not seen in other crustacean groups, especially micro-crustaceans. Therefore, it is likely that the region harbours a high number of undescribed species.

The Recherche Archipelago stretches across 4,000 km^2, from Kepa Kurl (Esperance) to Israelite Bay in the East and contains over 100 Islands and many more reefs. The islands are mostly granitic, steep sided and exposed to significant wave energy, creating a dynamic range of habitats. The quartz sand has low clay or organic content, keeping the sea water from becoming especially turbid and giving excellent visibility for diving. The Archipelago is still influenced by the warm water Leeuwin Current as it heads east along the southern Australia Coast, which is believed to help maintain the subtropical species that are found into South Australian waters (Kendrick et al., 2009). Historical collections from the region have been sporadic and largely limited to the coast and nearshore islands closest to Esperance (Museum, unpub. data). The relatively recent International Marine Biological Workshop held in Esperance (Wells et al., 2005) resulted in invertebrate collections from the western part of the Archipelago and coastal

Esperance areas, but the crustaceans were limited to the order Tanaidacea, albeit with an impressive result of 24 newly described species (Bamber, 2005). A primary aim of this survey was to collect from the eastern-most islands where little, if any, sampling had been undertaken previously.

Pre-survey expectations were modest for freshwater groups given the timing of collection. Ideally, the best time would have been late winter or early spring, following the raining period in the region (Pinder et al., 2004).

2. Methods

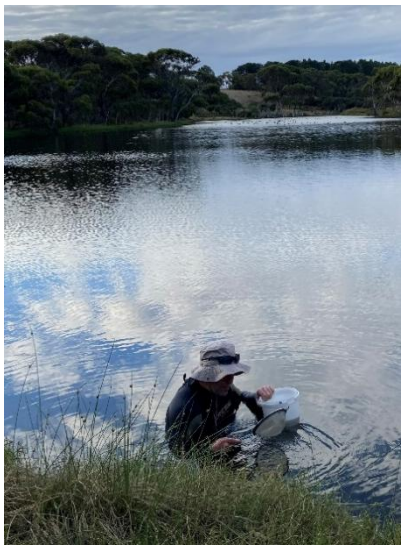
2.1 Site selection

Terrestrial sampling sites were located within terrestrial aquatic habitats in an area bounded by 33.543505°S and 34.389322°S and 121.352556°E and 123.936705°E, which consisted of urban, peri-urban, rural and conservation land between Kepa Kurl (Esperance), Mandoowernup (Cape Le Grand National Park) and Gauroojeninya (Cape Arid National Park). Sites were chosen to represent a wide a range of inland aquatic habitat types, including ponds, wetlands, lakes, streams and rivers. Site locations were partly determined by a pre-expedition desktop study of WA Museum, Atlas of Living Australia (https://www.ala.org.au/) and published survey records from Pinder et al. (2004). During the time of the surveys, some target survey sites were not sampled either due to the time or accessibility constraints. Local knowledge of site accessibility was provided through consultation with the WA Department of Biodiversity & Attractions Parks & Wildlife Service, Tjaltjraak Native Title Aboriginal Corporation and Doc Reynolds.

Marine sampling sites were also selected on a pre-expedition desktop study to find areas of low sampling intensity by looking at records in the WA Museum collections databases and the Atlas of Living Australia. This resulted in a loose prioritisation, with eastern islands such as Daw Island given the highest priority and working westwards. A range of habitat types, including intertidal, algal, sponge garden and seagrass were sampled across these islands. Local knowledge for selecting sampling sites, provided by commercial diver Mark Payne, was critical, particularly in adverse weather conditions. All operations were carried out from the live-aboard expedition vessel *Immortalis* and tenders.

2.2 Survey techniques

Land based team
Most freshwater crustaceans were collected using hand-held aquarium dip-nets or a metal kitchen sieve. Larger animals (such as crayfish) were visually targeted, whereas smaller animals were collected by scraping vegetation and sediment. Portions of sediment, debris and vegetation were also collected (~0.5 L) into buckets containing water from each survey site. This allowed detection of smaller crustaceans in the laboratory, using a series of geological survey sieves with varying sized meshes. Live crustaceans were observed under microscope and photographed with a Dinolite Premier 1.3 MP digital microscope and associated software (Aunet Pty Ltd, 20 Pomelaa Way, Clarkson, WA, 6030). Some marine species were collected in conjunction with, or by, the Fish team (Jenelle Ritchie and Michael Hammer) using a seine net.



Examples of hand nets (left) and hand-held kitchen sieve (right) used for collecting aquatic crustaceans in the field. **Left:** Ana Hara at a perched freshwater dune lake at Thistle Cove, Mandoowernup (Cape Le Grand National Park). Photo by Nicole Middleton. **Right:** Michael Klunzinger using hand-held kitchen sieve to scrape sediments and aquatic vegetation in search of aquatic molluscs and crustaceans at a farm dam upstream from Doombup Lake, near Bush Blitz Base Camp in Merivale.

Left: Ana Hara deploying a baited opera house trap for freshwater crayfish in Coramup Creek. **Right:** Michael Klunzinger and Ana Hara hand-collecting marron at Hidden Creek in Madoowernup (Cape Le Grand National Park). Photo by Nicole Middleton.

Nicole Middleton (left) and Jenelle Richie (right) seine netting for fish and crustaceans in the marine environment near shore among sea grass beds.

Tjaltjraak rangers, Elders, research scientists and teachers working together on Wudjari Country.

Marine team
The primary method of collecting was via scuba diving to depths around 25 m. Diving operations were undertaken with the aid of an aluminium cage, operated by Mark Payne, to provide protection during the ascent and descent phases, owing to the increased shark risk in this remote part of WA. Dives lasted approximately one hour and involved visual survey of the area near the cage for species and microhabitats to sample (e.g. sponges, seaweeds, sediments).

Other collecting methods included surveying intertidal areas, setting baited opera house traps and craypots for up to 24 hrs to catch mobile and scavenging fauna and using a box trawl to target fauna associated with seagrass beds.

Samples were brought aboard the *Immortalis* for sorting. Sediment samples were sieved through 500- and 250-micron mesh to retain microcrustaceans. Algal samples were washed in seawater to dislodge invertebrate fauna. Large sessile invertebrates such as sponges were inspected and dissected to extract any potential commensal species. Common species were typically returned to the sea alive. Retained specimens were then photographed on board using an Olympus tough TG5 digital camera, or back at the WA Museum under a Leica M125c microscope and preserved in 100% ethanol.

Left: Mark Payne and Lisa Kirkendale inside the diving cage. Right: example of a mixed algal and sponge reef common within the Recherche Archipelago.

2.2.1 Methods used at standard survey sites

Standard survey methods have not been developed for marine sampling yet. Terrestrial standard survey sites did not contain aquatic habitats, therefore were not applicable for this report.

2.3 Identifying the collections

Identification of vouchered specimens were made by the authors, initially in the field and then all retained vouchers were identified in the laboratory, using the preserved specimens, microscopes, available literature and museum collections. The following is a list of primary literature sources used for the identification of the collected specimens organised by taxa: Anomura (squat lobsters, hermit and porcelain crabs): Macpherson & Robainas-Barcia (2025), McLaughlin (2007), Morgan (1993); Brachyura (true crabs): Griffin & Tranter (1986), Lucas

(1981), McLay & Hosie (2022), Serène (1984), Poore (2004), Takeda & Miyake (1968); Caridea (shrimp): Banner & Banner (1975, 1982), Poore (2004); Parastacidae (crayfish): Morgan et al. (2011), Molony et al. 2004; Cirripedia (barnacles): Foster (1978) Hosie (2021), Hosie et al (2021), Jones (1990); Isopoda (slaters, sea centipedes): Bruce (1994), Harrison & Ellis (1991), Harrison & Holdich (1984), Poore & Lew Ton (1993) ; Amphipoda (beach hoppers, scuds): Barnard & Karaman (1991) Guerra-Garciá (2004), Lowry & Springthorpe (2001).

Representatives of identified species will be subsampled and kept at -80°C for future DNA sequencing.

3. Results and Discussion

Appendix 1 lists all marine and freshwater crustaceans recorded during the Bush Blitz. Collections made during this Bush Blitz will result in 642 specimens being added to public collections and 210 records being added to publicly accessible databases.

3.1 Un-named or not formalised taxa

Specimens that could not be confidently assigned to a known species were given temporary BBR (marine-based survey) or BBE (land-based survey) codes to maintain consistent identification across sites. Identifications lacking these codes indicate that morphospecies have not been confirmed and that multiple species may be present within the sample. In both situations these specimens may represent named or un-named species but will require further study to confirm.

Table 1. Putatively un-named or not formalised taxa

Taxon	**Comment**
Crustacea	
Ampithoidae, Maeridae, Melitidae, Spheromatidae, etc.	Family level, or higher, identifications such as these represent records where further study is required to determine identity and may still harbour multiple species. In some cases only females or juveniles are present making identification even more difficult.
Allorchestes sp. BBR1	One species, *A. compressus*, is known from southern Australia, but we are unsure if this species is conspecific.
Austrochiltonia sp. BBR1	Freshwater genus found across southern Australia subject to recent revision e.g. King & Leys (2011), probable undescribed species
Cerceis sp. BBR1	
Cerceis sp. BBR2	
Ericthonius sp. BBR1	
Kapalana? sp. BBR1	Tiny species, requiring significant dissection to identify
Melitidae? BBR1	This species is unusual and requires further study to confirm even family status
Natatolana sp. BBR1	
Ostracoda sp. BBE1	
Ostracoda sp. BBE2	
Paradexamine sp. BBR1	

Table 1. Putatively un-named or not formalised taxa	
Paridotea? sp. BBR1	Genus and species did not readily key out using Poore & Lew Ton (1993)
Podocerus sp. BBR1	
Pseudocerceis? sp. BBR1	Only juveniles of this species were collected
Sphaeromatidae sp. BBR1	Genus did not readily key out using Harrison & Ellis (1991)
Sphaeromatidae sp. BBR2	Genus did not readily key out using Harrison & Ellis (1991)
Sphaeromatidae sp. BBR3	Genus did not readily key out using Harrison & Ellis (1991)
Sunamphithoe sp. BBR1	
Tryphosella sp. BBR1	
Polychaeta	
Eunicidae sp. BBR1	
Oenonidae sp. BBR1	
Polynoidae sp. BBR1	

3.2 Putative new species (new to science)

In this report, 'putative new species' means an unnamed species that, as far as can be ascertained, was identified as a new species as a direct result of this Bush Blitz.

Results of the morphological examination of specimens has identified seven putative new species. However, more are expected to be identified once difficult taxa are examined by specialists or molecular data can be generated.

Amphipods and isopods are groups still rich in undescribed species and worth prioritising in future Bush Blitzes. The *Chevalia* and *Colomastix* recorded here have cryptic habits, which undoubtedly helped to keep them undescribed. The specimens of *Chevalia* BBR1 were found living in a presumed harem or family group inside a silk domicile that was attached under a rock. This genus is poorly known in Australia, with only one described species from the Great Barrier Reef (Myers, 2009). The single specimen of *Colomastix* BBR1 was found inhabiting a sponge, a typical habitat for the group. Only one species is known from southern Australia, *C. brazieri*, from Port Jackson, NSW (LeCroy, 2009). *Metacyproidea* BBR1 belongs to recently described genus that has not been identified from Australian waters previously (Ariyama, 2016).

The two species of barnacles are obligatory commensals on sponges (hosts still to be identified). Hosie (2021) documented many undescribed species and morphologically cryptic, but genetically distinct lineages of this group using COI barcodes. *Neoacasta* BBR1 morphologically belongs to a complex of similar species and will likely require DNA sequences to establish its identity unequivocally. *Acasta* BBR1 on the other hand, while superficially similar to the recently described *Acasta caveata* Hosie et al. (2021), does have some significant morphological characters that serve to distinguish it.

The *Heteroserolis* BBR1 represents the first record of this genus in WA waters, but there are six described species from similar habitats in southeastern Australia (Harrison & Poore 1984). This genus is typically found on sandy sediments. Unidentified species of *Exosphaeroma* have been recorded within the survey area previously (Pinder et al., 2004), but it is unclear if they represent the same species as we collected.

Table 2. Putative new species (new to science)	
Species	**Comment**
Amphipods	
Chevalia sp. BBR1	No described species of this genus are known from WA waters.
Colomastix sp. BBR1	No described species of this genus are known from WA waters
Metacyproidea sp. BBR1	No described species of this genus are known from Australian waters
Barnacles	
Acasta BBR1	Obligatory commensal species found inhabiting sponges
Neoacasta BBR1	Obligatory commensal species found inhabiting sponges
Isopods	
Exosphaeroma sp. BBR1	This genus is typically marine or estuarine, but this species was found in freshwater.
Heteroserolis sp. BBR1	No described species of this genus is known from WA waters

3.3 Exotic and pest species

Table 3. Exotic and pest species recorded			
Exotic/pest species	**Location sighted/observed**	**Indication of abundance**	**Comments**
Amphibalanus amphitrite	Goose Island	Only a single specimen seen	Near cosmopolitan fouling barnacle
Artemia "parthenogenetica"	Lake Hillier	Highly abundant	First record of this taxon from this lake.
Cherax cainii	Hidden Creek, Cape Le Grand	Common	This species is native to southern WA, but not the Bush Blitz survey area
Cherax destructor	Tjaltjaraak Boodja Park, Dunn Rocks Creek, Coramup Creek	Common	Native to eastern Australia, introduced to WA where it has become an invasive pest.

Example of a young Smooth marron, *Cherax canii.* Photo by Helen Cross.

The barnacle *Amphibalanus amphitrite* is a common fouling species thought to be native to the Indo-West Pacific, but subsequently spread via shipping to many other parts of the world. This species is common in and around Australian ports and adjacent impacted areas, but rarely seen in more pristine environments. The species has had a complex taxonomic history, making early historical records difficult to disentangle and determine its native distribution (Utinomi, 1967; Jones, 1992) as such it is best considered cryptogenic and may be native to northern Australia. In Western Australia, the earliest known records are from the early 20th century near Broome, and first detected on marine infrastructure in Esperance in 2002 (see Jones, 1992 and Huisman et al., 2008 for discussion and citations within). This is the first known record of this species found away from ports or artificial substrates in the survey area.

Asexual populations of the brine shrimp genus *Artemia* are commonly referred to as *A. parthenogenetica*, but the species name is not considered valid and subject to considerable debate (Boyer et al., 2021; Muñoz et al., 2010). Within Australia, the genus has been considered introduced through salt mining operations, as it was first detected in salt lakes with industrial activity, and subsequently spread, while pristine lakes were inhabited by the endemic *Parartemia* species (Timms et al., 2009). A competing theory is that encysting eggs were inadvertently carried by migratory birds that stop at these lakes during their long international migrations (McMaster et al., 2007). Lake Hillier has only been subjected to very minimal salt extraction, primarily in the late 19th century (Green et al., 2001). This seems to be the first record of brine shrimp in Lake Hillier and given the confusion around the specific identity, molecular sequencing is recommended to refine our identification.

The two species of freshwater crayfish, *Cherax cainii* and *C. destructor* are both considered invasive within the survey area. The smooth marron, *C. cainii*, is native to the southwestern corner of WA and has had its range expanded within Wudjari Country through officially sanctioned stocking of lakes and ponds as part of aquaculture and recreational fishery expansion since at least the 1960s. Similarly, *C. destructor*, the yabby, was introduced into WA from Victoria for the same reasons but is now considered a feral pest. It is typically thought that the easternmost extent of the distribution of native WA freshwater crayfish species is just east of Albany, at least in modern times.

3.4 Threatened species

No known threatened or listed species of crustacean were encountered during the survey. However, many ecosystems in the region face significant threats, such as salinisation and a drying climate that are likely to impact the populations of inland aquatic species in the survey area.

3.5 Range extensions

For the purposes of this report significant infilling or range extensions are categorised as species not previously recorded between Albany and the WA: SA border, a stretch of coastline well over 1,100 km long, as recorded on the ALA and the WAM crustacean database. The nearest WA locality is provided, followed by other states. Approximate distances are given as a straight line between localities, except to go around obvious terrestrial obstacles for marine species i.e. going around Cape Leeuwin rather than cutting straight across the continent.

Table 5. Range extensions or significant infill in distribution records for species

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
Amphipods			

Table 5. Range extensions or significant infill in distribution records for species			
Ochlesis eridunda	Goose Island	400 km	Previously from Albany, WA, SA & NSW
Paraproto spinosa	Pointer & Anvil Islands	2,000 km	First record for WA - previously known from VIC, TAS & NSW
Barnacles			
Euacasta acutaflava	Daw & Pointer Islands	2,500 km	Range extension – WA endemic, south from Montebello Islands
Lepas testudinata	Recherche Archipelago, attached to drifting buoy	400 km	Previously from Albany, WA, VIC & NSW
Trevathana synthesysae	Middle Island	1,000 km	Only known Australian record is Cockburn Sound, WA
Brine Shrimp			
Artemia 'parthenogenetica'	Lake Hillier	60 km	Range extension – known from salt lakes near Esperance (see section 3.3)
Decapods			
Actaea peronii	Daw & Middle Island	400 km	In-fill - between Albany and SA
Ancylomenes aesopius	Anvil Island	400 km	Previously known from Albany, WA & SA
Ceratoplax glaberrima	Mart Islands	400 km	In-fill - between Albany and SA
Cyclograpsus audouinii	Daw Island	400 km	In-fill - between Albany and SA
Heteropilumnus cf. *fimbriatus*	Mart Islands	1,200 km	New record for WA – Previous SA
Huenia cf. *bifurcata*	Middle Island	2,200 km	New record for WA – previous VIC & NSW
Latreutes compressus	Goose Island	400 km	Previously known from Albany, WA & SA, VIC, TAS, NSW & QLD
Microhalimus deflexifrons	Daw, Middle & Pointer Islands	400 km	In-fill - between Albany and VIC
Palaemon intermedius	Daw Island & Duke of Orleans Bay	400 km	Previously known from Albany, WA & SA
Philocheras intermedius	Anvil & Middle Islands	1,000 km	Previously known from Cockburn Sound, WA and SA
Phlyxia crassipes	Middle & Mart Islands	900 km	In-fill - between Bunbury and SA
Pippacirama tuberculosa	Middle Island	400 km	In-fill - between Albany and SA
Processa australiensis	Daw, Pasley & Pointer Islands	1,000 km	Previously known from Cockburn Sound, WA, SA, VIC, NSW & QLD
Stimdromia cf. *lamellata*	Middle & Goose Islands	1,000 km	SA, VIC, TAS, 1 record in db from Point Peron
Synalpheus fossor	Middle Island	400 km	Previously known from Albany, WA & SA
Tozeuma pavoninum	Middle Island	1,000 km	Previously known from Cockburn Sound, WA and SA

Table 5. Range extensions or significant infill in distribution records for species			
Isopods			
Amphoroidella elliptica	Daw & Marts Islands	1,200 km	Previously known from Jurien Bay, WA & SA
Cercosphaera coloura	Daw Island	1,000 km	First WA record, known from SA & VIC
Cercosphaera dilkera	Middle Island	1,200 km	Previously known from Dongara, WA & Flinders Island, SA
Crabyzos longicaudatus	Anvil Island	1,000 km	Previously known from Cockburn Sound, WA & SA, VIC & TAS
Diclidocella yackatoon	Daw Island	1,200 km	Previously known from Dongara, WA & SA
Euidotea bakeri	Daw, Mondrain & Pointer Islands	400 km	Previously known from Albany, WA, SA, TAS, VIC, NSW
Euidotea caerulotincta	Anvil Island	400 km	Previously known from Albany, WA, SA & TAS
Exosphaeroma cf. *bicolor*	Bandy Creek	1,200 km	New record for WA – Previously known from SA
Haswellia cilicioides	Daw & Middle Islands	800 km	Previously known from Cape Naturaliste, WA & SA
Haswellia emarginata	Daw & Mondrain Islands	1,200 km	Previously known from Jurien Bay, WA, SA, VIC & NSW
Idotea metallica	Recherche Archipelago, attached to drifting buoy	3,000 km	New record from WA - Previous records from NSW & QLD
Paracilicaea hamata	Daw & Middle Islands	1,200 km	Previously known from Jurian Bay, WA & SA
Platycerceis hyalina	Anvil	1,000 km	Previously known from Garden Island, WA & SA
Worms			
Ficopomatus enigmaticus	Duke Creek	400 km	Previously known from Albany, WA, SA, VIC, NSW & QLD
Hipponoe gaudichaudi	Recherche Archipelago, attached to drifting buoy	3,000 km	New record from WA - Previous records from NSW
Lepidonotus oculatus	Middle Island	700 km	Previously known from off Cape Leeuwin, WA, SA, VIC, NSW, WLD
Pectinaria antipoda	Middle & Pasley Islands	700 km	Previously known from off Cape Leeuwin, WA, SA, VIC, NSW, WLD

Examples of species that have had their known ranges significantly extended or in-filled. Left to right, the skeleton shrimp *Paraproto spinosa*, goose barnacle *Lepas testudinata* and the shrimp *Philocheras intermedius.*

3.6 Genetic information

Most specimens were fixed in 100% ethanol and preserved in 70% ethanol and will be made accessible for future molecular analysis by interested researchers.

4. Information on species lists

This survey was not meant to be a comprehensive inventory of the region, but a targeted effort to collect in specific habitats. As such, groups such as terrestrial isopods (slaters) and planktonic crustaceans were not collected. Relatively well-known groups such as decapods (crabs and shrimp) while not specifically targeted are prominent members at many of the sites surveyed and were retained to provide contemporary records. Commonly occurring or readily identified species were not kept at every site.

Groups such as isopods and amphipods are always numerous and diverse in marine habitats but are difficult to identify owing to small size and often sporadic literature. For this expedition these groups were often not identified to species level and over 20 specimen lots are still only at family or order level. We expect the diversity from this survey to increase as these specimens are worked up by specialists who were not a part of the survey.

5. Information for land managers

The wetlands in and around the land-based survey area have been heavily impacted by human use over the past few centuries, leading to changes in the hydrography of the region that is certainly having a negative impact on both the saline and freshwater invertebrate communities (Mayer et al., 2005; Pinder et al., 2004; Timms, 2005). Adoption of agricultural and conservation practices that can reduce future salinisation is necessary, especially for the strictly freshwater fauna. Not included in the above tables is an unconfirmed sighting of a third species of freshwater crayfish, possibly *Cherax preissii* (koonac) or *Cherax glaber* (glossy black koonac), at Dunn Rocks Creek. This sighting would be worth following up by land managers, as the

known native ranges for these species extend only as far east as Cheynes Beach. If *C. preissii* is confirmed to be present it would represent another translocated species in the region.

The terrestrial and aquatic crustacea east of Kepa Kurl (Esperance) are still poorly known and Museum records and previous studies of the region suggest that additional aquatic crustaceans may occur in areas that could not be accessed during this Bush Blitz Expedition. Follow-up surveys during late winter and spring, in partnership with land managers, Tjaltjraak stakeholders and WA Government would be beneficial for filling biodiversity information gaps and enhancing conservation management.

The marine habitats along the Esperance Coast and the Recherche Archipelago are within the area of a proposed WA Marine Park (https://www.dbca.wa.gov.au/management/parks/plan-our-parks/proposed-south-coast-marine-park). Biodiversity inventories of this region will be essential for monitoring for changes in ecosystems and the community. Similarly, the crustacean fauna that may be present living in terrestrial or inland aquatic habitats of the many islands of the Recherche Archipelago have not been surveyed.

6. Other significant findings

Many of the species identified represent typical temperate species, however, the impact of the warm water Leeuwin current can still be seen by the presence of several typically warm water species. Examples of this include the coral inhabiting *Trevathana synthesysae,* which likely represents the southernmost record of the barnacle family Pyrgomatidae (all are obligate symbionts of hard corals). In amongst the samples are numerous rare, or rarely encountered, species and beyond the excitement that comes with discovering new species, are the collections of specimens of particular interest to taxonomic practices. A sponge-inhabiting barnacle, *Neoacasta glans*, is significant as a type species for the genus *Neoacasta* and is vital for a revision of the genus and establishing the identity of several new species that have been confused with this likely Australian endemic.

Groups such as the amphipods and isopods, with their typically small size are easily confused and given historical limitations for microscopy in the 19th and early 20th century, the early attempts to accurately describe species are not always precise enough by modern standards. As such, many species need to be recollected and redescribed to modern standards. The freshly collected specimens of *Paracilicaea hamata*, *Exosphaeroma* cf. *bicolor*, *Haswellia cilicioides* and *H. emarginata* will hopefully be used to better understand their phylogenetic relationships and the biogeography of the Australian coast.

7. Conclusions

The results of this survey show that the crustacean fauna of this area is still poorly known and should by no means be considered to have been comprehensively surveyed. The results highlight the capabilities of a relatively small team seeking species discoveries with ~40% of species records exhibiting a significant range extension and seven species considered new to science. New species are significant finds and not always apparent during the initial identifications, further study on specimens with uncertain identifications are likely to add to this number.

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Appendix 1. List of Crustacea and worms recorded during the Wudjari Country Bush Blitz						
Family	**Species**	**Common name**	**Putative new species**	**Threatened (EPBC Act)**	**Threatened (State Act)**	**Exotic/ pest**
Alpheidae	*Alpheus parasocialis*	Snapping shrimp	No	No	No	No
Alpheidae	*Synalpheus fossor*	Snapping shrimp	No	No	No	No
Ampithoidae	sp.	Amphipods	No	No	No	No
Ampithoidae	*Sunamphithoe* sp. BBR1	Amphipods	No	No	No	No
Artemiidae	*Artemia* sp. *parthenogenetica*	Brine shrimp	No	No	No	Yes
Balanidae	*Acasta* sp. BBR1	Sponge barnacle	Yes	No	No	No
Balanidae	*Amphibalanus amphitrite*	Acorn barnacle	No	No	No	Yes
Balanidae	*Euacasta acutaflava*	Sponge barnacle	No	No	No	No
Balanidae	*Neoacasta* sp. BBR1	Sponge barnacle	Yes	No	No	No
Balanidae	*Neoacasta glans*	Sponge barnacle	No	No	No	No
Caprellidae	*Metaprotella haswelliana*	Amphipods	No	No	No	No
Caprellidae	*Paraproto spinosa*	Amphipods	No	No	No	No
Chevaliidae	*Chevalia* sp. BBR1	Amphipods	Yes	No	No	No
Chiltoniidae	*Austrochiltonia* sp. BBR1	Amphipods	No	No	No	No
Cirolanidae	*Cirolana hesperia*	Marine pillbug	No	No	No	No
Cirolanidae	*Natatolana* sp. BBR1	Marine pillbug	No	No	No	No
Class: Ostracoda	sp. BBE1	Seed shrimp	No	No	No	No
Class: Ostracoda	sp. BBE2	Seed shrimp	No	No	No	No
Colomastigidae	*Colomastix* sp. BBR1	Amphipods	Yes	No	No	No
Crangonidae	*Philocheras intermedius*	Sand shrimp	No	No	No	No
Cymothoidae	*Ourozeuktes bopyroides*	Parasitic isopod	No	No	No	No
Cyproideidae	*Metacyproidea* sp. BBR1	Amphipods	Yes	No	No	No
Dexaminidae	*Paradexamine* sp. BBR1	Amphipods	No	No	No	No
Diogenidae	cf. *Areopaguristes* sp.	Hermit crab	No	No	No	No
Diogenidae	*Calcinus dapsiles*	Hermit crab	No	No	No	No
Diogenidae	*Paguristes frontalis*	Hermit crab	No	No	No	No
Diogenidae	*Paguristes sulcatus*	Hermit crab	No	No	No	No
Diogenidae	sp.	Hermit crab	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Dogielinotidae	*Allorchestes* sp. BBR1	Amphipods	No	No	No	No
Dromiidae	cf. *Austrodromidia* sp.	Sponge crab	No	No	No	No
Dromiidae	*Fultodromia* cf. *nodipes*	Sponge crab	No	No	No	No
Dromiidae	*Stimdromia* cf. *lamellata*	Sponge crab	No	No	No	No
Epialtidae	*Huenia australis*	Decorator/spider cral	No	No	No	No
Epialtidae	*Huenia* cf. *bifurcata*	Decorator/spider cral	No	No	No	No
Epialtidae	*Huenia* cf. *halei*	Decorator/spider cral	No	No	No	No
Galatheidae	*Galathea australiensis*	Squat lobster	No	No	No	No
Grapsidae	*Planes minutus*	Sargassum crab	No	No	No	No
Hymenosomatidae	*Halicarcinus ovatus*	Three-pronged sea s	No	No	No	No
Hyppolytidae	*Hippolyte australiensis*	Weed shrimp	No	No	No	No
Hyppolytidae	*Latreutes compressus*	Slender sargassum s	No	No	No	No
Hyppolytidae	*Tozeuma pavoninum*	Arrow shrimp	No	No	No	No
Idoteidae	*Crabyzos longicaudatus*	Sea centipede	No	No	No	No
Idoteidae	*Euidotea bakeri*	Sea centipede	No	No	No	No
Idoteidae	*Euidotea caeruleotincta*	Marine pillbug	No	No	No	No
Idoteidae	*Idotea metallica*	Metallic Isopod	No	No	No	No
Idoteidae	cf. *Paridotea* sp.	Marine pillbug	No	No	No	No
Inachidae	*Dumea latipes*	Decorator/spider cral	No	No	No	No
Ischyroceridae	*Ericthonius* sp. BBR1	Amphipods	No	No	No	No
Ischyroceridae	cf. *Kapalana* sp.	Amphipods	No	No	No	No
Lepadidae	*Lepas anatifera*	Goose barnacle	No	No	No	No
Lepadidae	*Lepas testudinata*	Goose barnacle	No	No	No	No
Leptograpsodidae	*Leptograpsodes octodentatus*	Burrowing shore crab	No	No	No	No
Leptograpsodidae	sp.	Burrowing shore crab	No	No	No	No
Leucosiidae	*Ebalia* cf. *tubercuosa*	Pebble crab	No	No	No	No
Leucosiidae	*Phlyxia crassipes*	Pebble crab	No	No	No	No
Leucothoidae	*Leucothoe* sp.	Amphipods	No	No	No	No
Lomisidae	*Lomis hirta*	Hairy stone crab	No	No	No	No
Maeridae	sp.	Amphipods	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Maeridae	*Hoho carteta*	Amphipods	No	No	No	No
Maeridae	*Mallacoota* sp. BBR1	Amphipods	No	No	No	No
Majidae	*Leptomithrax sternocostulatus*	Decorator/spider cral	No	No	No	No
Majidae	*Microhalimus deflexifrons*	Decorator/spider cral	No	No	No	No
Majidae	*Naxia spinosa*	Decorator/spider cral	No	No	No	No
Majidae	*Pippacirama tuberculosa*	Decorator/spider cral	No	No	No	No
Majidae	*Schizophrys rufescens*	Decorator/spider cral	No	No	No	No
Melitidae	sp.	Amphipods	No	No	No	No
Melitidae?	sp. BBR1	Amphipods	No	No	No	No
Ochlesidae	*Ochlesis eridunda*	Amphipods	No	No	No	No
Order: Amphipoda	sp.	Amphipods	No	No	No	No
Paguridae	*Pagurixus amsa*	Hermit crab	No	No	No	No
Paguridae	*Pagurus sinuatus*	Hermit crab	No	No	No	No
Palaemonidae	*Ancylomenes aesopius*	Glass shrimp	No	No	No	No
Palaemonidae	*Palaemon intermedius*	Striped shrimp	No	No	No	No
Palaemonidae	*Palaemon litoreus*	Glass shrimp	No	No	No	No
Parastacidae	*Cherax cainii*	Smooth marron	No	No	No	Yes
Parastacidae	*Cherax destructor*	Yabby	No	No	No	Yes
Parastacidae	*Cherax preisii*	Koonac	No	No	No	No
Parastacidae	*Cherax* sp.	Freshwater crayfish	No	No	No	No
Penaeidae	*Penaeus* sp.	Prawn	No	No	No	No
Pilumnidae	*Ceratoplax glaberrima*	Hairy crab	No	No	No	No
Pilumnidae	*Heteropilumnus* cf. *fimbriatus*	Bearded crab	No	No	No	No
Pilumnidae	*Pilumnus* cf. *acer*	Long-spined hairy cra	No	No	No	No
Pilumnidae	*Pilumnus rufopunctatus*	Hairy crab	No	No	No	No
podoceridae	*Podocerus* sp. BBR1	Amphipods	No	No	No	No
Porcellanidae	*Acylocheles gravelei*	Porcelain crab	No	No	No	No
Porcellanidae	*Pisidia dispar*	Porcelain crab	No	No	No	No
Porcellanidae	sp.	Porcelain crab	No	No	No	No
Processidae	*Processa australiensis*	Odd-footed shrimp	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Pyrgomatidae	*Trevathana synthesysae*	Acorn barnacle	No	No	No	No
Serolidae	*Heteroserolis* sp. BBR1	Marine pillbug	Yes	No	No	No
Sphaeromatidae	sp.	Marine pillbug	No	No	No	No
Sphaeromatidae	sp. BBR1	Marine pillbug	No	No	No	No
Sphaeromatidae	sp. BBR2	Marine pillbug	No	No	No	No
Sphaeromatidae	sp. BBR3	Marine pillbug	No	No	No	No
Sphaeromatidae	*Amphoroidella elliptica*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cerceis* sp. BBR1	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cerceis* sp. BBR2	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cerceis* cf. sp. BBR1	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cercosphaera dilkera*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cercosphaera coloura*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Cymodoce* cf. *pelsarti*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Diclidocella yackatoon*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Exosphaeroma* sp. BBR1	Marine pillbug	Yes	No	No	No
Sphaeromatidae	*Exosphaeroma* cf. *bicolor*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Haswellia cilicioides*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Haswellia emarginata*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Paracilicaea hamata*	Marine pillbug	No	No	No	No
Sphaeromatidae	*Platycerceis hyalina*	Marine pillbug	No	No	No	No
Sphaeromatidae	cf. *Pseudocerceis* sp. BBR1	Marine pillbug	No	No	No	No
Superfamily: Anthuroidea	sp.	Anthurid isopod	No	No	No	No
Tetraclitidae	*Epopella simplex*	Acorn barnacle	No	No	No	No
Tetraclitidae	*Tetraclitella purpurascens*	Acorn barnacle	No	No	No	No
Tryphosidae	*Tryphosella* sp. BBR1	Amphipods	No	No	No	No
Varunidae	*Cyclograpsus audouinii*	Smooth shore crab	No	No	No	No
Varunidae	sp.	Smooth shore crab	No	No	No	No
Xanthidae	*Actaea calculosa*	Rubble crab	No	No	No	No
Xanthidae	*Actaea peronii*	Rubble crab	No	No	No	No
Serpulidae	*Ficopomatus enigmaticus*	Tube worm	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Nematoda	sp.	Round worm	No	No	No	No
Amphinomidae	*Hipponoe gaudichaudi*	Bristle worm	No	No	No	No
Eunicidae	sp. BBR1	Rock worm	No	No	No	No
Oenonidae	sp. BBR1	Bristle worm	No	No	No	No
Polynoidae	*Lepidonotus oculatus*	Scale worm	No	No	No	No
Polynoidae	sp. BBR1	Scale worm	No	No	No	No
Pectinariidae	*Pectinaria antipoda*	Mason worm	No	No	No	No