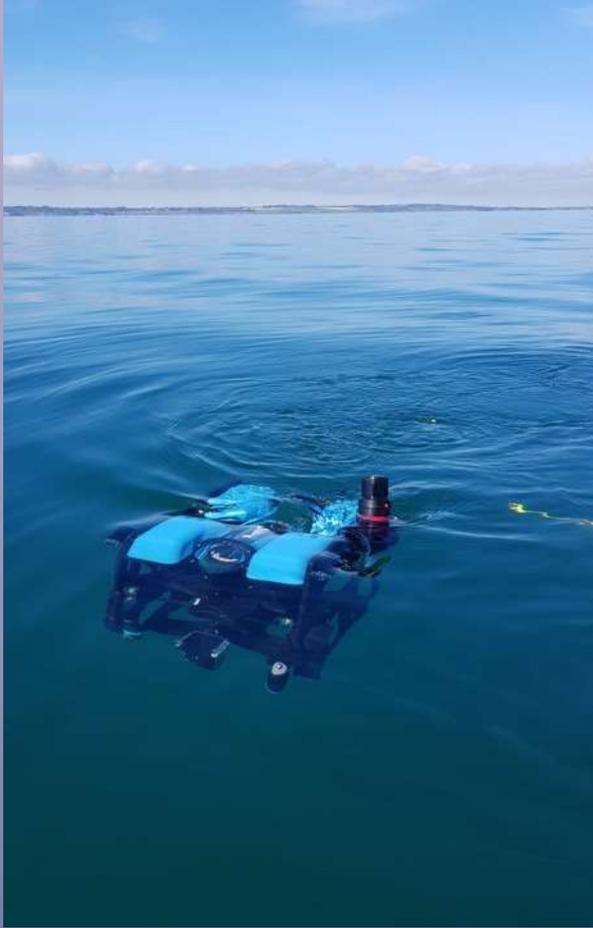


# Kingfish Reefs Site Assessment

## Port Phillip Bay



Report to Total Hydrographic Pty Ltd

April 2021



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# 1. Introduction

## 1.1. Background

The Victoria Fisheries Authority (VFA) is assessing the suitability of a site in Port Phillip Bay for the placement of artificial structures for the purpose of attracting fish and enhancing recreational fishing opportunities. The structures act as fish aggregating devices (FADs) and are targeted towards the attraction of yellowtail kingfish (*Seriola lalandi*), although several other species are likely to be attracted. The structures are constructed from concrete and have previously installed off Torquay<sup>1</sup> (Victoria). Similar structures have been installed off Newcastle (New South Wales).

Kingfish are seasonally targeted by recreational fishers in Port Phillip Bay heads and along with targeting seasonal influx of southern bluefin tuna, the fishery has become increasingly popular in Victoria. Kingfish are known to prefer areas of high or eddying currents and areas where waves break on islands or shores with steep slopes where they feed principally on small fishes. Therefore, artificial reefs must be placed in suitable hydrodynamic environments to attract prey such as yellowtail scad (*Trachurus novaezelandiae*), blue mackerel (*Scomber australasicus*) and other schooling species.

Fathom Pacific was contracted by Total Hydrographic Pty Ltd to complete a habitat assessment and underwater imaging survey of the proposed Kingfish Reefs sites in Port Phillip Bay.

## 1.2. Objectives

The aim of this study was to complete seafloor imaging surveys to describe biotopes at four proposed artificial reef sites and surrounding features of interest.

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<sup>1</sup> <https://vfa.vic.gov.au/recreational-fishing/fishing-locations/recreational-fishing-reefs/torquay-offshore-recreational-fishing-reef>

## 2. Methods

### 2.1. Study Area

The study area is located in southern Port Phillip Bay, between Point Nepean and the township of Portsea (Figure 1; Figure 2). The proposed artificial reef site is located within a bowl-shaped depression at the eastern terminus of an arm of the Entrance Canyon, a sinuous canyon feature that runs through Port Phillip Heads. Entrance Canyon is a feature of hydrographic, geological and biological significance in Victoria. In the western and southern reaches, the canyon is known for its remarkable walls and sponge gardens in the circalittoral zone (beyond ~19 m depth) and kelp beds in the infralittoral zone. In the eastern reaches of the canyon, sand waves are evident and sand-affected infralittoral and circalittoral reefs occur. Much of what is known about the circalittoral biotopes of the Entrance Canyon comes from biological surveys from the Port Phillip Bay Channel Deepening projects and knowledge of the infralittoral biotopes comes from the Parks Victoria Subtidal Reef Monitoring Project (SRMP).

The proposed Kingfish Artificial Reef site is outside any Marine Park, and multibeam bathymetry indicated sand ripples and sand wave features within the bowl-shaped depression (~19-37 m water depth) and a distinct ledge around its margin. On the flat seabed around the depression, sand ripples and other seabed textures were observable in the multibeam bathymetry.

The target areas for the artificial structures was provided by Total Hydrographic, additional sites of interest were identified using multibeam echosounder (MBES) bathymetry also provided by Total Hydrographic.

### 2.2. Survey method

Nineteen target sites were established at the artificial reef installation sites and surrounding seabed features that were identifiable in MBES bathymetry (Figure 3). Sites were surveyed using a transecting method using a remote operated underwater vehicle (ROV), launched from Fathom Pacific's research vessel, *RV Fathom II*.

The survey method followed the standardised ROV method for biotope classification developed for the Victoria-wide biotope assessment surveys previously completed for the Department of Environment, Land, Water and Planning (DELWP). The method involved transecting at a fixed altitude of 1.2–1.5 m above the seafloor with the camera orientated to provide a downward oblique view. Biotope classification requires species or morphospecies identification and therefore where seaweeds and epibiota were encountered, the ROV was used to make closer inspections.

Localised eddying currents and upwelling in the bowl-shaped feature made straight-line transects difficult. Slack-tide periods were targeted but current at the seafloor was different to that experienced in surface waters. The ROV was tracked using a Sonardyne MicroRanger2 USBL system consisting of an MRT transceiver topside and a Nano transponder on the ROV.

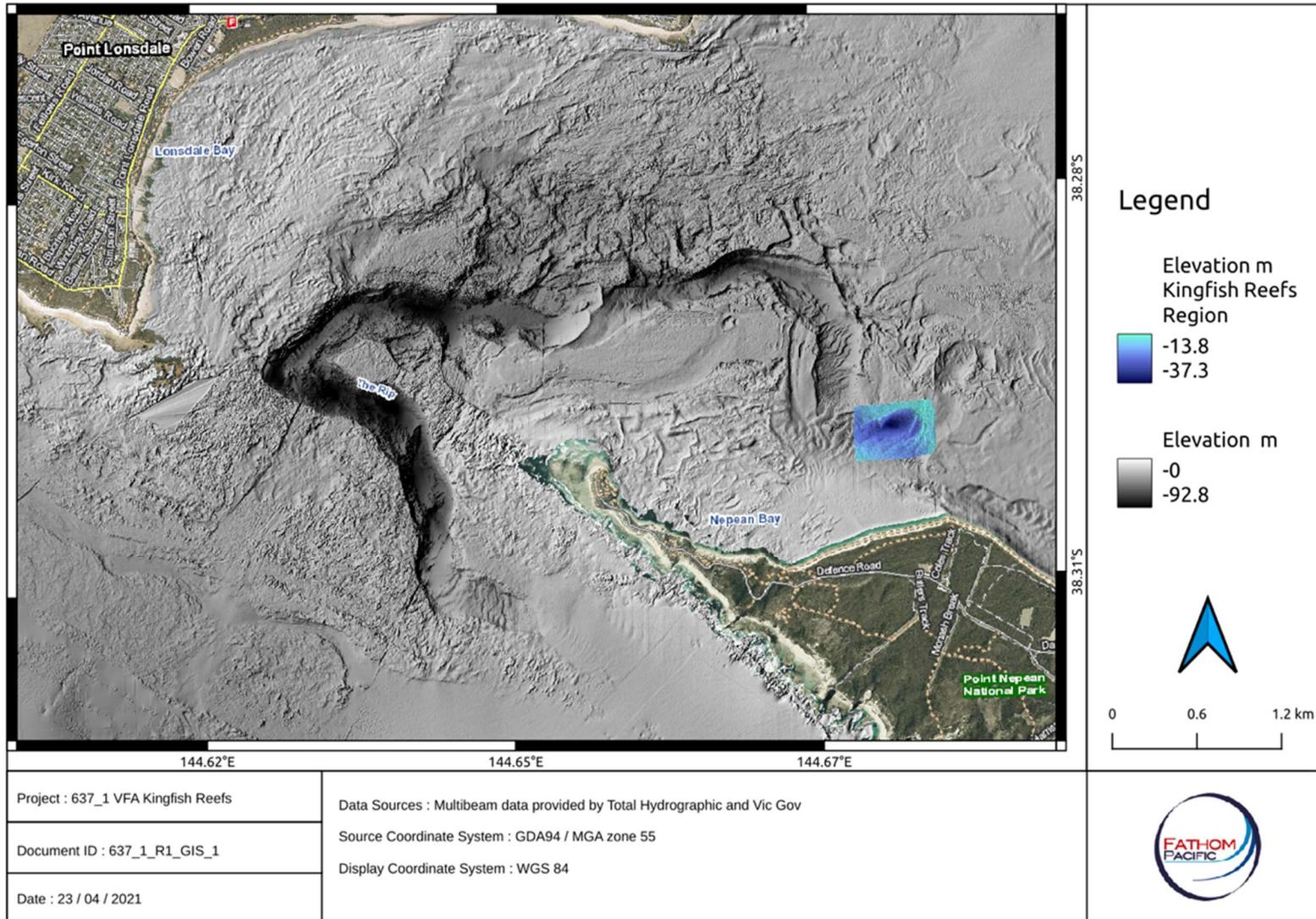


Figure 1 Highlighted bathymetry is the proposed Kingfish Reefs pyramids region.

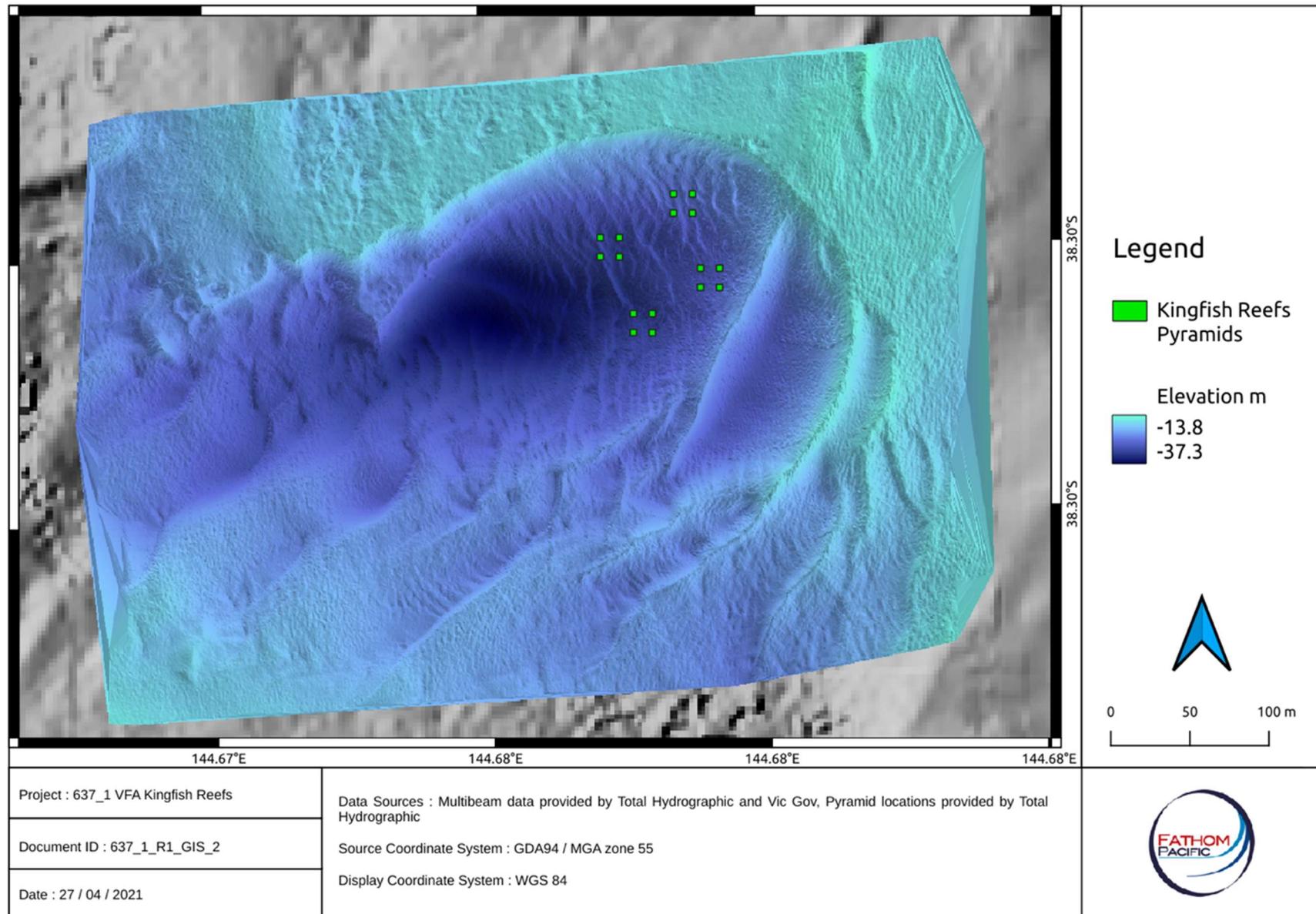


Figure 2. Proposed Kingfish Reef pyramid locations.

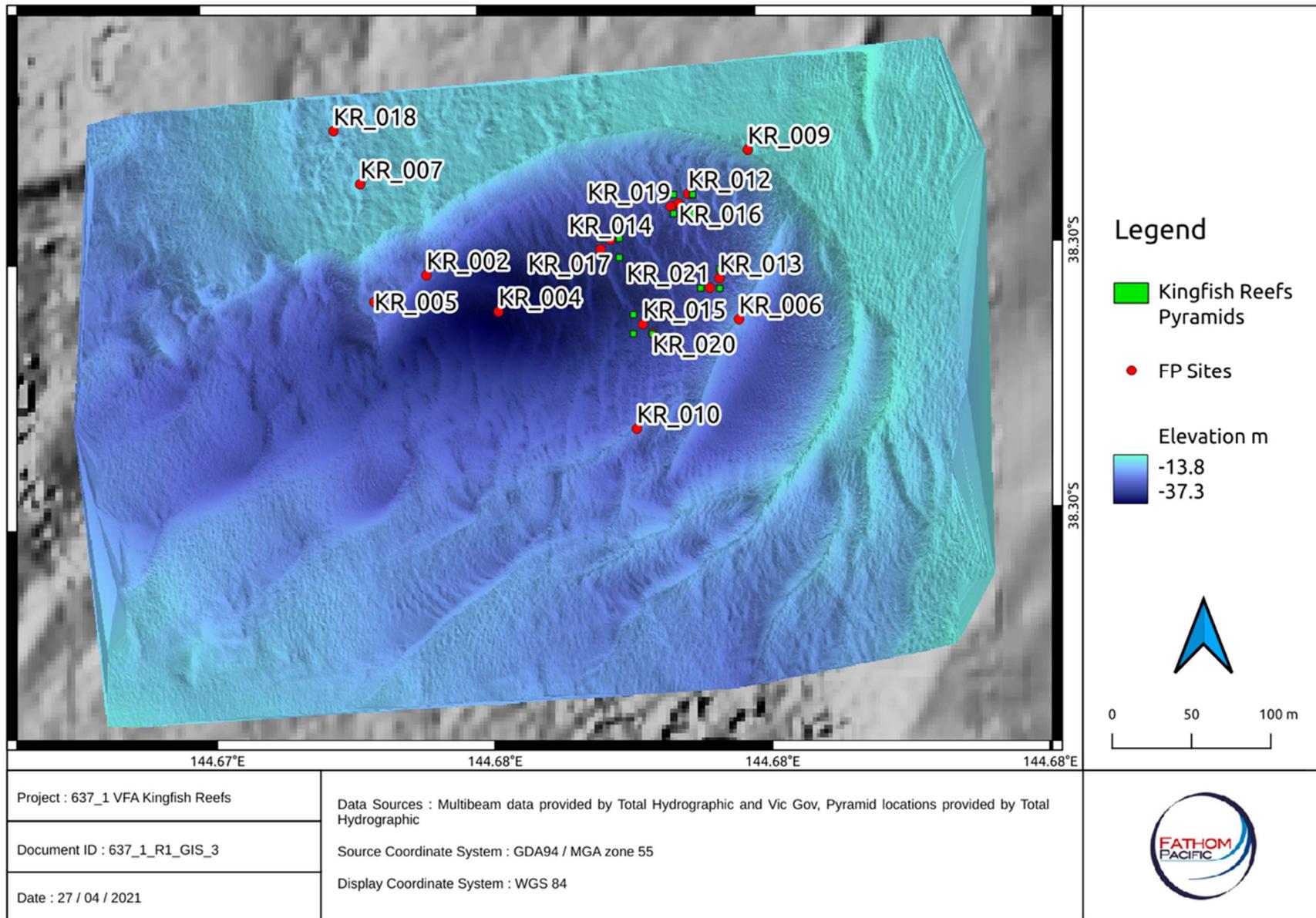


Figure 3. Fathom Pacific survey sites.

### **2.3. Biotope classification**

ROV tracks were classified using the time-synchronised video footage. Biotope classification was completed using the Combined Biotope Classification Scheme (CBiCS). Knowledge of the biotopes in the area, obtained through ongoing biotope assessment in Victorian waters, and the DELWP biotope atlas, was used to characterise the sites.

The scope of this project precluded a full modelling approach and the generation of biotope polygons. Rather, the biotopes in the area were described, contextualised within the broader southern Port Phillip Bay region, and any biological sensitivities identified.

### 3. Results and Discussion

#### 3.1. Biotope observations

The study area is located near the border of the CBiCS high and moderate energy zones for infralittoral rock biotopes. In the moderate energy zone there is a tide-swept communities sub-group and this aligns well with the biotic classes identified. Therefore, the study area is classed as a moderate energy environment in the CBiCS classification, which places the circalittoral rock biotopes described here within the tide-swept group.

The distinction between infralittoral and circalittoral biotopes is dictated by the relative dominance of seaweeds (infralittoral) and invertebrate filter feeders (circalittoral). The demarcation of infralittoral and circalittoral habitats is a function of light penetration and geofom. For example, in the turbid waters of Western Port, circalittoral reef is observed at approximately 8 m water depth in some areas. In the Port Phillip Heads region, the transition from relatively flat kelp-dominated biotopes to steep sponge-dominated walls coincides with the canyon wall step at approximately 19 m water depth.

At the Kingfish Reefs study site, seaweed-dominated infralittoral biotopes occur on the broad flat area around the depression. Additionally, an infralittoral seaweed biotope was observed on the crescent-shaped deep ledge feature on the northwestern margin of the depression at approximately 21–23 m water depth. Beyond this depth, circalittoral biotopes were observed and therefore a depth of 24 m was used to categorise the circalittoral zone in the study area.

Seven biotopes were identified in the area (Figure 4; Figure 5):

1. Infralittoral irregular rippled sand (ba5.234).
2. Circalittoral irregular rippled sand (ba5.252).
3. Mixed brown, red and green algae bed on sand with sparse interspersed sponges – algae dominant (ba5.731).
4. Mixed brown, red and green algae bed on sand with sparse interspersed sponges – sponge dominant (ba5.732).
5. Erect octocorals and isolated tufts of algae on fine sand (ba5.b73).
6. Red algae and sponge clumps on moderate, energy, sand affected reef (ba3.2g2).
7. Circalittoral sponge communities (ba4.2a).

##### 3.1.1. Artificial reef installation sites

All of the proposed artificial reef placement sites were characterised by infralittoral sediment (<24 m) and circalittoral sediment (>24 m) biotopes. Irregular and ripped sand, along with large sand waves were observed (Figure 6). These biotopes had no visible epifauna and the fauna in these biotopes is dominated by infauna. The morphology of ripples and sand waves at the reef installation sites is indicative of exposure to strong east-west currents.

Bare circalittoral sediment was recorded in the deep central basin. The long ridge features on the eastern side of the depressions were found to be sand waves.

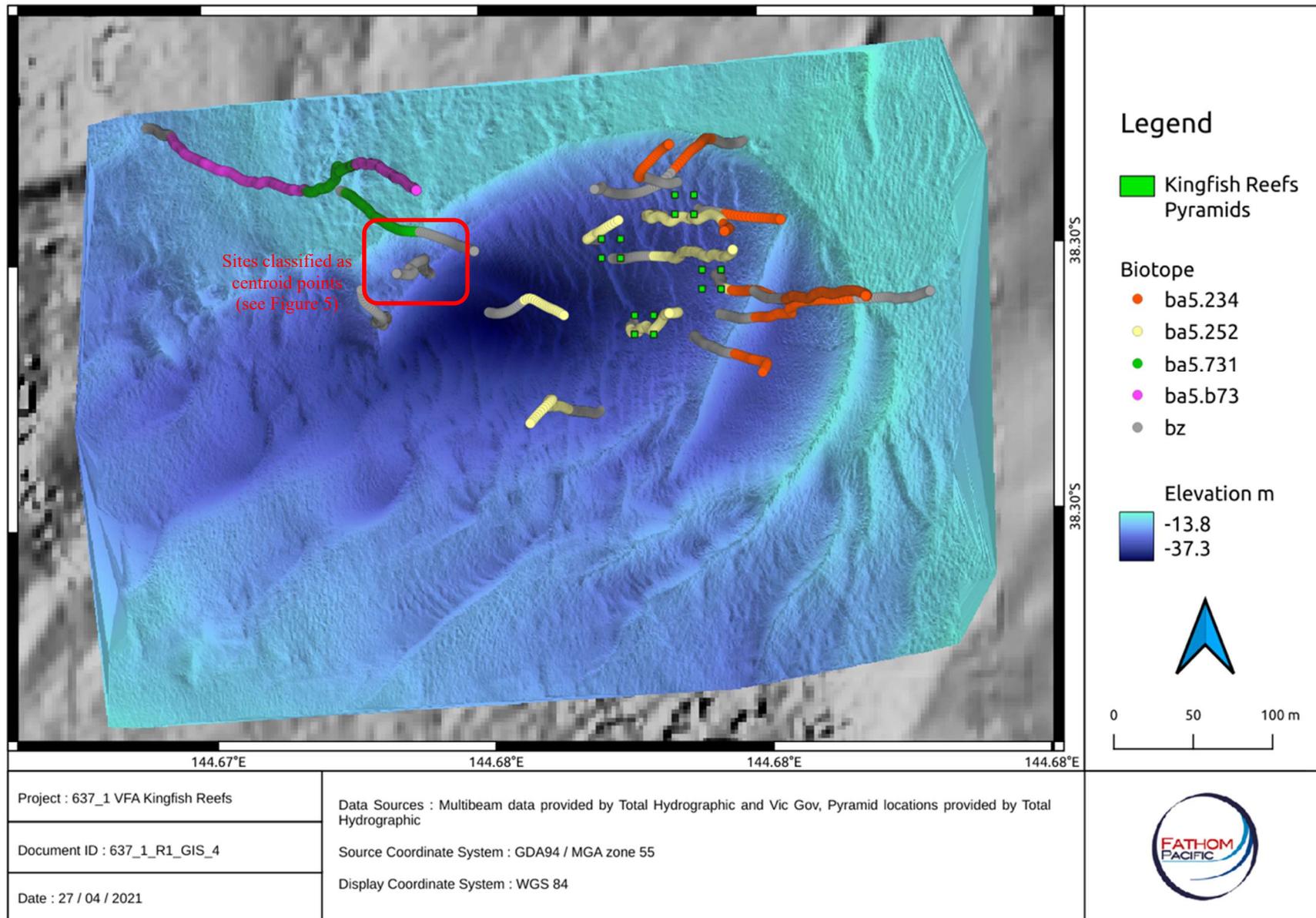


Figure 4. ROV classified to the CBiCS biotope classification scheme. Note: bz is a code for an unassigned segment of USBL track (ROV descent).

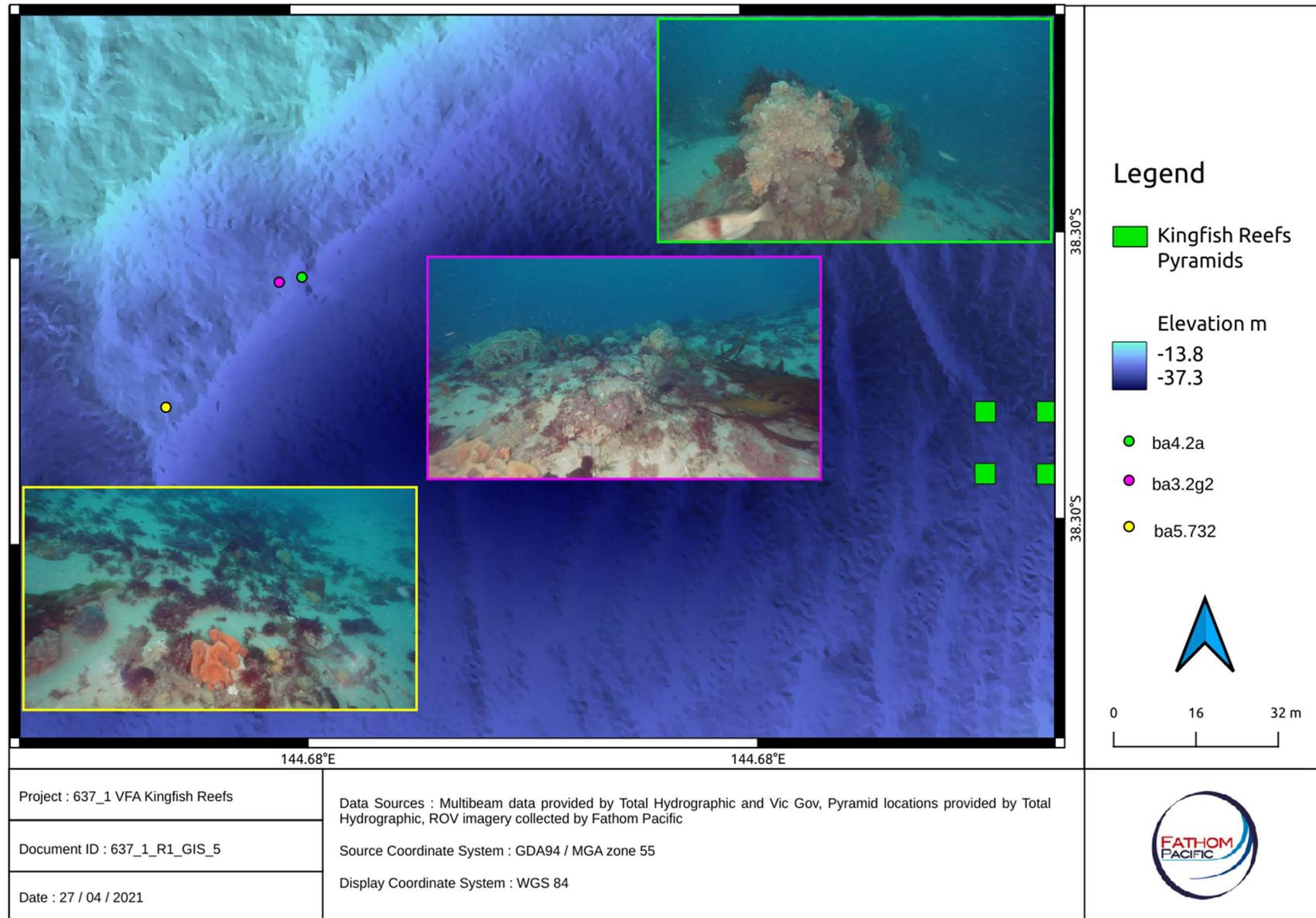
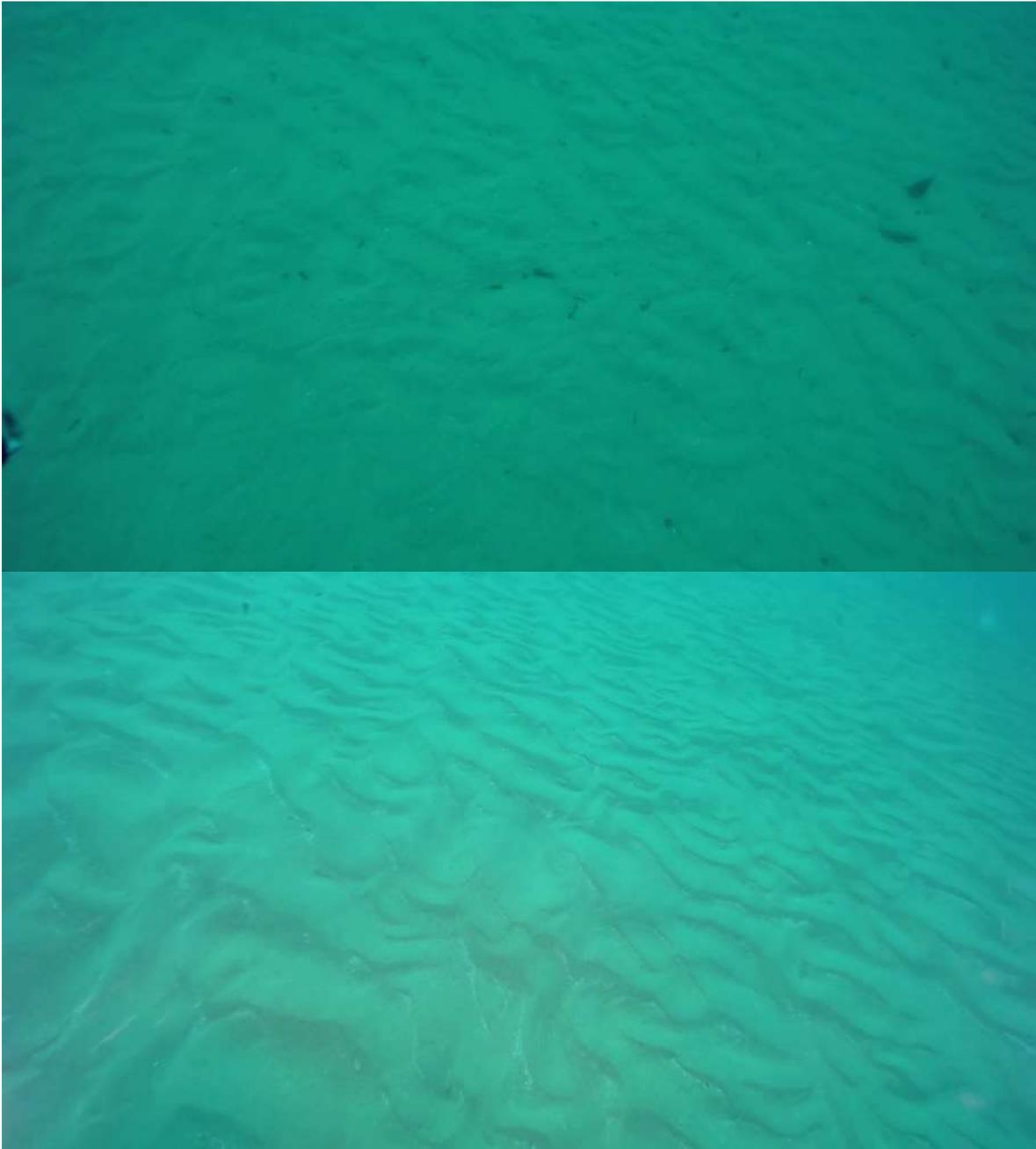


Figure 5. Biotopes classified on the northwestern ledge indicating a transition from infralittoral to circalittoral habitat at 24 m water depth.



**Figure 6.** Irregular rippled sand characteristic of the artificial reef placement sites.

### 3.1.2. Surrounding biotopes: shallow bordering flats

MBES indicated that flats bordering the depression to the northeast were sand wave habitats, and imaging confirmed the presence of infralittoral sediment biotopes in this area (Figure 4). The drop-off from the bordering flats into the depression in this sector is a sand slope with no rock observed in the transects that traversed the slope in the northeast sector.

MBES indicated the presence of textured seafloor on the flats bordering the depression to the northwest. In this area, a seaweed on sediment biotope complex (ba 5.73) was identified, that has also been recorded elsewhere in southern Port Phillip Bay (Figure 7). This biotope complex has two biotopes described at level 5 of the classification hierarchy: an expression that is seaweed-dominated (ba5.731) and an expression that is sponge-dominated (ba5.732).



**Figure 7.** Sub-biotopes of the seaweed on sediment biotope (ba5.731) that alternate between seaweed dominance and sponge dominance.

The seaweeds in this biotope are likely to be attached to sand-inundated reef but also consist of small thallose red forms that are attached to shell fragments. Seaweeds observed in this biotope were dominated by thallose and fine branching lower strata red algae morphospecies. *Ecklonia radiata* was observed in low abundance, restricted to small areas of presumably emergent rock. *Caulerpa scalpelliformis* and *C. longifolia* were present. A brown algae notionally identified as *Syctothalia dorycarpa* was present.



**Figure 8.** Algae morphospecies recorded in the seaweed on sediment biotope (ba5.731).

Sponge forms present in this biotope were morphospecies that have previously been identified in sand-affected areas including mounded and lamellate forms (see Figure 9).



Figure 9. Sponge morphospecies recorded in the seaweed on sediment biotope (ba5.731).

Also on the flats bordering the depression, an epibiota on sediment biotope was recorded (ba5.b73). The biotope is characterised by sponge encrusted erect branched stalks with small tufts of red and green algae (Figure 10). The stalks are reported to be tubes made by polychaete worms (R. Wilson, Melbourne Museum, pers. comm.)



**Figure 10.** Epibiota on sediment biotope (ba5.b73) with sponge-encrusted branching stalks.

### **3.1.3. Surrounding biotopes: northwestern ledge**

At the margin of a deep shelf feature to the northwest of the depression, a narrow lower infralittoral band was identified, characterised by a transition from algae-dominated biotope to a circalittoral environment (ba3.2g2, see Figure 5).

Further downslope, at the shelf ledge, a narrow band of circalittoral reef was observed. A particular target for the surveys was a feature that was suspected as being a sunken vessel but was in fact believed to be a megaclast that had broken off the ledge (Figure 11). Sponge communities here were identified as being in the biotope complex ba4.2a, a group of biotopes that are characteristic of sand-affected sponge biotopes in the lower canyon area. The

circalittoral reef here is therefore more closely aligned with the lower (western) canyon region as opposed to Portsea Hole.



**Figure 11.** Circalittoral reef biotope complex (ba 4.2a) associated with the ledge of the deep shelf feature on northwestern side of the depression.

## 3.2. Marine mammals and birds

### 3.2.1. Flora and Fauna Guarantee (FFG) Act listed species

One FFG listed dolphin species is known to regularly occur near to and regularly within the survey area, this species is currently listed as the Burruran dolphin (*Tursiops australis*)<sup>2</sup> (Charlton-Robb et al. 2011). An area between Police Point and Nepean Rock to 250 metres seaward, was declared a dolphin sanctuary zone in 2004 based on its significance for dolphins. The area known as the ‘Ticonderoga Bay Dolphin Sanctuary Zone’ aims to provide these animals with a higher level of protection from vessel activity in this area of apparent importance. Regulations specific to the sanctuary are in place and stipulate that vessels may not exceed speeds of greater than 5 knots and may not approach dolphins or whales closer than 200 m within the designated zone. The location of the artificial reefs has been measured as a minimum distance of 400 metres to the nearest boundary of the sanctuary zone. As the installation of the artificial reefs may attract higher vessel traffic to the area, we recommend consideration be given to this and the FFG listed species when planning for installation of the reef commences.

### 3.2.2. Other megafauna

The Ticonderoga Bay area is well known locally as a productive feeding area for predators such as marine mammals and seabirds (Figure 12). During our field survey, observations were made of bottlenose dolphins (*Tursiops cf. truncatus*), Australian fur seals (*Arctocephalus pusillus*) and primarily three species of seabird: Australasian gannet (*Morus serrator*), crested tern (*Sterna bergii*) and little penguin (*Eudyptula minor*) were made. Similar observations have occurred over decades during routine dolphin monitoring surveys and dolphin tourism operations in the area (Dolphin Research Institute pers. comm.).

Historical observations of other protected species in the region also include seasonal observations of humpback whales (*Megaptera novaeangliae*) (Dolphin Research Institute pers. comm. 2008; Donnelly et al. 2015; 2016; 2017; 2018; 2019).

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<sup>2</sup> Recent studies have confirmed that resident Port Phillip *Tursiops* are in fact not a separate species (Moura et al 2020 and Jedensjö et al 2020), hence our reference of *Tursiops cf truncatus* in Section 3.2.2.

		
<p>Bottlenose sighted dolphins during the present study.</p>	<p>Australian fur seal haul out at nearby Chinaman's Hat.</p>	<p>Little penguins</p>
		
<p>Australasian gannets</p>	<p>Crested tern</p>	<p>Humpback whale, off Ticonderoga Bay 2008 (Dolphin Research Institute)</p>

Figure 12. Marine fauna recorded from the Kingfish Reefs area.

## 4. Conclusions

The sites targeted for installation of artificial reefs are bare sediment biotopes characterised by sand ripples and sand waves with an absence of algae and epibiota.

In the flat, shallow area surrounding the bowl-like depression, seaweed on sediment biotopes were recorded, which comprise a number of algae and sponge species. These biotopes are reef-like, but are heavily sand-influenced. An epibiota on sediment biotope was also observed on the shallow flats.

The slopes around the margin of the depression are sand in the northeastern sector. However, on the northwestern side, there is a deep shelf feature, and at the outer ledge of this feature, a narrow band of exposed rock and circalittoral reef was recorded.

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