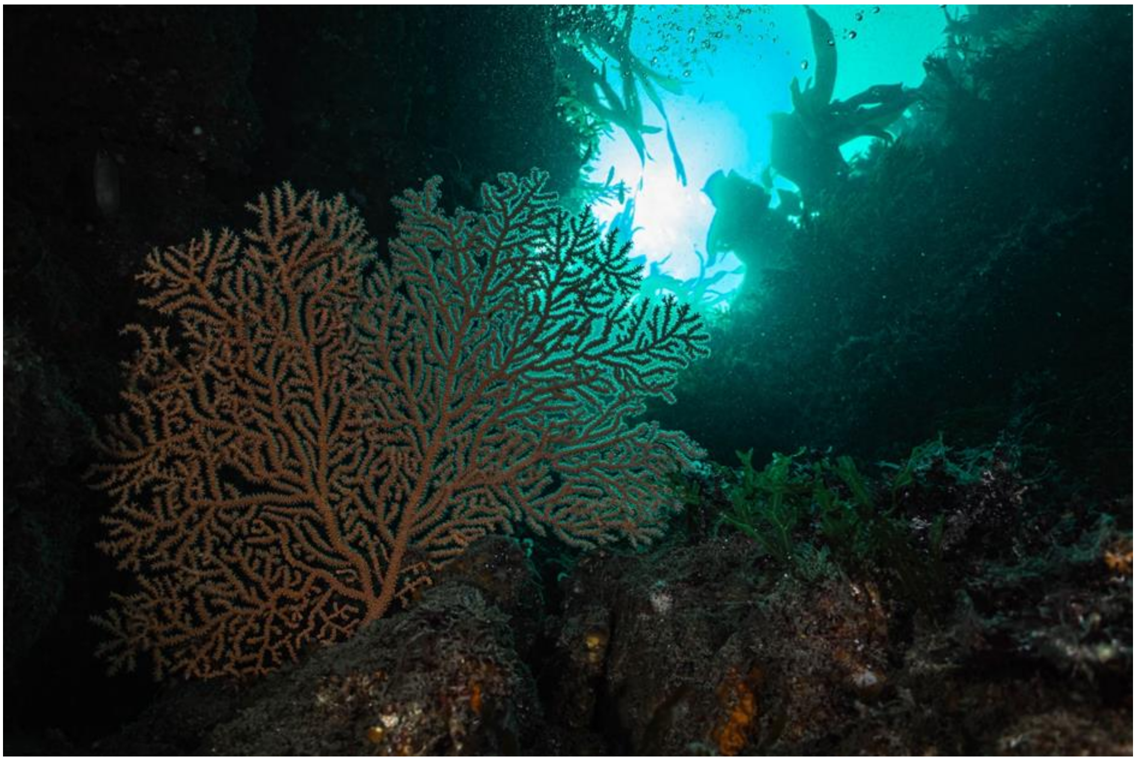
# A baseline description of the benthic assemblages of Les Sauvages Reef, Jersey

A report for Blue Marine Foundation



September 2023

Rees, A., Williamson, A., Watson, F., Fanshawe, S. 2023. A baseline description of the benthic assemblages of Les Sauvages reef, Jersey. A report for Blue Marine Foundation. Pp 44.

## Acknowledgements

Blue Marine Foundation (Blue Marine) wish to thank the following individuals and organisations for providing their time, expertise and data during the development of this report. Jersey Marine Conservation for data and fieldwork contribution, Jim, Paula and Sean O'Connor of Wreck & Reef Charters for skippering the dive vessel and providing field equipment and expertise. Samantha Blampied for provision of data and analysis, the Government of Jersey's Marine Resources department for provision of bathymetry data. Blue Marine would also like to give special thanks to the divers who provided their time, expertise and equipment on a voluntary basis: Tom Andrews, Samantha Blampied, Bede Davies, Emily Dow, Izzy Duggan, Wayne English, Clive Le Cocq, Kevin McIlwee and Sam Mead.

# Executive Summary

Jersey's marine estate is a unique and valuable asset for the Island and its people. It supports a diverse range of marine life, including many commercially important fish species, and contributes to the Island's economy, culture and identity. However, Jersey's marine environment faces multiple threats from overfishing, climate change and from other human activities. To safeguard its marine area, Jersey has committed to implementing the Convention on Biological Diversity's targets, which include protecting 30 per cent of its marine and terrestrial environment by 2030. Jersey has already established several Marine Protected Areas (MPAs) in the form of No Mobile Gear Zones (NMGZs) in its waters, which ban destructive fishing practices such as dredging and bottom-trawling. These zones cover about 6.5 per cent of Jersey's territorial waters and protect important habitats. In addition, Jersey is developing its first Marine Spatial Plan (MSP) by 2025, which will provide a strategic framework for managing the use and conservation of the marine estate.

Les Sauvages is a remote and biodiverse reef at the southeastern edge of Jersey's territorial waters. It is comprised of a sunken sandstone cliff with gullies, overhangs, caves and boulder fields. It hosts a variety of marine species and evidence from previous surveys suggest many are rare or endangered. Les Sauvages is currently unprotected and vulnerable to fishing pressure and other impacts. Despite recognition as a site of importance, the area is relatively understudied. To fully understand the ecological importance of the Les Sauvages reef, a series of underwater surveys were conducted in summer 2021 and 2022, facilitated by Blue Marine Foundation. This included dive surveys of the benthic habitat, baited remote underwater videos (BRUVs) and an assessment of current fishing pressures. The surveys collected data on the marine life associated with this isolated reef and we compare results to other similar reef habitats around Jersey's waters to assess the ecological importance of this site and improve current management should it be required.

The data presented here provide an ecological baseline of the site, and a comprehensive inventory of sessile, sedentary epibiota present on the reef, as well as some understanding of the mobile benthic associated species.

For sessile and encrusting species, abundances were observed to be several orders of magnitude higher at Les Sauvages compared to similar data from NMGZs in Jersey's territorial waters (1196 per cent higher than habitats protected by MPAs in Jersey's waters). A high abundance of individuals were recorded during the surveys, suggesting the reef is physically and ecologically playing a similar role to other protected habitats in Jersey's waters. Les Sauvages has high levels of benthic diversity and hosts slow-growing reef-associated species, important for the functioning of marine habitats. It is confirmed here that some of these species are rare and protected nationally and/or internationally (one such example being the pink sea fan).

Evidence provided in this report emphasises the high level of biodiversity at Les Sauvages. Given the known direct and indirect impacts of certain fishing methods upon the species and benthos recorded, it is recommended that the site is considered for further protection and robust fisheries management approaches are delivered. It is noted that a perceived lack of quantitative baseline data should not delay designation, which should be undertaken using a quick, pragmatic and precautionary approach. It is further recommended that Les Sauvages is incorporated into any Government of Jersey monitoring regime to capture the environmental baseline and changes over time.

The opportunity provided by the current development of Jersey's MSP should be taken to expedite protection of this highly biodiverse and archaeologically important site. It should be incorporated into the 'network of MPAs' required by the MSP, to protect important habitats for commercial and non-commercial species, assisting in the long-term health of Jersey's fishery, while reaching environmental targets developed to tackle the biodiversity crisis.

# Contents

# 1. Introduction

## 1.1 Jersey's marine environment

Jersey, the largest of the Channel Islands, is a self-governing British Crown Dependency, situated near the coast of northwest France. While Jersey's land area covers 120 km$^2$, its marine estate covers approximately 2,455 km$^2$. The marine territorial area has a maximum depth of 50 m and hosts rocky reefs, boulders, cobbles, gravel, sand and biogenic habitats, such as maerl and seagrass as well as intertidal habitats, the character and ecology of which are found nowhere else in Europe (Société Jersiaise Annual Bulletin 2019). Jersey's marine waters are also culturally rich with sites of cultural, archaeological and historical significance e.g. La Cotte de St Brélade, one of the most important Palaeolithic (Neanderthal) sites in northwest Europe.

Jerseys rich marine estate plays an important role in sustaining local commercial fisheries, by providing 'essential habitat' for many key commercial species. 'Essential habitat' is defined as waters and substrates needed for feeding, growth and reproduction of fish species throughout their life (Rosenberg *et al.* 2000). This might include habitat that fish and other species rely on during spawning and juvenile stages. Recently, habitat information has been incorporated into fisheries management both in the UK (Brown *et al.* 2019, Blampied *et al.* 2022a) and globally (Townsend *et al.* 2019), to move towards ecosystem-based fisheries management (Rosenberg & McLeod, 2005). Benthic habitats are particularly important for fisheries, providing shelter, foraging grounds and breeding grounds for species targeted by commercial fisheries (Howarth *et al.* 2011; Kritzer *et al.* 2016). Therefore, understanding of species-habitat associations is central to identifying essential habitats that support life stages of exploited species and are, therefore, of high priority for management to benefit both conversation and fisheries (Seitz *et al.* 2014). Jersey's extensive seagrass beds, kelp forests and maerl beds also play a role in sequestering carbon, along with many other marine biotopes. Current estimates put the weight of carbon that Jersey's marine environment removes at ~8.6 per cent of the Island's total carbon production annually (Government of Jersey 2022). This level of potential is achieved with current protections. As only 6.5 per cent of Jersey's marine environment is currently under protection, expanding protection to at least 30 per cent could significantly increase the amount of carbon stored in Jersey's marine habitats.

## 1.2 Jersey's fishery

Jersey's commercial fishery is comprised of a mixture of shellfish and wetfish, with 94 per cent of commercial landings attributed to five shellfish species: European lobster (*Homarus gammarus*); brown crab (*Cancer pagurus*); spider crab (*Maja brachydactyla)*; king scallop (*Pecten maximus*); and whelk (*Buccinum undatum*). Most commercial fishing by Jersey vessels for these five shellfish species (>90 per cent) takes place within Jersey's territorial waters. Approximately 90 per cent of Jersey's commercial fishing vessels only use static gear (pots, nets, diving and hook and line) to fish for whelk, lobster, crab, scallop and wetfish (Blue Marine Foundation 2022). From a socio-economic perspective, Jersey's fishery directly supports around 180 jobs on the Island (Marine Resources 2021). Lobster and crab alone made up approximately 70 per cent of the value of Jersey's commercial landings in 2021 (Marine Resources 2023). These species are particularly reliant on healthy habitats (Galparsoro *et al.* 2009).

While Jersey has historically hosted rich fishing grounds, recent years have seen declining catches due to overfishing and declines may also be linked to changes in environmental conditions (Devon & Severn IFCA 2019, Blampied 2022). Whelk, lobster and brown crab landings per unit of effort are down 42, 43 and 65 per cent, respectively, from their peaks in 2008, 2010 and 2015 (Marine Resources 2023). Globally, marine and coastal habitats are increasingly threatened by anthropogenic activities (Lotze *et al.* 2006, Halpern *et al.* 2007). Some commercial fishing activities have been shown to directly negatively impact marine habitats. The most negative impacts are typically associated with destructive mobile/active fishing practices e.g. dredging (Thrush &

Dayton, 2002), but negative effects associated with more static/passive fishing methods (e.g. pots/traps or monofilament netting) have also been recently documented (Rees *et al.* 2021).

## 1.3 Marine protection in Jersey – current and proposed

Marine Protected Areas (MPAs) and sustainable fisheries are intrinsically linked (Rees *et al.* 2020). MPAs are 'clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Day *et al.* 2012). The Government of Jersey (GoJ) has already made a strong commitment to marine conservation by establishing several MPAs in the form of No Mobile Gear Zones (NMGZs) within Jersey's waters, which protect areas from dredging and bottom-trawling, through the prohibition of mobile fishing gears at numerous sites (Les Minquiers, Les Écréhous and inshore areas) around the Island. These areas cover approximately 6.5 per cent (150 $km^2$) of Jersey's territorial waters. Marine habitats are already showing signs of recovery in these areas, benefitting fish stocks and other marine species (Blampied *et al.* 2022b). However, much of Jersey's waters, over 93 per cent, remain unprotected at time of writing.

Globally, protection targets for both marine and terrestrial areas are building momentum. The Global Ocean Alliance (GOA) is a 72-country alliance, led by the UK. The GOA champions ambitious ocean action within the Convention on Biological Diversity (CBD), including the Kunming-Montreal Global Biodiversity Framework (GBF) 30x30 ocean target. This target sets out to protect 30 per cent of the global marine and terrestrial environment by 2030. Each signatory to the CBD therefore has an obligation to reflect the GBFs 30x30 target. As a Crown Dependency, Jersey opted to have the CBD extended to the Island via the UK's signature (https://www.gov.je/Government/Departments/JerseyWorld/Pages/TreatiesConventionsDetail.aspx?id=113). This came into force in September 1994, giving Jersey a responsibility to comply with any of the CBD's decisions and recommendations, such as the GBF's targets, particularly 30x30, agreed in December 2022 at the 15th Conference of the Parties (COP 15).

Separately, in 2022, the GoJ embarked on creating Jersey's first Marine Spatial Plan (MSP) for Jersey's marine waters by 2025, which includes 'developing a network of MPAs which will be consistent with overall environmental, economic and social objectives' (Government of Jersey 2022). A well-managed MPA in the form of a marine park has been proposed by Blue Marine Foundation (Blue Marine) to protect at least 30 per cent of Jersey's territorial waters (States of Jersey 2022). A marine park, as supported by Blue Marine, proposed to include the designation of further MPAs through the extension of existing NMGZs to cover a much larger area. A recently published Ecosystem Services Valuation report of Jersey's marine environment concluded that designation of the proposed marine park could result in substantial (~800 per cent) increases in the ecosystem services provided to the island and mitigate against indirect financial losses that could occur from the removal of ecosystem service provision (Williamson *et al.* 2023).

As part of the marine park proposal, Blue Marine is working in collaboration with the local fishing community, the GoJ, local organisations and stakeholders to support further marine protection underpinned by robust science and evidence. Blue Marine is applying a model of fishery co-management, originally developed in Lyme Bay, which demonstrated that by supporting low-impact fishing methods within an MPA, fishermen's livelihoods can improve while marine biodiversity thrives. Blue Marine is supporting research with Jersey fishermen to inform local fisheries management plans to determine the next steps in safeguarding the future of Jersey's economically and culturally important fisheries.

## 1.4 Les Sauvages

Les Sauvages is an isolated seamount and reef located at the southeastern extent of Jersey's territorial limits, with anecdotal evidence suggesting it is highly biodiverse. It is formed from a drowned sandstone cliff and is comprised of undersea gullies, overhangs, caves and boulder fields. Within Les Sauvages there is a fossilised beach in the central trench at ~20 m below chart datum. Early dives on this fossilised beach recorded a nest of living brachiopods (*Argyrotheca cistellula)*, the first brachiopods recorded in the Channel Islands since the mid-19th century, and marine fossils suggesting it was deposited on an intertidal shingle bank circa 105,000 years ago, at a time when the climate was cooling, and the region was coming out of an interglacial warm period. Further geological visits to this trench will hopefully improve the understanding of this unusual geological feature (Chambers *et al.* 2016).

The reef is known to be home to an extraordinary array of marine biodiversity and is particularly notable for the presence of pink sea fans (*Eunicella verrucosa*), sunset cup corals (including the rare sunset cup coral *Leptopsammia pruvoti)* and sponges, with the top of the reef hosting a kelp bed. The area is also an important nursery for many commercial fish and shellfish species, including bream (Chambers *et al.* 2016).

The reef has been identified from surveys collected by the Société Jersiaise, Jersey Marine Conservation (JMC) and the GoJ's Marine Resources team as well as several local divers. Currently, Les Sauvages is not under any formal benthic protection in the form of spatial management. However, it lies just within a No Parlour Pot Zone (NPPZ), a spatial fisheries management tool which prohibits the use of parlour pots (two-compartment lobster traps that restrict the escape of catch).

For several years, local divers and geologists have been documenting the reef with a view to possible protection from local fishing pressure. The potential impact of fishing on the site includes damage to sea fans from ropes associated with static fishing gear (the site's rocky profile largely protects it from mobile gear) and from nearby mobile bottom-towed fishing. Seasearch surveys have been carried out by JMC on sites on all sides of the elongated reef structure of Les Sauvages in 1999 and from 2013–2021. Seasearch is a volunteer underwater survey project for recreational divers and snorkellers to record observations of marine habitats and the life they support around Britain and Ireland including the Channel Islands and Isle of Man. The Seasearch programme aims to gather information on benthic marine taxa and habitats and their distribution around UK and Ireland and make data available through websites, reports, and publications. All data is open source and available through the National Biodiversity Network gateway and Jersey Biodiversity Centre portal. A dataset of 257 species (or species groups) identified by JMC on the Les Sauvages reef during these surveys is included in Appendix 1 for context and validation of the results presented in the results.

## 1.5 Project rationale

Despite recognition as a site of marine biological and archaeological importance, the area is relatively understudied. Aside from JMC/Seasearch surveys (Appendix 1), further detailed, quantitative information on the marine life inhabiting Les Sauvages is lacking. To fully understand the ecological importance of the Les Sauvages reef, further surveys were required to document the marine life associated with this isolated reef. From initial dive reports it was understood that there were likely several important species in the area and that there was a need to better understand and quantify the current pressures on and around the reef. Blue Marine aimed to gather robust evidence on the benthic community of Les Sauvages reef and compare this to other similar reef habitats around Jersey's waters to adequately assess the ecological importance of this site and improve current management should it be required.

# 2. Methods

## 2.1 Study site

The Les Sauvages reef sits at a depth of around 20–25 m and is located on the southeastern edge of Jersey's territorial limits (48.8942, -2.018667). It is around 45 km from the Island and around 8 km from the nearby Les Minquiers NMGZ and just falls within the larger NPPZ (Figure 1). Bathymetric surveys of the area detailed the reef profile and indicated that the main structures are orientated roughly east to west with a larger deeper gulley running through the centre of the elevated reef from north to south and a shallower, less distinct, gully running east to west (Figure 2).

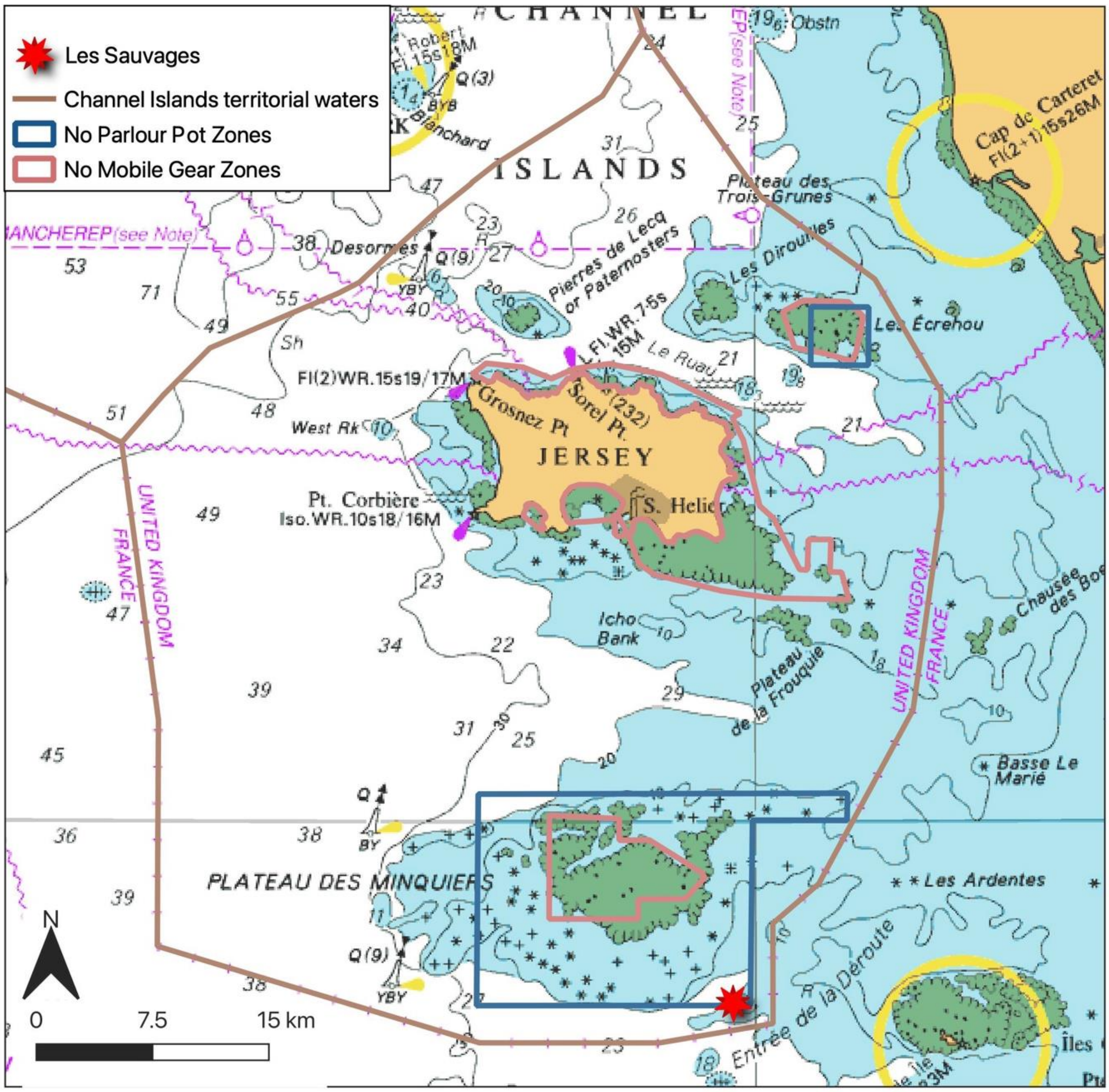



FIGURE 1. LOCATION OF LES SAUVAGES REEF WITHIN JERSEY'S TERRITORIAL WATERS. JERSEY'S CURRENT MARINE PROTECTED AREAS AREA OVERLAID.

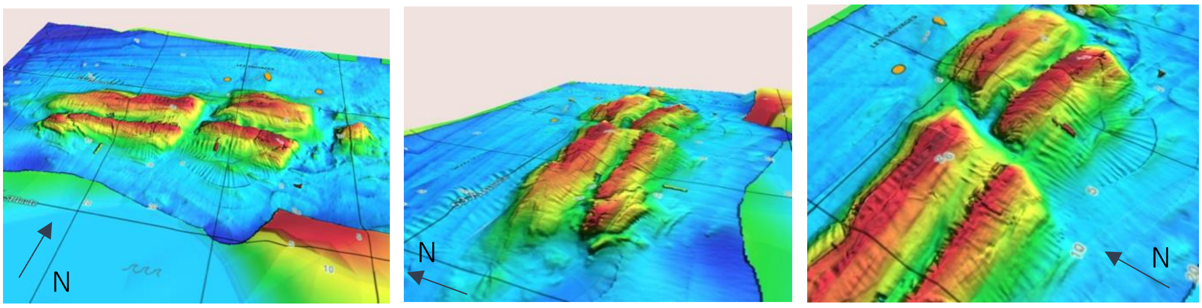



FIGURE 2. OUTPUTS FROM MULTIBEAM SURVEY OF LES SAUVAGES REEF. (GOVERNMENT OF JERSEY'S MARINE RESOURCES DEPARTMENT SURVEYS IN 2022)

## 2.2 Fishing pressure

The reef is exposed to some commercial fishing pressure. Automatic Identification System (AIS) point positional data for commercial fishing vessels (UK and French) were obtained for the area surrounding Les Sauvages from the Marine Management Organisation (MMO) for the period 01/01/2015–31/08/2022 (request reference number ATI2849). Data were filtered on account of vessel speed (<5 knots considered to be representative of active fishing rather than transiting or 'steaming' (points were joined by trip ID to give individual vessel tracks)). The raw tracks for filtered vessels are presented below in the area immediately surrounding Les Sauvages (Figure 3). This shows some evidence of commercial fishing vessels fishing to the south and southeast of the reef in particular. Relatively few tracks pass directly over the reef, which are likely mobile fishing vessels actively fishing with demersal gear.

Large rocky reef features such as Les Sauvages can cause entanglement and loss of gear, possibly leading to some avoidance of the site. Commercial fishing activity data, by fishing method, were obtained from the MMO and mapped to a 1 x 1 km grid. Fishing methods that operate near Les Sauvages are presented for scallop SCUBA diving (Figure 4); scallop dredging (Figure 5); and crustacean potting (Figure 6). Number of fishing trips was used as a proxy for fishing effort and categorised (colour strength denotes intensity). SCUBA diving and dredging for scallops operate quite near the Les Sauvages reef, however, for dredging, the tracks in Figure 3 suggest this activity does not occur directly over the reef. There is also evidence of crustacean potting near to Les Sauvages (Figure 6) and commercial potting fishing effort primarily occurs to the northeast of Les Sauvages (approximately 2km from the reef), inside the NPPZ.

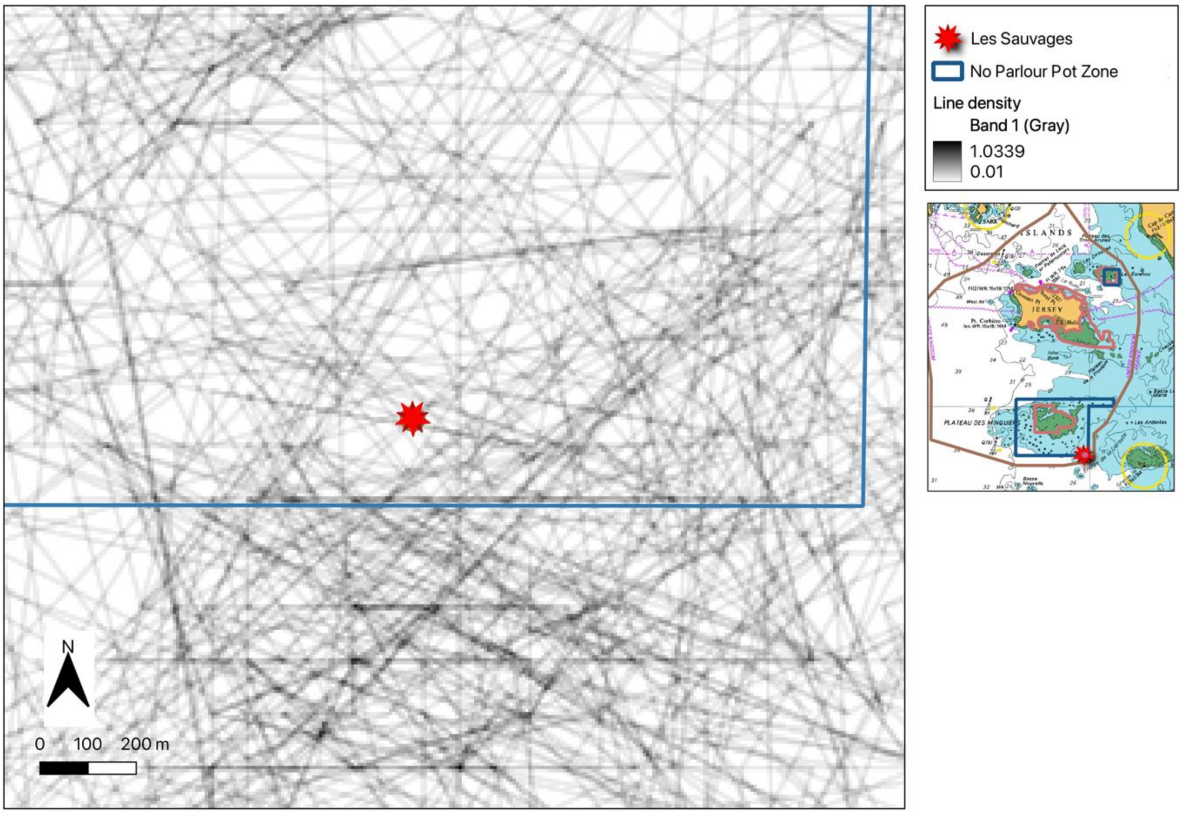



FIGURE 3. RAW AIS TRACKS FOR COMMERCIAL FISHING VESSELS NEAR LES SAUVAGES. DATA WERE CLEANED AND TRACKS REPRESENT LIKELY INDIVIDUAL FISHING EVENTS (VESSEL DATA RECEIVED FROM FREEDOM OF INFORMATION REQUEST TO MARINE MANAGEMENT ORGANISATION FOR THE PERIOD 01/01/2015–31/08/2022)

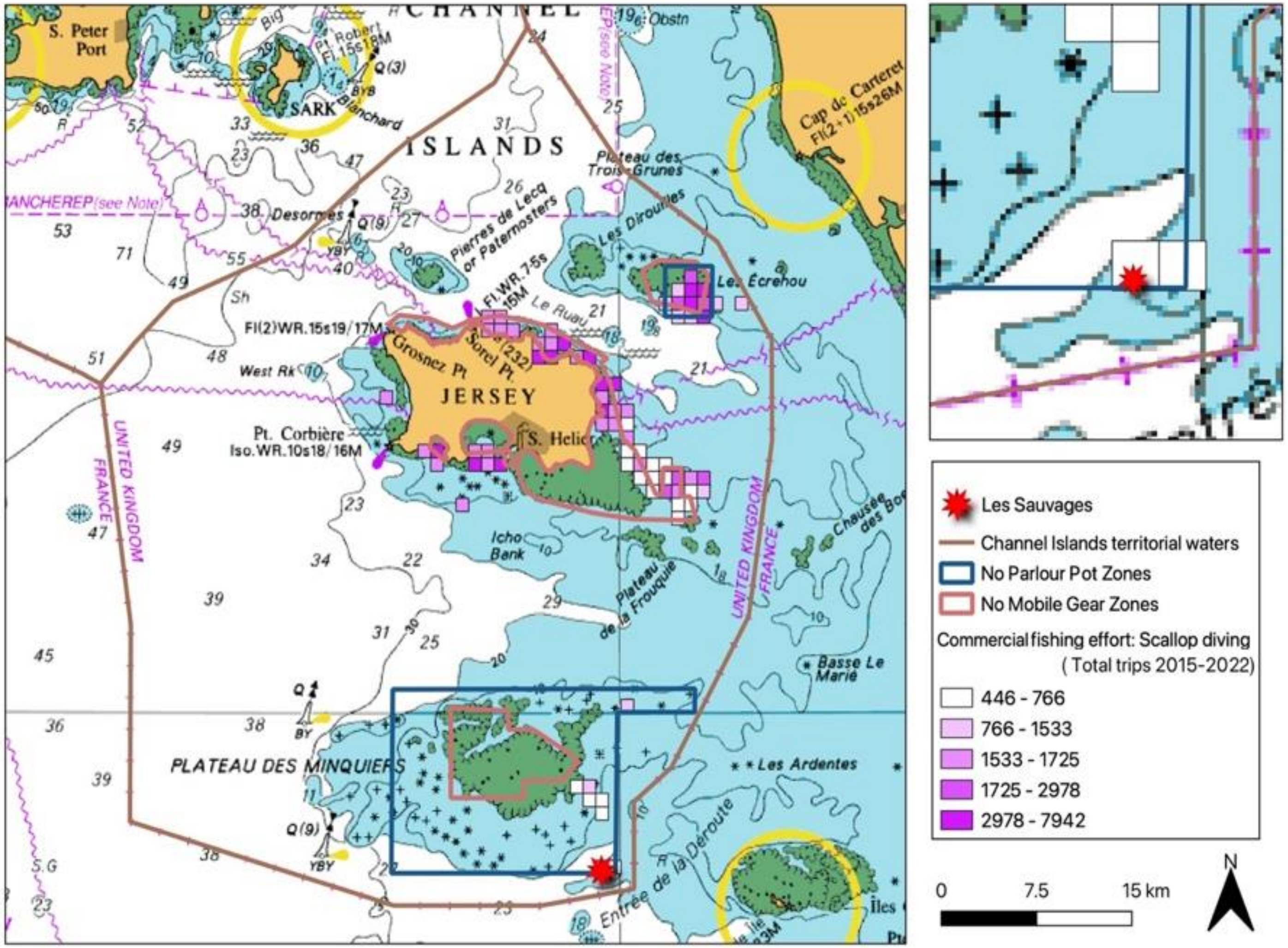



FIGURE 4. SUMMARISED COMMERCIAL FISHING 'EFFORT' (NUMBER OF TRIPS) FOR SCALLOP SCUBA DIVING. DATA FROM MMO FOR THE PERIOD 01/01/2015 – 31/07/2022. COLOUR STRENGTH = PROXY FOR EFFORT. MPAS ARE OVERLAID AND LES SAUVAGES REEF IS IDENTIFIED. INSET SHOWS A CLOSE UP OF THE LES SAUVAGES REEF.

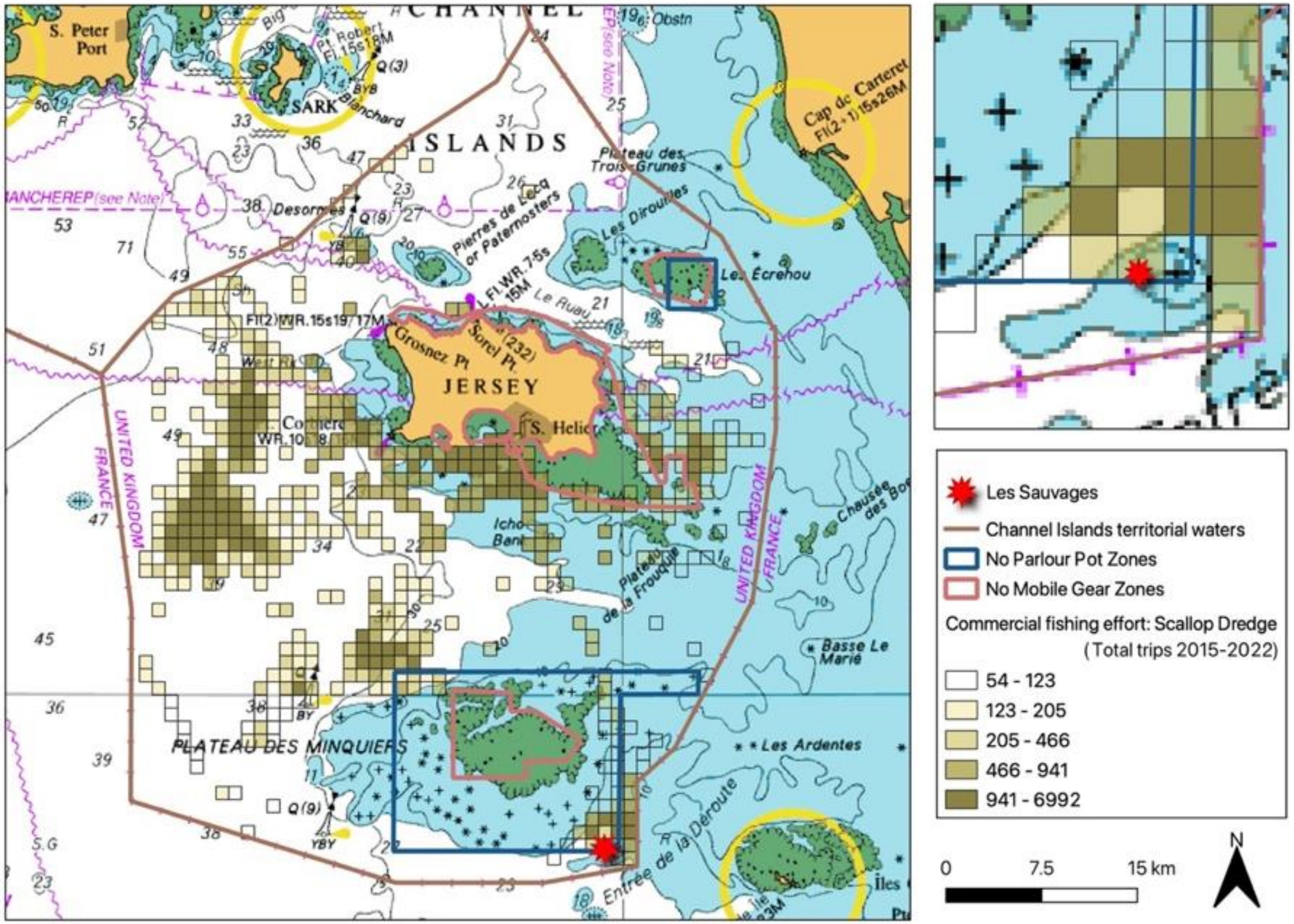



FIGURE 5. SUMMARISED COMMERCIAL FISHING 'EFFORT' (NUMBER OF TRIPS) FOR SCALLOP DREDGING. DATA FROM MMO FOR THE PERIOD 01/01/2015 – 31/07/2022. COLOUR STRENGTH = PROXY FOR EFFORT. MPAS ARE OVERLAID AND LES SAUVAGES REEF IS IDENTIFIED. INSET SHOWS A CLOSE UP OF THE LES SAUVAGES REEF.

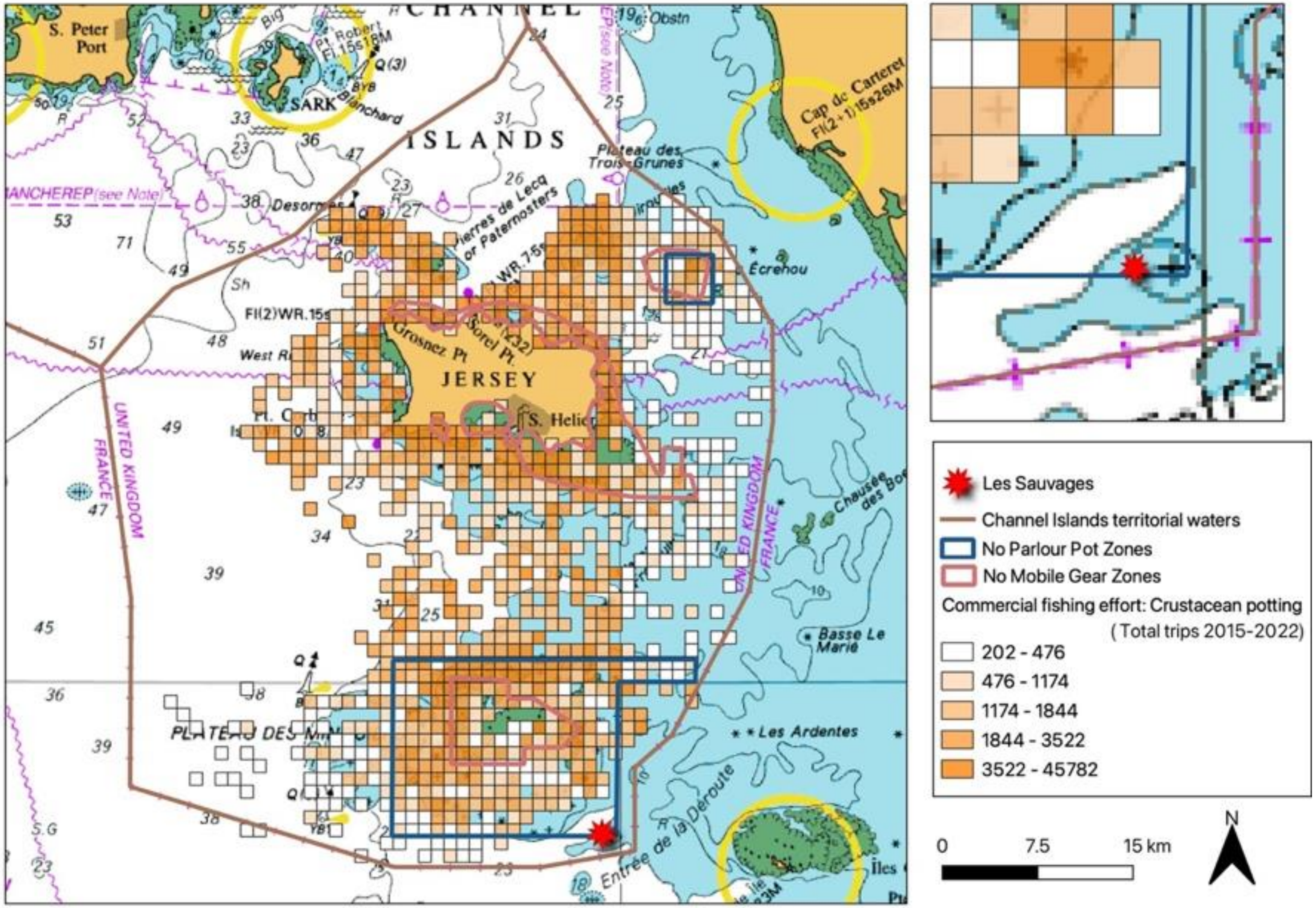



Figure 6. Summarised commercial fishing 'effort' (number of trips) for crustacean potting. Data from MMO for the period 01/01/2015 – 31/07/2022. Colour strength = proxy for effort. MPAs are overlaid and Les Sauvages reef is identified. Inset shows a close up of the Les Sauvages reef.

## 2.3 Dive surveys

To collect quantitative data on the benthic assemblages, dive surveys were carried out in 2021 and 2022. A preliminary dive survey at one site was undertaken on 2 August 2021 (Figure 7) and further dive surveys were completed at five sites on the Les Sauvages reef between 5 and 9 August 2022, (Figure 7). Sites were selected a priori using a combination of bathymetric survey outputs and considering the operational constraints (e.g. safety, tidal conditions, weather conditions, boat availability, experience of dive team, depth). The average depth of the dives conducted was 21.1 m.

These surveys focused on the rocky seabed habitat, the associated conspicuous epifaunal assemblage of the reef itself and the closely associated benthic mobile fauna (the mobile marine life that is likely to use the reef for shelter or feeding grounds).

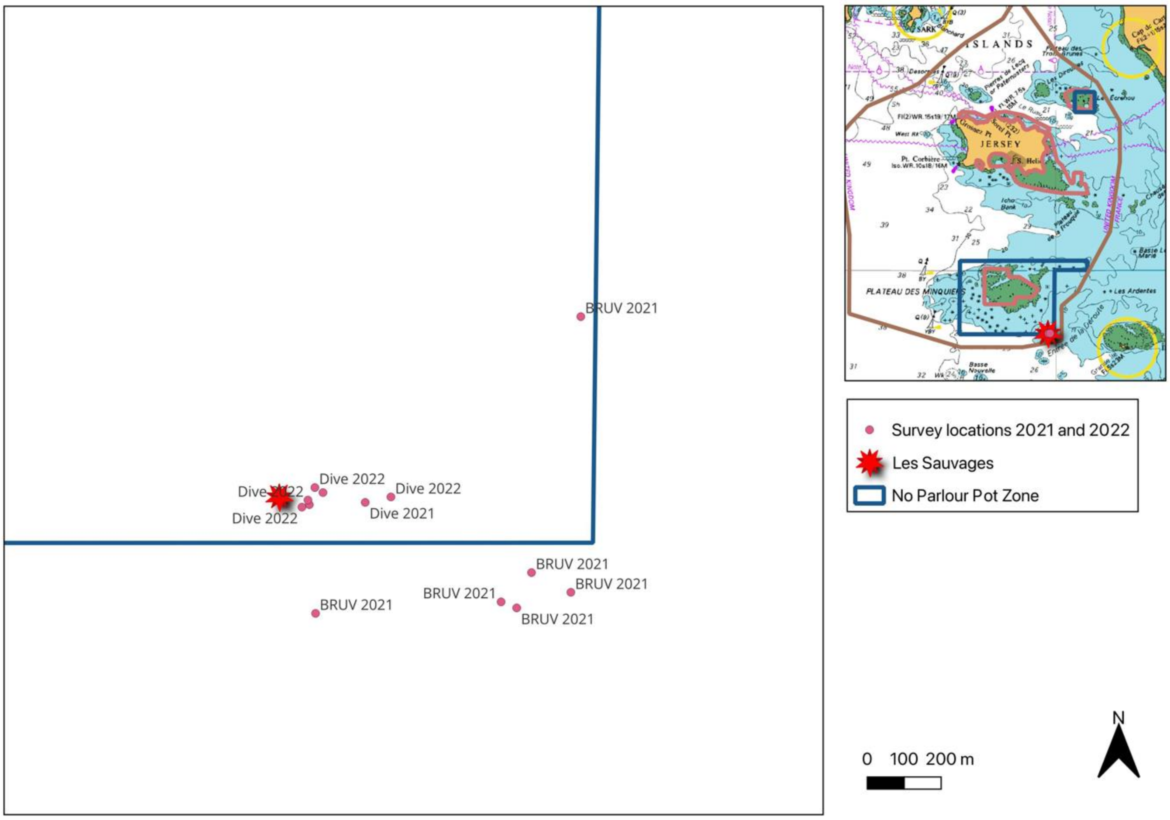



FIGURE 7. 2021 AND 2022 DIVE AND BRUV (BAITED REMOTE UNDERWATER VIDEO) SURVEY SITE LOCATIONS (RED DOTS) AROUND THE LES SAUVAGES REEF (RED STAR)

At each site, four pairs of divers were deployed. Each dive pair followed one of two dive profiles: descending down a section of the reef wall, along the reef wall and then ascending up (approximately 30 m) forming a U shape transect; or, where this profile was not possible, divers followed a linear profile along 30 m of the reef. In both 2021 and 2022, the benthic habitat every 2 m was photographed, and, to improve resolution of the photographs, each quadrat was formed from four images photographed separately (30 x 30 cm). A marked dive slate with a ruler (0–30 cm with 5 cm increments) was used as a measure for each quarter of each quadrat. Dive torches were used to light the images where required/possible. Photos were either taken using GoPro Hero 9 cameras or a Panasonic GH5.

Prior to photographing the reef, a photograph of the dive computer was collected to record depth, temperature and time information. This was repeated five to twelve times along each transect, depending on the availability of substrate to photograph, current strength and difficulty of the dive. The second diver swam the length of the transect, noting counts of mobile species and recording video of the mobile organisms to be identified after the dive. For both video and photo surveys, species of interest outside of the survey area were also recorded on dive slates.

# 3. Data collection

## 3.1 Dive Survey

### *3.1.1 Photo quadrats*

All images were first visually reviewed for quality control. Any duplicate or blurred images (where the benthic habitat/species could not be distinguished) were removed from the analysis. Images without a visible dive slate and ruler and/or physical quadrat were also removed. Once reviewed, all remaining images were analysed. Annotation, the process of extracting biological information from images was undertaken manually. Images were annotated using the open access software Biigle 2.0 (Langenkämper *et al*. 2017), accessible on https://biigle.de/. Biigle 2.0 is a web browser-based software that facilitates the visualisation, analysis and sharing of data. Images were uploaded to Biigle's server and then remotely accessed via Biigle online. Biigle retains an indefinite record of all annotations for quality control and processing transparency (the database for this project can be reached here: https://biigle.de/project-invitations/0bf2fa54-3fba-4f52-8f95-fa007957bd31). In 2021 ImageJ software was used to calculate size/area for each quadrat image instead of the repository Biigle. The results from 2021 and 2022 are provided in this report.

Organisms present in images were identified as Operational Taxonomical Units (OTUs). OTUs correspond to various taxonomic levels and are defined by what can be distinguished in pictures rather than actual taxonomic criteria (e.g. 'red algae' = unidentifiable red algal species). Thus, they do not always correspond to a coherent taxon, as, due to the nature of the marine environment and the quality of some of the photographs taken, identifying to species level was difficult. Some groups of smaller, less well-defined organisms were categorised on account of pragmatic groups manually created, defined by features such as shape and colour.

The images were annotated in a random order. A digital area (900 $cm^2$) was drawn over each image. The view on the image was zoomed to original resolution, and the "lawnmower" tool was enabled to restrict the number of animals visible on screen at a time and make the searching and detecting more systematic. The tool sequentially moves the zoomed in window from section to section, methodically going over the whole image. This makes the analysis time longer but tends to increase detected richness and abundance of epifauna. All conspicuous organisms were identified to the highest taxonomic level and annotated in Biigle (Figure 8). The majority of species were calculated by 'area' in $m^2$, calculated by drawing polygons over the species in question. Some singular, non-colony forming, erect sessile organisms were quantified as count per $m^2$, e.g. *Eunicella verrucosa*, as this was deemed more appropriate than area (Figure 8). Habitat was also recorded for each image in the same way. For ease, habitats were only recorded if they differed from 'subtidal hard substate'. The term 'stones' was used for small coarse stone dominated substate. Individual quadrats were combined and averaged per transect.

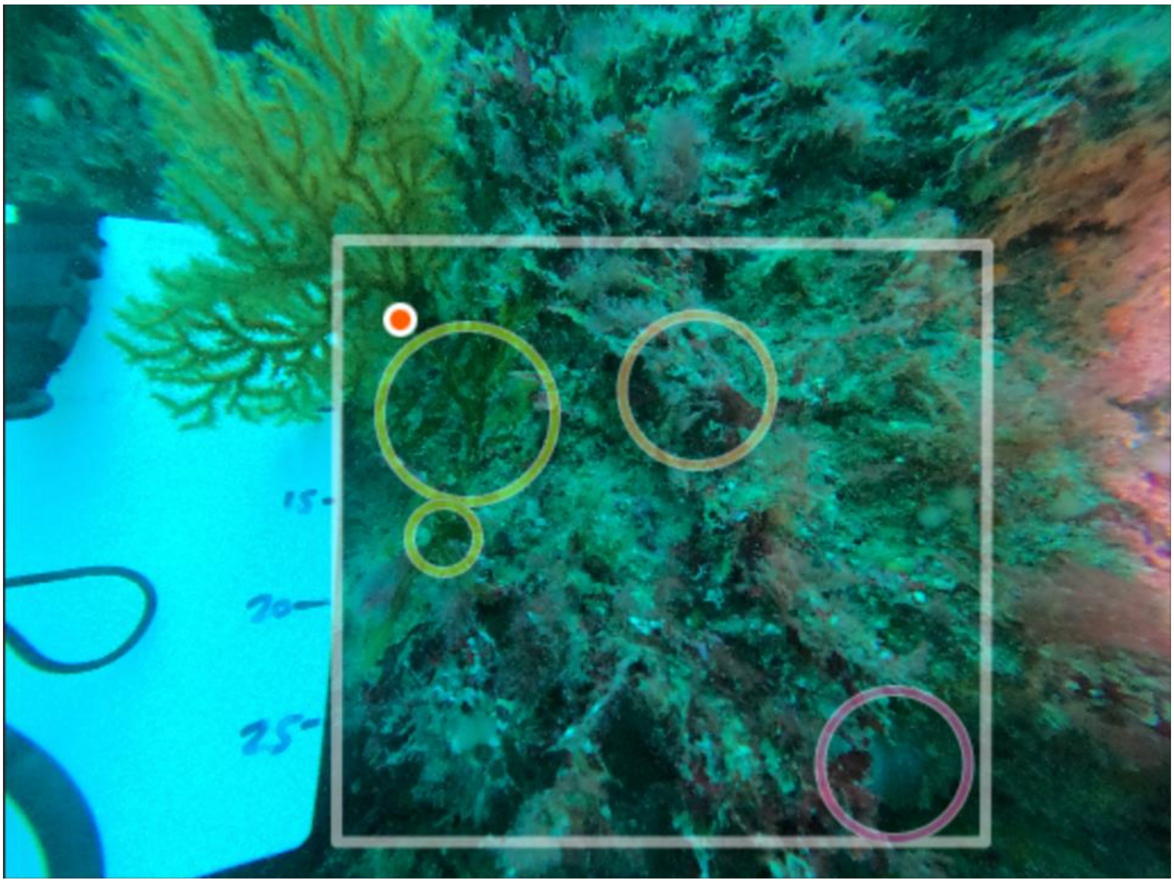



FIGURE 8. EXAMPLE OF 2022 IMAGE ANNOTATION, IN BIIGLE, OF A DIVER SURVEY QUADRAT. THE QUADRAT AREA IS DEFINED (WHITE BOX), WITH CONSPICUOUS SPECIES IDENTIFIED EITHER BY AREA (*DICTYOPTERIS POLYPODIOIDES,* YELLOW CIRCLE) OR BY INDIVIDUAL (E.G. *EUNICELLA VERRUCOSA,* RED DOT)

### *3.1.2 Video survey*

In 2021, videos of each dive transect (benthos and reef associated animals) were recorded and analysed post-survey. All species present were enumerated and identified. In 2022, oceanic conditions made following transects in the same way problematic. Therefore, in 2022, some of the dive transects were also recorded but videos did not follow a prescribed transect, but videos of the general area of survey were recorded. Videos again focussed on the benthos and surrounding area. These videos were considered opportunistic rather than structured video sampling. As such, only large, conspicuous species that might have been missed in the photo quadrat survey were recorded (Figure 9). This was supplemented by information recorded by divers immediately post-dive who noted species of interest on dive slates. These species have been included in the overall species list. Due to these videos being opportunistic, species identified were expressed as presence only and not quantified per area/distance covered.

FIGURE 9. SCREENSHOT TAKEN FROM DIVER VIDEO RECORDING, 2022. POUTING (*TRISOPTERUS LUSCUS*) ARE VISIBLE

## 3.2 Baited Remote Underwater Videos (BRUVs)

Baited Remote Underwater Videos (BRUVs) were used to quantify differences in mobile species assemblage composition, diversity and abundance for the Les Sauvages reef. BRUVs are used widely in marine research and the method typically involves deploying static remotely controlled cameras to passively record fish assemblages (Roberts *et al.* 2016). BRUVs provide a non-extractive way of assessing and quantifying the mobile fauna associated with a habitat or location over short time periods. While BRUVs cannot be used to measure absolute abundance, they can provide a way of understanding relative differences in mobile species assemblages (Cappo, Speare and De'ath, 2004). BRUVs were used to gather a mobile species baseline dataset for the Les Sauvages reef and surrounding area. BRUVs were deployed at five sites on the reef between July and August 2021 (Figure 7).

BRUV units consisted of a 0.8 m (8 mm diameter) fiberglass bait pole attached at a 90-degree angle to a 0.5 m (10 mm diameter) fiberglass base pole with weights attached to one end of the base pole (2 kg) and a float attached to the other to ensure the correct orientation of the unit (Blampied *et al*. 2022b). A metal bait cage was attached at the end of the bait pole. A GoPro (Hero 4 or 6) was attached to the base pole underneath the bait pole, with the field of view angled at the bait cage. Each unit was attached to ~20 kg of lead weight via a leading rope (~5 m) and a marker buoy attached to the lead weight with 20 m of leaded line. The bait cage was filled with ~100 g of Atlantic mackerel (*Scomber scombrus*); after each deployment, leftover bait was discarded and replaced with fresh bait. To account for the large tidal range in Jersey and the effect of current speed on bait plume (chemical stimuli or proteins released from bait into the water column) size, all BRUVs were deployed on neap tides within a two-hour period around slack water. BRUVs were left to ‘soak’ for 40 minutes before being recovered and were spaced a minimum of 300 m from one another to ensure bait plumes were independent.

### *3.2.1 Data collection*

Videos were assessed for quality and were not analysed if the camera was out of focus, the seabed was not in view, or the view of the bait box was obscured. Videos (n=5) were analysed for 40 min from the moment the BRUV was stationary on the seafloor. The number of individuals of each mobile species on screen were recorded every minute, to the highest taxonomic resolution possible. For every minute recorded, the greatest count of each species was taken as the MaxN (maximum number of individuals on screen), and the largest value over the 40 min period was used. MaxN was used to decrease the chance of an individual being recorded more than once, giving an estimate of relative abundance rather than absolute abundance (Cappo, Speare and De'ath, 2004). Small and cryptic benthic species, such as hermit crabs (*Pagurus* spp.), dog whelk (*Tritia reticulata*), and dragonet (*Callionymus* spp.) were not recorded as it was not possible to accurately record these species in high algal cover sites (Blampied *et al.* 2022b).

# 4. Results

## 4.1 Dive survey

### *4.1.1 Photo quadrats*

A total of 2,844 individual quadrats were analysed during the photo quadrat analysis (from 2021 and 2022), covering five individual transects of the Les Sauvages reef. Quadrats were combined per replicate (n = 4 per replicate). The number of replicates per transect varied from eight to twelve. All species and groups of species are expressed as coverage area (in square meters). The maximum coverage area in the dataset is 0.0864 $m^2$, which corresponds to the substate "stones" category. The minimum coverage area in the dataset is 0.0003 $m^2$, corresponding to several species, including *Polymastia penicillus* (chimney sponge) and *Tethya citrina* (golf ball sponge).  Overall, the most dominant species in 2022 were *Pachymatisma johnstonia* (elephant hide sponge; 0.0518 $m^2$)*, Halidrys siliquosa* (sea oak; 0.0494 $m^2$)*, Styela clava* (leathery sea squirt; 0.0445 $m^2$), red feather weed (0.0389 $m^2$) and *Dictyopteris polypodioides* (netted wing weed; 0.0337 $m^2$) (Figure 10).

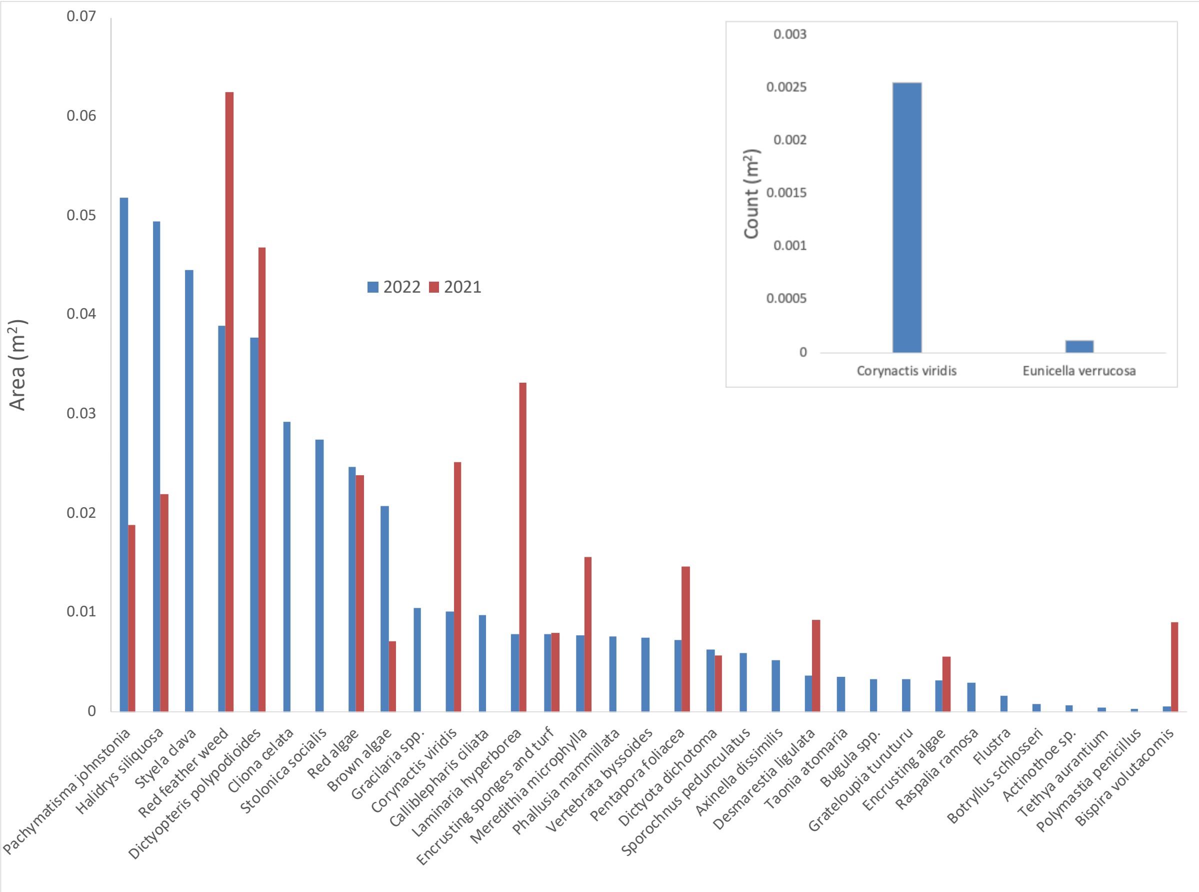



FIGURE 10. AVERAGE AREA ($M^2$) OF SPECIES IDENTIFIED DURING PHOTO QUADRAT ANALYSIS (OPERATIONAL TAXONOMICAL UNITS (OTUS)) CORRESPOND TO VARIOUS TAXONOMIC LEVELS/GROUPINGS APPLIED. DATA FROM 2021 DIVE SURVEYS AND 2022 ARE SHOWN. INSET SHOWS 'COUNT' INSTEAD OF AREA FOR TWO SPECIES

The average number of species recorded per transect was 14.36 species per 30 m. Two habitats were recorded in the analysis. 75.98 per cent of the habitat was characterised as subtidal hard substrate, while 24.01 per cent was considered as 'stones'.

Two species were expressed as counts (Figure 10); *Corynactis viridis* (jewel anemone)*, Eunicella verrucosa* (pink sea fan), with counts of 0.0002 and 0.0001 individuals per $m^2$, respectively. Counts were used for these species, as individuals are easily distinguishable and area data can be misleading as these species are singular and solitary. A complete list of species identified in the quadrat survey is incorporated in Table 1.

### *4.1.2 Video survey*

A total of 98 videos were taken during dives in 2021 and 2022. A total of 53 species were identified and recorded from the video surveys (Table 1). Species were recorded from the following phyla: Cnidaria, Mollusc, Echinodermata, Porifera, Annelida, Chordata, Bryozoa, Rhodophyta, Arthropoda and Ochrophyta. These species have been combined with species identified from the other survey methods and a complete species list is presented in the next section (Table 1).

## 4.2 BRUV Survey

A total of 15 species from four classes were identified from the BRUV video analysis, the most common of which was black seabream (*Spondyliosoma cantharus*) followed by pouting (*Trisopterus luscus*). There was only one species of Malacostraca, spider crab (*Maja brachydactyla*), and of Cephalopoda, common cuttlefish *(Sepia officinalis*; Figure 11). Spider crab and the small-spotted catshark (*Scyliorhinus canicula*) were also abundant species (Figure 11). The mean number of taxa per sample was 7.75 species (± 2.6) and was dominated by chordates (14 species) with one Mollusca species, the average abundance (all species) was 23.25 (± 6.9). A complete list of species identified in BRUV surveys is incorporated in Table 1.

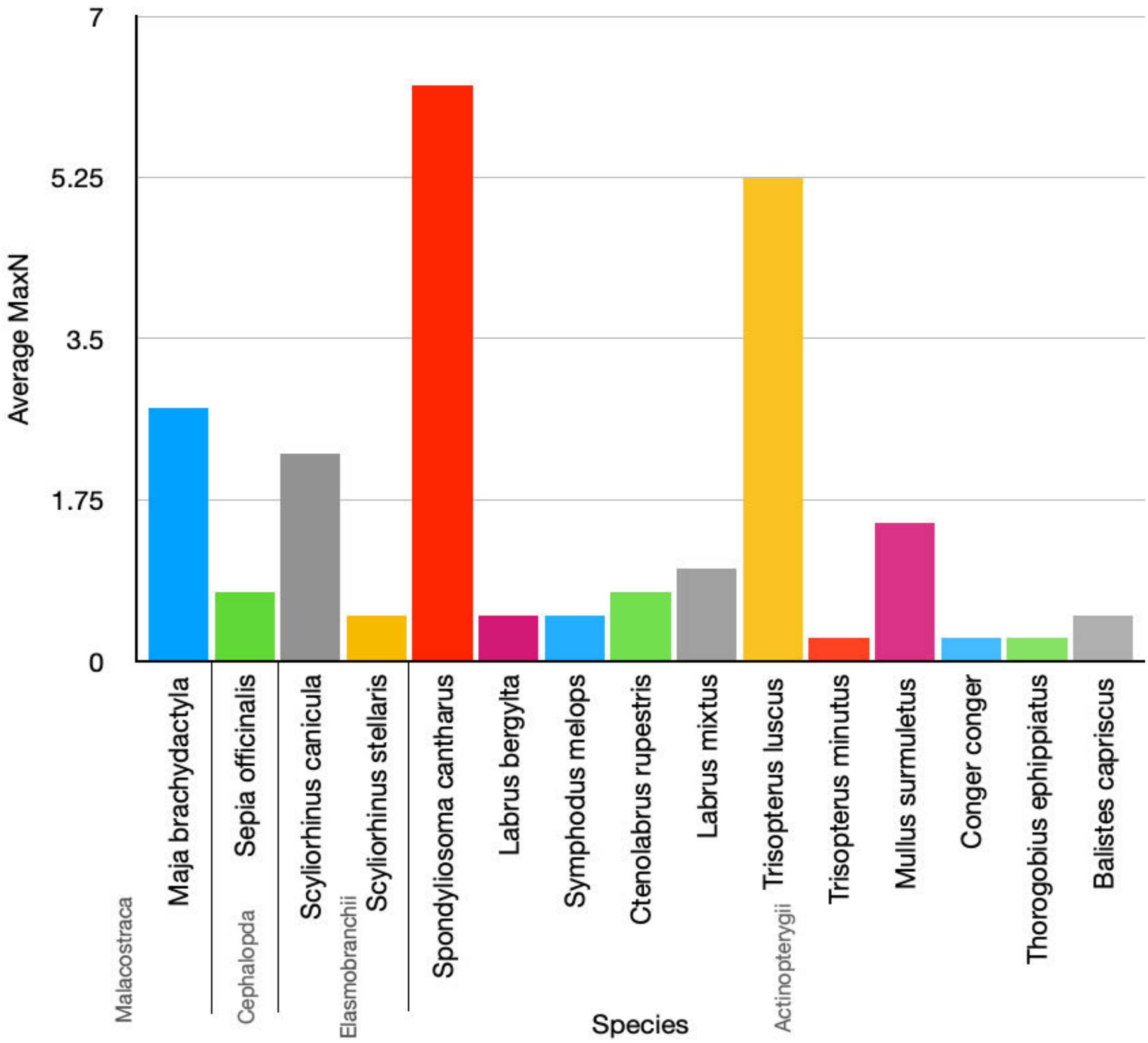



FIGURE 11. ABUNDANCE (MAXN) OF SPECIES IDENTIFIED FROM BRUV VIDEOS FROM LES SAUVAGES IN 2021

## 4.3 Total Species Observed

A complete list of species from all surveys conducted in 2021 and 2022 is presented in Table 1. In total, 82 species, or groups of species (where taxonomic identification was not complete), were recorded from all surveys (dive video, quadrats and BRUVs). For validation, species identified in during the research were compared to the list of species identified by Seasearch from dives surveys of Les Sauvages in 1999 and from 2013–2021.

Table 1. Species recorded in all surveys from dive video surveys in 2021 and 2022 cross-referenced with Seasearch dive survey data from Les SAuvages.

| Species | Phylum | Order | Family | 2021 | Method of quantification | 2022 | Method of quantification | Seasearch 1999/2013–2023 |
|---|---|---|---|---|---|---|---|---|
| *Actinothoe* spp | Cnidaria | Actiniaria | Sagartiidae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Aiptasia mutabilis* | Cnidaria | Actiniaria | Aiptasiidae | ✓ | Video | ✓ | Video | |
| *Aplysia punctata* | Mollusca | Aplysiida | Aplysiidae | ✓ | Video | ✓ | Video | ✓ |
| *Asterina gibbosa* | Echinodermata | Valvatida | Asterinidae | ✓ | Quadrat | | | ✓ |
| *Axinella dissimilis* | Porifera | Axinellida | Axinellidae | ✓ | Video | ✓ | Quadrat + video | ✓ |
| *Balistes capriscus* | *Chordata* | Tetradontiformes | Balistidae | ✓ | BRUV | | | ✓ |
| *Bispira volutacornis* | Annelida | Sabellida | Sabellidae | ✓ | Quadrat | ✓ | Quadrat + video | ✓ |
| *Botryllus schlosseri* | Chordata | Stolidobranchia | Styelidae | ✓ | Video | ✓ | Quadrat | ✓ |
| Brown algae | | | | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Buccinum undatum* | Mollusca | Neogastropoda | Buccinidae | ✓ | Video | | | |
| *Bugula* sp. | Bryozoa | Cheilostomatida | Bugulidae | | | ✓ | Quadrat | ✓ |
| *Calliblepharis ciliata* | Rhodophyta | Gigartinales | Cystocloniaceae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Callionymus sp.* | Chordata | Callionymiformes | Callionymidae | ✓ | Video | | | ✓ |
| *Calliostoma zizyphinum* | Mollusca | Trochida | Calliostomatidae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Cancer pagurus* | Arthropoda | Decapoda | Cancridae | ✓ | Video | ✓ | Video | ✓ |
| *Caryophyllia smithii* | Cnidaria | Scleractinia | Caryophylliidae | ✓ | Video | ✓ | Video | |
| *Centrolabrus exoletus* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video | ✓ | Video | ✓ |
| *Cereus pedunculatus* | Cnidaria | Actiniaria | Sagartiidae | ✓ | Video | ✓ | Video | |
| Pachycerianthus indet | Cnidaria | Spirularia | Cerianthidae | ✓ | Video | ✓ | Video | |
| *Chelon* spp. | Chordata | Mugiliformes | Mugilidae | | | ✓ | Video | |
| *Ciocalypta penicillus* | Porifera | Suberitida | Halichondriidae | ✓ | Video | ✓ | Video | ✓ |
| *Cliona celata* | Porifera | Clionaida | Clionaidae | | | ✓ | Quadrat | ✓ |
| *Conger conger* | Chordata | Anguilliformes | Congridae | | | | | ✓ |

| Species | Phylum | Order | Family | 2021 | Method of quantification | 2022 | Method of quantification | Seasearch 1999/2013–2023 |
|---|---|---|---|---|---|---|---|---|
| *Corynactis viridis* | Cnidaria | Corallimorpharia | Corallimorphidae | ✓ | Quadrat | ✓ | Quadrat + video | ✓ |
| *Ctenolabrus rupestris* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video | ✓ | Video | ✓ |
| *Dendrodoris limbata* | Mollusca | Nudibranchia | Dendrodorididae | ✓ | Video | | | |
| *Desmarestia ligulata* | Ochrophyta | Desmarestiales | Desmarestiaceae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Dictyopteris polypodioides* | Ochrophyta | Dictyotales | Dictyotaceae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Dictyota dichotoma* | Ochrophyta | Dictyotales | Dictyotaceae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| Encrusting algae | | | | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| Encrusting sponges and turf | | | | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Eunicella verrucosa* | Cnidaria | Malacalcyonacea | Eunicellidae | ✓ | Video | ✓ | Quadrat + video | ✓ |
| Female *Labrus mixtus* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video | ✓ | Video | ✓ |
| *Flustra foliacea* | Bryozoa | Cheilostomatida | Flustridae | | | ✓ | Quadrat | ✓ |
| *Furcellaria lumbricalis* | Rhodophyta | Gigartinales | Furcellariaceae | ✓ | Video | ✓ | Video | |
| *Gobius* spp. | Chordata | Gobiiformes | Gobiidae | ✓ | Video | | | ✓ |
| *Gracilaria* sp. | Rhodophyta | Gracilariales | Gracilariaceae | | | ✓ | Quadrat | |
| *Grateloupia turuturu* | Rhodophyta | Halymeniales | Grateloupiaceae | | | ✓ | Quadrat | |
| *Haliclona* sp. | Porifera | Haplosclerida | Chalinidae | ✓ | Video | ✓ | Video | ✓ |
| *Halidrys siliquosa* | Ochrophyta | Fucales | Sargassaceae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Homarus gammarus* | Arthropoda | Decapoda | Nephropidae | ✓ | Video | | | ✓ |
| *Inachus* spp. | Arthropoda | Decapoda | Inachidae | ✓ | Video | | | ✓ |
| *Labrus bergylta* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Laminaria hyperborea* | Ochrophyta | Laminariales | Laminariaceae | ✓ | Quadrat | ✓ | Quadrat + video | ✓ |
| *Lanice conchilega* | Annelida | Terebellida | Terebellidae | ✓ | Video | | | ✓ |

| Species | Phylum | Order | Family | 2021 | Method of quantification | 2022 | Method of quantification | Seasearch 1999/2013–2023 |
|---|---|---|---|---|---|---|---|---|
| *Leptopsammia pruvoti* | Cnidaria | Scleractinia | Dendrophylliidae | | | ✓ | Quadrat + video | ✓ |
| *Maja brachydactyla* | Arthropoda | Decapoda | Majidae | ✓ | Video + BRUV | ✓ | | ✓ |
| *Male Labrus mixtus* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video | ✓ | Video | ✓ |
| *Marthasterias glacialis* | Echinodermata | Forcipulatida | Asteriidae | ✓ | Video | | | |
| *Meredithia microphylla* | Rhodophyta | Gigartinales | Kallymeniaceae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Mimachlamys varia* | Mollusca | Pectinida | Pectinidae | ✓ | Video | ✓ | Video | ✓ |
| *Mullus surmuletus* | Chordata | Mulliformes | Mullidae | ✓ | BRUV | | | ✓ |
| *Necora puber* | Arthropoda | Decapoda | Polybiidae | ✓ | Video | ✓ | Video | ✓ |
| *Nemertesia* spp. | Cnidaria | Leptothecata | Plumulariidae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Ostrea edulis* | Mollusca | Ostreida | Ostreidae | ✓ | Video | ✓ | Dive photo | ✓ |
| *Pachymatisma johnstonia* | Porifera | Tetractinellida | Geodiidae | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| *Pagurus* spp. | Arthropoda | Decapoda | Paguridae | ✓ | Video | | | ✓ |
| *Palinurus elephas* | Arthropoda | Decapoda | Palinuridae | ✓ | Video | ✓ | Video | ✓ |
| *Parablennius gattorugine* | Chordata | Blenniiformes | Blenniidae | ✓ | Video | ✓ | Video | ✓ |
| *Pecten maximus* | Mollusca | Pectinida | Pectinidae | ✓ | Video | ✓ | Video | ✓ |
| *Pentapora foliacea* | Bryozoa | Cheilostomatida | Bitectiporidae | ✓ | Quadrat | ✓ | Quadrat + video | ✓ |
| *Phallusia mammillata* | Chordata | Phlebobranchia | Ascidiidae | | | ✓ | Quadrat | ✓ |
| *Pollachius pollachius* | Chordata | Gadiformes | Gadidae | ✓ | Video | ✓ | Video | ✓ |
| *Polymastia boletiformis* | Porifera | Polymastiida | Polymastiidae | ✓ | Video | ✓ | Video | ✓ |
| *Polymastia penicillus* | Porifera | Polymastiida | Polymastiidae | | | ✓ | Quadrat + video | ✓ |
| *Raspailia ramosa* | Porifera | Axinellida | Raspailiidae | | | ✓ | Quadrat | |
| Red algae | | | | ✓ | Quadrat | ✓ | Quadrat | ✓ |
| Red feather weed | | | | ✓ | Quadrat | ✓ | Quadrat | ✓ |

| Species | Phylum | Order | Family | 2021 | Method of quantification | 2022 | Method of quantification | Seasearch 1999/2013–2023 |
|---|---|---|---|---|---|---|---|---|
| *Sabella* sp. | Annelida | Sabellida | Sabellidae | ✓ | Video | ✓ | Video | ✓ |
| Sandeel shoal | Chordata | | | ✓ | Video | | | |
| *Scyliorhinus canicula* | Chordata | Carcharhiniformes | Scyliorhinidae | ✓ | Video + BRUV | | | ✓ |
| Scyliorhinus stellaris | Chordata | Carcharhiniformes | Scyliorhinidae | ✓ | BRUV | | | ✓ |
| *Sepia officinalis* | Mollusca | Sepiida | Sepiidae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Spondyliosoma cantharus* | Chordata | Eupercaria incertae sedis | Sparidae | ✓ | BRUV | ✓ | Video | ✓ |
| *Sporochnus pedunculatus* | Ochrophyta | Sporochnales | Sporochnaceae | | | ✓ | Quadrat | ✓ |
| *Stolonica socialis* | Chordata | Stolidobranchia | Styelidae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Styela clava* | Chordata | Stolidobranchia | Styelidae | ✓ | Video | ✓ | Quadrat | ✓ |
| *Symphodus bailloni* | Chordata | Eupercaria incertae sedis | Labridae | | | ✓ | Video | ✓ |
| *Symphodus melops* | Chordata | Eupercaria incertae sedis | Labridae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Tethya aurantium* | Porifera | Tethyida | Tethyidae | | | ✓ | Quadrat | ✓ |
| *Tethya citrina* | Porifera | Tethyida | Tethyidae | ✓ | Video | ✓ | Video | ✓ |
| *Thorogobius ephippiatus* | Chordata | Gobiiformes | Gobiidae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Trisopterus luscus* | Chordata | Gadiformes | Gadidae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Trisopterus minutus* | Chordata | Gadiformes | Gadidae | ✓ | Video + BRUV | ✓ | Video | ✓ |
| *Tritia reticulata* | Mollusca | Neogastropoda | Nassariidae | ✓ | Video | ✓ | Video | ✓ |
| *Vertebrata byssoides* | Rhodophyta | Ceramiales | Rhodomelaceae | | | ✓ | Quadrat | |

# 5. Discussion

## 5.1 Dive survey

The results from the dive surveys show that the sites surveyed were dominated by subtidal hard substrate (subtidal hard substrate = 75 per cent of area surveyed), considered to be the second most valuable habitat for Jersey's commercial fisheries (Blampied *et al.* 2022a). All rock and boulder categories below the low-water mark were grouped into subtidal hard substrate (Blampied *et al*. 2022a). The total area of this habitat in Jersey's territorial waters is 806 $km^2$, where 8.91 per cent is currently protected through existing designations (MPAs). Hard substrate plays a crucial role in various ecological processes and has several important benefits (supporting epibiotic reefs and communities for settlement and establishment, providing protection for marine organisms, and as a result these areas are often biodiversity hotspots) (Michaelis *et al.* 2019).

Dive survey results from 2022 show the epibiota that dominated this subtidal hard substrate were *Pachymatisma johnstonia, Halidrys siliquosa, Styela clava*, red feather weed and *Dictyopteris polypodioides*. These are established massive sponges, red and brown algae and a solitary ascidian (Figure 12).

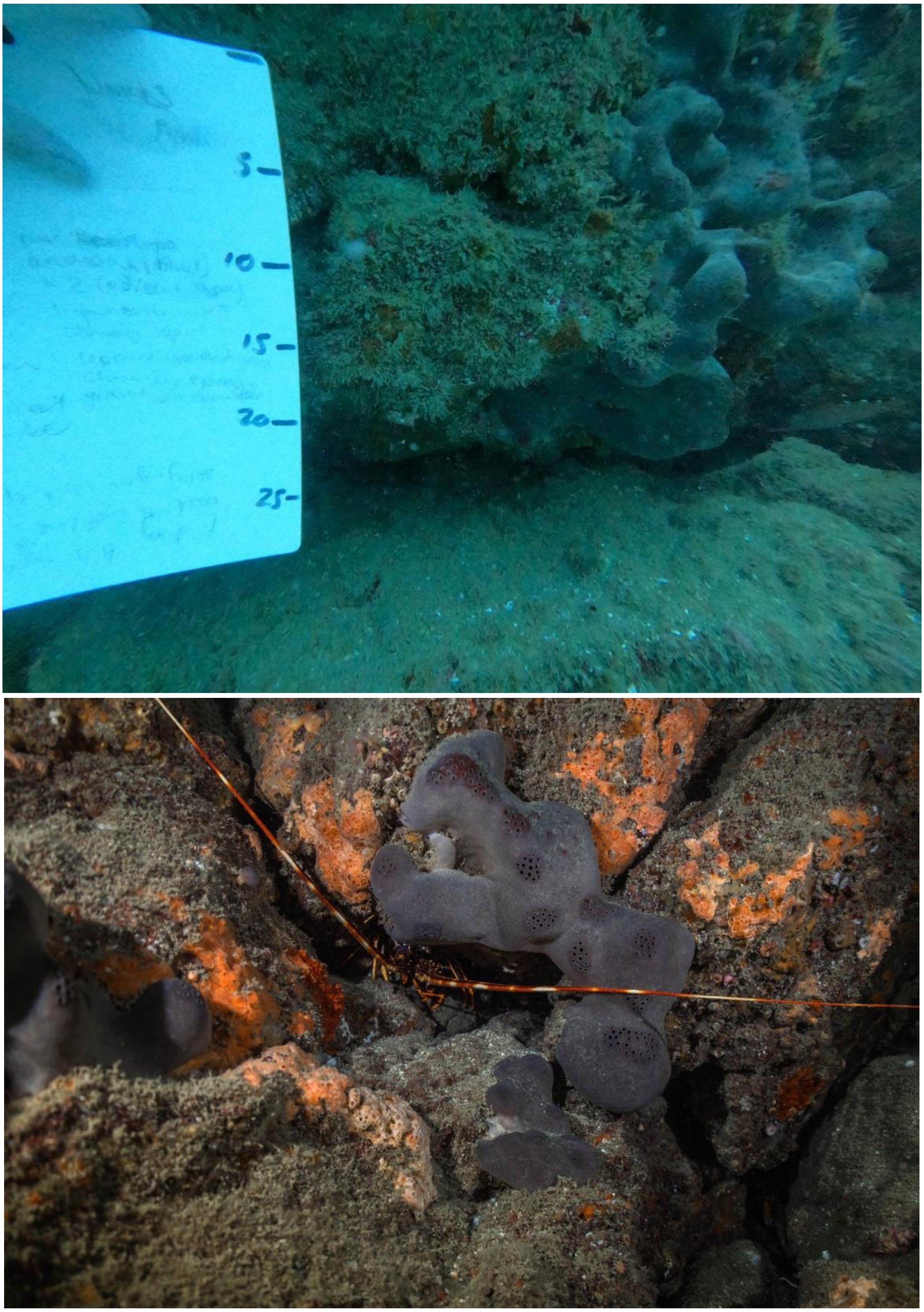



Figure 12. Top) *Pachymatisma johnstonia*, a massive sponge (known as the elephant hide sponge) from a dive survey quadrat in 2022, bottom) same species in a different location (encrusting sponges and spiny lobster (*Palinurus elephas*) visible) taken by a diver in situ in 2022, for clarity

### *5.1.1 Species of Importance*

The dive surveys identified the presence of important anemones, seafans and sensitive, slow growing species including the jewel anemone (Figure 13), the pink sea fan (Figure 14), the sunset cup coral (*Leptopsammia pruvoti*) and the ross coral (*Pentapora folicea)*.

#### 5.1.1.1 Jewel Anemone

The jewel anemone (*Corynactis viridis*), is a species of sea anemone, occurring in the northeastern Atlantic Ocean and the Mediterranean Sea. It occurs from the lower shore and into the subtidal to about 50 m (sometimes to 80 m) on rocks, in caves and beneath overhangs where it is shaded from light. The anemone is often found in dense aggregations especially on vertical rock faces (Picton and Costello 1998). As a sensitive species, the jewel anemone has significant importance as an indicator of environmental change and the health of marine ecosystems (Palladino *et al*. 2021). Their abundance, distribution, and overall condition can provide valuable information about the impacts of human activities, climate change, and pollution on coastal and reef environments. Monitoring their populations can help identify and address potential threats to the marine ecosystem. The jewel anemone is also a key species in some Marine Conservation Zones (MCZs) designated to protect rare and threatened marine wildlife and habitats in England, for example at the Western Channel MCZ near the Lizard Peninsula in Cornwall (DEFRA 2016).

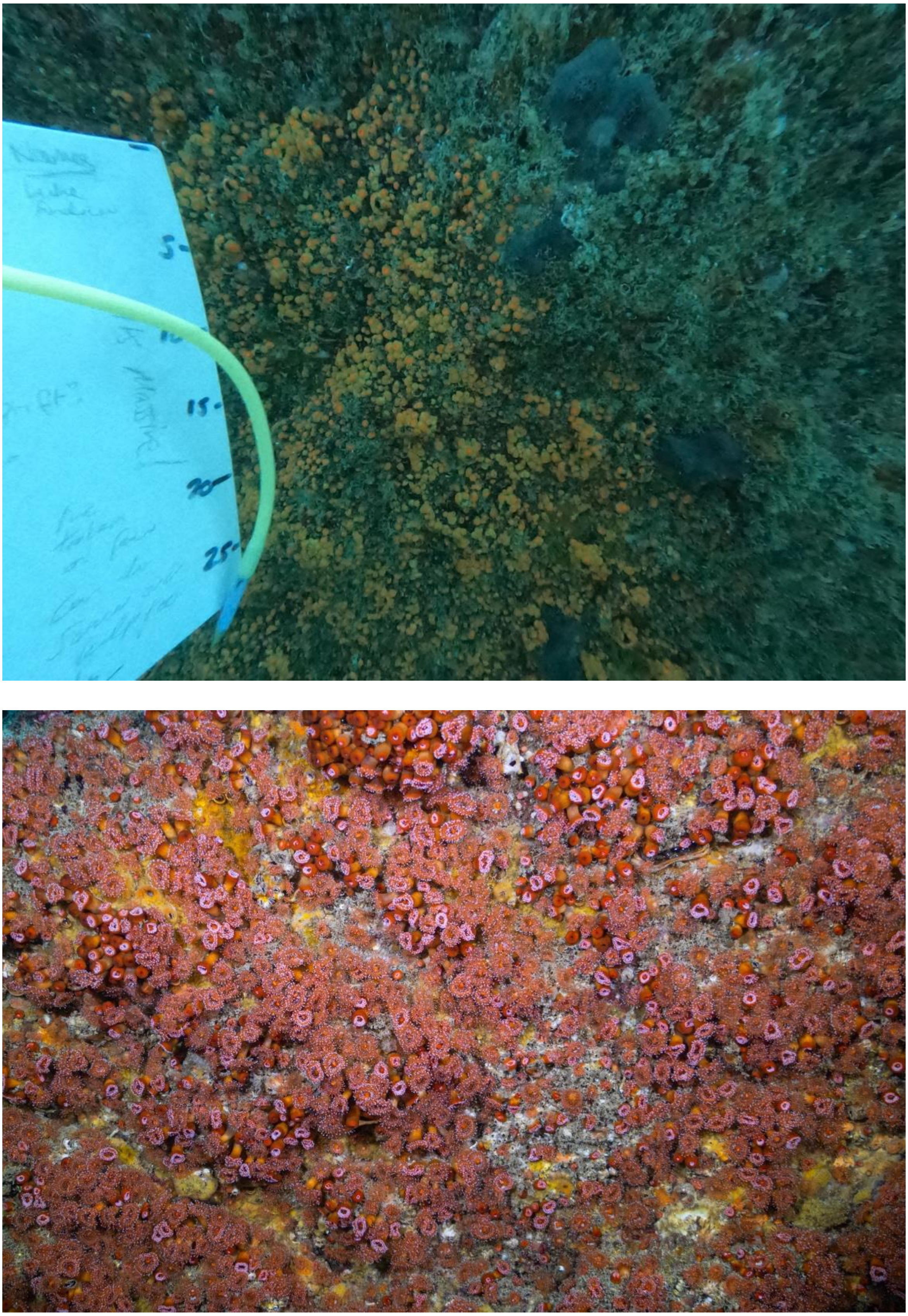



FIGURE 13. TOP) EXAMPLE IMAGE FROM DIVER SURVEY QUADRAT IN 2022 OF JEWEL ANEMONE (*CORYNACTIS VIRIDIS*) ABUNDANCE ON HARD SUBSTRATE. BOTTOM) SAME SPECIES IN A DIFFERENT LOCATION TAKEN BY A DIVER IN SITU IN 2022

### 5.1.1.2 Pink Sea Fan

The pink sea fan is a nationally protected species in the UK and Jersey. It is protected under Jersey's Wildlife Law (updated in 2021 to include the pink sea fan (WILDLIFE (AMENDMENT OF SCHEDULES TO LAW) (JERSEY) ORDER 2022)). It is a slow-growing, cold-water coral that is recognized as a species of principal importance in English waters and has been specifically identified for protection within a UK MPA network (Pikesley *et al.* 2016). In the UK, the pink sea fan is protected under the Wildlife and Countryside Act 1981 and is a Priority Species under the UK Post-2010 Biodiversity Framework. Additionally, it is a Feature of Conservation Importance for which MCZs can be designated (Pikesley *et al.* 2016). The pink sea fan is classified as Vulnerable on the global IUCN Red List (World Conservation Monitoring Centre. 1996).

FIGURE 14. PINK SEA FAN (*EUNICELLA VERRUCOSA*) PHOTOGRAPHED ON THE LES SAUVAGES REEF BY A DIVER IN 2022

### 5.1.1.3 Cerianthid Anemone

A large cerianthid anemone was observed during the video survey from a dive undertaken in 2022 (Figure 15). It was noted during the dive that this anemone appeared different to other cerianthid species observed at Les Sauvages, and analysis post hoc supports this. This anemone appears to have no valid scientific name, being referred to as *Cerianthus mediterraneus* by scientists, but it is considered a species of the genus *Pachycerianthus* (currently *Pachycerianthus indet*) (Picton and Morrow 2016). The colour of inner tentacles is described as white, with pale buff marginal tentacles with slightly darker brown bands. This species appears to be recorded in the British Isles only from the Channel Isles and is not found on the English side of the English Channel (Picton and Morrow 2016). This species has previously been recorded by Seasearch divers which supports this identification.

FIGURE 15. SCREENSHOT FROM VIDEOS TAKEN DURING DIVER SURVEY 2022 OF SUSPECTED *PACHYCERIANTHUS INDET* ANEMONE SPECIES

### 5.1.1.4 Native Oyster

The presence of the native/European oyster was observed during both dive surveys, however was not observed on the 2022 transects (rather it was observed when not sampling; Figure 16). The species was observed and recorded in the 2021 dive survey. This oyster species is native to the UK and other European coastal waters (Thurstan *et al.* 2013). The native oyster population in the UK has declined significantly historically due to overharvesting, habitat loss, disease, and pollution. As a result, it is considered a species of conservation concern, and efforts are underway to restore and protect oyster populations (Pogoda *et al.* 2020). In England and Wales, the native oyster is protected under the Wildlife and Countryside Act 1981. The oyster beds are also designated as European Marine Sites and Special Areas of Conservation under the EU Habitats Directive, providing additional protection to their habitats. The presence of this species in Les Sauvages is important and could suggest a naturally recruiting population, especially in the context of Jersey once having a thriving native oyster fishery, which completely collapsed due to overfishing in 1862 (Blampied 2022).

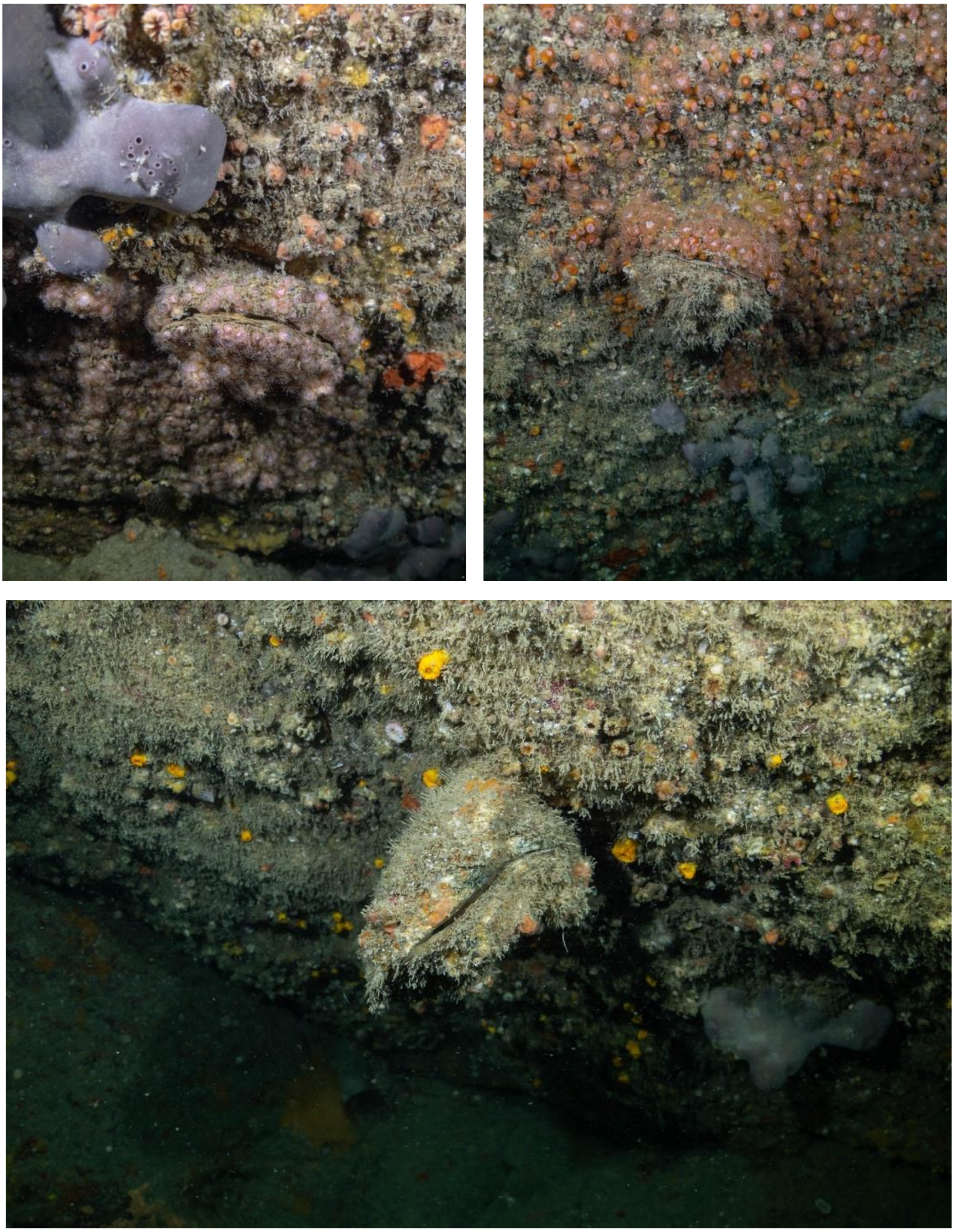


FIGURE 16. OBSERVATIONS OF THE NATIVE OYSTER (*OSTREA EDULIS*) AT LES SAUVAGES. ANECDOTAL PHOTOGRAPHS TAKEN BY DIVERS DURING THE 2022 SURVEY

### 5.1.1.5 Sunset Cup Coral

The sunset cup coral is a bright yellow or orange stony coral which typically resembles an anemone. It has a tentacular polyp that emerges from a porous, calcareous skeleton (Jackson 2008). These corals typically occur as solitary individuals and is rarely found in small groups forming 'pseudocolonies'. It has been observed in areas of the Atlantic coast of SW England, the Channel Islands, Brittany and Portugal. This species is considered to be at the northern limit of its range possibly forming a relic from a larger previous distribution (Sanderson 1996). It is now restricted to 'ideal' locations. The species is protected under the UK Biodiversity Action Plan and Jersey's wildlife laws. Recently, the JMC found what was believed to be 'the largest colony of Sunset Cup Coral of its kind in the North East Atlantic' at Les Sauvages. This species was noted during the 2022 dive surveys and its presence is of biodiversity importance and emphasises the uniqueness of the Les Sauvages reef (Figure 17).

FIGURE 17. SUNSET CUP CORAL (*LEPTOPSAMMIA PRUVOTI*) PHOTOGRAPHED ON THE LES SAUVAGES REEF BY A DIVER IN 2022

### *5.1.2 Wider Ecosystem*

Despite the small number of sampling events, the surveys have shown the reef to be dominated by subtidal hard substate with epibiotic communities dominating this substrate. The abundance and diversity of mobile species are considered to be comparable in both number and species diversity to other protected areas around Jersey's territorial waters, including the nearby Les Minquiers reef and NMGZs. For sessile and encrusting species, abundances are far higher in Les Sauvages than in the NMGZs. Towed video surveys completed inside and outside of the MPAs found the number of taxa per 100 m to be between one and four species and one and six individuals (Blampied. 2022). The number of species recorded on a 30 m transect at Les Sauvages was observed here to be much higher (14.36 species per 30 m), equating to a 1196 per cent increase in species richness per 100 m. These comparisons are being made by comparing deeper rocky reef, to a range of protected habitats which are shallower, closer to the island of Jersey, and comprise of a mosaic of reef, maerl and seagrass habitats. However, the comparison is worthwhile for contextualising the results presented here.

Temperate benthic habitat literature supports the theory that physical structural complexity in benthic marine habitats can provide ecological benefits and support more diverse marine assemblages (Bradshaw *et al*. 2003). High structural complexity provides a diverse range of microhabitats, offering shelter, refuge, and feeding opportunities for a wide array of species (Bradshaw *et al*. 2003). This results in increased species richness and diversity, supporting a more resilient and stable ecosystem in the face of environmental changes and disturbances (Kovalenko *et al.* 2012). Complex rocky reefs have been shown to act as important nursery habitats for juvenile fish and invertebrates, providing protection from predators and enhancing survival rates (Lefcheck *et al.* 2019).

Biogenic reefs, also known as biological reefs, are formed by living organisms that actively construct physical structures within marine environments. These reefs significantly increase benthic structural complexity and are characterised by the presence of various species that actively contribute to the creation and maintenance of the reef's physical structure. The most obvious way biogenic reefs increase complexity is by providing a three-dimensional physical structure in an otherwise flat benthic environment. Reefs can be composed of hard structures like coral skeletons, calcium carbonate formations (e.g. maerl beds), or the shells of molluscs (e.g. horse mussels). Other biogenic reef building species include kelp, seagrasses, sponges, maerl and corals (Lefcheck *et al*. 2019).

The presence of slow growing, structure-forming, reef associated species (e.g. pink sea fan, ross coral, elephant hide sponge, the native oyster), suggests a well-established rocky reef habitat exists in Les Sauvages. The presence of these species is often regarded as indicative of healthy habitat and they are known to be found in other marine areas around the UK of high biodiversity (Sheehan *et al.* 2013).

## 5.2 BRUV survey

BRUV survey results from Les Sauvages showed the average number of species and average number of individuals to be relatively high. Although sampling power was low (and therefore variation was high) 7.75 species per sample and 23.25 individuals are comparable to results observed from BRUV surveys of the Les Minquiers NMGZ (where the mean number of species was greater inside the MPA (4.9 ± 1.8) compared to Open Controls (3.9 ± 1.7), as were individuals inside the MPA (23.8 ± 15.2) compared to Open Controls (12.4 ± 10)) (Blampied *et al.* 2022b). Blampied *et al.* remark that the presence of adult black seabream (*Spondyliosoma cantharus*) within the MPAs was high compared to Open Controls, however, this was not significant. BRUV results show Les Sauvages is characterised by black seabream. Black seabream is of commercial value to Jersey fishers and their presence could be indicative of Les Sauvages being an important feeding ground or area of habitat for this species.

## 5.3 Fishing pressure

Analysis of fishing activity within the area of Les Sauvages shows that the frequency of fishing is medium to high (relative proportion of fishing events compared to all fishing events for the period of data analysed (2015–2022)), particularly for scallop dredging, scallop diving and crustacean potting. These activities are likely occurring near the Les Sauvages reef in the case of scallop dredging, as opposed to directly on top of the reef for diving and potting. The most likely direct fishing pressure would occur from crustacean potting activity due to the relief of the Les Sauvages reef. This is due to the elevated nature of the reef and the threat the reef would pose particularly to mobile scallop dredging. The area is also suitable for diving. Anecdotal reports from divers in 2021 include the evidence of discarded/lost fishing gear attached to the Les Sauvages reef. This supports the fishing pressure data presented here. Crustacean potting has been shown to have lower environmental impact in terms of physical disturbance to benthic habitats than dredging and bottom-trawling, which have more direct destructive impacts (Hall-Spencer and Moore 2000), as well as having several indirect effects on marine organisms (e.g. resuspension of sediments leading to smothering of sessile species) (Bradshaw *et al.* 2021). Crustacean potting is, however, not benign, and can degrade rocky reef habitats and remove sensitive structure forming species through abrasion and crushing from potting hauling and deployment (Gall *et al.* 2020, Rees *et al*. 2021). The impacts of all fishing methods should be considered when assessing the sensitivity of Les Sauvages. Some of the sessile and sedentary species identified in this study are particularly susceptible to damage and disturbance which suggests areas of Les Sauvages may not be very resilient to physical disturbance from a range of fishing gears.

# 6. Summary

This study and the data gathered provides further robust quantitative evidence of benthic assemblages on the Les Sauvages reef in Jersey. The surveys, although limited, provide an ecological baseline of the site, and a comprehensive inventory of sessile, sedentary epibiota present on the reef, as well as some understanding of the mobile benthic associated species. It is acknowledged this study is limited in the number of surveys carried out by divers in 2021 and 2022. However, best efforts have been made to accurately quantify these assemblages.

For sessile and encrusting species, abundances were observed to be several orders of magnitude higher at Les Sauvages compared to similar data from NMGZs in Jersey's territorial waters. Nursery areas in marine habitats tend to be highly productive (Beck *et al*. 2001; Howarth *et al.* 2015) and complex habitat structures improve the survivorship of juvenile species (Bradshaw *et al.* 2003), indicating that habitats within the NMGZs may be more structurally complex. This could be the case for Les Sauvages with a high abundance of individuals recorded, suggesting the reef is physically and ecologically playing a similar role to other protected habitats in Jersey's waters.

Les Sauvages has high levels of benthic diversity and hosts slow-growing reef-associated species, important for the functioning of marine habitats. Some of these species are rare and protected nationally and/or internationally (e.g. the pink sea fan). The reef is currently unprotected, and fishing activity takes place in close proximity.

Les Sauvages has previously received attention from marine researchers and managers on account of the reefs' relatively high levels of marine biodiversity, its' ecosystem service provision and archaeological rarity. The conclusions drawn here strengthen the current understanding of the importance of this isolated reef from a marine ecological stance and management recommendations have been outlined below.

## 6.1 Recommendations

Evidence provided in this report emphasises the high level of biodiversity at Les Sauvages (1196 per cent higher than habitats protected by MPAs in Jersey's waters). Given the known direct and indirect impacts of certain fishing methods upon the species and benthos recorded, **it is recommended that the site is considered for further protection and robust fisheries management approaches are proposed, consulted upon and delivered.**

Any MPA, including new designations, should have a comprehensive monitoring regime to capture the environmental baseline and changes over time. **It is recommended that Les Sauvages is incorporated into any GoJ monitoring regime**. However, it should be noted that a perceived lack of quantitative baseline data should not delay designation, which should be undertaken using a quick, pragmatic and precautionary approach.

The opportunity provided by the current development of Jersey's MSP should be taken to expedite protection of this highly biodiverse and archaeologically important site. It should be incorporated into the 'network of MPAs' required by the MSP, to protect important habitats for commercial and non-commercial species, assisting in the long-term health of Jersey's fishery, while reaching environmental targets developed to tackle the biodiversity crisis.

# 7. References

Beck, M.W., Heck, K.L., Able, K.W., Childers, D.L., Eggleston, D.B., Gillanders, B,M., Halpern, B., Hays, C.G., Hoshino, K., Minello, T.J., Orth, R.J., Sheridan, P.F., Weinstein. M.P. (2001) The identification, conservation, and management of estuarine and marine nurseries for fish and invertebrates Bioscience, 51 (8), pp. 633-641, https://doi.org/10.1641/0006-3568(2001)051[0633:TICAMO]2.0.CO;2

Blampied, S., Sheehan, E.V., Binney, F.C.T., Attrill, M.J., Rees, S.E. (2022a) Value of coastal habitats to commercial fisheries in Jersey, English Channel, and the role of marine protected areas. Fisheries Management and Ecology. https://doi.org/10.1111/fme.12571

Blampied S., Rees S., Attrill, M., Sheehan E.V. (2022b) Removal of Bottom-Towed Fishing from Whole-Site Marine Protected Areas Promotes Mobile Species Biodiversity. Estuarine, Coastal and Shelf Science. Volume 276, 5 October 2022, 108033 https://doi.org/10.1016/j.ecss.2022.108033

Blampied (2022) A socio-economic and ecological approach to informing sustainable marine management in Jersey, Channel Islands. PhD thesis. University of Plymouth. https://pearl.plymouth.ac.uk/bitstream/handle/10026.1/19400/2022Blampied10369582phd.pdf?sequence=4

Blue Marine Foundation (2022) Delivering a Marine Park for Jersey. For people, nature and climate. A BRIEFING BY BLUE MARINE FOUNDATION. https://www.bluemarinefoundation.com/wp-content/uploads/2022/02/JerseyBriefing_2022_Digital_Final.pdf

Bradshaw, C., Collins, P., Brand, A.R. (2003) To what extent does upright sessile epifauna affect benthic biodiversity and community composition? Mar. Biol., 143 (4), pp. 783-791, 10.1007/s00227-003-1115-7

Bradshaw, C., Jakobsson, M., Brüchert, V., Bonaglia, S., Mörth, C-M., Muchowski, J., Stranne, C., Sköld, M. (2021) Physical Disturbance by Bottom Trawling Suspends Particulate Matter and Alters Biogeochemical Processes on and Near the Seafloor. *Frontiers in Marine Science*. 8. https://doi.org/10.3389/fmars.2021.683331

Brown, C.J., Broadley, A., Adame, M.F., Branch, T.A., Turschwell, M.P. & Connolly, R.M. (2019) The assessment of fishery status depends on fish habitats. Wiley, Fish and Fisheries, 20, 1–14. https://doi.org/10.1111/faf.12318

Cappo, M. Harvey, E.S., Shortis, M. (2006) Counting and measuring fish with baited video techniques – an Overview. Aust. Soc. Fish. Biol. Workshop Proc. Pp. 101-114.

Chambers, P., Binney, F., Jeffreys, G. (2016) Les Minquiers: A Natural History Charonia Media, ISBN 095606552X, 9780956065520, 540 pp

Day, J., Dudley, N., Hockings, M., Holmes, G., Laffoley, D., Stolton, S. (2012) Guidelines for applying the IUCN protected area management categories to marine protected areas. Gland, Switzerland: IUCN.

DEFRA. (2016) Western Channel Marine Conservation Zone. Designation Order 2016. https://www.legislation.gov.uk/ukmo/2016/23/contents/created

Devon and Severn IFCA (2019) Briefing Notes – Brown Edible Crab fisheries in England and Jersey. https://www.devonandsevernifca.gov.uk/content/download/5260/36100/version/2/file/Crab+briefings+October+2019.pdf

Gall, S. C. Rodwell, LD., Clark, S., Robbins, T. (2020) The impact of potting for crustaceans on temperate rocky reef habitats: Implications for management. Mar. Environ. Res. 162, 105134.

Galparsoro, I., Borja, A., Bald, J., Liria, P., Chust, G. (2009) Predicting suitable habitat for the European lobster (*Homarus gammarus*), on the Basque continental shelf (Bay of Biscay), using Ecological-Niche Factor Analysis, Ecological Modelling, Volume 220, Issue 4, 556-567, ISSN 0304-3800.

Government of Jersey (2022) Bridging Island Plan 2022–2025. P.36/2021. www.gov.je/SiteCollectionDocuments/Planning%20and%20building/P%20Bridging%20Island%20Plan.pdf

Government of Jersey (2023) Marine Resources Annual Report 2021: https://www.gov.je/SiteCollectionDocuments/Government%20and%20administration/R%20Marine%20Resources%20Annual%20Report%202021%2007062023%20DM.pdf

Hall-Spencer, J.M., Moore, P.G. (2000) Scallop dredging has profound, long-term impacts on maerl habitats, *ICES Journal of Marine Science*, Volume 57, Issue 5, 1407–1415, https://doi.org/10.1006/jmsc.2000.0918.

Halpern, B.S., Selkoe, K.A., Micheli, F., Kappel, C.V. (2007) Evaluating and ranking the vulnerability of global marine ecosystems to anthropogenic threats. Conservation Biology, 21(5), 1301– 1315.

Howarth, L.M., Wood, H.L., Turner, A.P., Beukers-Stewart, B.D. (2011) Complex habitat boosts scallop recruitment in a fully protected marine reserve. Marine Biology, 158(8), 1767– 1780.

States of Jersey (2022) Island Plan 2022-25: Approval (P.36/2021) – Eighty-Eighth Amendment (P.36/2021 Amd.(88)) – Amendment. https://statesassembly.gov.je/AssemblyPropositions/2021/P.36-2021%20Amd. (88) Amd.pdf

Jackson, A. (2008) *Leptopsammia pruvoti* Sunset cup coral. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 18-08-2023]. Available from: https://www.marlin.ac.uk/species/detail/1285

Kovalenko, K.E., Thomaz, S.M., Warfe, D.M. Habitat complexity: approaches and future directions. Hydrobiologia 685, 1–17 (2012). https://doi.org/10.1007/s10750-011-0974-z

Kritzer, J.P., Delucia, M.B., Greene, E., Shumway, C., Topolski, M.F., Thomas-Blate, J. (2016) The importance of benthic habitats for coastal fisheries. Bioscience, 66(4), 274– 284.

Langenkämper, D., Zurowietz, M., Schoening, T., Nattkemper, T. W. (2017) 'BIIGLE 2.0 – Browsing and Annotating Large Marine Image Collections', *Frontiers in Marine Science*, 4(83).

Lefcheck, J.S., Hughes, B.B., Johnson, A.J. (2019) Are coastal habitats important nurseries? A meta-analysis. Conservation Letters. 12:e12645. https://doi.org/10.1111/conl.12645.

Lotze, H.K., Bourque, B.J., Bradbury, R.H., Cooke, R.G. (2006) Depletion, degradation, and recovery potential of estuaries and coastal seas. Science, 312, 1806–1809.

Michaelis, R., Haas, C., Mielck, F., Papenmeier, S., Sander, L. Ebbe. B., Gutow, L., Wiltshire, K.H. (2019) Hard-substrate habitats in the German Bight (South-Eastern North Sea) observed using drift videos, Journal of Sea Research, Volume 144, Pages 78-84, ISSN 1385-1101, https://doi.org/10.1016/j.seares.2018.11.009

Picton, B.E., Costello, M.J. (1998) BioMar biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland. Environmental Sciences Unit, Trinity College, Dublin.

Picton, B.E. & Morrow, C.C. (2016) *Pachycerianthus indet* . [In] Encyclopedia of Marine Life of Britain and Ireland. http://www.habitas.org.uk/marinelife/species.asp?item=D10810

Pikesley, S,K., Godley, B. J., Latham, H., Richardson, P.B., Robson, L.M., Solandt, JL., Trundle, C., Wood, C., Witt. M. J. (2016) Pink sea fans (*Eunicella Verrucose*) as indicators of the spatial efficacy of Marine Protected Areas in southwest UK coastal waters, Marine Policy, Volume 64, 38-45, ISSN 0308-597X,https://doi.org/10.1016/j.marpol.2015.10.010

Pogoda, B., Boudry, P., Bromley, C., Cameron, T.C., Colsoul, B., Donnan, D.W. (2020) NORA moving forward: Developing an oyster restoration network in Europe to support the Berlin Oyster Recommendation. Aquat. Conserv. 30, 2031-2037. Doi: 10.1002/aqr.3447.

Rees, S.E., Sheehan, E.V., Stewart, B.D., Clark, R., Appleby, T., Attrill, M.J. (2020) Emerging themes to support ambitious UK marine biodiversity conservation. Marine Policy, 117, 103864.

Rees, A., Sheehan, E.V., Attrill, M.J. (2021) Optimal fishing effort benefits fisheries and conservation. Sci Rep 11, 3784. https://doi.org/10.1038/s41598-021-82847-4

Rosenberg, A., Bigford, T.E., Leathery, S., Hill, R.L. & Bickers, K. (2000) Ecosystem approaches to fishery management through essential fish habitat. Bulletin of Marine Science, 66(3), 535– 542.

Roberts, L., Pérez-Domínguez, R., Elliott, M. (2016) Use of baited remote underwater video (BRUV) and motion analysis for studying the impacts of underwater noise upon free ranging fish and implications for marine energy management. Marine Pollution Bulletin, 112(1-2), 75–85. doi:10.1016/j.marpolbul.2016.

Rosenberg, A. & McLeod, K.L. (2005) Implementing ecosystem-based approaches to management for the conservation of ecosystem services. Marine Ecology Progress Series, 300, 270– 274.

Sanderson, W.G., (1996) Rare benthic marine flora and fauna in Great Britain: the development of criteria for assessment. Joint Nature Conservation Committee, Peterborough. JNCC Report, no. 240.

Seitz, R.D., Wennhage, H., Bergstrom, U., Lipcius, R.N., Ysebaert, T. (2014) Ecological value of coastal habitats for commercially and ecologically important species. ICES Journal of Marine Science, 71(3), 648–665.

Sheehan E.V., Stevens T. F., Gall, S. C., Cousens, S. L., Attrill M. J (2013) Recovery of a Temperate Reef Assemblage in a Marine Protected Area following the Exclusion of Towed Demersal Fishing. PloS ONE 8: e83883. doi:10.1371/journal.pone.0083883 .

Société Jersiaise Annual Bulletin (2019). Vol.32(3): 549-560.

Townsend, H. Harvey, C.J. deReynier, Davis, Y., Zador, D., Stephani, G. Gaichas, S. Weijerman, M. Hazen, E. L. Kaplan, I. C. (2019) Progress on Implementing Ecosystem-Based Fisheries Management in the United States Through the Use of Ecosystem Models and Analysis. Frontier in Marine Science. 6. doi: 10.3389/fmars.2019.00641

Government of Jersey (2022) Carbon Neutral Roadmap. https://www.gov.je/Government/Pages/StatesReports.aspx?ReportID=5530

Thrush, S.F., Dayton, P.K. (2002) Disturbance to marine benthic habitats by trawling and dredging: implications for marine biodiversity. Annual Review of Ecology and Systematics, 33, 449473.

Trade and Cooperation Agreement (2021) Between the European Union and the European Atomic Energy Community, of the one part, and the United Kingdom of Great Britain and Northern Ireland, of the other part. Official Journal of the European Union. L 149/11.

Thurstan, R.H., Hawkins, J.P., Raby, L., and Roberts, C.M. (2013) Oyster (Ostrea edulis) extirpation and ecosystem transformation in the Firth of Forth, Scotland. J. Nat. Conserv. 21, 253-261. Doi:10.1016/j.jnc.2013.01.004

Williamson, A., Barisa, K., Robertson, M., Watson, F., Davies, W., Kiberd, E. (2023) A valuation of Jersey's marine habitats in providing ecosystem services. A report by Blue Marine Foundation and New Economics Foundation.

World Conservation Monitoring Centre. (1996) *Eunicella verrucosa*. The IUCN Red List of Threatened Species 1996:e.T8262A12903486. https://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T8262A12903486.en

# Appendix 1

Table 2. Complete list of species identified from Seasearch dive surveys undertaken on Les Sauvages in 1999 and 2013–2021. Common name and species group is also included.

| JERSEY MARINE CONSERVATION SEASEARCH SAUVAGE SPECIES DATA 1999 & 2013–2021 | | |
|---|---|---|
| **Species group** | **Species** | **Common name** |
| alga | Algae | Alga |
| alga | Acrosorium | |
| alga | *Acrosorium ciliolatum* | |
| coelenterate (=cnidarian) | *Actinothoe sphyrodeta* | Sandalled Anemone |
| sponge (Porifera) | *Adreus fascicularis* | |
| mollusc | *Aequipecten opercularis* | Queen Scallop |
| bryozoan | *Aetea anguina* | |
| coelenterate (=cnidarian) | Aglaophenia | |
| chromist | Aglaozonia (asexual cutleria) | |
| bryozoan | *Alcyonidium diaphanum* | |
| coelenterate (=cnidarian) | *Alcyonium* | |
| coelenterate (=cnidarian) | *Alcyonium digitatum* | Dead-man's fingers |
| coelenterate (=cnidarian) | *Alcyonium glomeratum* | Red dead men's fingers |
| bony fish (Actinopterygii) | *Ammodytes* | |
| bony fish (Actinopterygii) | *Ammodytes tobianus* | Lesser Sand-eel |
| sponge (Porifera) | *Amphilectus fucorum* | |
| coelenterate (=cnidarian) | *Anemonia viridis* | Snakelocks anemone |
| crustacean | *Anilocra* | |
| crustacean | *Anilocra physodes* | |
| coelenterate (=cnidarian) | *Antennella secundaria* | |
| tunicate (Urochordata) | *Aplidium* | |
| tunicate (Urochordata) | *Aplidium elegans* | |
| tunicate (Urochordata) | *Aplidium punctum* | |
| mollusc | *Aplysia punctata* | Sea hare |
| sponge (Porifera) | *Aplysilla rosea* | |
| sponge (Porifera) | *Aplysilla sulfurea* | |
| tunicate (Urochordata) | *Ascidia mentula* | |
| tunicate (Urochordata) | *Ascidia virginea* | |
| tunicate (Urochordata) | *Ascidiella aspersa* | |
| echinoderm | *Aslia lefevrei* | Brown Sea Cucumber |
| fungus | *Asterina* | |
| echinoderm | *Asterina gibbosa* | |
| sponge (Porifera) | *Axinella damicornis* | |
| sponge (Porifera) | *Axinella dissimilis* | |

| | | |
|---|---|---|
| sponge (Porifera) | *Axinella infundibuliformis* | |
| coelenterate (=cnidarian) | *Balanophyllia (Balanophyllia) regia* | Scarlet-and-gold Star Coral |
| bryozoan | *Bicellariella ciliata* | |
| annelid | *Bispira volutacornis* | Twin Fan Worm |
| bony fish (Actinopterygii) | Blenniidae | |
| tunicate (Urochordata) | *Botryllus schlosseri* | Star Ascidian |
| bryozoan | *Bryozoa indet crusts* | |
| bryozoan | *Bugula* | |
| bryozoan | *Caberea* | |
| alga | *Calliblepharis ciliata* | Eyelash Weed |
| alga | *Calliblepharis jubata* | Lance-shaped Eyelash Weed |
| bony fish (Actinopterygii) | *Callionymus lyra* | Common Dragonet |
| bony fish (Actinopterygii) | *Callionymus reticulatus* | Reticulated Dragonet |
| mollusc | *Calliostoma zizyphinum* | Painted top shell |
| alga | *Callophyllis laciniata* | |
| crustacean | *Cancer pagurus* | Edible crab |
| bryozoan | Candidae | |
| coelenterate (=cnidarian) | *Caryophyllia (Caryophyllia) inornata* | Southern Cup Coral |
| coelenterate (=cnidarian) | *Caryophyllia (Caryophyllia) smithii* | Devonshire cup coral |
| bryozoan | *Cellaria* | |
| bryozoan | *Cellepora pumicosa* | |
| bony fish (Actinopterygii) | *Centrolabrus exoletus* | Rock Cook |
| coelenterate (=cnidarian) | *Cerianthus* | |
| annelid | *Chaetopterus* | |
| annelid | *Chaetopterus variopedatus* | Parchment Worm |
| alga | *Chondrus crispus* | Carrageen |
| sponge (Porifera) | *Ciocalypta penicillus* | |
| tunicate (Urochordata) | *Ciona intestinalis* | |
| crustacean | Cirripedia | Barnacle |
| alga | *Cladophora* | |
| sponge (Porifera) | *Clathrina* | |
| sponge (Porifera) | *Clathrina lacunosa* | |
| tunicate (Urochordata) | *Clavelina lepadiformis* | Light Bulb Tunicate |
| sponge (Porifera) | *Cliona celata* | |
| alga | *Codium* | |
| alga | *Codium vermilara* | |
| bony fish (Actinopterygii) | *Conger conger* | Conger Eel |
| alga | *Corallina officinalis* | Coral Weed |
| alga | Corallinaceae | Coralline crusts |
| tunicate (Urochordata) | *Corella parallelogramma* | Gas Mantle Ascidian |
| coelenterate (=cnidarian) | *Corynactis viridis* | Jewel anemone |

| | | |
|---|---|---|
| mollusc | *Crepidula fornicata* | American Slipper Limpet |
| bryozoan | *Crisia* | |
| bryozoan | *Crisularia plumosa* | |
| bony fish (Actinopterygii) | *Ctenolabrus rupestris* | Goldsinny |
| coelenterate (=cnidarian) | *Cylista elegans* | |
| alga | *Delesseria sanguinea* | Sea Beech |
| tunicate (Urochordata) | *Dendrodoa grossularia* | Baked Bean Ascidian |
| sponge (Porifera) | *Dercitus (Dercitus) bucklandi* | |
| chromist | *Desmarestia ligulata* | |
| bony fish (Actinopterygii) | *Dicentrarchus labrax* | Sea Bass |
| chromist | *Dictyopteris polypodioides* | |
| chromist | *Dictyota dichotoma* | |
| tunicate (Urochordata) | *Didemnum* | |
| tunicate (Urochordata) | *Didemnum maculosum* | |
| coelenterate (=cnidarian) | *Diphasia margareta* | |
| tunicate (Urochordata) | *Diplosoma spongiforme* | |
| bryozoan | *Disporella* | |
| mollusc | Doto | |
| crustacean | *Dromia personata* | Sponge Crab |
| mollusc | *Duvaucelia odhneri* | |
| sponge (Porifera) | *Dysidea fragilis* | |
| echinoderm | *Echinus esculentus* | Edible urchin |
| bryozoan | *Electra pilosa* | |
| alga | encrusting algae indet. | |
| coelenterate (=cnidarian) | *Epizoanthus couchii* | |
| coelenterate (=cnidarian) | *Eunicella verrucosa* | Pink Sea-fan |
| chromist | Filamentous brown algae | |
| annelid | *Filograna* | |
| bryozoan | *Flustra foliacea* | Hornwrack |
| chromist | Foliose brown algae | |
| alga | Foliose red algae | |
| alga | *Furcellaria lumbricalis* | |
| bony fish (Actinopterygii) | Gadidae | Cod |
| crustacean | Galathea | |
| crustacean | *Galathea strigosa* | |
| cartilagenous fish (Chondrichthyes) | *Galeorhinus galeus* | Tope |
| bony fish (Actinopterygii) | *Gobius niger* | Black Goby |
| bony fish (Actinopterygii) | *Gobiusculus flavescens* | Two-spotted Goby |
| coelenterate (=cnidarian) | *Halecium halecinum* | Herring-bone hydroid |
| sponge (Porifera) | *Halichondria (Halichondria) panicea* | Breadcrumb Sponge |
| sponge (Porifera) | *Haliclona (Haliclona) oculata* | Mermaid's Glove |

| | | |
|---|---|---|
| sponge (Porifera) | *Haliclona fistulosa* | |
| chromist | *Halidrys siliquosa* | Sea Oak |
| chromist | *Halopteris filicina* | |
| alga | *Halurus equisetifolius* | Sea Mare's-tail |
| alga | *Halurus flosculosus* | |
| sponge (Porifera) | *Hemimycale columella* | |
| echinoderm | *Henricia* | |
| echinoderm | *Henricia oculata* | Bloody Henry Starfish |
| alga | *Heterosiphonia plumosa* | |
| sponge (Porifera) | *Hexadella racovitzai* | |
| mollusc | *Hiatella* | |
| crustacean | *Homarus gammarus* | Common Lobster |
| coelenterate (=cnidarian) | *Hoplangia durotrix* | Weymouth carpet coral |
| coelenterate (=cnidarian) | Hydrozoa | |
| sponge (Porifera) | *Hymedesmia (Hymedesmia) paupertas* | |
| sponge (Porifera) | *Hymeniacidon perlevis* | |
| crustacean | *Inachus* | |
| crustacean | *Inachus phalangium* | Leach's spider crab |
| coelenterate (=cnidarian) | *Isozoanthus sulcatus* | |
| bony fish (Actinopterygii) | Labridae | Wrasse |
| bony fish (Actinopterygii) | *Labrus bergylta* | Ballan Wrasse |
| bony fish (Actinopterygii) | *Labrus mixtus* | Cuckoo Wrasse |
| chromist | *Laminaria* | Kelp |
| chromist | *Laminaria hyperborea* | Cuvie |
| chromist | *Laminaria ochroleuca* | |
| annelid | *Lanice conchilega* | Sand Mason |
| coelenterate (=cnidarian) | *Leptopsammia pruvoti* | Sunset Cup Coral |
| sponge (Porifera) | *Leucosolenia* | |
| sponge (Porifera) | *Leucosolenida* | |
| tunicate (Urochordata) | *Lissoclinum perforatum* | |
| alga | *Lithothamnion* | |
| crustacean | *Maja brachydactyla* | Common Spider Crab |
| alga | *Membranoptera alata* | |
| alga | *Meredithia microphylla* | |
| mollusc | *Mimachlamys varia* | Variegated Scallop |
| bony fish (Actinopterygii) | *Mola mola* | Sun-fish |
| tunicate (Urochordata) | *Morchellium argus* | |
| bony fish (Actinopterygii) | *Mullus surmuletus* | Striped Red Mullet |
| cartilagenous fish (Chondrichthyes) | *Mustelus mustelus* | Smooth Hound |
| annelid | *Myxicola infundibulum* | |
| crustacean | *Necora puber* | Velvet swimming crab |

| | | |
|---|---|---|
| coelenterate (=cnidarian) | *Nemertesia antennina* | Sea beard |
| echinoderm | *Neopentadactyla mixta* | Gravel Sea Cucumber |
| coelenterate (=cnidarian) | *Obelia geniculata* | |
| bird | *Oceanites oceanicus* | Wilson's Petrel |
| mollusc | *Ocenebra erinaceus* | Oyster Drill |
| bryozoan | *Omalosecosa ramulosa* | |
| echinoderm | *Ophiothrix fragilis* | Common Brittlestar |
| mollusc | *Ostrea edulis* | Common Oyster |
| coelenterate (=cnidarian) | *Pachycerianthus* | 'Dorothy'? |
| sponge (Porifera) | *Pachymatisma johnstonia* | |
| crustacean | *Palinurus elephas* | European Spiny Lobster |
| bony fish (Actinopterygii) | *Parablennius gattorugine* | Tompot Blenny |
| bryozoan | *Parasmittina trispinosa* | |
| coelenterate (=cnidarian) | *Parazoanthus axinellae* | Yellow Cluster Anemone |
| echinoderm | *Pawsonia saxicola* | Sea Gherkin |
| mollusc | *Pecten maximus* | Great Scallop |
| bryozoan | *Pentapora foliacea* | |
| tunicate (Urochordata) | *Perophora* | |
| tunicate (Urochordata) | *Perophora listeri* | Dwarf Ascidian |
| alga | *Phaeophyceae* | |
| tunicate (Urochordata) | *Phallusia mammillata* | Neptune's Heart Sea Squirt |
| sponge (Porifera) | *Phorbas fictitius* | |
| sponge (Porifera) | *Phorbas plumosus* | |
| alga | *Phyllophora crispa* | |
| alga | *Phyllophora pseudoceranoides* | |
| bryozoan | *Plagioecia* | |
| bony fish (Actinopterygii) | *Pleuronectes platessa* | Plaice |
| alga | *Plocamium* | |
| bony fish (Actinopterygii) | *Pollachius pollachius* | Pollack |
| tunicate (Urochordata) | *Polycarpa* | |
| tunicate (Urochordata) | *Polycarpa pomaria* | |
| mollusc | *Polycera* | |
| mollusc | *Polycera faeroensis/kernowensis* | |
| tunicate (Urochordata) | Polyclinidae | |
| alga | *Polyides rotunda* | |
| sponge (Porifera) | *Polymastia boletiformis* | |
| sponge (Porifera) | *Polymastia penicillus* | |
| tunicate (Urochordata) | *Polysyncraton* | |
| tunicate (Urochordata) | *Polysyncraton lacazei* | Colonial sea squirt |
| bony fish (Actinopterygii) | *Pomatoschistus* | |
| bony fish (Actinopterygii) | *Pomatoschistus pictus* | Painted Goby |
| sponge (Porifera) | Porifera | Sponges |

| | | |
|---|---|---|
| sponge (Porifera) | Porifera indet crusts | |
| flatworm (Turbellaria) | *Prostheceraeus vittatus* | Candy stripe flatworm |
| annelid | *Protula tubularia* | |
| tunicate (Urochordata) | *Pycnoclavella* | |
| tunicate (Urochordata) | *Pycnoclavella aurilucens* | Orange Lights Seasquirt |
| tunicate (Urochordata) | *Pycnoclavella stolonialis* | |
| sponge (Porifera) | *Raspailia (Clathriodendron) hispida* | |
| sponge (Porifera) | *Raspailia (Raspailia) ramosa* | |
| coelenterate (=cnidarian) | *Rhizocaulus verticillatus* | Horse-tail hydroid |
| alga | Rhodophyta | Red seaweed |
| alga | *Rhodymenia pseudopalmata* | |
| mollusc | *Rissoa parva* | |
| annelid | Sabellidae | |
| annelid | *Salmacina* | |
| chromist | *Sargassum muticum* | Wireweed |
| alga | *Schizymenia dubyi* | |
| alga | *Schottera nicaeensis* | |
| bryozoan | *Scrupocellaria* | |
| cartilagenous fish (Chondrichthyes) | *Scyliorhinus canicula* | Lesser Spotted Dogfish |
| cartilagenous fish (Chondrichthyes) | *Scyliorhinus stellaris* | Nurse Hound |
| crustacean | *Semibalanus balanoides* | Acorn Barnacle |
| mollusc | *Sepia officinalis* | Common Cuttlefish |
| annelid | *Serpula vermicularis* | |
| annelid | Serpulidae | |
| coelenterate (=cnidarian) | *Sertularella* | |
| bony fish (Actinopterygii) | Sparidae | Sea-breams |
| annelid | *Spirobranchus* | |
| annelid | Spirorbinae | |
| sponge (Porifera) | *Stelligera rigida* | |
| sponge (Porifera) | *Stelligera stuposa* | |
| mollusc | *Steromphala cineraria* | Grey Top Shell |
| tunicate (Urochordata) | *Stolonica socialis* | Orange Sea Grapes |
| tunicate (Urochordata) | *Styela clava* | Leathery Sea Squirt |
| sponge (Porifera) | *Suberites ficus* | |
| sponge (Porifera) | Suberitidae | |
| sponge (Porifera) | *Sycon ciliatum* | |
| bony fish (Actinopterygii) | *Symphodus bailloni* | Baillon's Wrasse |
| bony fish (Actinopterygii) | *Symphodus melops* | Corkwing Wrasse |
| annelid | *Terebellidae* | |
| sponge (Porifera) | *Terpios gelatinosus* | |

| | | |
|---|---|---|
| sponge (Porifera) | *Tethya citrina* | |
| sponge (Porifera) | *Tethyspira spinosa* | |
| bony fish (Actinopterygii) | *Thorogobius ephippiatus* | Leopard-spotted Goby |
| echinoderm | *Thyone* | |
| echinoderm | *Thyone roscovita* | |
| mollusc | *Trapania pallida* | |
| mollusc | *Tricolia pullus* | Pheasant shell |
| bony fish (Actinopterygii) | *Tripterygion delaisi* | Black-face Blenny |
| bony fish (Actinopterygii) | *Trisopterus luscus* | Pouting |
| bony fish (Actinopterygii) | *Trisopterus minutus* | Poor Cod |
| mollusc | *Tritia nitida / reticulata* agg. | Netted Dog Whelk |
| mollusc | *Tritia varicosa* | Small Dog Whelk |
| sponge (Porifera) | *Ulosa stuposa* | |
| mollusc | *Venus verrucosa* | Warty Venus |
| bryozoan | *Vesicularia spinosa* | |
| chromist | *Zanardinia typus* | Penny Weed |
| bony fish (Actinopterygii) | *Zeus faber* | John Dory |