Wrasse Tagging Falmouth Bay Survey Report 2018

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Glossary of terms

Exposed: 'At these sites, prevailing wind is onshore although there is a degree of shelter because of extensive shallow areas offshore, offshore obstructions, a restricted (<90°) window to open water. These sites will not generally be exposed to strong or regular swell. This can also include open coasts facing away from prevailing winds but where string winds with a long fetch are frequent' (Hiscock, 1996).

Moderately exposed: 'These sites generally include open coasts facing away from prevailing winds and without a long fetch but where strong winds can be frequent' (Hiscock, 1996).

Nights Lie: the numbers of nights since the traps were baited.

Sheltered: 'At these sites, there is a restricted fetch and/or open water window. Coasts can face prevailing winds but with a short fetch (say <20 km) or extensive shallow areas offshore or may face away from prevailing winds' (Hiscock, 1996).

String(s): A collection of fish traps, set together on one back rope.

Trap(s): The individual fish traps used for catching wrasse.

(Wrasse) Tagged: All ballan, goldsinny, corkwing and rock cook that were retained in traps were tagged using coloured tags which are injected beneath clear or translucent tissue and externally visible.

(Wrasse) Recaptured: All ballan, goldsinny, corkwing and rock cook that were previously tagged and that were retained in traps again.

1 Project background

Wrasse have been found to be particularly effective as cleaner fish and have been used as part of many salmon production company's sea lice control strategies along with more traditional chemical treatments. Although having been practiced in Scotland and off the Norwegian coast for nearly 30 years, fishing for and retaining of live wrasse to supply the salmon production industry with cleaner fish is an extremely new and innovative fishery to the south west of England. Concerns for the long term effectiveness of current chemical treatments and the impact of those chemicals to the wider marine environment has seen measures introduced to restrict their use. Additionally, the industry has recognised the economic benefits of using cleaner fish rather than a dependence on chemical controls. The restrictions applied to the use of chemical treatments and increased use of cleaner fish has seen production companies sourcing wrasse from further afield than Scotland to maintain supply without exhausting local stocks (L Bennett, R Hawkins, 2017, pers. comm.). In Cornwall, fishing for wrasse using traps began as very small scale experimental fishing during 2014. Those initial trials have led to the fishers who carried out those early experiments now almost wholly relying on the fishery for their income. There are five known species of wrasse in Cornwall IFCA district; ballan (*Labrus bergylta*), corkwing (*Symphodus melops*), rock cook (*Centrolabrus exoletus*), goldsinny (*Ctenolabrus rupestris*) and cuckoo (*Labrus mixtus*). Cuckoo wrasse are not targeted by the fishery. Ballan, corkwing, rock cook and goldsinny are targeted out of Plymouth and only ballan wrasse are targeted near Falmouth and Mevagissey.

Cornwall Inshore Fisheries and Conservation Authority (IFCA) Scientific Officers have carried out independent sampling effort onboard their own survey vessel, Tiger Lily VI, in 2016 (Street *et al.,* 2016) and 2017 (Street *et al.,* 2017a), alongside carrying out sampling onboard the commercial wrasse fishing vessels (Street *et al.,* 2017b; Sturgeon *et al.,* 2018a). This sampling has gathered data on catch per unit effort (CPUE), fishery spatial distribution, species composition, length frequency, spawning state, size at maturity and sex ratios of wrasse within Cornwall IFCA district. This data has resulted in greater understanding of wrasse habitat preferences locally and baseline data on wrasse populations retained in traps. There is still, however, limited information on wrasse stocks within the Cornwall IFCA district and because of this Cornwall IFCA introduced its Live Wrasse Fishing (Limited Permit) Byelaw[1] to manage and monitor the fishery. Street *et al.* (2017b) recommended for future Cornwall IFCA surveys, a mark and recapture study in order to estimate population sizes locally.

With the help of Natural England, Cornwall IFCA received funding from the DEFRA Science Capital Bid to purchase survey equipment including; fish traps (and associated rigging e.g. ropes, buoys) and Visible Implant Elastomer (VIE) Tagging equipment (Northwest Marine Technology Inc.). VIE tags are coloured tags which are injected as liquid, implanted beneath clear or translucent tissue, which then cures into a pliable solid. The VIE tags remain externally visible and when using fluorescent colours, they can be highly visible under a deep violet light.

A pilot survey was carried out in order to determine VIE tagging methodology and the effectiveness of using VIE tags to carry out a mark and re-capture survey in Veryan Bay (Sturgeon *et al.,* 2018b). This report summarises a wrasse tagging

[1] The Live Wrasse Fishing (Limited Permit) Byelaw came into force on 4th February 2019 https://secure.toolkitfiles.co.uk/clients/17099/sitedata/Byelaws%20and%20orders/Cornwall_IFCA/Live-Wrasse-Fishing-Byelaw-2018.pdf

survey carried out in Falmouth Bay which provides baseline data of wrasse population estimates in a previously fished area for future monitoring.

1.1 Aims and Objectives

The aims of the study were to use VIE tags on wrasse for a mark and re-capture survey within Falmouth Bay.

1.1.1 Aims

- To carry out a mark and re-capture survey within previously fished areas of Falmouth Bay using VIE tags.

1.1.2 Objectives

- Set and haul sixteen strings of 10 traps within Falmouth Bay from research vessel (R/V) Tiger Lily VI.
- Compare catch data from two separate hauls at each string and between the six separate locations
- Assess number of tagged wrasse recaptured.

2 Methodology

2.1 Survey equipment set up

2.1.1 Size of traps

The local fishers use wrasse traps supplied by the salmon farms. The traps (Figure 1) are supplied by Carapax[2], measure 72 cm length x 40 cm width x 28 cm height, weigh 3.7 kg and are composed of small mesh netting with a self-closable parlour entrance. A local fisher allowed Cornwall IFCA to borrow their gear while it was not in use. The traps were already rigged with a back rope, and markers.

Figure 1: Carapax wrasse trap used for survey (source: carapax.se).

2.1.2 Weight of traps

The traps used had a frame around the base of the trap to add weight and protect the base (Figure 2). In the wrasse fishery, modifications have been made that appear to increase the efficieny and longevity of the traps.

[2] http://en.carapax.se/creelspotstraps/cleaning-wrasse-traps/wrasse-trap.html

Figure 2: Example of modifications that have been made to wrasse traps.

2.1.3 Condition of the traps

The traps used had not been cleaned during the season and had built up a layer of algae (Figure 3).

Figure 3: An example of the algae growth covering the wrasse traps.

2.1.4 Escape gaps

The traps had escape gaps which were closed off using flexible black plastic and cable ties (Figure 4).

Figure 4: An example of the closed off escape gaps on each wrasse trap.

2.1.5 Distance between traps

Local fishers have a 10 fathom (18.3 m) backrope between traps.

2.1.6 Weighted ends

The strings were rigged with one parlor pot at each end as shown in Figure 5.

Figure 5: Parlour pots attached to either end of the string of wrasse traps, used as weight ends.

2.1.7 Number of traps per string

The strings were set with 10 traps per string and sixteen strings were used in the survey. However, one string had 11 traps.

2.1.8 Nights lie

Due to logistical issues, the sixteen strings did not all have a consistent two night lie. Fourteen strings were set on 30th October and the two remaining strings (at Rosemullion Head) on 31st October. Strings were hauled on 1st and 2nd November for tagging. The strings for recapture, three strings at St Mawes and one at Trefusis, were set on 20th November and hauled on 22nd and 23rd November.

2.2 Methodology for setting and hauling traps

The survey was carried out from Cornwall IFCA research vessel (R/V) Tiger Lily VI (Figure 6), which is a South Boats 11 m Island MkII catamaran with twin IVECO 450hp engines (Annex 1).

Figure 6: Research Vessel (R/V) Tiger Lily VI – Cornwall IFCA's research survey vessel.

2.2.1 Shooting

The traps were first shot from a commercial fishing vessel. The traps were shot into the tide, with the back rope kept tight so that the traps were evenly spaced. Once at the starting position for a string the first marker was deployed over the side. The skipper slowly navigated the boat to the desired end point of the string whilst the deck crew deployed the traps; as the back rope became tight the first trap was deployed, then the processed repeated with each trap until the entire string was in the water. A mark was made on a handheld GPS for start and end of line. When shooting from RV Tiger Lily, a target was made on HYPACK®MAX (Version 2018) when each parlour pot and trap was deployed over the side and was labelled with the trap and string number. A clear line of sight and communication was maintained between skipper and deck crew throughout the shooting operation.

The traps were baited using a large handful of cooked crab shell (approximately two handfuls per trap).

2.2.2 Hauling

The traps were hauled into the tide so that the vessel didn't run over the back line as it was being hauled. The traps were hauled slowly to try to prevent swim bladder damage so as to limit damage to the wrasse. As each trap was brought aboard the contents of each trap were emptied into a fish box (Figure 7) and a photograph was taken using an Olympus TG-5 camera. The state of the trap, including the escape gaps on each trap, was noted. The species, size and sex of the individual wrasse was recorded and a note was made if they were spawning. To check if the wrasse were spawning they were 'stripped' by running two fingers with a small amount of pressure along the underside of the wrasse and noting if eggs (female) or milt (male) came out. Once measured, the wrasse were transferred to a bucket full of seawater (Figure 7) before being tagged. The remaining contents of the fish box were emptied over the side of the vessel. The trap was then safely stacked on deck. This process was repeated for each trap in the string.

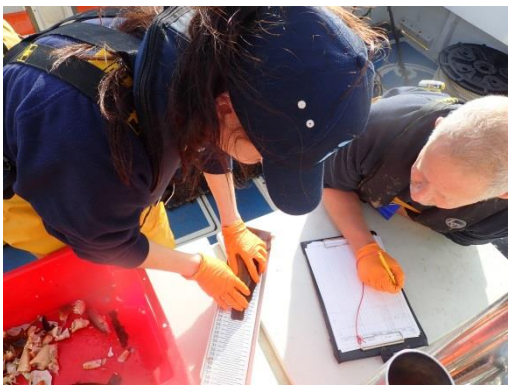


Figure 7: Wrasse being measured from the fish box and then into a bucket with fresh seawater.

2.2.3 VIE Tagging

The unmixed VIE was stored in the fridge onboard the vessel when not in use. Before each string was hauled, the selected coloured elastomer and curing agent were mixed in a 10:1 ratio according to Northwest Marine Technology Inc. instructions[3] (NWM, 2017). Officers used 0.25 ml of elastomer and 0.025 ml of the curing agent which would equate to approximately 50-125 tags and 25-62.5 wrasse (two tags per wrasse) once mixed. The elastomer and curing agent were mixed in a 15 ml cup using a toothpick for one minute. The mixed VIE was drawn up into a 1 ml transfer

[3] Available from: https://www.nmt.us/wp-content/uploads/2017/11/10-to-1-Manual-VIE-Kits-Nov-2017.pdf [Accessed: 04/10/2018].

syringe and approximately 0.1 ml was filled into a 0.3 ml injection syringe. Care was taken to ensure no air pockets had formed within the syringes. The injection syringe containing the mixed VIE was stored in the freezer compartment of the fridge until needed to maximise shelf life. To verify the elastomer had cured properly, the mixing cups and transfer syringes were kept in a sealed container for over 24 hours and checked to see if they had set.

Pick and pluck foam was fitted into a plastic box and filled with seawater. Each wrasse that had been measured was placed upside down into a slot in the foam to stabilise the wrasse (Figure 8) and ensure that the sampling officer could keep their non-injecting hand away from the needle. Using the Manual Elastomer Injector, pressure was exerted until the coloured VIE was seen on the tip of the needle. Excess VIE was cleared using paper towel. The needle was inserted under the skin in front of the pectoral fins and VIE was injected as the needle was pulled back. Dispensing of the VIE was stopped before the needle was completely withdrawn. This was to ensure that there was no trailing material to stop the wound from healing or increase tag loss. The two VIE tags were placed parallel, ventrally and were approximately 3 mm long depending on the size of the wrasse (Figure 9). The use of the foam filled box to hold the fish ensured that the sampling officer could keep their non-injecting hand away from the needle.

Figure 8: Examples of wrasse placed in upside down in foam, whilst inserting VIE tags.

Figure 9: Example of VIE tags in ballan wrasse; pink VIE (left), red VIE (middle) and blue VIE (right).

After tagging, the wrasse were placed carefully into a bin full of fresh seawater to recover. Two bins were used to split the wrasse into traps one to five and traps six to ten (Figure 10). This was so the wrasse could be separated by which traps they were caught in and returned as close to where they were caught as possible.

Figure 10: Bins of fresh seawater to acclimatise tagged wrasse before returned back to sea which were split into wrasse from traps 1-5 and 6-10.

At the end of each string, the wrasse were returned to the sea. This was done by first returning those caught in traps one to five by positioning the vessel centrally as possible to the set of five traps where they were caught using the targets marked on HYPACK. Wrasse were transferred to a smaller bucket using a hand net and once the vessel was in position the bucket was slowly tipped under the water from the stern of the vessel. Officers ensured all the wrasse had swum down before the vessel moved. This was repeated for the wrasse caught in traps six to ten.

Figure 11: Wrasse being returned back to sea which were split into wrasse from traps 1-5 and 6-10.

For the second day of hauling, the method from section 2.2.2 was repeated. But instead of tagging the wrasse after measuring, wrasse were screened for the presence of VIE tags. This was carried out by placing the wrasse onto the foam in a shaded area. Shade was created by putting the wrasse inside a domestic bin lid. Using a Visible Implant (VI) Light torch (supplied by Northwest Marine Technology Inc.), the area in front of the pectoral fins, ventrally, was lit to show signs of VIE tags (Figure 12). The VI torch is used to fluoresce VIE tags and it has a deep violet wavelength (405 nm). Officers also looked in ambient light in case the glare of the VI Light torch obscured the VIE tags. The VIE Colour Standard (supplied by Northwest Marine Technology Inc.) was kept in close proximity in order to compare the colour sample directly beside a VIE tag for comparison (Figure 12).

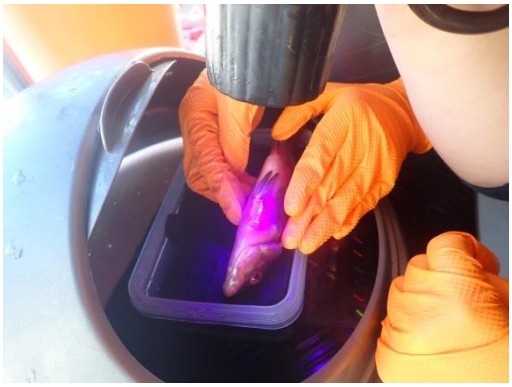


Figure 12: Wrasse being screened for VIE tags using the VI Light torch

2.3 Ethics

For animal welfare the three R's (Replace, Reduce and Refine) were considered during the initial survey planning (Russell and Burch 1959; ASPA 1986). During previous surveys Cornwall IFCA officers have been able to refine the sampling procedure in order to minimise stress to all species caught (Street *et al.* 2016, 2017a & 2017b). This includes the handling and release of all species (including by-catch) promptly and with minimal injury. Handling was kept to a minimum and gloves were worn to reduce unnecessary loss of external mucus or scales. Holding buckets and bins were replenished with fresh seawater and monitored to allow wrasse to recover before returning to sea. By-catch was photographed and returned immediately.

Ethical considerations were made for intrusive sampling (VIE tagging) on the welfare of wrasse. Prior to carrying out the survey, Cornwall IFCA officers experimented on dead fish (two mackerel and one ballan) to become familiar with the tagging procedure and determine suitable tagging locations, as well as consulting with previous work carried out (Skiftesvik *et al.,* 2013). Additionally, a pilot tagging study was carried out to evaluate suitable VIE tag locations, retention rates and tag visibility on wrasse (Sturgeon *et al.,* 2018b). The size and location of the VIE tags used in wrasse were deemed to be appropriate for the size of wrasse. It was also thought desirable that the size and type of tag used should not affect wrasse social interactions or reduce predator avoidance capability. During the survey cuckoo wrasse were excluded from tagging as this species is not targeted by the wrasse fishery and therefore deemed to be not relevant to meet the aims of the survey. By carrying out the tagging in November, this avoided the main spawning period and would reduce tagging vulnerable breeding wrasse. It was also decided before carrying out the survey that any wrasse which were under 7 cm would be deemed too small to be tagged.

Before tagging, the wrasse were visually inspected for any signs of damage to ensure tagging would not hinder the wrasse's health further. For each wrasse the total handling and tagging procedure took less than 30 seconds. During the tagging procedure, wrasse remained still and docile when on their underside, being immersed in water and eyes covered. All wrasse which were caught (excluding cuckoo and individuals less than 7 cm total length) were tagged as this was deemed an appropriate amount in order to obtain a large enough sample size for a mark and recapture study and achieve the objectives of the survey.

The use of VIE tags in wrasse was deemed to have no lasting harm to wrasse or not to be harmful to humans from introduction into the food chain. The VIE tags are non-toxic and information on the ingestion of VIE tags can be seen in

Annex 2. Additionally, the wrasse were not anesthetised as it was deemed unnecessary and it was not possible to ensure that the anaesthetised wrasse, once released, would not end up for human consumption.

Before undertaking the survey, Cornwall IFCA researched relevant legislation and regulations to this survey methodology and sought advice from the University of Exeter. It was decided that VIE tagging carried out to the planned method was not considered to be a regulated procedure under the Animals (Scientific Procedures) Act 1986 Section 2 (8) (e).

2.4 Temporal variables

There are a number of temporal variables which were judged to have a potential impact on the results of this survey. To limit the impact of the tide, wind speed, wind direction and water visibility the following mitigation measures were followed;

2.4.1 Tidal range

It has been reported that tidal range has an influence over catch rates and Street *et al.* (2017) found catch rates were highest for the period of time after a peak spring tide. The tidal height range was 4.3 m to 5.2 m (taken from the closest port, Falmouth) for the duration of the survey.

2.4.2 Wind speed

The survey would only take place in wind speeds of less than 30 mph for the entire time that the traps are fishing.

2.4.3 Wind direction

All survey locations were to be on the south coast with a southerly or easterly aspect. No survey would take place in an easterly wind with a NE-S wind above 10 mph. This was for vessel safety when working so close in to shore and to reduce the influence of wind on the survey.

2.4.4 Water parameters

A profile using Cornwall IFCA's Valeport Swift Sound Velocity Profiler (SVP)[4] was taken at each site to determine sound velocity, pressure, temperature, salinity and density.

2.5 Location of strings

Six locations within Falmouth Bay were chosen as the focus of the survey (Figure 13) and these were chosen as areas that have previously been fished. St Anthony Head was chosen as exposed reef habitat, Mawnan to August Rock and Rosemullion Head were selected as moderately exposed reef habitat and sheltered seagrass beds in St Mawes, Trefusis and Helford were also chosen. Three strings were set per location, except for Trefusis where only one string was set.

[4] Valeport Swift Sound Velocity Profiler Specifications http://www.valeport.co.uk/Portals/0/Docs/Datasheets/Valeport-SWiFT-SVP.pdf

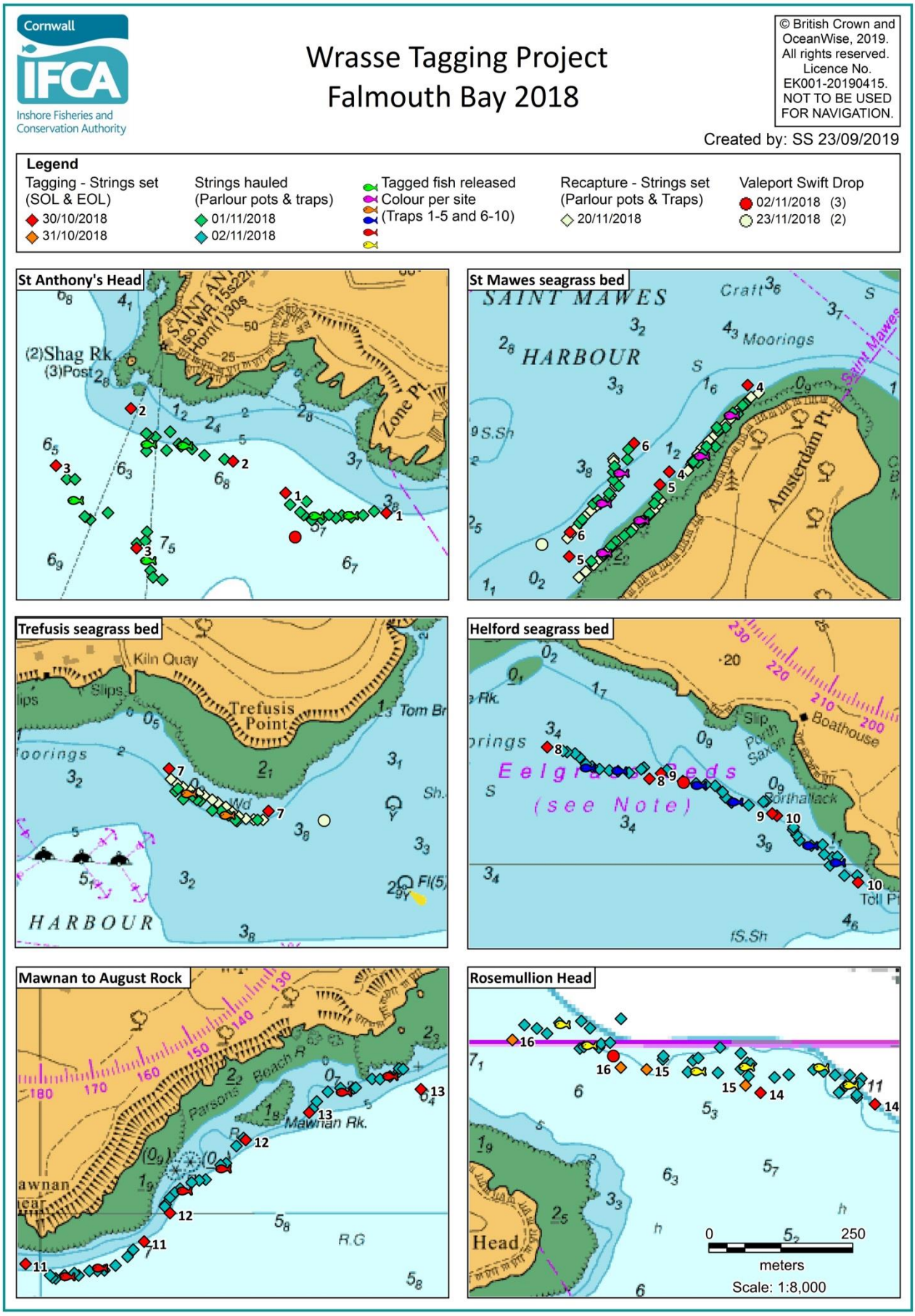


Figure 13: Location of strings and Valeport Swift Sound Velocity Profiler drops in Falmouth Bay.

2.6 Data recording

When each trap was shot overboard a GPS waypoint or HYPACK target for their position was created, enabling them to be accurately located and the whole string replicated for the following recapture. Images taken on the camera were copied and transferred into organised files. By-catch was recorded by analysing each image of trap contents. When recording catch details, the species, length, sex, spawning or not spawning, damage to the wrasse and swim bladder damage was documented on waterproof paper. As well as tag colour, number of tags and tag location and any other relevant information e.g. hole in trap. All catch details were then transferred into a Microsoft Excel workbook for analysis. Waypoints and track data from the handheld GPS were exported using Garmin MapSource (Version 6.13.7). The targets were exported from HYPACK as a .txt file and opened in Excel. Once reviewed, the Excel file was then transferred to the GI software, MapInfo Profession (Version 17.0.2) where data points were created to give a visualisation of the location of each string. Analysis of total length (cm) was carried out in R Version 3.6.1 (R Core Team, 2019).

The daily logs for all survey days are shown in Annex 3.

3 Results

During the tagging survey, a total of 1,135 wrasse were retained and measured from five different species of wrasse; ballan, cuckoo, goldsinny, corkwing and rock cook. A total of 1,066 wrasse (excluding cuckoo) were tagged (Table 1).

Table 1: Number of ballan, goldsinny, corkwing and rock cook caught and tagged on 1st and 2nd November 2018.

Sites		#Ballan	#Goldsinny	#Corkwing	#Rock cook	#Total
All Sites - Total	Number Tagged	294	274	214	284	1,066
	Number Not Tagged	0	20	8	6	34
	Total Caught	294	294	222	290	1,100
St Anthony Head	Number Tagged	20	110	86	158	374
	Number Not Tagged	0	1	1	3	5
	Total Caught	20	111	87	161	379
St. Mawes seagrass bed	Number Tagged	140	1	28	0	169
	Number Not Tagged	0	0	0	0	0
	Total Caught	140	1	28	0	169
Trefusis seagrass bed	Number Tagged	36	0	15	0	51
	Number Not Tagged	0	1	0	0	1
	Total Caught	36	1	15	0	52
Helford seagrass bed	Number Tagged	32	19	21	0	72
	Number Not Tagged	0	3	6	0	9
	Total Caught	32	22	27	0	81
Mawnan to August Rock	Number Tagged	42	20	37	10	109
	Number Not Tagged	0	2	1	0	3
	Total Caught	42	22	38	10	112
Rosemullion Head	Number Tagged	24	124	27	116	291
	Number Not Tagged	0	13	0	3	16
	Total Caught	24	137	27	119	307

Only two sites were surveyed for recapture, St Mawes and Trefusis seagrass beds. A total of 52 wrasse were retained and measured from two species of wrasse; ballan and corkwing and no tagged wrasse were identified (Table 2).

Table 2: Number of ballan, goldsinny, corkwing and rock cook caught and recaptured on 22nd and 23rd November 2018

Sites		#Ballan	#Goldsinny	#Corkwing	#Rock cook	#Total
St. Mawes seagrass bed	Number Tagged	0	0	0	0	0
	Total Caught	31	0	9	0	40
Trefusis seagrass bed	Number Tagged	0	0	0	0	0
	Total Caught	11	0	1	0	12

3.1 Catch composition

The number of wrasse per string for each survey day is shown in Figure 14 and Figure 15.

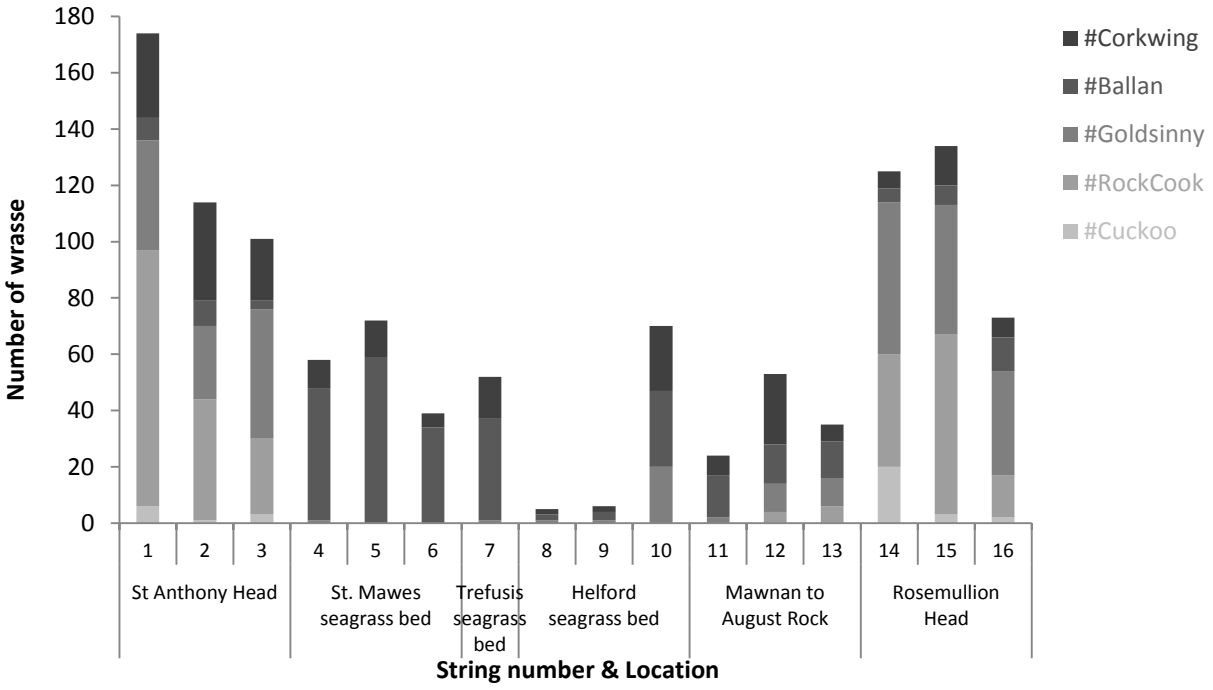


Figure 14: The number of species of wrasse (ballan, corkwing, goldsinny, rock cook and cuckoo) per string from 1st and 2nd November 2018.

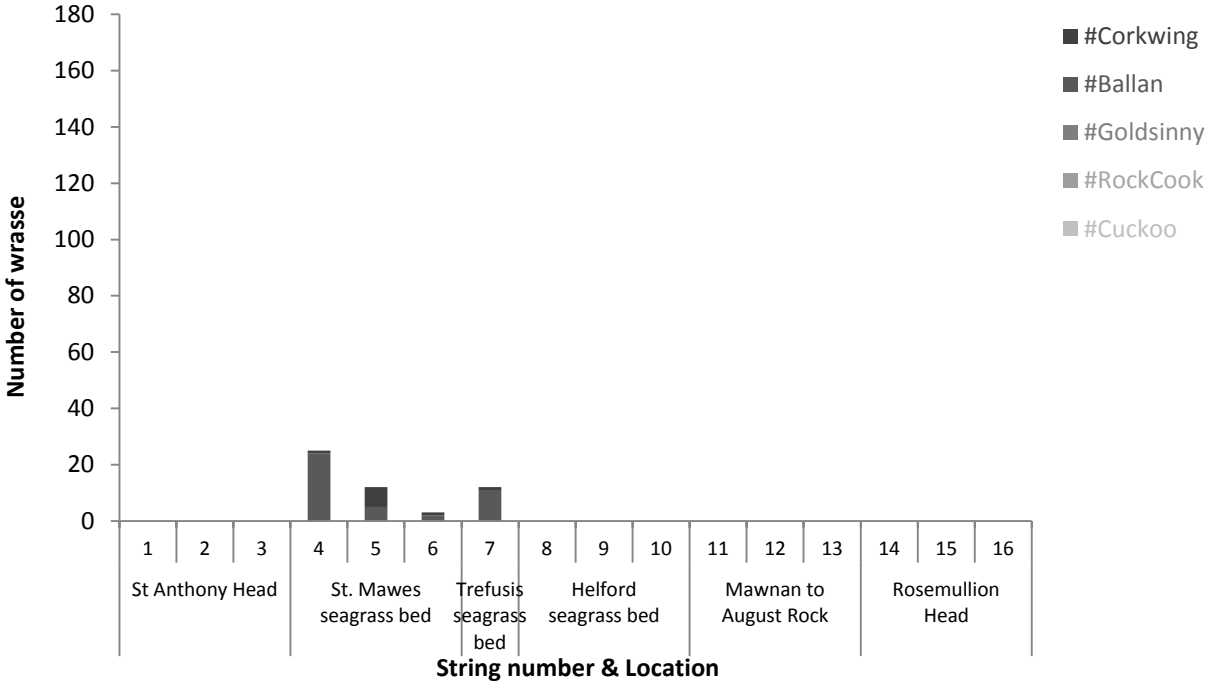


Figure 15: The number of species of wrasse (ballan, corkwing, goldsinny, rock cook and cuckoo) per string from 22nd and 23rd November 2018.

The catch composition of wrasse per location is shown in Figure 16 to Figure 21 for 1st and 2nd November.

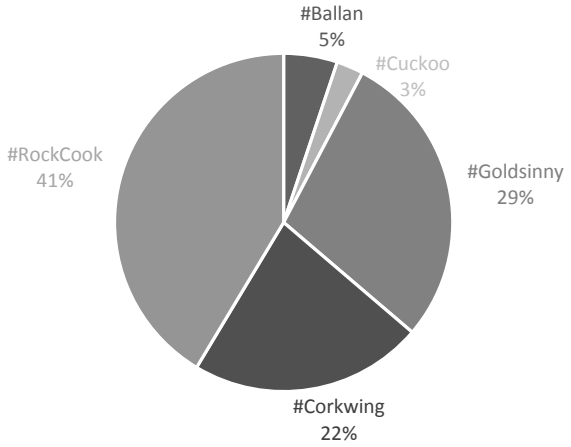


Figure 16: Catch composition of the wrasse species recorded at St Anthony Head on 1st Novemeber 2018.

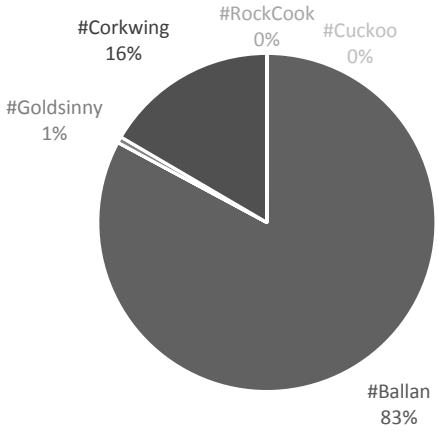


Figure 17: Catch composition of the wrasse species recorded at St Mawes on 1st Novemeber 2018.

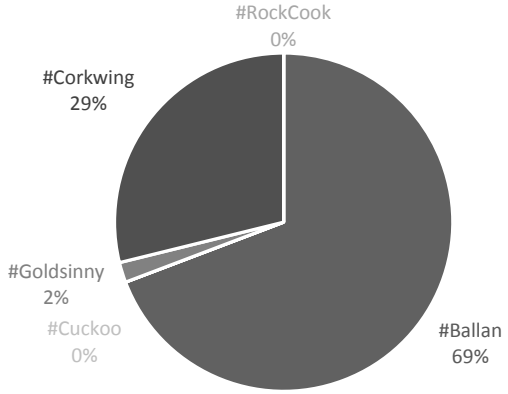


Figure 18: Catch composition of the wrasse species recorded at Trefusis on 1st Novemeber 2018.

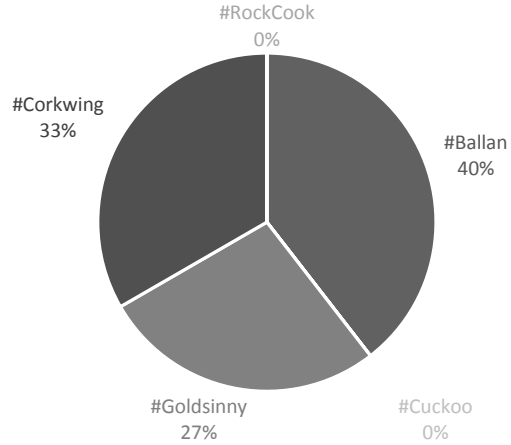


Figure 19: Catch composition of the wrasse species recorded at Helford seagrass bed on 2nd Novemeber 2018.

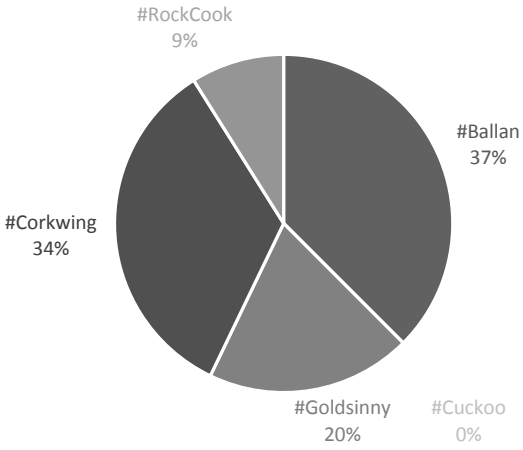


Figure 20: Catch composition of the wrasse species recorded at Mawnan to August Rock on 2nd Novemeber 2018.

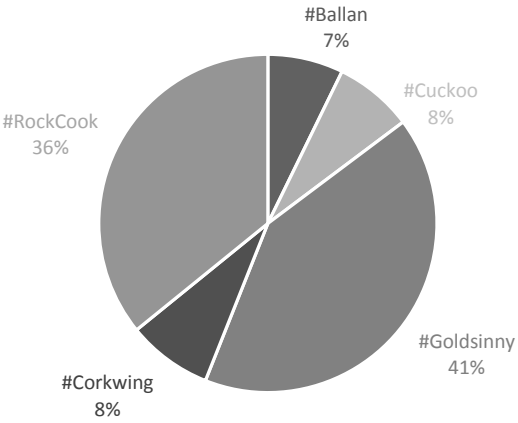


Figure 21: Catch composition of the wrasse species recorded at Rosemullion Head on 2nd Novemeber 2018.

For the recapture surveys, on 22nd and 23rd November, the catch composition of wrasse is show in Figure 22 and Figure 23.

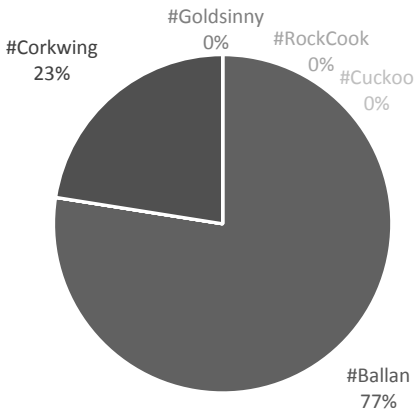


Figure 22: Catch composition of the wrasse species recorded at St Mawes on 22nd and 23rd Novemeber 2018.

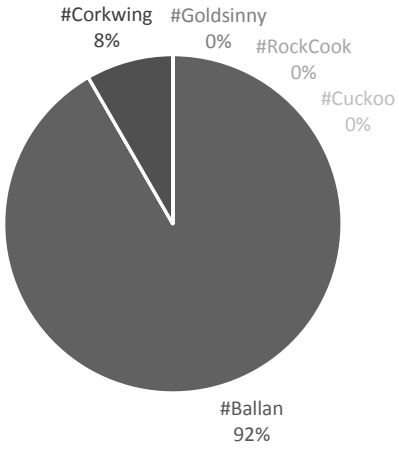


Figure 23: Catch composition of the wrasse species recorded at Trefusis on 23rd Novemeber 2018.

3.2 Length Frequency

The total length of ballan, goldsinny, corkwing, rock cook and cuckoo wrasse for each site can be seen in Figure 24 to Figure 29.

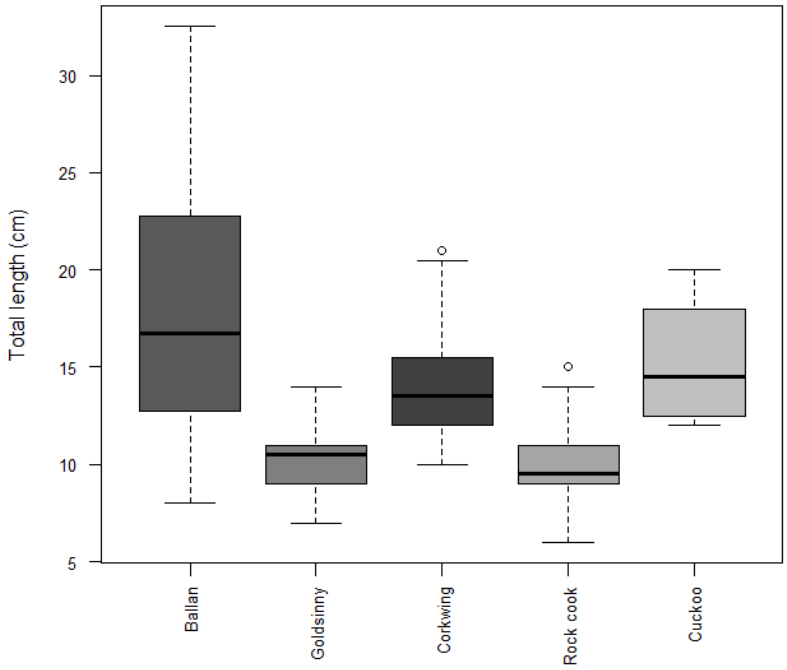


Figure 24: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at St Anthony Head. Data is grouped by strings 1-3. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

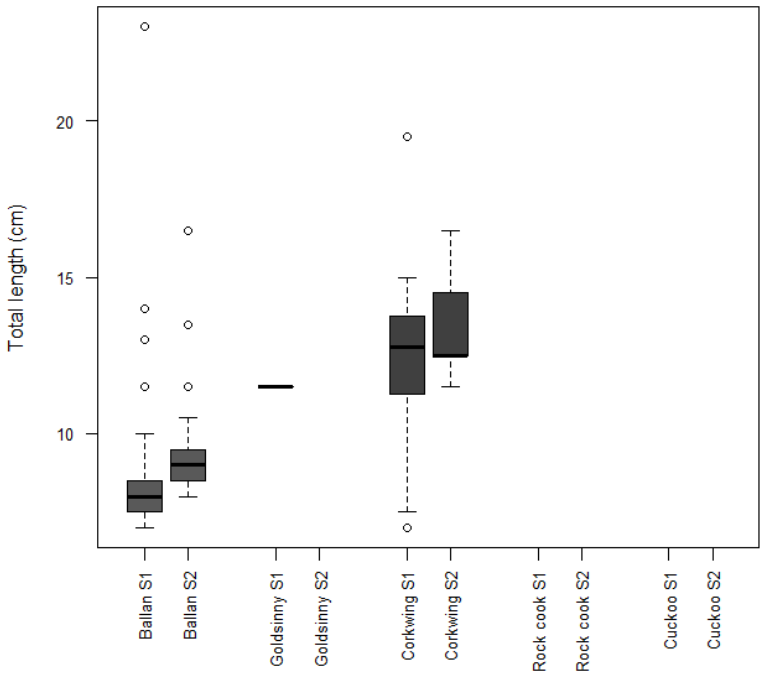


Figure 25: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at St Mawes seagrass bed on 1st to 2nd November and 22nd to 23rd November 2018. Data is grouped by sample number (S1 and S2) and by strings 4-6. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

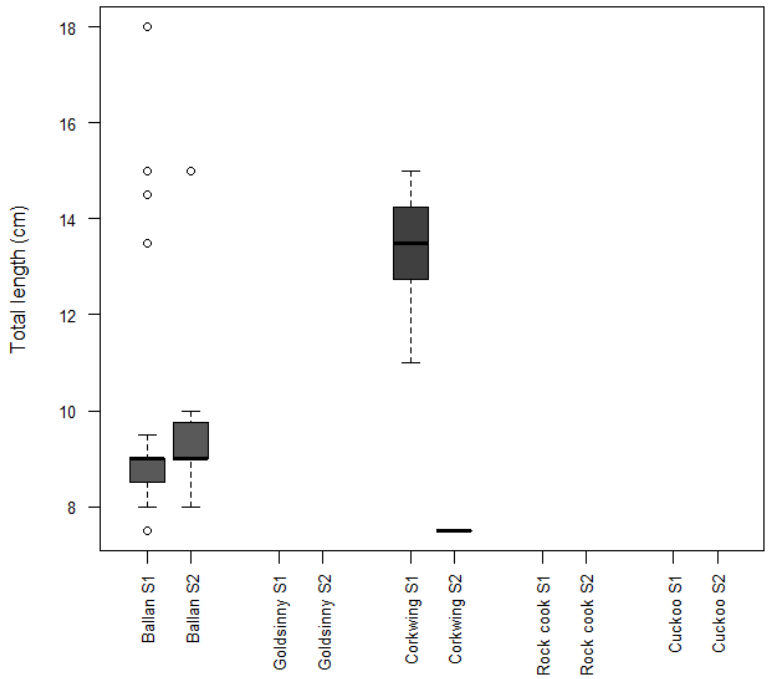


Figure 26: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at Trefusis seagrass bed on 1st to 2nd November and 22nd to 23rd November 2018. Data is grouped by sample number (S1 and S2) and from string 7. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

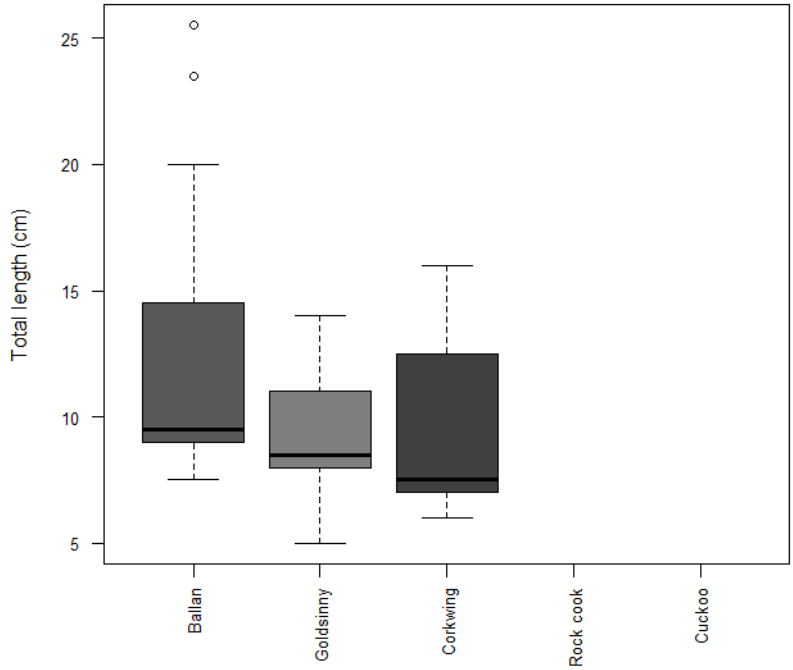


Figure 27: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at Helford seagrass bed. Data is grouped by strings 8-10. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

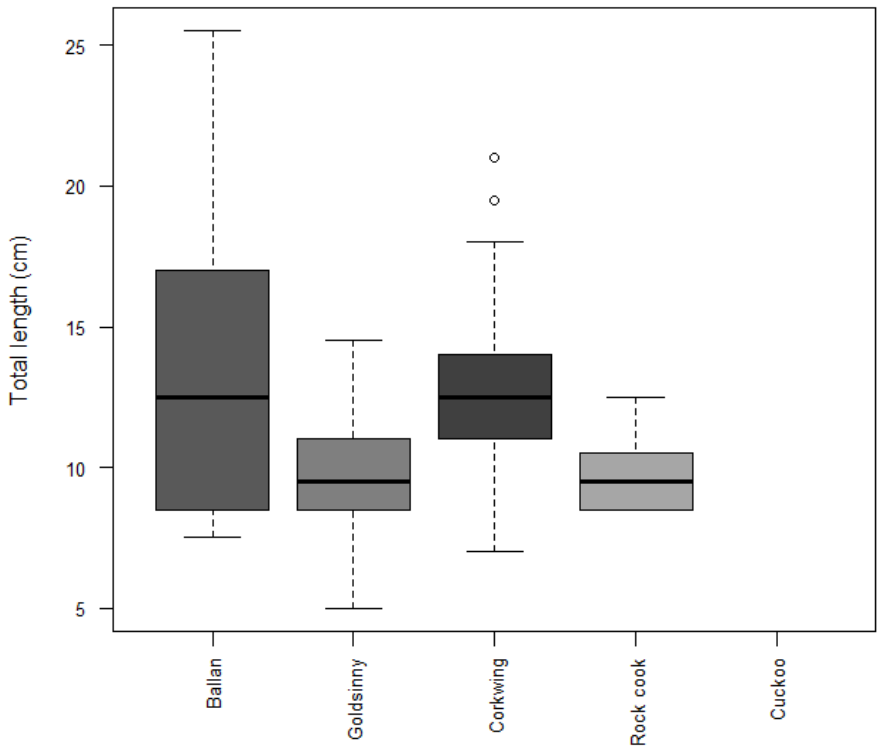


Figure 28: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at Mawnan to August Rock. Data is grouped by strings 11-13. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

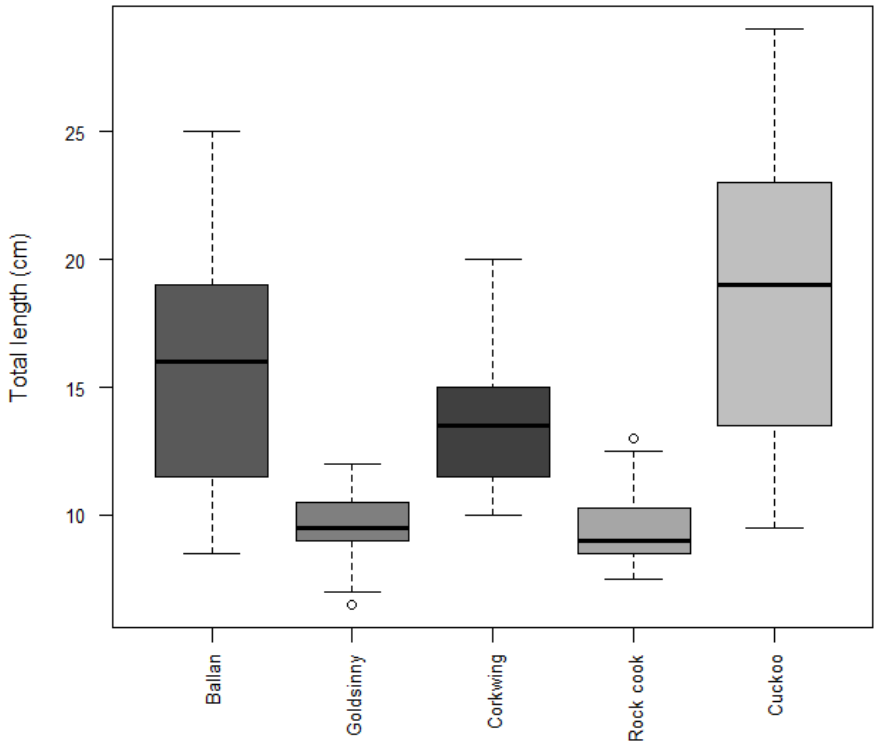


Figure 29: Total length in cm for ballan, goldsinny, corkwing, rock cook and cuckoo wrasse sampled at Rosemullion Head. Data is grouped by strings 14-16. Stripes show median, boxes show inter-quartile, error bars show range and hollow circles show outliers.

3.3 By-catch

Each trap was emptied into a fish box once recovered to deck and photographed. A list of the recorded by-catch can be seen in Table 3 and Table 4.

Table 3: List of by-catch species recorded from all six sites during the wrasse surveys on 1st and 2nd November 2018.

Common name	Species name
Sea hare	*Aplysia punctata*
Common dragonet	*Callionymus lyra*
Edible crab	*Cancer pagurus*
Shore crab	*Carcinus maenas*
Conger eel	*Conger conger*
Juvenile Gadidae	Gadidae sp.
Shore rockling or five bearded rockling	*Gaidropsarus mediterraneus* or *Ciliata mustela*
Three bearded rockling	*Gaidropsarus vulgaris*
Squat lobster	*Galathea squamifera*
Juvenile lobster	*Homarus gammarus*
Spider crab	Inachus sp.
Clingfish sp.	*Lepadogaster* sp.
Spiny starfish	*Marthasterias glacialis*
Velvet swimming crab	*Necora puber*
Prawn sp.	*Palaemon* sp.
Tompot Blenny	*Parablennius gattorugine*
Butterfish	*Pholis gunnellus*
Juvenile pollack	*Pollachius pollachius*
Greater pipefish	*Syngnathus acus*
Long-spined sea scorpion	*Taurulus bubalis*
Bib	*Trisopterus luscus*
Netted dog whelk	*Tritia reticulata*
Topknot	*Zeugopterus punctatus*
Seagrass	*Zostera* sp.
Prawn sp.	Unidentified sp.
Hermit crab sp.	Unidentified sp.
Topshell sp.	Unidentified sp.

Table 4: List of by-catch species recorded during the wrasse surveys on 22nd and 23rd November 2018.

Common name	Species name
Common dragonet	*Callionymus lyra*
Painted topshell	*Calliostoma zizyphinum*
Edible crab	*Cancer pagurus*
Shore crab	*Carcinus maenas*
Conger eel	*Conger conger*
Juvenile Gadidae	Gadidae sp.
Shore rockling or five bearded rockling	*Gaidropsarus mediterraneus* or *Ciliata mustela*
Squat lobster	*Galathea squamifera*
Black goby	*Gobius niger*
Juvenile lobster	*Homarus gammarus*
Spider crab	Inachus sp.
Velvet swimming crab	*Necora puber*
Common prawn	*Palaemon serratus*
Tompot Blenny	*Parablennius gattorugine*
Butterfish	*Pholis gunnellus*
Long-spined sea scorpion	*Taurulus bubalis*
Netted dog whelk	*Tritia reticulata*
Seagrass	*Zostera* sp.
Hermit crab sp.	Unidentified sp.
Topshell spp.	Unidentified sp.

3.4 Water parameters

Four profiles using the Valeport Swift SVP were taken on 2nd November 2018 which recorded depth (m), sound velocity (m/s), pressure (dBar), temperature(°C), salinity (PSU) and density (kg/m³). At the maximum depth the average seabed temperature was 12.9 °C and average salinity 35 PSU. Figure 30 to Figure 32 show the temperature profiles at each dop in Falmouth Bay, the location of each drop can be seen in Figure 13.

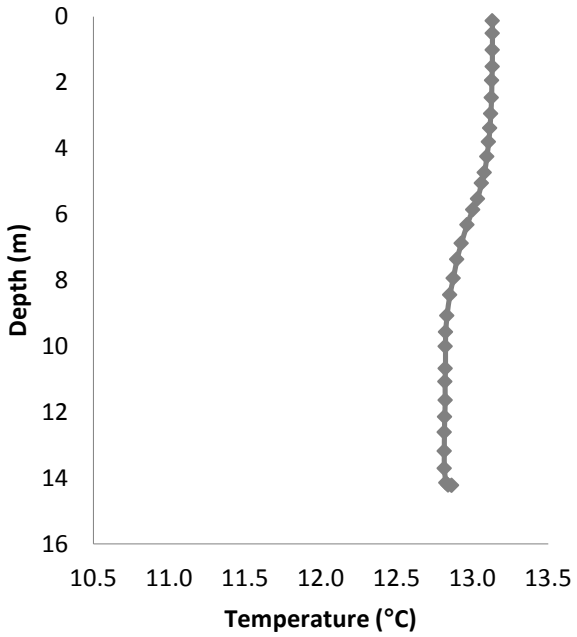


Figure 30: Temperature profile from Valeport Swift Sound Velocity Profiler Drop 1 near Rosemullion Head on 2nd November 2018.

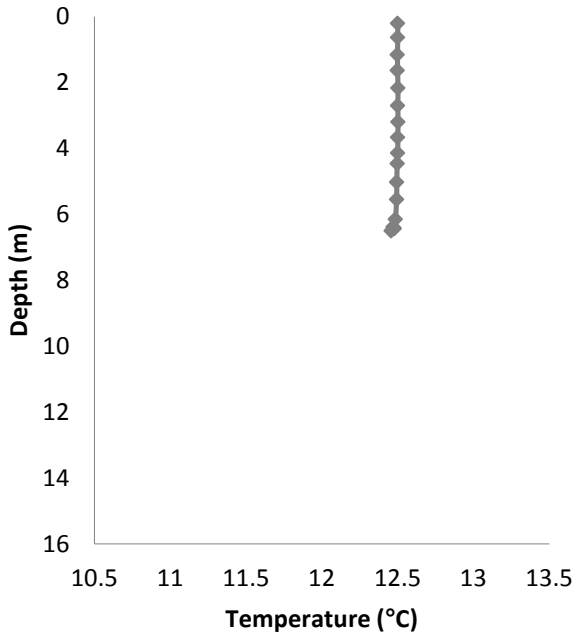


Figure 31: Temperature profile from Valeport Swift Sound Velocity Profiler Drop 2 near Helford seagrass bed on 2nd November 2018.

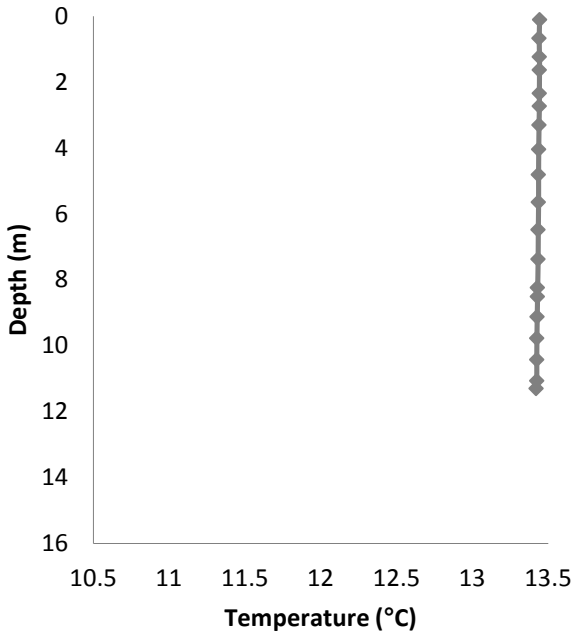


Figure 32: Temperature profile from Valeport Swift Sound Velocity Profiler Drop 3 near St Anthony Head on 2nd November 2018.

Two profiles were taken on 23rd November near Trefusis and St Mawes (Figure 33 and Figure 34). At the maximum depth the average seabed temperature was 11.1 °C and average salinity 34.4 PSU.

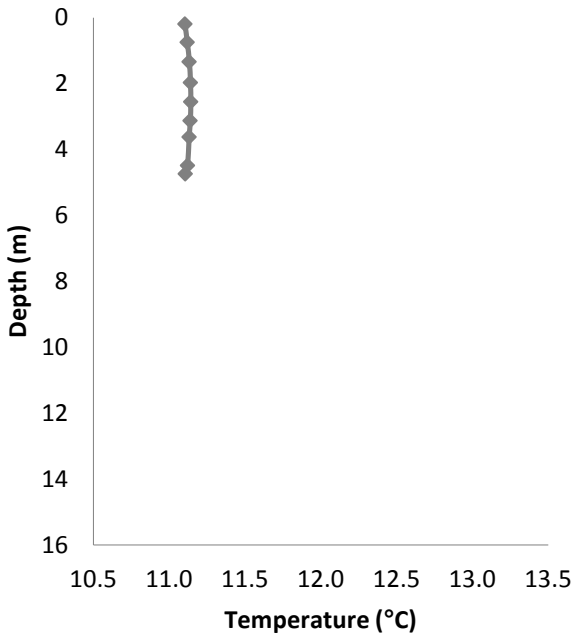


Figure 33: Temperature profile from Valeport Swift Sound Velocity Profiler Drop 4 near Trefusis on 23rd November 2018.

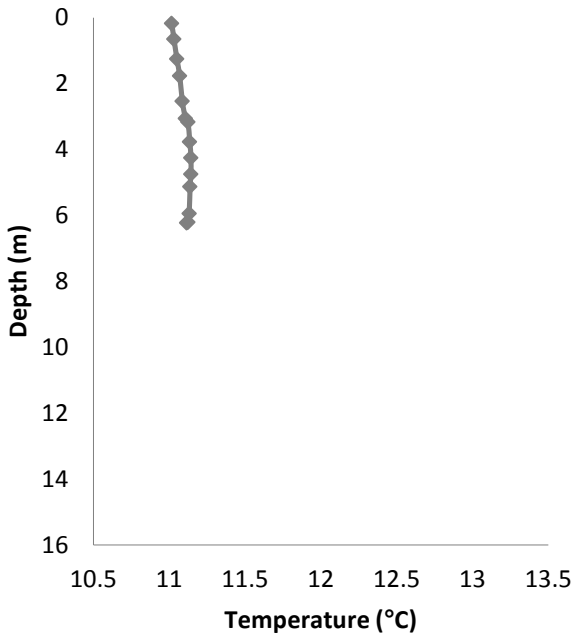
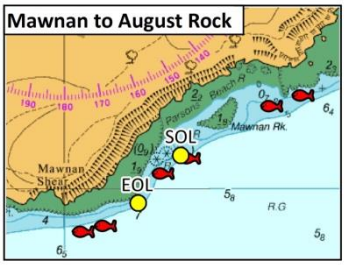
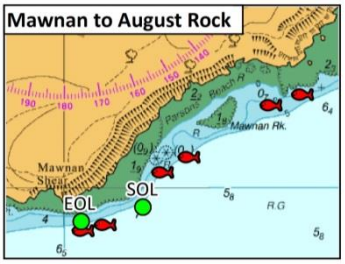
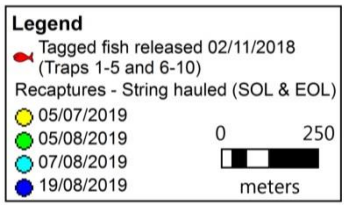
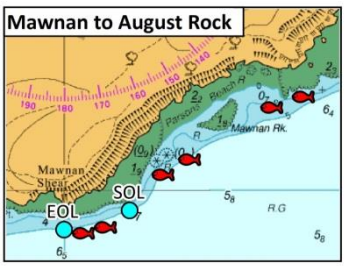
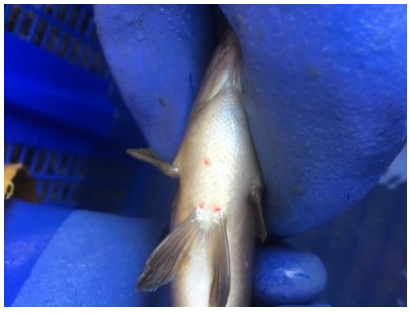
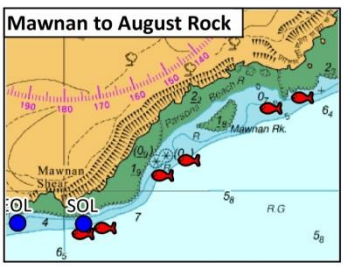


Figure 34: Temperature profile from Valeport Swift Sound Velocity Profiler Drop 5 near St Mawes on 23rd November 2018.

3.5 2019 Recaptures

During onboard sampling in 2019 tagged wrasse, from the November 2018 survey, were found near the Mawnan to August Rock site. A total of four wrasse have been recaptured so far (September 2019) and one of which was recaptured again (Table 5). Between May and September 2019, onboard sampling was from 65 strings (seven survey days) aboard a commercial fishing vessel and 18 strings (two survey days) on Tiger Lily VI. A total of 16 strings at St Anthony Head, 22 strings at Rosemullion Head, 22 strings at Mawnan to August Rock and 6 strings at Helford seagrass bed were surveyed. No strings were surveyed in the Trefusis and St Mawes seagrass beds. The remaining 17 strings were over 500 m from the tagged wrasse release sites.

Table 5: List of recaptured wrasse with VIE tags during 2019 onboard surveys near Mawna to August Rock.

Date	Species	Size (cm)	Sex	Wrasse with VIE Tags caught	Location of recapture
05/07/19	Goldsinny	13	Male		
05/08/19	Corkwing	17.5	Female		
	Ballan	16	Unsure		©British Crown and OceanWise, 2019. All rights reserved. Licence No. EK001-20190415. NOT TO BE USED FOR NAVIGIATION. 
07/08/19	Ballan	16	Unsure		
19/08/19					

4 Discussion

4.1 Wrasse tagging

A total of 1,066 wrasse were tagged at six different locations during the survey. Unfortunately, due to unforeseen circumstances, a full recapture survey was not carried out and no tagged wrasse were found during the recapture at two of the sites. The number of wrasse caught during the recapture survey at St Mawes and Trefusis were significantly lower than that originally caught and tagged. This is thought to be because of the poor weather conditions during the recapture survey. Additionally, the average seabed water temperature had dropped by 1.8 °C.

There was an obvious difference in catch composition between the reef habitats and seagrass beds. Ballan wrasse dominated the catch, followed by corkwing in the seagrass beds (Figure 17 to Figure 19). The median total length for ballan was smaller at the seagrass bed sites (8, 9 and 9.5 cm) compared to reef habitats (16.75, 12.5 and 16 cm).

4.2 2019 recaptures

A total of five recaptures were found during onboard sampling in 2019 which shows tag retention for up to nine months. Two of the wrasse recaptured, one ballan and one corkwing, only had one VIE tag visible which shows the importance of double marking. The maximum distance the recaptured wrasse could have travelled, dependent on original release location, was 700 m. The ballan caught on 7th August was tagged again during the Wrasse Tagging Falmouth Bay Survey 2019 (Sturgeon *et al.,* 2019) and was recaptured again on 19th August (Table 5).

4.3 Limitations

The limitations in this study and recommendations to minimise these on future surveys are shown below.

4.3.1 Weather conditions

Due to adverse weather conditions it meant that the recapture survey could not be carried out in full. There was a limited time window when the gear was available to be used by Cornwall IFCA before it was going to be taken out of the water overwinter to avoid damage. Only two sites were surveyed for recapture and this was undertaken during poor weather period (wind speed greater than 30 mph) when catch rates are believed to be lower.

4.3.2 Water visibilty

Secchi disks should be taken on every survey on hauling and setting days to determine water visability, as it is considered that this may have an influence on the catch rates.

4.3.3 Location of strings

The areas which were surveyed were locations that are subject to fishing activity. Locations which have previously been unfished and that are within the closed areas of the Live Wrasse Fishing (Limited Permit) Byelaw would be beneficial as control sites to draw comparisons.

4.4 Recommendations for future surveys

- Carry out the survey work early in autumn or late summer to limit bad weather hindering survey.

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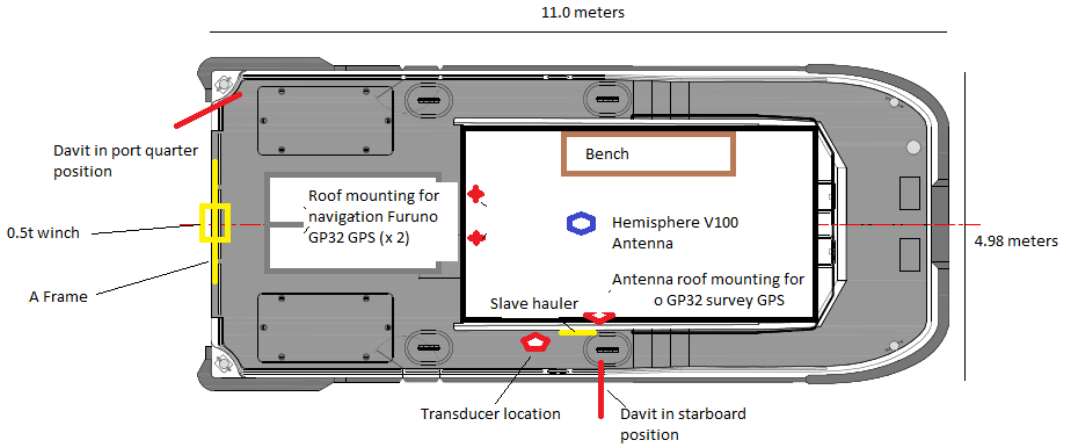
6 Appendices

Annex 1 – RV Tiger Lily vessel specification, deck plan and offsets

Builder	South Boats Ltd
Model	Island MkII
Built	2007
LOA	11.0m
Beam	4.98m
Draught	1.1m (aft)
Tonnage	c.10 tonnes
Area of operation	MCA Category 2
Call sign	MRWR7
MMSI Number	235054954
MECAL Certification number	M07WB0111059
Complement	14 (including min 2 crew)
Propulsion	2 x 450hp Iveco NEF series
Speed	Cruising: 16 – 18 knots Top: 24 – 26 knots
Range	c. 400 nautical miles
240v AC supply	Victron 3Kw power inverter 5KvA Volvo-Perkins generator (All 240 AC power is accessed via APC Smart UPS C1500)
Stern Gantry	500kg SWL
Winch (on stern gantry)	Spencer Carter 0.5t with scrolling level wind
Slave hauler	Sea Winch 200m dia.
Electric line hauler	12v Spencer Carter Bandit
Positioning	Hemisphere V100 GNSS 3 x Furuno GP32
NMEA data outputs	4 x USB 4 x Serial 4 x banjo
Navigation	Olex with data export Knockle Hypack Max

Tiger Lily VI General Layout - Plan view



			Offset (m)		
NMEA Device	**Make/Model**	**Offset Name**	**X (f'wd)**	**Y (port)**	**Z (+/-)**
Sounder	Furuno Navnet	Transducer	7.0	4.2	-0.5
GPS	Furuno GP32	GPS 1	4.8	3.48	+2.2
GNSS	Hemisphere V100	GNSS 1	5.0	2.5	+2.35

Annex 2 – Ingestion of Visible Implant Elastomer

Northwest Marine Technology, Inc.

13 May, 2014

Ingestion of Visible Implant Elastomer

Northwest Marine Technology's Visible Implant Elastomer (VIE) is made from a two part silicon-based material that is mixed together just before tagging. One part is the "curing agent" and the other part is the silicon base. It is injected as a liquid and cures to a pliable solid. About 90% of the VIE is comprised of the pigment and a medical grade silicone which is approved in the United States for surgical implants in humans, specifically for breast implants. Like all silicones used for human implants, ours uses the non-toxic platinum catalysts.

The manufacturer of the pigment states "The pigments … have been pre-approved through Duke University for the ACMI certification program. They are essentially non-toxic and contain no constituent heavy metals or inorganic phosphors." (ACMI stands for Arts and Crafts Manufacturers Institute who approves materials used for things like crayons, paints, and children's toys; www.acminet.org).

We have not applied for approval of VIE as a food additive by the Food and Drug Administration (i.e. it is not approved by the FDA for consumption), and therefore, when possible, encourage people to tag in body parts that would not be consumed. On the other hand, we know that the elastomer has been consumed, including by some people in our office, and there have been no reports of ill effects.

Geraldine Vander Haegen
Research Biologist

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Tumwater, WA 98501, USA
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Annex 3 – Daily Logs

30th October 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181030_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	30/10/2018	
Vessel	Commercial Fishing Vessel	
Staff		
Survey role	**Company**	**Name**
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Weather and tides		
High water time (Falmouth):	08:37	
High water (m)	4.75	
Time weather recorded		
Wind direction		
Wind speed		
Beaufort scale		
Cloud coverage		
Safety		
Toolbox talk time		
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
08:11:31	String 7 SOL (Trefusis seagrass bed) Shot Back	
08:12:52	String 7 EOL (St Mawes seagrass bed) Shot Back	
10:04:32	String 4 SOL (St Mawes seagrass bed) Shot Back	
10:06:09	String 4 EOL (St Mawes seagrass bed) Shot Back	
10:25:37	String 5 SOL (St Mawes seagrass bed) Shot Back	
10:27:05	String 5 EOL (St Mawes seagrass bed) Shot Back	
10:45:39	String 6 SOL (St Mawes seagrass bed) Shot Back	
10:47:15	String 6 EOL (St Mawes seagrass bed) Shot Back	
11:23:20	String 3 SOL (St Anthony Head) Shot Back	
11:24:48	String 3 EOL (St Anthony Head) Shot Back	
11:48:04	String 2 SOL (St Anthony Head) Shot Back	
11:49:41	String 2 EOL (St Anthony Head) Shot Back	
12:14:49	String 1 SOL (St Anthony Head) Shot Back	
12:16:09	String 1 EOL (St Anthony Head) Shot Back	
12:44:15	String 14 SOL (Rosemullion Head) Shot Back	
12:45:56	String 14 EOL (Rosemullion Head) Shot Back	
13:52:40	String 10 SOL (Helford seagrass bed) Shot Back	
13:54:10	String 10 EOL (Helford seagrass bed) Shot Back	
14:08:15	String 9 SOL (Helford seagrass bed) Shot Back	
14:09:56	String 9 EOL (Helford seagrass bed) Shot Back	
14:23:25	String 8 SOL (Helford seagrass bed) Shot Back	
14:24:45	String 8 EOL (Helford seagrass bed) Shot Back	
14:56:22	String 11 SOL (Mawnan to August Rock) Shot Back	
14:57:53	String 11 EOL (Mawnan to August Rock) Shot Back	
15:18:10	String 12 SOL (Mawnan to August Rock) Shot Back	
15:19:36	String 12 EOL (Mawnan to August Rock) Shot Back	
15:41:48	String 13 SOL (Mawnan to August Rock) Shot Back	
15:43:15	String 13 EOL (Mawnan to August Rock) Shot Back	

31st October 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181031_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	31/10/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Weather and tides		
High water time (Falmouth):	09:41	
High water (m)	4.5	
Time weather recorded		
Wind direction		
Wind speed		
Beaufort scale		
Cloud coverage		
Safety		
Toolbox talk time		
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
13:55:14	String 15 SOL (Rosemullion Head) Shot Back	
13:57:39	String 15 EOL (Rosemullion Head) Shot Back	
13:58:34	String 16 SOL (Rosemullion Head) Shot Back	
14:00:55	String 16 EOL (Rosemullion Head) Shot Back	

1st November 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181101_02_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	01/11/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Stephanie Sturgeon
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Visitor/ Engineer	Cornwall IFCA	Tom Belcher
Weather and tides		
High water time (Falmouth):	10:59	
High water (m)	4.3	
Time weather recorded	07:40	
Wind direction	NW	
Wind speed	12 mph	
Beaufort scale	2	
Cloud coverage	6/8	
Safety		
Toolbox talk time	07:45	
Induction	07:20	
Summary of operations		
Time (UTC)	**Activity**	
07:30:00	Departed Mylor. Mixed Green VIE	
08:20:00	SOL - String 1	
09:32:00	EOL - String 1	
09:39:00	String 1 - Traps 1-5 Fish released	
09:41:00	String 1 - Traps 6-10 Fish released	
10:08:00	SOL String 1 Shot back	
10:11:00	EOL String 1 Shot back	
10:12:00	Steam to String 2	
10:24:00	SOL - String 2	
11:08:00	EOL - String 2	
11:12:00	String 2 - Traps 1-5 Fish released	
11:15:00	String 2 - Traps 6-10 Fish released	
11:24:00	SOL String 2 Shot back	
11:26:00	EOL String 2 Shot back	
11:42:00	SOL - String 3	
12:12:00	EOL - String 3	
12:19:00	String 3 - Traps 1-5 Fish released	
12:21:00	String 3 - Traps 6-10 Fish released	
12:31:00	SOL String 3 Shot back	
12:34:00	EOL String 3 Shot back	
12:35:00	Lunch break	
13:10:00	Steam to String 4. Mixed Pink VIE	
13:15:00	SOL - String 4	
13:37:00	EOL - String 4	
13:40:00	SOL String 4 Shot back	
13:45:00	EOL String 4 Shot back	
13:50:00	String 4 - Traps 1-5 Fish released	

13:51:00	String 4 - Traps 6-10 Fish released
13:56:00	SOL - String 5
14:19:00	EOL - String 5
14:23:00	SOL String 5 Shot back
14:26:00	EOL String 5 Shot back
14:28:00	String 5 - Traps 1-5 Fish released
14:30:00	String 5 - Traps 6-10 Fish released
14:40:00	SOL - String 6
14:59:00	EOL - String 6
15:04:00	SOL String 6 Shot back
15:07:00	EOL String 6 Shot back
15:14:00	String 6 - Traps 1-6 Fish released
15:16:00	String 6 - Traps 6-10 Fish released
15:40:00	SOL - String 7
15:57:00	EOL - String 7
16:03:00	SOL String 7 Shot back
16:05:00	EOL String 7 Shot back
16:10:00	String 7 - Traps 1-7 Fish released
16:11:00	String 7 - Traps 7-10 Fish released
16:13:00	Steam to Mylor
16:25:00	Arrive Mylor

2nd November 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181101_02_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	02/11/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Stephanie Sturgeon
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Scientific Officer	Cornwall IFCA	Hilary Naylor
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Weather and tides		
High water time (Falmouth):	12:23	
High water (m)	4.35	
Time weather recorded	07:20	
Wind direction	S	
Wind speed	12 mph	
Beaufort scale	2	
Cloud coverage	1/8	
Safety		
Toolbox talk time	07:25	
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
07:15:00	Depart Mylor, mixed blue VIE	
07:45:00	Arrive on site	
07:50:00	SOL String 8	
08:03:00	EOL String 8	
08:05:00	SOL String 8 Shot back	
08:07:00	EOL String 8 Shot back	
08:09:00	Fish released String 8 Traps 1-5	
08:10:00	Fish released String 8 Traps 6-10	
08:15:00	SOL String 9	
08:30:00	EOL String 9	
08:30:00	SOL String 9 Shot back	
08:36:00	EOL String 9 Shot back	
08:38:00	Fish released String 9 Traps 1-5	
08:40:00	Fish released String 9 Traps 6-10	
08:45:00	SOL String 10	
09:11:00	EOL String 10	
09:11:00	SOL String 10 Shot back	
09:16:00	EOL String 10 Shot back	
09:17:00	Fish released String 10 Traps 1-5	
09:19:00	Fish released String 10 Traps 6-10	
09:35:00	Break. Mixed red VIE	
09:51:00	SOL String 11	
10:05:00	EOL String 11	
10:15:00	SOL String 11 Shot back	
10:17:00	EOL String 11 Shot back	
10:20:00	Fish released String 11 Traps 1-5	
10:21:00	Fish released String 11 Traps 6-10	

10:26:00	SOL String 12
10:50:00	EOL String 12
10:57:00	SOL String 12 Shot back
10:59:00	EOL String 12 Shot back
11:01:00	Fish released String 12 Traps 1-5
11:03:00	Fish released String 12 Traps 6-10
11:11:00	SOL String 13
11:29:00	EOL String 13
11:37:00	SOL String 13 Shot back
11:39:00	EOL String 13 Shot back
11:42:00	Fish released String 13 Traps 1-5
11:44:00	Fish released String 13 Traps 6-10
11:50:00	Break for lunch
12:20:00	Steam to next string
12:34:00	SOL String 14
13:10:00	EOL String 14
13:17:00	SOL String 14 Shot back
13:19:00	EOL String 14 Shot back
13:23:00	Fish released String 14 Traps 1-5
13:25:00	Fish released String 14 Traps 6-10
13:30:00	SOL String 15
14:08:00	EOL String 15
14:15:00	SOL String 15 Shot back
14:17:00	EOL String 15 Shot back
14:20:00	Fish released String 15 Traps 1-5
14:22:00	Fish released String 15 Traps 6-10
14:28:00	SOL String 16
14:53:00	EOL String 16
14:58:00	SOL String 16 Shot back
14:59:00	EOL String 16 Shot back
15:04:00	Fish released String 16 Traps 1-5
15:06:00	Fish released String 16 Traps 6-10
15:08:00	CTD - Nansidwell
15:19:00	CTD - Helford
15:37:00	CTD - St.Anthony lighthouse
15:44:00	CTD - St.Mawes
16:15:00	Arrive Mylor

20th November 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181120_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	20/11/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Stephanie Sturgeon
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Weather and tides		
High water time (Falmouth):	15:08	
High water (m)	4.8	
Time weather recorded	09:20	
Wind direction	NE	
Wind speed	14-16 mph, gusting 33 mph	
Beaufort scale	4	
Cloud coverage	0/8	
Safety		
Toolbox talk time	09:30	
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
09:20:00	Departed Mylor	
09:30:00	Arrived at survey site - St Mawes	
09:40:00	String 6 - SOL hauling	
09:46:00	Gear caught around mooring	
10:10:00	Pot 5 recovered - rest of string still stuck	
10:12:00	Decision made to cut string as stuck around mooring block	
10:17:00	Hauling gear from the possible other end of string	
10:20:00	Picked up buff from another string 3 - started hauling this string	
10:32:00	Ditched gear attached to end of string - struggling to haul it	
10:37:00	Ditched gear removed off line - EOL String 3	
10:41:00	Winched ditched gear onboard	
10:42:00	Working out where gear is lying	
10:54:00	Got the buff for the other end of string 6 to recover other 5 traps - gear tangled around mooring block	
11:07:00	Buff put back in as gear is still tangled (buoy number is G1). Can't recover gear ourselves	
11:12:00	String 5 - checking gear is correct- start hauling	
11:17:00	Scallop dredge caught on gear	
11:27:00	Scallop dredge recovered to deck using winch	
11:28:00	Continue hauling string - parlour pot onboard	
11:29:00	Know gear is wrasse gear - deciding where to shoot back gear for string 5 to haul later	
11:45:00	SOL String 6 shot back (string came from location of either string 3/4)	
11:48:00	EOL String 6 shot back (string came from location of either string 3/4)	
11:50:00	String 5 - SOL hauling	
12:03:00	String 5 - EOL hauling	
12:09:00	SOL String 5 shot back	
12:11:00	EOL String 5 shot back	

12:14:00	String 4 - SOL hauling
12:28:00	String 4 - EOL hauling
12:32:00	SOL String 4 shot back
12:34:00	EOL String 4 shot back
12:36:00	Transit to Flushing for lunch
13:00:00	Lunch break
13:40:00	Finish lunch
13:43:00	String 7 - SOL hauling
14:00:00	String 7 - EOL hauling
14:08:00	SOL String 7 shot back
14:11:00	EOL String 7 shot back
14:12:00	Transit to St.Mawes (percuil) to recover two strings to take ashore
14:25:00	String 1 - SOL hauling. Keep string onboard to put ashore in Mylor
14:40:00	Gear stuck
14:44:00	Gear free
14:46:00	String 1 - EOL hauling
14:48:00	String 2 - SOL hauling. Keep string onboard to put ashore in Mylor
15:01:00	String 2 - EOL hauling
15:05:00	Transit to Mylor
15:40:00	Put strings of gear on quay
16:10:00	Clean off deck
16:35:00	Vessel alongside

22nd November 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181122_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	22/11/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Stephanie Sturgeon
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Weather and tides		
High water time (Falmouth):	16:31	
High water (m)	5.1	
Time weather recorded	08:20	
Wind direction	SE	
Wind speed	25-35 mph	
Beaufort scale	5	
Cloud coverage	6/8	
Safety		
Toolbox talk time	08:30	
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
08:10:00	Depart Mylor	
08:37:00	Arrived at survey site	
08:41:00	Started hauling string 6	
08:59:00	EOL String 6 - Parlour pot	
09:03:00	All fish released	
09:13:00	SOL - String 6 shot back (1 blue and 1 white mark)	
09:15:00	EOL - string 6 shot back (1 blue and 1 black)	
09:19:00	Start hauling string 5	
09:22:00	String 5 aborted - swell pushing vessel near rocks and low tide	
09:25:00	Decision made to stand down and wait for the tide	
10:21:00	Transit to Flushing to check tide there	
10:35:00	Tide too low and swell rolling in over gear - head back to St.Mawes	
10:50:00	Arrive at St.Mawes. Waiting on tide	
11:45:00	Lunch break	
12:30:00	Decision made to return to Mylor due to weather conditions	
12:50:00	Arrive Mylor	

23rd November 2018 – Wrasse Tagging Falmouth Bay Survey

Project information		
Project	Wrasse Tagging 2018	
Survey code	20181123_CIFCA_Wrasse	
Location	Falmouth Bay	
Date	23/11/2018	
Vessel	Tiger Lily VI	
Staff		
Survey role	**Company**	**Name**
Principal Scientific Officer	Cornwall IFCA	Colin Trundle
Scientific Officer	Cornwall IFCA	Stephanie Sturgeon
Scientific Officer	Cornwall IFCA	Kate Owen
Scientific Officer	Cornwall IFCA	Annie Jenkin
Skipper/ Enforcement Officer	Cornwall IFCA	Daniel McIntyre
Weather and tides		
High water time (Falmouth):	17:13	
High water (m)	5.18	
Time weather recorded	07:20	
Wind direction	SE	
Wind speed	16-22 mph	
Beaufort scale	4	
Cloud coverage	7/8	
Safety		
Toolbox talk time	07:40	
Induction	N/A	
Summary of operations		
Time (UTC)	**Activity**	
07:19:00	Departed Mylor	
07:38:00	Arrived at survey site	
07:44:00	SOL String 5	
08:07:00	EOL String 5	
08:11:00	SOL String 5 shot back	
08:13:00	EOL String 5 shot back	
08:15:00	All fish released	
08:21:00	SOL String 4	
08:40:00	EOL String 4	
08:41:00	String 4 - All fish released	
08:42:00	SOL String 4 shot back	
08:44:00	EOL String 4 shot back	
08:46:00	Transit to Flushing	
09:00:00	Arrive in Flushing	
09:04:00	SOL String 7	
09:19:00	EOL String 7	
09:19:00	String 7 - All fish released	
09:22:00	SOL String 7 shot back	
09:24:00	EOL String 7 shot back	
09:29:00	CTD drop - Flushing	
09:46:00	CTD drop - St.Mawes	
09:15:00	Arrive at Mylor	