



Protecting *Manx Wildlife*
for the future

The Isle of Man Shark Tagging Programme

End of Year Report 2021



Written for:

The Department of Environment, Food and Agriculture (DEFA)

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Introduction

The Small Shark Tagging Programme in the Isle of Man has been operating since May 2013, with the Manx Wildlife Trust (MWT) working on behalf of the Department of Environment, Food and Agriculture (DEFA) to collect data. Sharks, rays and skates are currently subject to multiple threats from fisheries and harvest, including small-scale subsistence fishing, large scale harvesting and unintentional bycatch. These species are therefore protected in many jurisdictions. However, little is known about the distribution, movement or population sizes of these cryptic species in Manx waters. The Small Shark Tagging Programme aims to work with local anglers to tag small sharks and rays with identification tags or streamers, on a catch and release basis. The data are hoped to provide much needed information on the distribution and numbers of these small shark populations. Going forward, this fundamental understanding is crucial in providing effective and evidence-based data for the future management of these species and the best ways to protect them. The present report is a continuation of this project, summarising the findings of the seventh year of the programme.

To date over 57 anglers have received small shark tagging training, with over 300 sharks tagged. The most predominant elasmobranch species caught by anglers in Manx waters are bull huss (*Scyliorhinus stellaris*), spurdog (*Squalus acanthias*) and tope (*Galeorhinus galeus*). These are the only species tagged to date. Bull huss are considered 'Near Threatened' with a decreasing population trend (Ellis *et al.*, 2015). It is estimated that the species has declined by almost 30% in European waters for the three-generation period (45-60 years) due to overfishing (Baino *et al.*, 2001). Both spurdog and tope are classified as 'Vulnerable' by the IUCN Red List (Fordham *et al.*, 2016; Walker *et al.*, 2006). This assessment is based on a continuing sharp decline in the number of mature individuals and severely fragmented populations. In a promising step for the programme, one of the individuals tagged was recaptured in May 2018 in the Netherlands. This highlights that if more individuals are tagged, the more likely further recaptures are to happen again in the future. The programme has also recaptured individuals from other international programmes including Cefas and the Scottish Shark Tagging Programme.

Although the Scottish Shark Tagging Programme was subsequently disbanded, it contributed greatly to this programme and showed what can be achieved through citizen science programmes. Up until its closure in 2018 the Scottish Shark Tagging Programme shared knowledge and resources from the inception of the MWT programme. This included the deployment of two officers who trained Manx local anglers in 2013 (funded by DEFA), design of a project logo and the annual provision of tags/tagging equipment. In addition, they also increased public awareness highlighting the need for shark protection, the importance of sea angler's conservation efforts, and contributed to shark fisheries management.

Due to the COVID-19 pandemic, the Small Shark Tagging Programme was unable to tag any small sharks or complete further training during 2020. The project resumed in 2021 and was one of the most successful years for shark tagging for the project.

Project Aims:

- Promote public awareness on the importance of small shark species and the need for their protection.
- Engage with local anglers to undertake tagging and record subsequent recaptures.
- Utilise the data collected to determine the abundance and distribution of Manx small shark populations.
- Examine local threats to small shark species to inform management plans and conservation activities.

Methodology

The project is advertised locally and interested anglers targeting small sharks are invited to partake in the programme. Unfortunately, no additional anglers were trained due to a limited number of tags available. A total of 65 anglers having been trained since the beginning of the programme in 2013. In total, 11 anglers administered tags during 2021.

All trained anglers were given a minimum landing size crib sheet, recording cards and tagging equipment (Appendix 1 and 2). Prior to tag application, the condition of each shark was visually assessed to ensure normal appearance and minimum landing size. Any injured or otherwise abnormally appearing sharks, or those below the minimum landing size, would have been rejected from the tagging pool. Next, information was recorded on the species, location, date, length, girth, sex and condition. The tagging equipment consisted of a canula with five Floy® streamer tags (Appendix 3) and a micro gun with ten micro-tags for tagging smaller sharks. Tag equipment was replaced in small quantities when required, depending on angler's likelihood of being able to fish. One external tag with imprinted unique identification numbers was applied to each fish, which was recorded on the recording card.

Streamer tags were inserted using a canula tool and inserted at a 45° angle to a depth of around 35 mm, with the tag barb pointing upwards. Following insertion, the canula was twisted 90° to anchor the tag, then the tool was removed, and the tag lightly tugged to set the dart. The micro-tags were also inserted at a 45° angle, then the trigger was pushed to insert the tag. The needle was then removed, and the tag lightly tugged to set the dart. Following tagging, all sharks were released and monitored to ensure normal post capture behaviour. Currently, the data is stored with the MWT. Previously data had also been stored with the SSTP. Anglers were able to email tagging information directly to the MWT.

Results

Sharks tagged in 2021

In 2021, three boat trips were organised by the MWT (3rd August, 31st August and 2nd September), also aiding the tagging effort the year. In total, 53 individuals were tagged during 2021, including 22 tope and 31 spurdog (Figure 1). Of the tagged tope, 7 were male and 15 were female. For tagged spurdog, 7 were male, with and 24 were female (Figure 1). No bull huss were caught and tagged in 2021.

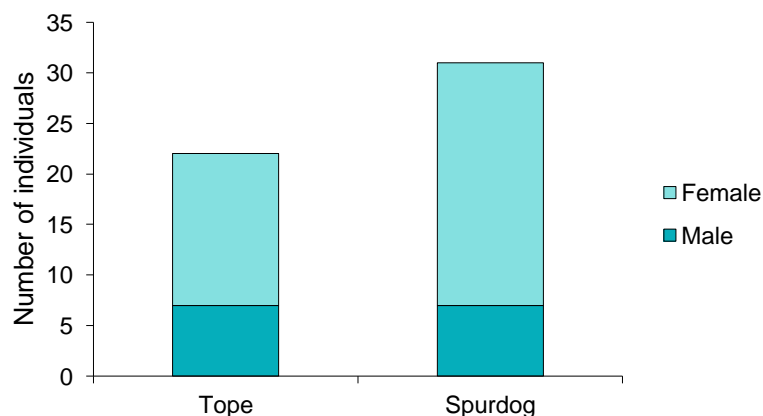


Figure 1. The number and sex of small sharks tagged in Manx waters during 2021.

The range in length of tope was 60 cm – 168 cm, with an average length of 127.91 cm (± 26.54 cm). The range in length of spurdog was 50 cm - 115 cm, with an average length of 84.48 cm (± 19.02 cm). The range and average length of tagged tope and spurdog are depicted in Figure 2.

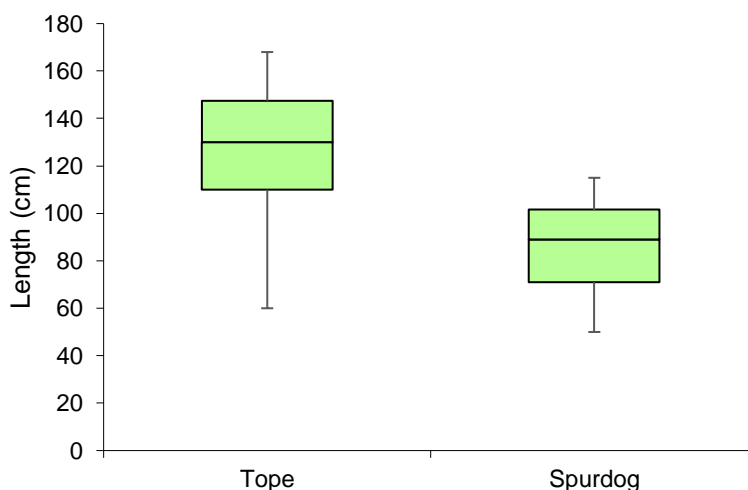


Figure 2. Box plot showing the medium length, and interquartile range (i.e., the range in values of the central 50% of the data) of tagged tope and spurdog in 2021. Whiskers indicate the minimum and maximum lengths recorded.

Distribution of sharks tagged in 2021

Sharks were tagged towards the south and west of the Island during the 2021 tagging season, as shown in Figure 3. It should be noted that the data displayed in Figure 3 does not show seven of the tagged sharks' locations as this data was not collected during tagging. It should also be noted that Figure 3 may not reflect survey effort and may potentially be unrepresentative of species distribution. However, anglers do tend to fish in areas where certain species are known to be found. Nevertheless, in combination with data obtained in subsequent tagging years, this data may contribute to the identification of hotspots, sex aggregations or nursery areas.

Recaptures

This year, no recaptures were reported. A tope tagged in May 2018 was captured in the Netherlands in September 2018. However, no further information (e.g., tag number, sex or length) was recorded. Regardless, this is an interesting finding, suggesting tope inhabiting Manx waters may be migrating across Europe. This species is known to migrate, but it would be useful to determine which localised areas small sharks are utilising within Manx waters in order to design effective management plans (Holden and Horrod, 1979).

Comparison of sharks tagged 2013-2021

In total, 373 small sharks have been tagged since 2013 (Table 1). This year, spurdog was the most tagged species, which is unusual in comparison to previous years. A greater number of spurdog have only been tagged once before, in 2017.

In comparison to 2019, significantly more individuals were tagged, with 11 anglers reported to have tagged small sharks in 2021 in comparison to five in 2019. Several anglers have continued to support the tagging programme since its inception, including eight new anglers in 2021. It should be noted that in 2017 two group angling/tagging trips were organised by the MWT resulting in uncharacteristically high tagging success.

Table 1. The number of small sharks per species tagged between 2013 – 2021.

Species	Year							
	2013	2014	2015	2016	2017	2018	2019	2021
Bull huss	16	1	0	0	0	0	0	0
Spurdog	6	1	1	4	90	14	8	31
Tope	28	22	20	12	40	30	10	22
Total	50	24	21	16	130	44	18	53

Tope

Whilst the sex ratio of tagged tope shows annual variation, females have been more frequently tagged than males over the last four years, as shown in Figure 4. Also, the total average number of females seems to be relatively increasing, whilst the number of males caught on average seems to be generally decreasing.

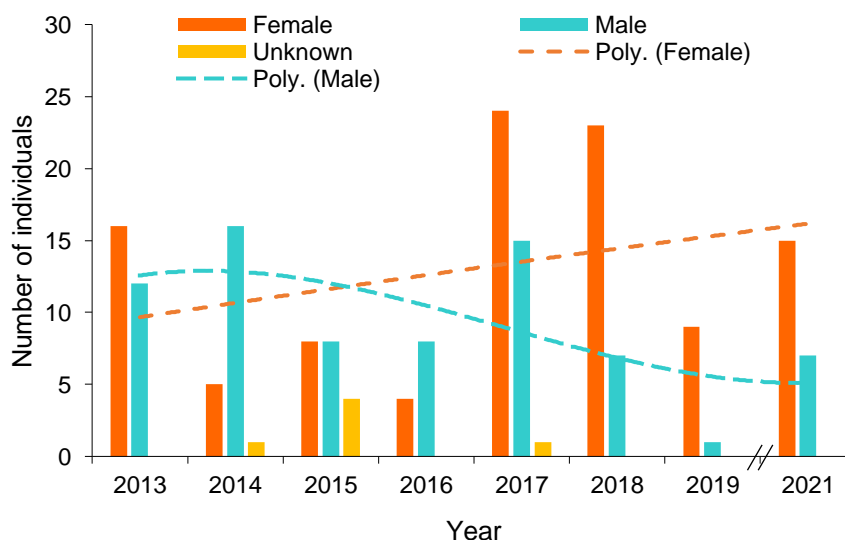


Figure 4. The number of individual tope females (orange) and males (blue), as well as the unidentified individuals (yellow) between 2013 – 2021. The dotted line indicates average number of males (blue) and females (orange) over time.

The proportion of females to males could be interpreted to suggest that Manx waters may predominantly be used by females, perhaps utilising the area as a small shark nursery ground. Currently the small number of total tope tagged each year cannot provide in-depth population

sex data. This study will need to generate more long-term data to disentangle whether female tope is using Manx waters for nursing grounds.

The average length of tope in 2021 decreased to 127.91 cm (± 26.54 cm) from 148.10 cm (± 17.88 cm) in 2019, a decrease of 20.19 cm. The average length of tagged tope had generally been increasing since 2015, as shown in Figure 5 (Appendix 4), however, in 2021 that was not the case. A steady increase in minimum length would indicate tagged tope are more likely to be mature or semi-mature individuals able to reproduce. Mature tope sharks' range in length from 135 - 175 cm for males and 150 - 195 cm for females (Jenkins, 1958). The average length of tagged male tope in 2021 was 122.14 cm. The average length of tope reached the minimum length for mature males (135 cm) in 2013, 2017 and in 2019 respectively (Figure 5). For female tagged tope, the average length had been steadily increasing since 2014 towards the minimum length of 150 cm for mature individuals, however in 2021 it saw a decline to 130.60 cm on average (Figure 5).

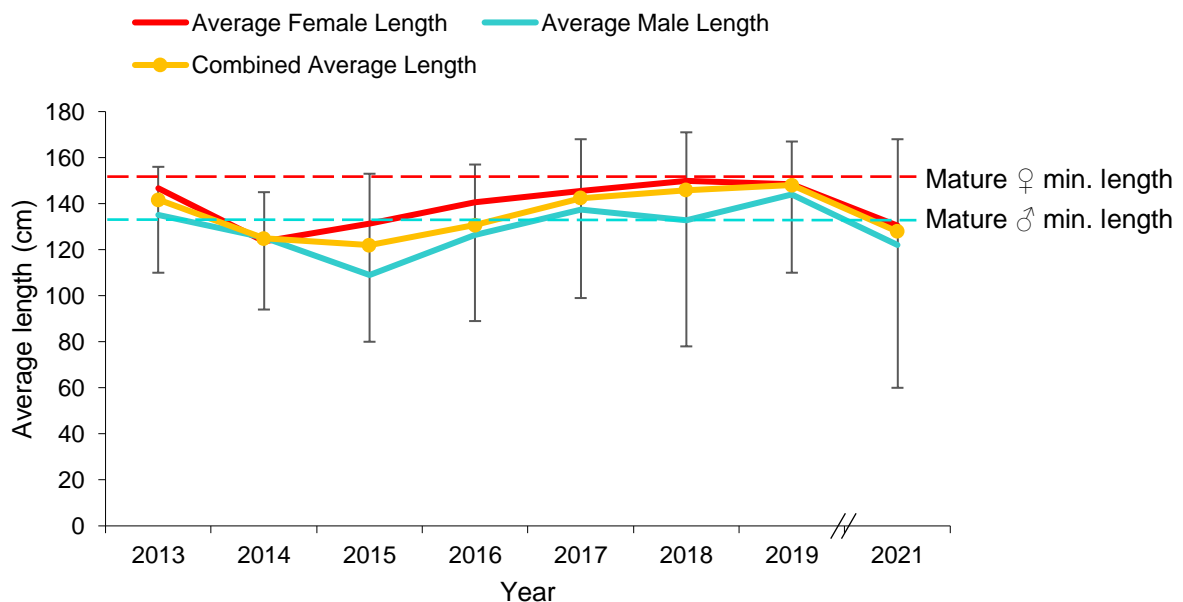


Figure 5. The minimum and maximum range in tagged tope lengths (whiskers); average length (cm) of total tagged tope (orange); average length (cm) of female tagged tope (red); average length (cm) of male tagged tope (blue); and minimum length for mature males (135 cm, dashed blue) and mature females (150 cm, dashed red) between 2013 – 2021.

In terms of the distribution of tope during the 2021 survey period, tope were captured and tagged around the Calf of Man and to the southwest of the Island (Figure 3). Individuals were also tagged further offshore than in previous years. In comparison to 2019, the tagged individuals were found exclusively to the south.

Spurdog

Females have been more frequently tagged than males across the entire project, as shown in Figure 6. Nine male spurdog have been tagged in total, with seven of those being in 2021. The ratio of tagged male to female individuals across the study period indicates that Manx waters are predominantly used by females. This is standard for the species, which typically segregates by sex as well as size (Henderson *et al.*, 2002).

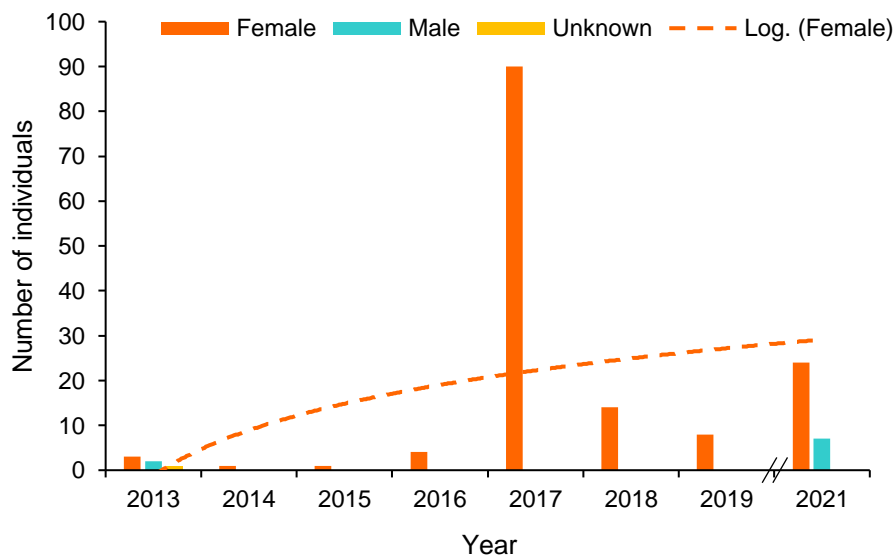


Figure 6. The number of individual spurdog females (orange) and males (blue), as well as the unidentified individuals (yellow) between 2013 – 2021. The dotted line indicates average number of females (orange) over time.

Figure 7 illustrates the average length of female spurdog between 2013 to 2021 (Appendix 4). In 2021, the average length of female spurdog decreased to 84.48 cm (± 19.02 cm) from 96.75 cm (± 3.83 cm) in 2019, a decrease of 12.27 cm. The average length from 2021 is the lowest recorded since 2013, although there was also the greatest variation in size of spurdog tagged. Sexual maturity (50 % certainty) for females off western Ireland was 78.2 cm in length (Henderson, Flannery and Dunne, 2002). In 2021, ~67 % of tagged spurdog were > 75 cm. Most tagged individuals from this project have been > 97 cm and were therefore likely sexually mature. This indicates that Manx waters may provide nursery grounds for this species (Figure 7).

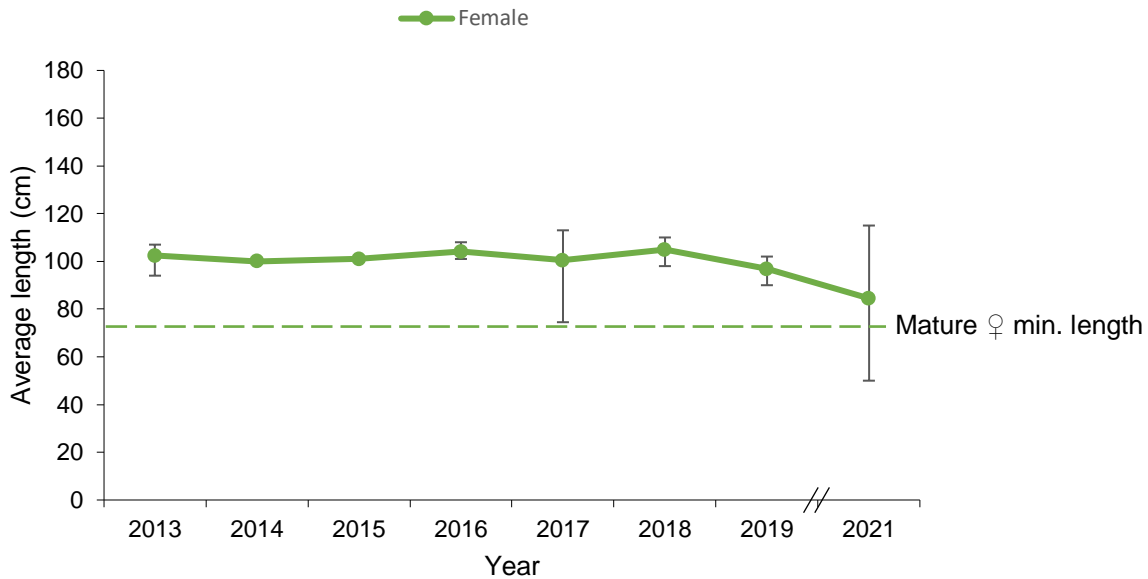


Figure 7. The minimum and maximum length (cm) of tagged female spurdog (whiskers) and average length between 2013 – 2021. Dashed line indicates minimum length of maturity (75 cm). One individual was tagged in 2014 and 2015 respectively, therefore data was modelled for these years to generate an average length.

In terms of the distribution of spurdog during the 2021 survey period, spurdog were tagged around relatively close to shore around the Calf of Man as well as off Peel to the west (Figure 3). In 2019, spurdog were also only found to the south of the Island.

Bull huss

Figure 8 below shows that bull huss have only been caught and tagged in 2013 and 2014. Males were tagged in both years, with females only tagged in 2013. It is unclear as to why bull huss have not been caught since 2014. A potential explanation is that the species range is regarded as patchy, particularly around offshore islands, where there are small local populations with limited exchange between them (Ellis *et al.*, 2015).

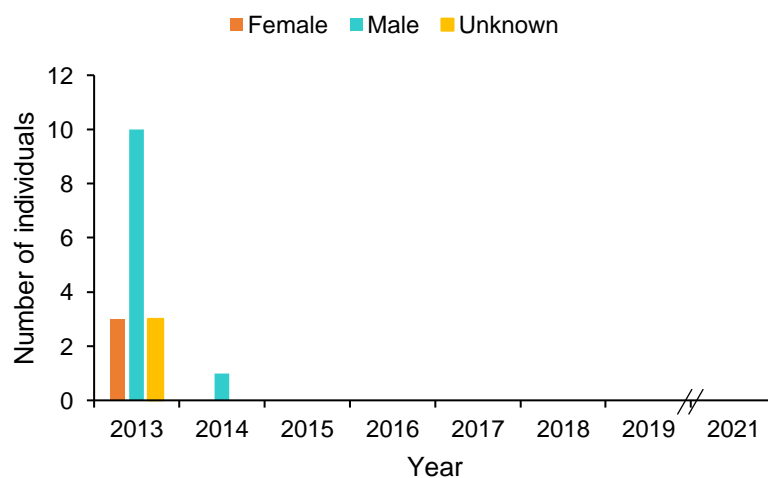


Figure 8. The number of individual bull huss females (orange) and males (blue), as well as the unidentified individuals (yellow) between 2013 – 2021.

The average length of bull huss caught and tagged is 91.06 cm (Table 2). Sexual maturity is attained at a length of 77–79 cm, which corresponds to an age of four years if growth rates remain constant (Capapé *et al.*, 2006). Of the individuals tagged throughout this project, 82.35% have been over the minimum length of maturity (77 cm).

In terms of the distribution of bull huss, in previous survey years they have exclusively been found off the northwest coast adjacent to Kirk Michael and Jurby. This data is based off tagged individuals from the 2013 and 2014 survey period.

Overview of Programme

The numbers of tagged individuals for the 2021 survey period increased on the previous year's numbers. In 2021, spurdog were the species caught and tagged the most. Tope have typically been tagged more frequently each year, apart from in 2017. Female tope and spurdog are more commonly caught and tagged than males.

The average length of tope and spurdog declined in 2021. However, there was also a larger range in the size of small sharks tagged and the average length remains relatively stable in comparison with previous years across both species. Tagging a wider range of shark sizes may provide the programme with more insight in the future about species longevity and geographical distribution. Table 2 shows the cumulative average length for all small shark species tagged across the study period, 2013 – 2019.

Table 2. The total average length (cm) of bull huss (n = 17), spurdog (n = 155) and tope (n = 191) tagged between 2013 – 2021.

Species	Length range (cm)		Average length (cm)	Standard deviation (±)
	Minimum	Maximum		
Bull huss	63.0	110.0	91.06	14.14
Spurdog	50.0	115.0	97.34	12.29
Tope	60.0	171.0	137.17	20.87

Conclusions and Recommendations

In total, 373 small sharks have been tagged since 2013. An additional 13 small sharks were tagged prior to the formal commencement of the Small Shark Tagging Project in 2013. Only two recaptures have occurred from other areas, one individual tope in 2018 and another tope in 2014 from Scotland. A greater occurrence of recaptures, and thus more substantial data, had been anticipated throughout the project. At present, little data has been obtained about the migration patterns of small sharks utilising Manx waters. Continued tagging and capture of previously tagged individuals (recaptures) are crucial to obtain useful information about the distribution and population structure of small sharks in Manx waters.

Based on the present data set, particular areas requiring greater protection (perhaps in the form of restrictions or reserve formation) are suggested. Therefore, it may be necessary to implement conservation activities that apply to Manx waters in their entirety, to conserve these threatened small shark species. Currently, there are three Marine Nature Reserves (MNRs) protecting the key hotspots where small sharks have been tagged: The Calf and Wart Bank MNR, Langness MNR and Little Ness MNR. However, these sites only cover up to the 3 nm boundary of Manx waters. Further protection is needed in the wider 3-12 nm zone around the Island to protect these areas from damaging marine developments and fishing. Protecting the

wider area of the Calf and Wart Bank MNR provides wider protection for this key area. Additionally, protecting the other key hotspot off Langness, within the 3-12 nm boundary, will further aid the conservation of small shark species.

The Manx Wildlife Trust is grateful for the support of this programme and is optimistic for future data collection.

References

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Appendices

Appendix 1. Tagging guidance crib sheet.

SSTP Floy Dart Tagging Guidelines



Floy dart tags are inserted using a sharp, clean canula.

1. Insert the tag into the canula (take a note of the tag number)
2. Insert the canula at an angle of 45° to a depth of around 35mm with the tag barb pointing upwards
3. Twist the canula at least 90° to anchor the tag
4. Remove the canula and give the tag a short tug to set the barb


Submit your data to Eleanor – eleanor@manxwt.org.uk or drop in at 7-8 Market Place, Peel, IM5 1XF or online at: www.tagsharks.com

These tagging guidelines are for floy darts and canulas **ONLY**.

SSTP minimum sizes are set to protect fish, if for any reason you are unsure about tagging please **do not tag the fish!**

SSTP Floy Dart Minimum Tagging Sizes	
Common Skate (wingspan)	55cm (5.3lb)
Tope	100cm (10.0lb)
Spurdog	90cm (6.4lb)
Smooth-hound	100cm (6.5lb)
Bull Huss	100cm (7lb)
Rays (wingspan)	50cm (5.25lb)

SSTP Micro-Tag Guidelines



Micro-tags are inserted using a tagging gun. When not in use we recommend that you use the needle guard to prevent injury!

1. Fit a strip of micro-tags into the tagging gun
2. Insert the needle at an angle of 45°
3. Push the trigger to insert a single tag into the fish
4. Remove the needle and give the tag a short tug to set the barb

Submit your data to Eleanor – eleanor@manxwt.org.uk or drop in at 7-8 Market Place, Peel, IM5 1XF or online at: www.tagsharks.com

These tagging guidelines are for tagging guns and micro-tags **ONLY**.

SSTP minimum sizes are set to protect fish, if for any reason you are unsure about tagging please **do not tag the fish!**

SSTP Micro-Tag Minimum Sizes	
Common Skate (wingspan)	Canula
Tope	65cm (2.8lb)
Spurdog	65cm (2.3lb)
Smooth-hound	70cm (2.2lb)
Bull Huss	65cm (2.5lb)
Rays (wingspan)	35cm (2.1lb)

Appendix 2. Record card.

Please send details to Eleanor by email: eleanor@manxwt.org.uk
Or drop in/post to: 7-8 Market Place, Peel, IM5 1XF

Name/s: _____


Email address: _____

Date: _____ Time start: _____ Time end: _____

Location (please circle): NE NW SW SE

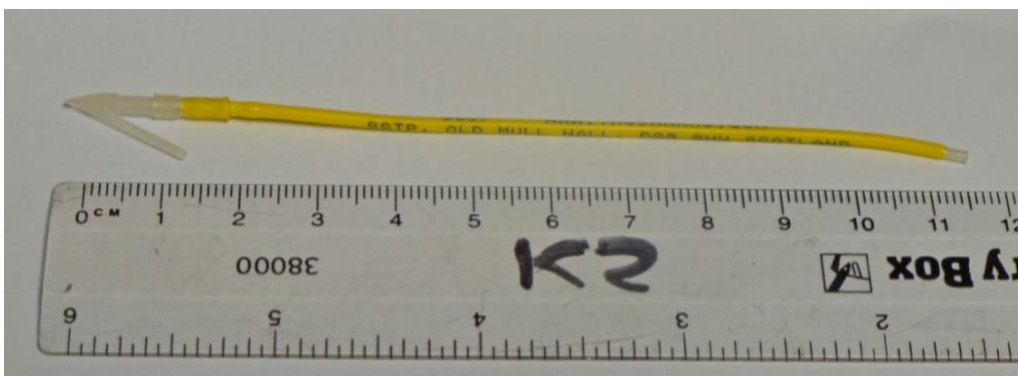
Lat/Long (this will NOT be made public): _____ N _____ W

In association with:



Tag No.	Species	Sex	Length (cm)	Girth (cm)	Condition

Appendix 3. Floy® streamer tag.



Appendix 4. The range and average length (cm) of tagged sharks between 2013 – 2021.

Table 1. The range and average length (cm) of tagged tope between 2013 – 2021.

Year	Length range (cm)		Average length (cm)	Standard deviation (±)
	Minimum	Maximum		
2013	110	156	141.71	12.32
2014	94	145	124.95	14.95
2015	80	153	122.00	24.10
2016	89	157	130.70	24.07
2017	99	168	142.38	14.51
2018	78	171	145.93	21.97
2019	110	167	148.10	17.88
2021	60	168	127.91	26.54

Table 2. The range and average length (cm) of tagged spurdog between 2013 – 2021. N.B: values for 2014 and 2015 have been omitted as only one individual was tagged in each of these years.

Year	Length range (cm)		Average length (cm)	Standard deviation (±)
	Minimum	Maximum		
2013	75	107	94.17	11.92
2014	100		-	-
2015	101		-	-
2016	101	108	104.00	3.16
2017	74.50	113	100.49	6.76
2018	98	110	104.93	3.67
2019	90	102	96.75	3.83
2021	50	115	84.48	19.02