

Scottish Sea Angling Conservation Network

Loch Etive, Argyll Nature Conservation MPA Proposal based on the
Priority Marine Feature Spurdog *Squalus acanthias*.





Executive Summary

The Scottish Sea Angling Conservation Network (SSACN) welcomes the opportunity to submit a 3rd party Nature Conservation Marine Protected Area as part of the Scottish MPA Project.

We propose the designation of a Nature Conservation MPA in Loch Etive, Argyll north-east of Oban. The MPA is part of a coherent ecological network of protected areas proposed by SSACN that runs northwards from the Sound of Jura, through the Firth of Lorn and Sound of Mull to Loch Sunart.

SSACN believe Loch Etive should be afforded MPA status on the basis of populations of critically endangered Spurdog that inhabit the area and a possible juvenile and nursery area.

Tagging data collected by the Scottish Shark Tagging Programme identifies Loch Etive as an extremely important area for Spurdog: with a recapture rate of ~38.5% in Loch Etive it is evident that Spurdog in this area displaying site fidelity. Recaptures occur throughout the entire year within the loch and there have been several captures near the mouth of the loch emphasizing the need for the spatial protection of ecological pathways to ensure that populations of endangered elasmobranchs do not become fragmented and areas isolated.

The Argyll area is widely regarded as one of Scotland's most valuable recreational sea angling destinations with many safe, easily accessible shore marks, boat launch sites and a number of charter boats. Each year over 250,000 angling days are spent in the region generating an estimated £22,500,000 for Argyll and Lochaber. Loch Etive has been identified as the fourth most popular shore site in Scotland, accounting for £1.5m, with the addition of £4.1m from boat angling in the loch.

Other recreational activities include SCUBA diving and sight-seeing, it is expected that such activities would also benefit from the designation of a Nature Conservation MPA.

Allowing recreational sea angling in protected areas has consistently been shown to generate sustainable income to rural areas and increase public support and acceptance of MPAs. In addition to the direct benefits of such a designation to both the local communities and native marine life a host of indirect benefits exist: indirect benefits include the overspill of commercially important species and preservation of genetic diversity in marine organisms.

Complex migratory life strategies like those seen in the Spurdog may require a combination of fisheries management (with statutory instruments) and spatial management (through the identification and designation of MPA's to protect the species and critical habitats). It has previously been supported that additional spatial protection such as MPA's can be beneficial to many mobile species such as Spurdog, particularly in cases where populations show a high degree of site fidelity.

SSACN believe it is essential for the protection of Scottish Spurdog populations that Loch Etive is considered for MPA designation and included in the MPA search locations.

Loch Etive, Argyll Nature Conservation MPA Proposal based on the Priority Marine Feature Spurdog *Squalus acanthias*.

1.1 Proposal

The Scottish Sea Angling Conservation Network welcomes the opportunity to submit a 3rd party marine protected area proposal and would like to propose the designation of a Nature Conservation MPA in Loch Etive, Argyll in order to protect critical habitats for vulnerable Spurdog *Squalus acanthias* populations. Any ecological corridors linking the population within Loch Etive should also be searched and suitably protected in order to ensure that populations do not become fragmented and the area does not become an isolated hotspot for Spurdog. This will allow sufficient migration to take place, ensuring the long term viability of this mobile species.

Data available from SSACN suggests there may be a resident population of Spurdog present within the Loch, with recaptures of tagged fish seen throughout the entire year despite the fact that Spurdog are considered a classic migratory species. This sea loch is also believed to be a pupping and nursery area for the species. Loch Etive may play an important part in a complex life strategy of Spurdog, which requires further research to conclude what determines site fidelity or when migration may take place.

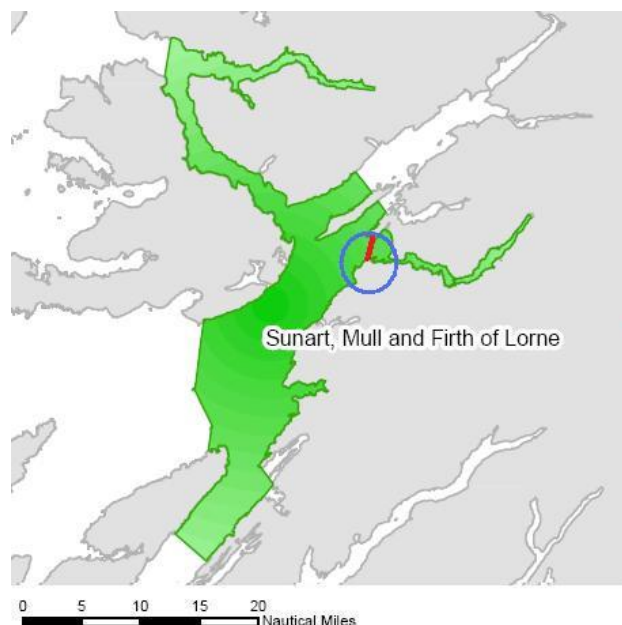


Figure 1: Nature Conservation MPA network proposed by SSACN based on priority marine feature (Spurdog *Squalus acanthias*). Boundary lines at the mouth of Loch Etive are marked in red.

2. Loch Etive

2.1 Site Description

Loch Etive is sea loch located in northern Argyll, approximately 6km north-east of Oban. From the narrow mouth at Ardmucknish Bay to the head of the loch at Glen Etive, the loch stretches for over



30km and provides a unique environment being one of Scotland's most brackish sea lochs. Loch Etive is already regarded as a spectacular hotspot for sea angling and other recreational activities.

2.2 Important Marine Feature

Spurdog are a slow growing shark species that was once extremely common around Scotland, as a result of commercial overfishing and the Spurdog's complex life history the population crashed.

Female spurdog may be 11-12 years old by the time they reach sexual maturity¹ and have the longest gestation period of any vertebrate at up to 24 months^{2, 3}. Females then give birth to a small litter of 2-16 pups⁴. This *k*-selected life history accounts for Spurdog having the lowest intrinsic rate of population increase (2.3–7% depending on stock) known in any marine fish⁵. This - coupled with a tendency to aggregate by sex and age - makes them particularly vulnerable to depletion either through targeted fisheries or as by-catch.

Spurdog populations in the north-east Atlantic have been depleted by up to 95% in some areas. The species is currently listed on the OSPAR list of threatened or declining features and "vulnerable" on the IUCN Red List⁶. Spurdog are listed by CITES as a species threatened unless strict controls are enforced on international trade. Site fidelity, pupping and a high number of juveniles within Loch Etive would make this species particularly suitable for spatial protection through the designation of a Nature Conservation MPA.

The Community Plan of Action (CPOA) for the conservation and management of sharks (2009) aims to ensure a greater understanding of sharks and their role in ecosystems and fisheries and identified an urgent need for improved data collection. The work of SSACN through the Scottish Shark Tagging Programme (SSTP) plays a vital role in the collection of this essential data for many species found in Scottish waters and it is likely that this research will assist the Scottish Government in achieving their international commitments to protect vulnerable shark species.

SSACN believe the data collected thus far indicates that spatial protection of Spurdog and critical habitat is required in addition to statutory instruments that may be put in place. This will allow the government to effectively manage and conserve this vulnerable shark species.

2.3 Pupping and Nursery Area

Loch Etive is believed to be an important pupping and nursery area for Spurdog; there is overwhelming anecdotal and photographic evidence of juveniles being captured and released by anglers throughout the entire year to support this theory, as shown in appendix I.

Females Spurdog are often captured having recently pupped, or in the late stages of gestation (noted by experienced anglers). Due to self imposed SSTP minimum size limits for tagging, many juvenile fish caught in Loch Etive are too small to tag with the plastic dart tags though the presence of undersized fish is now recorded by anglers and reported to the SSTP.

2.4 Residency

Historical literature suggests that the Spurdog pupping period is between November and January and that females generally migrate to pupping areas every two years to give birth⁷. Historical tagging programmes conducted off the west coast of Scotland and North Sea suggested that Spurdog have a winter migration northward to Norway from Scottish waters with a return migration in the summer months^{8, 9}. This has generally been accepted as a typical migratory behaviour of the

species¹⁰.

Data gathered by the SSTP suggests that Spurdog are present in Loch Etive throughout the year with a degree of residency based on the recapture of tagged fish. Previous research confirmed that during ground surveys of Loch Etive, Spurdog were captured in every trawl regardless of the time of year¹¹. At a sample site in Airds Bay Spurdog were present in 46 out of 50 hauls; at the upper loch station Spurdog were present in 14 out of 15 of the hauls¹¹. In contrast, a survey conducted in the Firth of Lorne, outside the mouth of Loch Etive, only reported Spurdog in samples taken between the months of October and January¹¹.

As part of an ongoing acoustic tagging project in Loch Etive carried out by SSACN and Scottish Natural Heritage a group of Spurdog inside Loch Etive were fitted with acoustic tags. Preliminary results have shown that only a single fish from the group passed by an acoustic gateway at the mouth of the Loch (unpublished, pers comm.). It should be noted that one receiver unit is still to be retrieved from the Loch.

To date, regular migration patterns previously associated with Spurdog¹² have not been observed in SSTP tag and recapture data, acoustic tagging projects or historical literature on Spurdog from the region. This information suggests that resident populations of Spurdog may exist in Loch Etive.

SSTP tag and recapture data suggests Spurdog are present within the loch, throughout the year as shown in figures 1 and 2. Although the majority of recaptures fall within Q4, this is in part due to the fact that SSACN and the SSTP run an annual “Tagathon Event” which attracts a large number of participating anglers to the region in November each year: fishing effort within this period tends to be greater and should be taken into account.

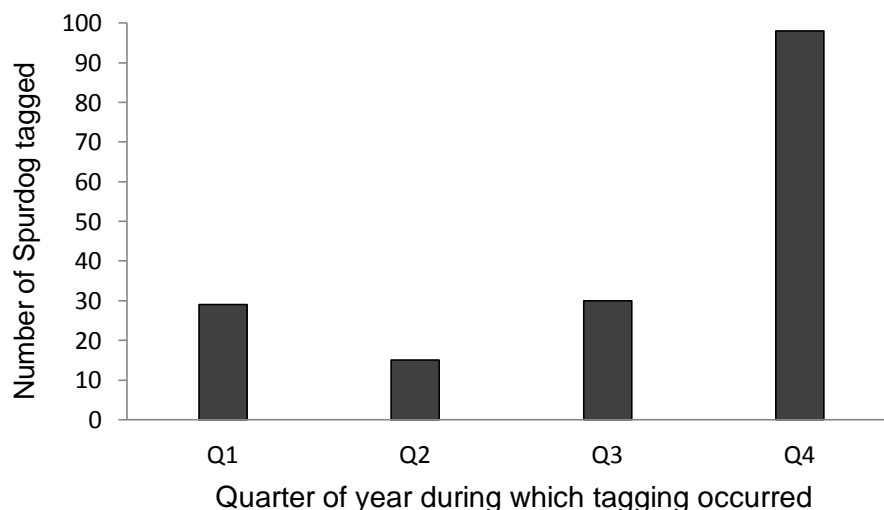


Figure 1: Number of Spurdog tagged in Loch Etive shown by time of year

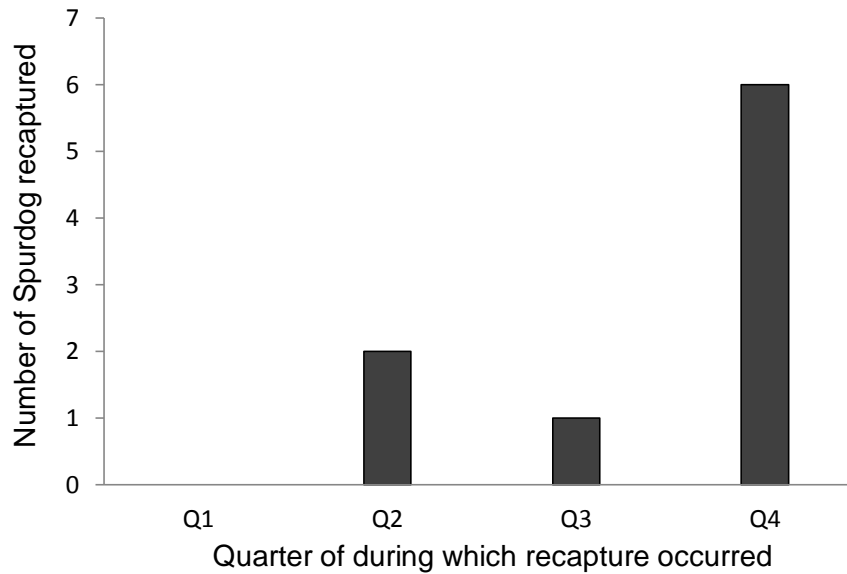


Figure 2: Number of Spurdog recaptured in Loch Etive shown by time of year

Over half of the recaptured Spurdog on the SSTEP database are caught in a different quarter of the year and range between 23 and 974 days at liberty between captures. The rate of recaptures of SSTEP tagged Spurdog in Loch Etive is 5.2% (173 tagged fish); outside of Loch Etive the recapture rate for SSTEP tagged Spurdog is only 0.8% (248 tagged fish). This value excludes recaptures of tagged Spurdog in Loch Sunart (recapture rate = 4.5%), Loch Sunart is also considered an important area for populations of Spurdog and is addressed in another Nature Conservation MPA proposal from SSACN. A full summary of SSTEP Spurdog tagging data can be found in appendix II.

Table 2.5.1: The nine recaptured Spurdog, *S.acanthius*, within Loch Etive, broken down by each quarter of the year (Q1-Q4) in which the initial tagging and the recapture took place.

Tag Number	Quarter Captured		Days at Liberty
	Initially Tagged	Recapture	
27987	Q1	Q2	104
27996	Q1	Q4	974
1809	Q2	Q4	227
1806	Q3	Q2	264
2004	Q3	Q3	75
27926	Q3	Q4	484
368	Q4	Q4	363
1542	Q4	Q4	23
6074	Q4	Q4	350
5935	-	Q1	-

3. Current Protection & Alternative Management Options

The recent protection order put forward by the Scottish Government to protect shark species in Scottish waters will include Spurdog¹³. However, such measures will not protect the species from



any direct or indirect impacts of other activities that are currently permitted within the Loch or that may be permitted in the future. Spatial protection to include habitats critical during key life stages of mobile species is required in order for slow growing species such as the Spurdog to regenerate¹⁴.

Further research into the population ecology of juvenile and adult Spurdog within Loch Etive, migratory life strategies and genetic mixing will determine the best combination of management options throughout Scotland and Europe. Nature Conservation MPA's are required in key regions such as Loch Etive where Spurdog are pupping and may be spending a large and vulnerable proportion of their life. This, alongside current tagging programmes, will facilitate future research at little or no cost.

4. Ongoing Activities in Loch Etive

4.1 Recreational Sea Angling

Loch Etive is a well known and extremely important destination for recreational sea anglers on the west coast of Scotland. Loch Etive provides a wide range of safe, sheltered fishing spots from both the boat and shore that are productive all year round attracting anglers from around the country.

Approximately 80% of angling takes place from the shore around Loch Etive, with angling from a boat (charter or private) accounting for the remaining 20%¹⁵. This year-round angling opportunity has allowed a constant feedback of anecdotal evidence, and in recent years tagging data, to be collected by anglers.

SSACN have been gathering data on Spurdog SSTP since 2009. Records, along with historical tagging data from the Glasgow Museum and UK Shark Tagging Programmes, are now held by SSACN in one master database. Further details on available tagging data can be provided and a summary of Spurdog tagging data can be found in appendix II of this document.

Charter boat tourism is an economically important sector in Argyll, with an estimated annual turnover of around £4.56 million from Campbeltown to Port Appin. Many charter vessels are used primarily for recreational sea angling: other activities include SCUBA diving, sightseeing and wildlife watching.

Many countries have already successfully implemented MPAs whilst allowing recreational sea angling as a means of generating income to rural areas and increasing public acceptance and support of MPA designations¹⁶.

4.2 Aquaculture

There are several aquaculture facilities present in Loch Etive. Based on the best available data, SSACN do not believe this has a negative effect on Spurdog pupping or the nursery habitat and therefore expect that these activities would continue should Loch Etive be designated a Nature Conservation MPA.

4.3 Creeling

Creeling is carried out throughout Loch Etive. Based on the best available evidence, SSACN do not believe this has a negative effect on Spurdog populations or their habitats and therefore SSACN expect that these activities would continue should Loch Etive be designated a Nature MPA.

4.4 Prawn Trawling

Currently, there is prawn trawling activity at mouth of the Loch, near Ardmucknish Bay. SSACN does not believe this occurs elsewhere within Loch Etive. It is expected that any future use of mobile fishing gear within Loch Etive would be required to be assessed against the conservation objectives of the MPA designation in order to protect this species and habitat.

4.5 Long lining

At the moment there are no long-liners active within Loch Etive. SSACN supports the Argyll & Bute Council's presumption against this returning to Loch Etive (Argyll & Bute Council, 2011). It is expected that any future use of long lining gear within Loch Etive would be required to be assessed against the conservation objectives of the MPA designation in order to protect this species and habitat.

4.6 Mobile fishing gear

There are no known fisheries within Loch Etive which employ mobile fishing gear. It is expected that any future use of mobile fishing gear within Loch Etive would be required to be assessed against the conservation objectives of the MPA designation, in order to protect this species and habitat.

5. Additional Research

A Nature Conservation MPA in Loch Etive would facilitate further research necessary to ensure the viability of Spurdog stocks. Continued collection of SSTEP data by anglers will help determine the migratory life strategy and to what extent Spurdog show site fidelity in Loch Etive. The knowledge on Spurdog life history characteristics would also increase, whilst spatially protecting pupping and juvenile Spurdog.

The SSTEP currently supplies essential data for two PhD projects (based at the University of Aberdeen) investigating the population dynamics of elasmobranchs in Scottish waters.

Research carried out in 2009 found that the Argyll and Lochaber region is one of the top areas for recreational sea angling in Scotland. Loch Etive was identified as the fourth most popular shore site in Scotland accounting for over 44,300 sea angling days per year¹⁵. This contributes to over 250,000 days spent annually by recreational sea anglers in the Argyll and Lochaber region with an estimated annual expenditure of over £22,500,000 - £4,1m of which can be attributed to boat angling and £1.5m to shore angling¹⁵.

The vast majority of recreational sea anglers (and all SSTEP volunteer taggers) fishing Loch Etive do so primarily on a voluntary catch-and-release basis. It is expected that not only would recreational sea angling be permitted should an MPA be designated, but that the socio-economic benefits to the area would increase through promotion of the sport, an increase in species abundance and diversity, and an increase in tourism. Recreational sea anglers volunteering with the SSTEP play a vital role in the collection of essential data through tagging and release of species such as Spurdog and can play a vital role in future research.

6. Implications of MPA status

SSACN believe that spatial management is required to ensure long term protection of the habitat

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and the species should the current legislations or management plans be revised. Any activity returning to the area would need to be assessed against the conservation objectives of the proposed MPA and managed in accordance.

It is likely that the MPA status of Loch Etive would be met with minimum opposition due to the low level of commercial activity in the Loch. The Loch could also be used as a least damaged/most natural site due to the current low levels of activities - particularly for the use of destructive mobile fishing gear - and could provide a key area for demonstration and research purposes as part of the wider Nature Conservation MPA network.

Based on the Scottish Governments report on the economic value of recreational sea angling (detailed above), it is thought that the area would generate a significant income if developed as recreational sea angling centre for Scotland. MPA status and the development of a sea angling centre for Scotland would benefit both elasmobranch species in Loch Etive and the local economy. In addition, there have been over 40 named species recorded within the Loch over the past 8 years which would benefit from the designation and contribute to the reputation of Loch Etive as one of Scotland's premier recreational sea angling destinations.

7. Conclusion

Spatial management measures are required in order to protect and allow regeneration of Spurdog in Scotland and throughout Europe. Loch Etive is believed to be a critical habitat for Spurdog reproduction and development and it has previously been shown that spatial protection in the form of MPAs can be extremely beneficial to mobile species.^{14, 17} Juvenile Spurdog are also believed to spend a large proportion of their immature life stages within the Loch and mature adults have been shown a degree of site fidelity in SSTP tagging data.

Complex migratory life strategies of Spurdog may not conform to previous findings¹⁰ and may require a combination of fisheries management (with statutory instruments) and spatial management (through the identification and designation of MPA's to protect the species and critical habitat).

Recreational sea angling has a very low impact and generates sustainable income to rural areas of Scotland whilst providing a low cost method of gathering valuable data through the SSTP. The vast majority of recreational sea anglers already target elasmobranchs in Scotland on a voluntary catch-and-release basis. Promotion of recreational sea angling in Loch Etive would increase local support and acceptance of the MPA designation in addition to the socio-economic benefits of attracting visiting anglers to the region.

The value of this data collected by SSTP volunteers is already apparent and should continue to enhance the research, with MPA status in the area. SSACN believe it is essential for the protection of this species, both within Scottish and European waters, that Loch Etive is considered for MPA designation and included in the MPA search areas.



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Appendix

Annex I – Juvenile Spurdog in Loch Etive

Various sizes of juvenile Spurdog are captured within the loch. Figures 3 a-c show a small sample of photographic evidence that SSTP anglers are beginning to record.



Figure 3a: Juvenile Spurdog captured in Loch Etive by Peter Hutchison on 20th March 2011. Juvenile is slightly longer than a sheet of A4 paper (30cm). Picture courtesy of Gordon Goldie



Figure 3b: Juvenile Spurdog captured by Gordon Goldie in Loch Etive, 15th February 2009. Picture courtesy of Gordon Goldie



Figure 3c: Juvenile Spurdog captured by Peter Hutchison in Loch Etive, 15th February 2009. Picture courtesy of Gordon Goldie

Appendix II: Summary of SSTEP Spurdog Tagging Information

Summary of Spurdog Recaptures (Correct as of 30th Dec 2011)

Full data set	Numbers	Recapture Rate
Total Captures	733	
Recaptures	24	3.40%
Tagged fish	709	
Etive Summary	Numbers	Recapture Rate
Total Captures	182	
Recaptures	9	5.20%
Tagged fish	173	
Sunart Summary	Numbers	Recapture Rate
Total Captures	301	
Recaptures	13	4.50%
Tagged fish	288	
Etive & Sunart Summary	Numbers	Recapture Rate
Total Captures	483	
Recaptures	22	4.80%
Tagged fish	461	
Full Data Set Excluding Sunart & Etive	Numbers	Recapture Rate
Total Captures	250	
Recaptures	2	0.80%
Tagged fish	248	
Percentage of recaptures to Area	Numbers	% of Total Recaptures on Database
Total Recaptures	24	
Recaptures from Loch Etive & Sunart	22	91.67%
Recaptures from Loch Etive	9	37.50%
Recaptures from Loch Sunart	13	54.17%