



Madrid, le 8 janvier 2025

CIRCULAIRE ICCAT n° 00102 / 2025

OBJET : APPEL D'OFFRES - POURSUITE DES ÉTUDES SUR LA CROISSANCE, LA REPRODUCTION ET LA GÉNÉTIQUE DE L'ESPADON : COLLECTE ET ANALYSE D'ÉCHANTILLONS BIOLOGIQUES - PHASE N°7

J'ai le plaisir de vous faire parvenir ci-joint les Termes de référence concernant la poursuite des études sur la croissance, la reproduction et la génétique de l'espadon : collecte et analyse d'échantillons biologiques - phase n°7.

Je vous serais reconnaissant de bien vouloir distribuer cet appel d'offres aux personnes et institutions qualifiées susceptibles d'être intéressées.

En conséquence, l'ICCAT sollicite une nouvelle offre pour procéder à ce travail, à élaborer conformément aux Termes de référence ci-joints. L'offre détaillée devra être soumise à **l'attention exclusive** du Secrétaire exécutif de l'ICCAT, [M. Camille Jean Pierre Manel](#), en ajoutant [Mme Stasa Tensek](#) en copie, avant le **29 janvier 2025**.

Pour de plus amples informations concernant cet appel d'offres, veuillez prendre contact avec le [Dr Miguel Neves dos Santos](#) au Secrétariat de l'ICCAT.

Je vous prie d'agréer l'expression de ma parfaite considération.

Secrétaire exécutif



Camille Jean Pierre Manel

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– **Parties, Entités ou Entités de pêche coopérantes**

Pièce jointe : Termes de référence de l'appel d'offres (en anglais uniquement).



Terms of reference

Continuation of the swordfish growth, reproduction and genetics studies: Biological samples collection and analysis – Phase 7

1. Background and objectives

As approved by the SCRS in 2017, the Swordfish Species Group initiated in 2018 a biological sample collection programme to collect biological data for swordfish (SWO), which has now been integrated into the Swordfish Year Programme (SWOYP). It aims to improve the knowledge of stock distribution, age and sex of the catch, growth rate, age at maturation, maturation rate, spawning season and location and diet, and thereby contribute to the next major advance in the assessment of swordfish status, by permitting the development of more spatially and biologically realistic population models used in both Atlantic and Mediterranean populations assessments and within the ICCAT Management Strategy Evaluation (MSE) for North Atlantic swordfish. This should translate into more reliable advice on stock status for an internationally and collectively managed resource. The Swordfish Species Group has identified this work to be of very high priority and will address critical deficiencies in our understanding of the population dynamics and ecology of swordfish.

The objectives of this Swordfish Species Group project are to:

1. Resolve the spatial-temporal distribution of the three known swordfish stocks found within the Atlantic Ocean and Mediterranean Sea using a genetic analysis of tissue sampled from the catch of participating CPCs.
2. Resolve the age and size at maturity of the three known swordfish stocks found within the Atlantic Ocean and Mediterranean Sea using samples/measurements provided by participating CPCs.
3. Characterize the age composition of the catch and validate the growth curves for each swordfish stock.
4. Determine the spawning period and areas of each stock taking into account existing literature.
5. Develop a protocol/template based on genetic analysis that will allow for the assignment of tissue samples to a particular stock.
6. Develop a biological database that links the sample information to the age, stock origin, sex, size, diet and maturity data of each fish.
7. Update the ICCAT Manual with new pertinent information.
8. Address spatial-temporal gaps by age/size class in existing sampling.

This work will be closely linked to the sampling programmes of CPCs that support the goals and objectives of ICCAT and the Swordfish Species Group. The points of contact for participants of this programme are the Swordfish Species Group Rapporteurs for the Atlantic and Mediterranean stocks, with contributions from the Swordfish Species Group members, the SCRS Chair, as well as the ICCAT Secretariat.

As part of this biological study, scientific institutes and public or private entities are asked to submit tenders to continue the work started in 2018. In particular, the work to be developed includes provision of biological data, collection of samples and performance of samples processing and data analysis, as described below. Submission of a single offer by a consortium of Scientific Institutes/Universities covering all areas would be highly preferable. All the data collected under the research programme will be used for scientific purposes only and in accordance with ICCAT rules. Any other use of these data should be specifically authorized by ICCAT. Samples will be collected and appropriately balanced from the geographical areas/fleets with the highest swordfish catches. For reference, see **Figure 1** and **Table 1** and **Appendix 1**.



2. Contractor tasks

The main objective of the project is to determine the spatial-temporal distribution including stock boundaries and mixing, age composition, maturity schedule and age at maturity of Atlantic and Mediterranean swordfish. Swordfish are landed in a broad range of ports bordering the Atlantic Ocean and Mediterranean Sea, and over a fishing season that spans the entire year. A further complication is that the species is sexually dimorphic based on size and potentially exhibit sex based spatial segregation.

The Contractor shall ensure that biological samples from this heterogeneous population will be made available according to the sampling design established by the Swordfish Species Group which will ensure that the fishery is covered on a proportionate basis by sex, age, size, season and area.

It must be noted that for biological sampling and analysis, small-scale and short-term sampling is considered of little use for meeting the project objectives. As such tenders should be made on a **regional and collaborative basis**.

It is expected that the Contractor will use trained field technicians to obtain the necessary biological samples (fish length, weight, assess maturity (and optionally, collect gonads), assess sex, collect fin or muscle tissue, anal fin spine (and optionally, otolith), record sample metadata) on every fish sampled if possible. In recognition of the difficulty in collecting stomach samples, the sample will be considered complete if that component is missing. In addition, for samples collected in ports not all sample components may be available; and will be considered to be partially complete.

The Contractor must ensure that all sample information is properly cross referenced, Quality Assured and Quality Controlled (QA/QC) and stored in a relational database. Uniquely identified tissue samples and anal fin spines must be sent to an entity to be determined by the Swordfish Species Group. Otoliths will also be collected and processed, mostly for comparative purposes and calibration with ages estimated from spines. Protocols used during the sampling must be developed based on current best practices and, in the case of tissue and anal fin spines, not interfere with further processing or cause degradation of the samples. Replicate tissue samples are required. These protocols must be approved by the Swordfish Species Group Rapporteur before any collection starts.

The Swordfish Species Group has identified priority areas where additional sampling is required. The Contractor shall adhere to the following protocol for collection of samples, using the existing sampling database as a reference to ensure that compensation is only being provided for samples obtained from locations, size classes, and sexes that are currently unsampled or under-sampled. To ensure samples are obtained from both temperate and tropical areas in the Atlantic, the North and South Atlantic stock areas have each been divided into 4 quadrants. To balance East and West portions of the Mediterranean, this stock area has been divided in two (East and West - at 20°E). Each project area (ageing & growth, reproduction, genetics) has different sampling gaps given the differing sample types that have been collected over the first 6 phases of SWOYP and the different sample priorities. These gaps and priorities are detailed by quadrant in **Appendix 1**. Given the scope of the gaps and the availability of samplers, it is not expected that all of the sample gaps will be addressed by this project phase. The Contractor shall stay in close contact with project collaborators to ensure that samples that are submitted for compensation fit within the priorities listed below. It is expected that sampling will continue until the sample budget allocation is exhausted. Institutes (or individuals) collecting samples should be strongly encouraged to collect full samples (i.e. fin spine, otolith, tissue, and for female fish, a section of gonad), and fish of a variety of sizes within each size bin.

The Contractor shall work to fill sampling gaps described in detail in **Appendix 1**.



3. Deliverables

1. **SCRS documents and/or power point presentations** to be submitted by **12 September 2025** and presented at 2025 Swordfish Species Group annual meeting (September 2025) regarding the:
 - a) Distribution of the collected samples by area, season, and sex will be made to the SCRS;
 - b) Any updates on the protocols for sampling, aging and assignment of maturity stage;
 - c) Report on the level of completion of sample collection and processing;
 - d) Report of final results already available;
 - e) Labelled anal spines, otoliths and tissue samples to be shipped according to the established protocols;
 - f) A relational database containing the sample data that has undergone thorough QA/QC is to be provided. This database will reside at the ICCAT Secretariat and will be made available for distribution upon request;
 - g) Shipping and processing of samples determined to be analyzed by the selected laboratories.

2. **A draft final report** to be submitted by **12 December 2025** at the latest, in the form of an SCRS document, which will shall include:
 - a) Executive summary;
 - b) Full description of the work carried out;
 - c) Description of final results;
 - d) Proposals of further activities to be developed for achieving the objectives of the project.

3. **The final report:** The Swordfish Species Group Rapporteurs and the SCRS Chair, in consultation with the ICCAT Secretariat, will review and will provide comments and communicate any necessary revisions to Deliverable #2 (if applicable) to the Contractor and/or inform of approval within 5 days of the submission(s). The Contractor shall submit the revised final documents (if changes are requested) by **31 December 2025** at the latest.

4. Payment details

Disbursement will be made according to the following schedule:

- 40% of the total amount of the contract upon **signing the contract** and after receiving a regular invoice, which may be submitted at the latest **30 days after the signature** of the contract;
- 30% of the total amount of the contract upon the provision of the SCRS documents and/or power point presentations (**Deliverable #1**) and after receiving a regular invoice;
- 20% of the total amount of the contract upon the provision of the draft final report (**Deliverable #2**) and after receiving a regular invoice;
- 10% of the total amount of the contract, after approval of the final report (**Deliverable #3**), and after receiving a regular invoice.



5. Submission of proposals

The proposals should be developed according to the Terms of reference herein attached. The detailed offer(s) shall be submitted **only to the attention of Mr Camille Jean Pierre Manel** (camille.manel@iccat.int), the Executive Secretary of ICCAT, and Cc'ing Ms. Stasa Tensek (stasa.tensek@iccat.int), by **29 January 2025 (18:00, Madrid time)**, including:

- a) A detailed offer shall include: i) the detailed description of the activities to be carried out; and ii) detailed (breakdown) budget, including unitary costs for the collected samples.
- b) The *curriculum vitae* of the tenderer (in case of individual scientists) and of any collaborator (sub-contractor).
- c) The *curriculum vitae* of the institution (if an institution is the service provider), with any documented experience in reproductive studies.
- d) The name, address, and telephone number of the tendering person/entity.
- e) The institutional and administrative background of the tendering person/body (e.g. statutes, type of institution, annual budget, budget control procedures, etc. (if applicable)).
- f) A list of any relevant subcontracting activities.
- g) The declaration that the offering person/entity shall follow the ICCAT procedures and formats for data to be provided.
- h) A declaration that all the comments eventually made will be incorporated prior to submission to the ICCAT Secretariat of the final report (if applicable).
- i) Acknowledgment of this Call for tenders (if applicable).
- j) A statement specifying the extent of agreement with all terms, conditions and provisions included in the attached Terms of reference.

For further information concerning this Call for tenders, please contact the ICCAT Secretariat at the following address: miguel.santos@iccat.int.

6. Selection of proposals

The ICCAT Secretariat will carry out a review of the offer(s). Following the review process, the ICCAT Executive Secretary will notify the entity selected for the contract as soon as the selection process is completed. A contract will be awarded on the basis of competitive tendering and the evaluation of proposals will be undertaken objectively, consistently and without bias towards particular suppliers. Proposal(s) will be evaluated against a pre-determined set of criteria, which include: (i) cost; (ii) proven track record; (iii) technical merit based on work plan; and (iv) flexibility to future changes to requirements.

7. Logistics

All documents provided by the Contractor must be in open format ODF 1.2 ([click here](#)) such as MS word or "*.odf" of Apache OpenOffice and LibreOffice, tables must be in Excel format or compatible, figures and pictures must be in JPEG or TIFF format or compatible. All documents submitted must be provided in English.

Data must be provided in the standard ICCAT format for statistics. The biological data must be submitted in a format to be defined by the ICCAT Secretariat.



8. Copyright

All the material produced by the Contractor will remain the property of ICCAT, will be kept confidential, and cannot, in any case, be circulated by the Contractor selected. The scientific use of the data by the Contractor shall always be notified to ICCAT in advance for clearance.

For information concerning this Call for tenders, please contact the ICCAT Secretariat at the following address: miguel.santos@iccat.int



Table 1. Continued.

Species	Stock	Status	FlagName	GearGrpDset	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
SWO	ATS	CP	EU-España	LL t1	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073	5183	5801	4700	4852	4184	4113	5059	4992	4654	4404	4224	4442	4470	3592	4092		
SWO	ATS	CP	EU-España	LL t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	
SWO	ATS	CP	Brazil	LL t1	1571	1970	1892	4100	3844	4721	4579	4075	2903	2917	2984	3780	4430	4243	3413	3386	2926	2984	2831	2361	2892	2594	2935	2406	2792	2859	2105	2823	2196	1719		
SWO	ATS	CP	Brazil	LL t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	a	a	a	a	a	a	a	a	
SWO	ATS	CP	Japan	LL t1	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2155	1600	1340	1314	1233	1162	684	976	659	637	915	640	648	552	480	631	490		
SWO	ATS	CP	Japan	LL t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	
SWO	ATS	NCC	Chinese Taipei	LL t1	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410	428	496	582	451	554	480	527	472	395	353	532	420	379		
SWO	ATS	NCC	Chinese Taipei	LL t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	
SWO	ATS	CP	Namibia	LL t1	22					374	452	607	504	187	549	832	1118	1038	518	25	408	366	22	129	395	225	466	600	881	811	774	623	1100	664		
SWO	ATS	CP	Namibia	LL t2	a					a	a	ab	a	a	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	a	a	a	a	a	a	a	a	a	a		
SWO	ATS	CP	Uruguay	LL t1	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370	501	222	179	40	103												
SWO	ATS	CP	Uruguay	LL t2	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	
SWO	ATS	CP	EU-Portugal	LL t1	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263	184	125	252	236	250	466	369	323	335	224	210	360			
SWO	ATS	CP	EU-Portugal	LL t2	a	a	a	ab	ab	ab	ab	ab	ab	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	
SWO	ATS	CP	China PR	LL t1				29	534	344	200	423	353	278	91	300	473	470	291	296	248	316	196	206	328	222	302	355	211	89	37	188	109			
SWO	ATS	CP	China PR	LL t2				a	a	a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	
SWO	ATS	CP	South Africa	LL t1		1			240	143	327	547	649	293	295	199	186	207	142	170	145	97	50	171	152	218	164	189	189	251	149	179	161	291		
SWO	ATS	CP	South Africa	LL t2					ab	ab	ab	ac	abc	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	
SWO	ATS	CP	Ghana	GN t1	51	103	140	44	106	121	117	531	372	734	343	55	32	65	177	132	116	60	54	37	26	56	36	55	6	32	31	19	16	21		
SWO	ATS	CP	Ghana	GN t2	a	a	ab	b	ab	b	ab	ab	ab	ab	ab	ab	a	ab	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	
SWO	ATS	CP	S Tomé e Príncipe	TR t1	190	178	166	148	135	129	120	120	120	120	126	147	138	138	172	188	193	60	84	60	94	145	77	65								
SWO	ATS	CP	S Tomé e Príncipe	TR t2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
SWO	ATS	CP	Belize	LL t1	1					17	8																									
SWO	ATS	CP	Belize	LL t2	a					a	a																									
SWO	ATS	CP	Senegal	LL t1																																
SWO	ATS	CP	Senegal	LL t2																																
SWO	ATS	CP	Korea Rep	LL t1	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223	10	147	70	65	47	53	5	19	11	18	9	15	6	6	5		
SWO	ATS	CP	Korea Rep	LL t2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	
SWO	ATS	CP	USA	LL t1																																
SWO	ATS	CP	USA	LL t2																																
SWO	ATS	NCO	Cuba	LL t1	452	778	60	60																												
SWO	ATS	NCO	Cuba	LL t2	1	1	1	1																												



COMISION INTERNACIONAL PARA LA
CONSERVACION DEL ATUN ATLANTICO

Species	Stock	Status	FlagName	GearGrpDset	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
SWO	MED	CP	EU-Italy	LL t1	3844	3035	2617	2458	2458	2680	2639	2236	1841	5844	5452	5560	5253	4564	5246	5438	5919	5313	4474	3304	3921	4883	4540	3882	2289	2461	2231	1998	2038	2297		
SWO	MED	CP	EU-Italy	LL t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	b	ab	ab	b	bc	abc	abc	abc	abc	abc	abc	abc	abc	bc	ac	abc	abc	abc	abc	abc		
SWO	MED	CP	EU-España	LL t1	1402	1351	1040	1184	1409	867	1396	1402	1421	1165	930	860	1405	1648	2063	1994	1785	1730	1580	1605	2019	2289	1732	1487	1470	1548	1425	1557	1542	1442		
SWO	MED	CP	EU-España	LL t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	
SWO	MED	CP	EU-Italy	GN t1	3921	4264	2657	3632	3632	3632	4863	4152	1698	2540	1483	1891	2373	1948																		
SWO	MED	CP	EU-Italy	GN t2	ab	b	b	b	b	b	b	b	-1	b	b	b	b	-1																		
SWO	MED	CP	EU-Greece	LL t1	2520	974	1237	750	1650	1520	1960	1730	1680	1230	1129	1424	1374	1907	989	1132	1494	1306	877	1731	1344	761	761	392	350	745	657	686	371	444		
SWO	MED	CP	EU-Greece	LL t2	ab	ab	-1	-1	ab	ab	ab	ab	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	
SWO	MED	CP	Maroc	GN t1	2109	1518	2461	4653	2905	2979	2503	2266	2230	1629	1299	722	603	615	587	477	410	387														
SWO	MED	CP	Maroc	GN t2	b	-1	-1	-1	c	bc	abc	abc	b	b	b	b	b	b	abc	-1	abc	abc														
SWO	MED	CP	Maroc	LL t1	527	169	273	245	323	259	205	754	1149	1670	1954	1801	1455	1107	1713	1388	1501	800	1003	963	968	604	1395	1350	1368	982	951	924	891	896		
SWO	MED	CP	Maroc	LL t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	bc	abc	abc	abc	abc	abc	abc	ab	bc	abc	abc	
SWO	MED	CP	Tunisie	LL t1	298	378	352	346	414	468	483	567	1138	285	791	791	949	1024	1232	1233	1238	1267	1265	1262	1302	1307	1273	1377	1338	994	918	891	857	733		
SWO	MED	CP	Tunisie	LL t2	-1	-1	-1	-1	-1	a	a	a	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
SWO	MED	CP	Algerie	LL t1	185	247	247	247	178	126	166	439	347	238	174	93	496	492	977	570	560	234	433	467	693	705	842	755	725	517	501	446	472	472		
SWO	MED	CP	Algerie	LL t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	a	a	-1	-1	-1	ab	ab	ab	ab	-1	-1	-1	ab	a	ab	b	ab	
SWO	MED	CP	EU-Malta	LL t1	47	72	72	100	153	187	175	102	257	163	195	362	239	213	260	266	423	532	503	460	376	489	410	330	308	407	361	391	380	360		
SWO	MED	CP	EU-Malta	LL t2	-1	-1	-1	-1	-1	ac	ac	ac	-1	-1	-1	abc	bc	ab	abc	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab		
SWO	MED	CP	Algerie	GN t1	415	560	560	560	590	531	599	642	467	427	233	311	87	108																		
SWO	MED	CP	Algerie	GN t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
SWO	MED	CP	Türkiye	LL t1									70	76	69	84	73	71		441	344	382	217	76	111	71	45	90	556	544	386	376	357	306	344	
SWO	MED	CP	Türkiye	LL t2									-1	-1	-1	-1	-1	-1	-1	a	a	a	ab	ab	a											
SWO	MED	CP	Türkiye	GN t1	533	306	320	350	450	230	370	360	300	274	317	341	337	352																		
SWO	MED	CP	Türkiye	GN t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	ab	ab	ab	ac	c												
SWO	MED	CP	EU-Italy	UN t1																329	921	694	718													
SWO	MED	CP	EU-Italy	UN t2																-1	-1	-1	-1													
SWO	MED	CP	Libya	LL t1					11			8	6		10	2		16									585	960	30	70	26		22	19	21	13
SWO	MED	CP	Libya	LL t2					-1			a	a		-1	-1		-1									-1	-1	-1	-1	-1	-1	-1	-1	-1	
SWO	MED	CP	EU-Cyprus	LL t1	159	89	40	51	61	92	82	135	104	47	49	53	43	67	67	38	31	35	35	51	59	54	53	50	45	24	30	56	36	58		
SWO	MED	CP	EU-Cyprus	LL t2	a	a	a	a	a	-1	a	a	a	a	a	a	ab	abc	abc	abc	abc	abc	abc	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc
SWO	MED	CP	EU-France	LL t1								12	27	20	19	22	20	14	14	10	73	39	10	58	119	178	172	108	83	69	104	91	60	64		
SWO	MED	CP	EU-France	LL t2																						a	b	-1	-1	b	-1	-1	-1	-1	abc	a

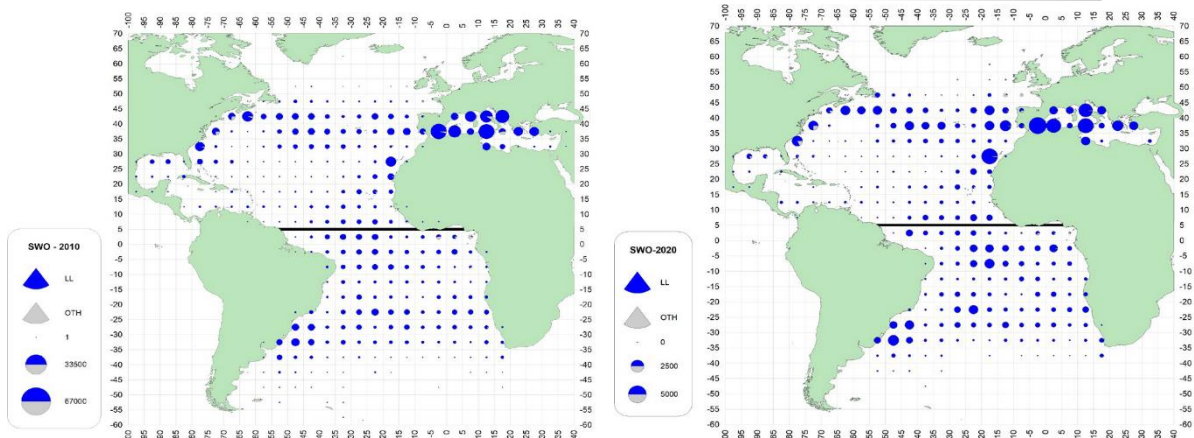


Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown for the 2010-2019 (left) and 2020-2021 (right) periods (SWO Executive Summary in the [Report for biennial period 2024-25, Part I \(2024\), Vol. 2](#)).

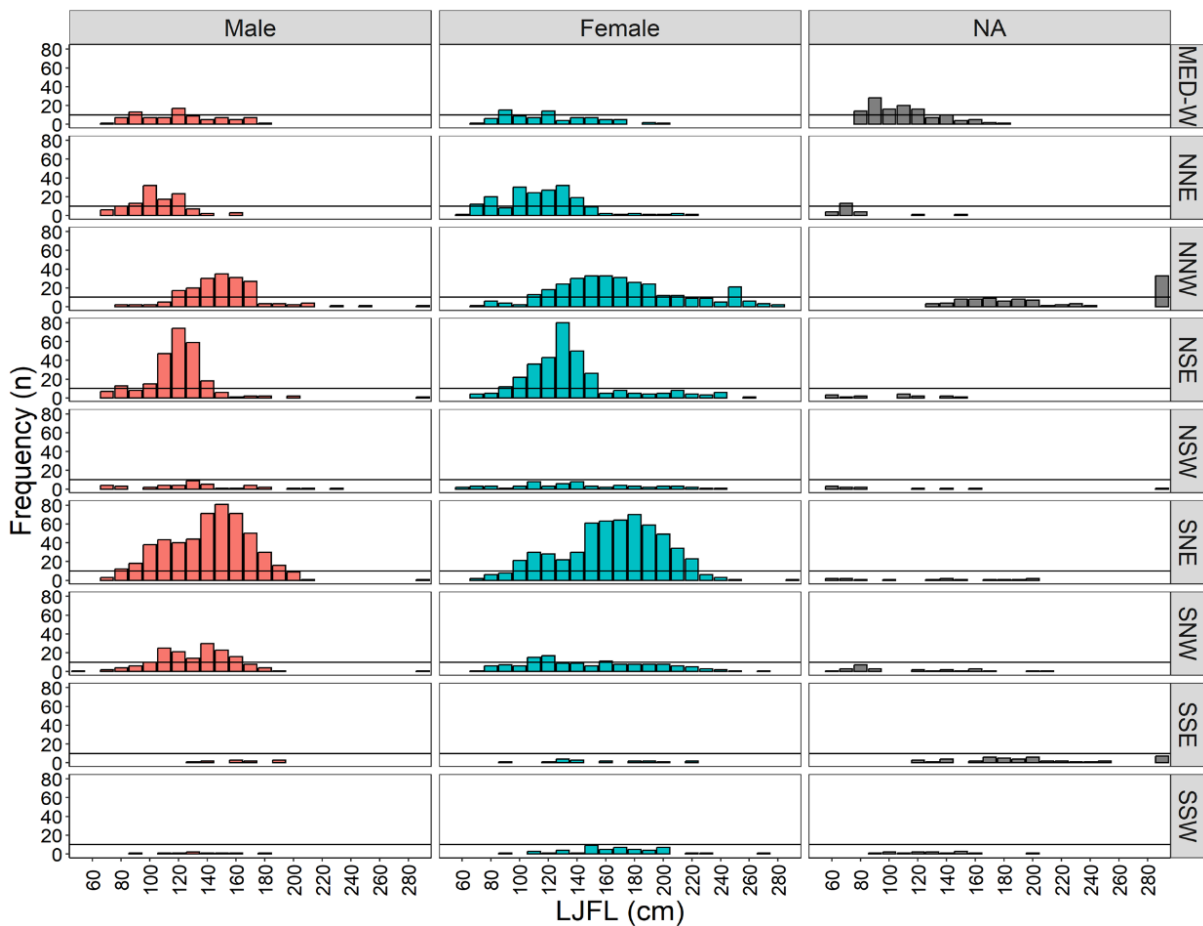


Figure 2. Histograms of sampled spines with a N=10 horizontal line for the ocean zones. The horizontal lines represent the minimum sampling goal for the ageing and growth component of this programme.

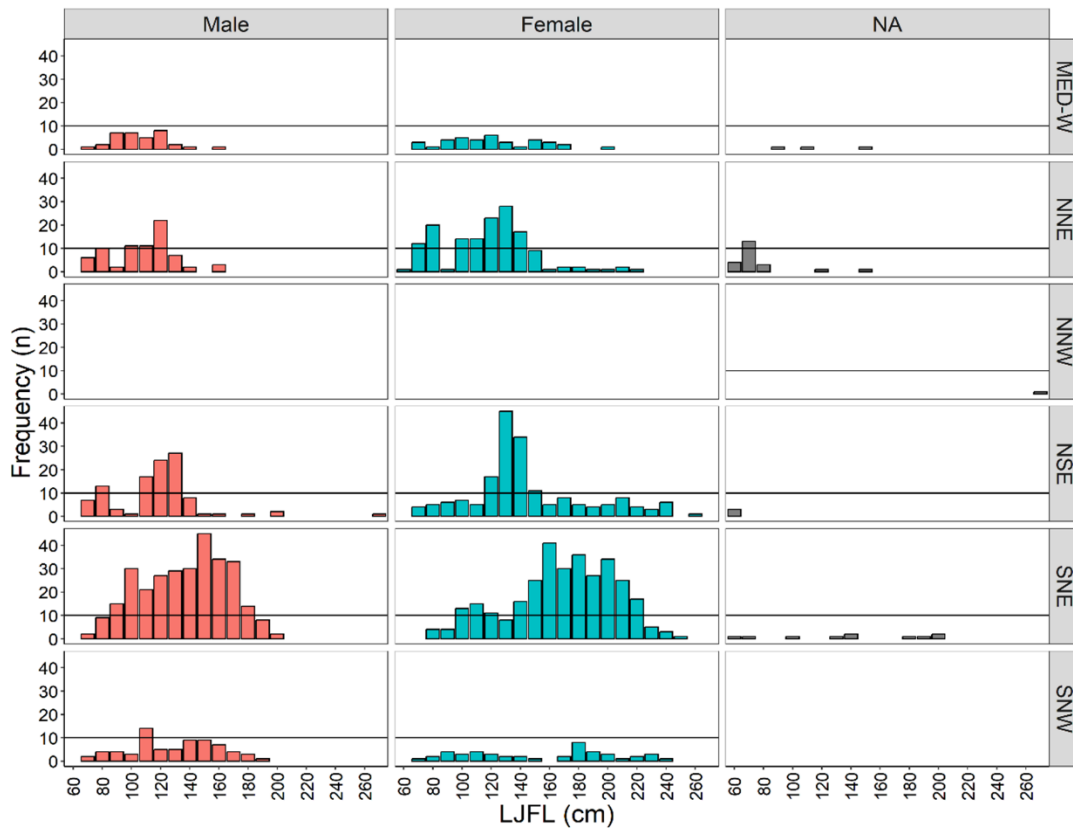


Figure 3. Histograms of sampled otoliths with a N=10 horizontal line for the ocean zones. The horizontal lines represent the minimum sampling goal for the ageing and growth component of this programme.



Sampling gaps

Swordfish growth, reproduction and genetics studies: Biological samples collection and analysis sampling coverage summary

Description

This document and the figures contained in it describe the sampling coverage for the swordfish biology research programme (the Swordfish Year Programme – SWOYP) as of July 2024. Since 2018, the ICCAT Swordfish Species Group has undertaken efforts to increase the sampling coverage for Atlantic and Mediterranean swordfish (SWO; *Xiphias gladius*) tissues to improve understanding of the growth rates, age at maturity, spawning, stock mixing dynamics and diet of the species in the Atlantic Ocean. In the Terms of reference (ToRs) for the continuation of the biological sampling programme for SWO (Phase 6), multiple goals were outlined for improving sample coverage for the research areas of ageing and growth, genetics, and reproduction. This document summarizes the sample coverage as supported by the SWO biological sampling database relative to the sampling priorities outlined in the ToRs for Phase 7. Recommendations are made for bringing the sampling coverage closer to that which is outlined for each of the three priority research areas.

Methodology

The sampling coverage summary figures were generated by assigning each sample in the database to a particular sampling area as described in the ToRs priorities, split up by quadrants in both the North and South Atlantic, and by separating the Mediterranean Sea into East and West areas. This generated 10 priority sampling areas, which differ from the ICCAT billfish sampling area. This was done to achieve the specific objectives identified by the Swordfish Species Group. All samples, regardless of sample type, were visualized on area-specific maps for each of the 10 areas.

For ageing and growth, spine and otolith counts were plotted separately for both males and females, and binned by 10 cm increments. Lengths were all converted to lower jaw fork length (LJFL) using SCRS-adopted methods (Coelho *et al.*, 2022; Rey and González-Garcés, 1978). In absence of length, weights were converted to LJFL using SCRS-adopted conversions. The goal for ageing and growth is to achieve sampling coverage of 10 fish for each sex for each 10 cm length increment for the 10 sampling areas.

For genetics, tissue sample counts were plotted relative to 10 cm length increments to visually compare coverage between areas. Separate plots and count tables were generated to evaluate the achievement of temporally and spatially-specific goals that are outlined in the TosR. Such goals include:

- Collecting 35 tissue samples from the first quarter of the year (January – March) in the two quadrants in the South Atlantic (SNW and SSW);
- Collecting 45 – 50 tissue samples from the south-west quadrant of the North Atlantic (NSW) from each quarter of the year;
- Collecting 35 tissue samples from the eastern Mediterranean (MED-E) from November through May;
- Collecting 20 tissue samples from 200 km on either side of the Strait of Gibraltar (50 total);
- 10 new samples from each stock (North Atlantic, South Atlantic, and Mediterranean) from a broad range of size classes to support epigenetic ageing.

For reproduction, only coverage for female gonads was assessed. Due to relatively low sample sizes, lengths were binned by 50 cm increments (e.g. lengths between 100 – 150 cm correspond to length increment 150 cm). Bar plots showing female gonad sample counts for each 50 cm increment were visually assessed.



To determine which CPCs are best-suited to addressing the gaps in the sampling coverage, landings data from 2017 – 2021 were aggregated and catch was assigned to each of the 10 sampling areas. Mean annual catch was then ranked and the top 5 CPCs for each sampling area were identified.

Sampling coverage

There are currently tissues available for all 10 sampling areas, however the coverage across all sample types varies greatly by sampling area. In terms of ageing and growth, coverage for spines is better than coverage for otoliths, likely owing to greater ease of collection for spines. There are spine samples available for every sampling area, with the exception of the Mediterranean-East (MED-E). Only half of the sampling areas have significant coverage of otoliths, with < 10 otolith samples for each of the other half of the sampling areas (**Table 1**). As specified in the ToRs, priority should be placed on collecting spines and otoliths for large SWO > 180 cm LJFL.

Samples in support of genetic analysis are available for all 10 areas, with the best representation for the South Atlantic – North East (SNE) sampling area. There are area-specific requirements designed to aid in stock delineation that are noted in the area-specific coverage descriptions below.

Samples in support of reproduction and maturity analysis are the least comprehensive of the three research areas outlined here, with samples available for 6 out of 10 sampling areas (**Table 1**).

Table 1. Summary counts for Atlantic swordfish (*Xiphias gladius*) tissues collected by the biological sampling program as of July 2024.

Sample area	Tissue count	Spine count	Otolith count	Female gonad count
NNW	248	603	1	51
NNE	464	328	245	8
NSW	68	119	4	0
NSE	637	596	292	222
SNW	260	329	116	30
SNE	1163	1124	624	52
SSW	124	73	0	0
SSE	76	76	0	0
MED-W	865	288	73	129
MED-E	41	0	0	0

North Atlantic – North West (NNW) sampling area coverage

Ageing and growth: A total of 603 SWO spines are available for analysis from the NNW area (**Table 1**). Spine collection coverage from the NNW area is relatively strong for SWO belonging to length bins 130 – 180 cm for both sexes and up to 260 cm for females (**Figure 1**). To improve coverage, SWO spine samples from fish between 70 – 120 cm are required, as well as more samples from fish > 180 cm, to increase the number of male samples within the poorly represented ranges. Otolith samples from SWO of all lengths are required for the NNW area (**Figure 1**).

Genetics: The ToRs do not specify an area-specific requirement for the NNW sampling area, however, there is reasonably good representation for genetic samples from this area (n = 248; **Table 1**) from SWO between 100 – 240 cm (**Figure 1**).

Reproduction: There are 51 female SWO gonad samples for the NNW area across 150 – 250 cm increments. More samples from the 100 cm increment would help to address a gap in coverage (**Figure 1**).

Addressing sampling coverage: Based on the mean annual catch in the NNW area, Spain, Canada, USA, Portugal and Japan are candidate CPCs for filling gaps in the NNW sampling coverage.

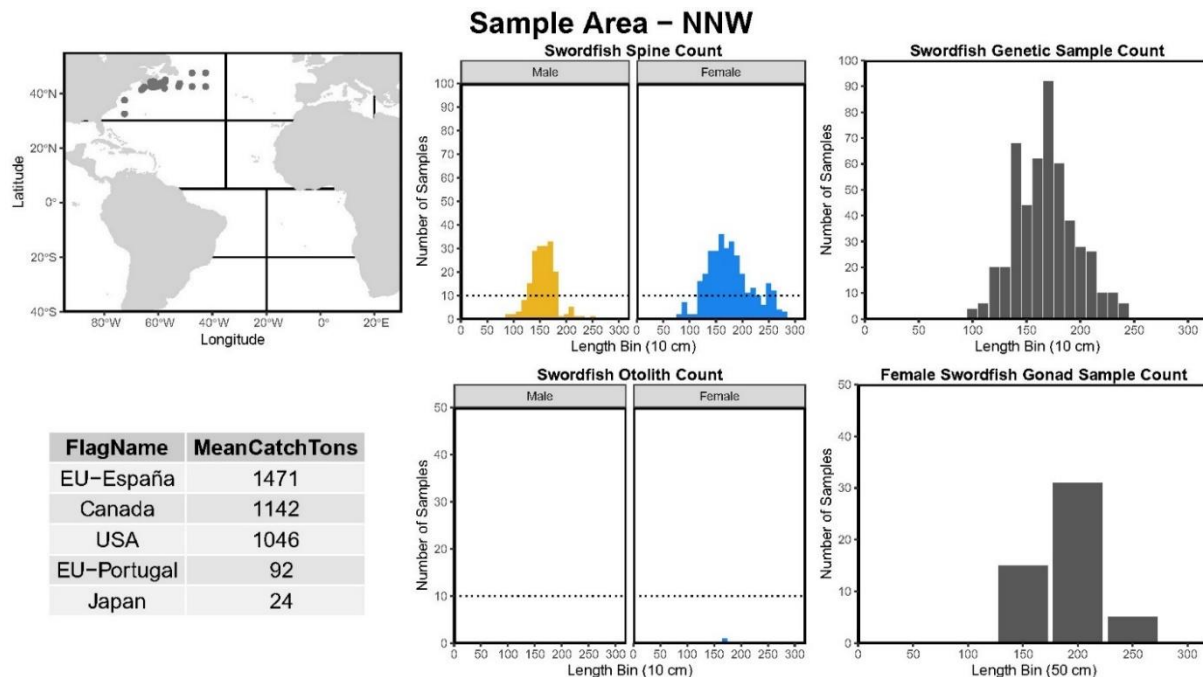


Figure 1. Swordfish sampling coverage for the North Atlantic – North West (NNW) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

North Atlantic – North East (NNE) sampling area coverage

Ageing and growth: Spine coverage is acceptable for both sexes of SWO between 100 – 140 cm from the NNE sampling area and up to 150 cm for females specifically (**Figure 2**). Similarly, otolith coverage is relatively strong between 110 – 140 for both sexes, although more otoliths are required for males < 110 cm, which would also help to address some gaps in spine coverage for smaller males, if complete sample collection is prioritized. Overall, greater emphasis on collection of both spine and otoliths from SWO > 150 cm would help to address gaps in ageing and growth analysis for the NNE area.

Genetics: There are currently 464 tissue samples available for genetic analysis of SWO from the NNE, making it one of the more well-represented areas for SWO genetics (**Table 1**). Although there are a large number of samples from this area overall, more samples are required that are closer to the Strait of Gibraltar, since only 3 samples have been collected within 200 km west of the Strait (**Figure 3**). An additional 17 tissue samples for genetic analysis will be required within 200 km west of the Strait of Gibraltar to accomplish the goal set in the ToRs.

Reproduction: There are only 8 female SWO gonad samples for the NNE area across 100 – 150 cm increments. This is insufficient coverage for this area and greater numbers of female gonad samples are required, particularly for individuals > 150 cm.

Addressing sampling coverage: Based on the mean annual catch in the NNE area, Portugal, Spain, Morocco, France and Ireland are candidate CPCs for filling gaps in the NNE sampling coverage.

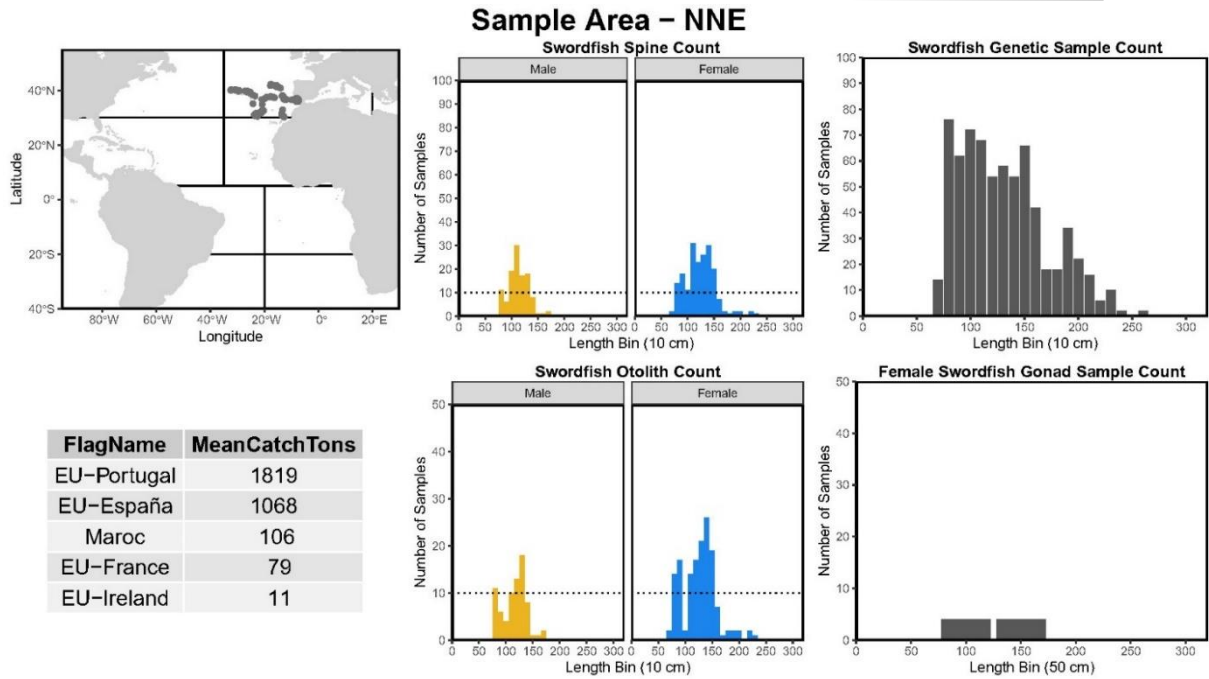


Figure 2. Swordfish sampling coverage for the North Atlantic – North East (NNE) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

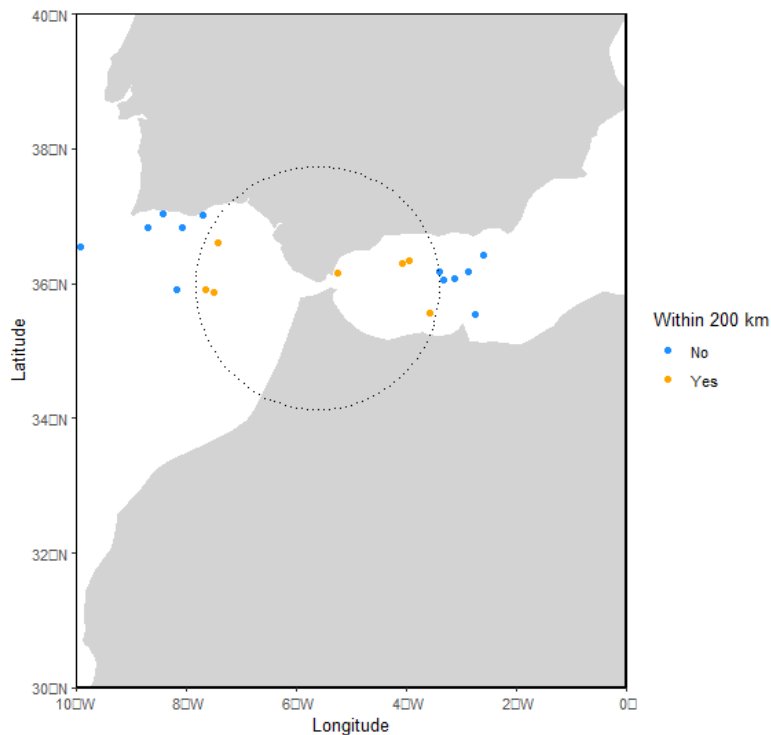


Figure 3. Atlantic swordfish (*Xiphias gladius*) tissue samples collected near the Strait of Gibraltar to support genetic analysis. A circle reaching 200 km on either side of the Strait is provided in as a dotted line.



North Atlantic – South West (NSW) sampling area coverage

Ageing and growth: There are 119 SWO spines available from the NSW area (**Table 1**), however more spines are required from every size class for this area to address sampling gaps for both males and females (**Figure 4**). Otolith samples from SWO of all lengths are required for the NSW area.

Genetics: The ToRs specify that for the NSW area 45 – 50 samples across each of the four quarters are required to support genetic analysis. Currently, the first two quarters of the year have 28 and 24 samples, whereas the last two quarters have far fewer samples (**Figure 5**). Greater emphasis needs to be placed on collecting tissues for genetic analysis from the NSW sampling area to achieve this sampling goal.

Reproduction: There are no gonad samples for this sampling area, so many are required across lengths and seasons to address this need (**Figure 4**).

Addressing sampling coverage: Based on the mean annual catch in the NSW area, USA, Brazil, Belize, China and Mexico are candidate CPCs for filling gaps in the sampling coverage.

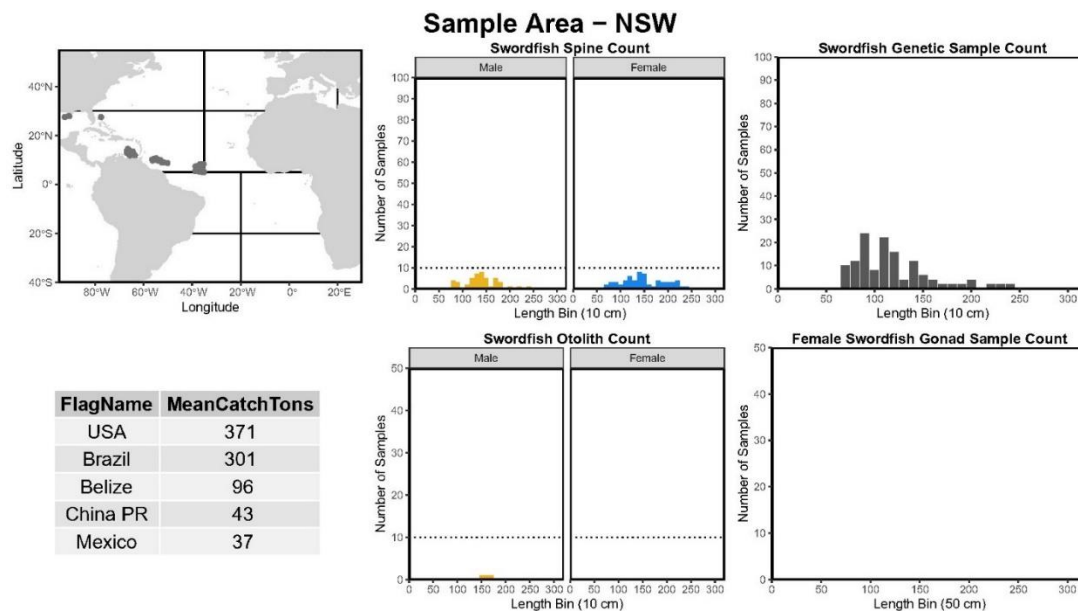


Figure 4. Swordfish sampling coverage for the Southwest North Atlantic – South West (NSW) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

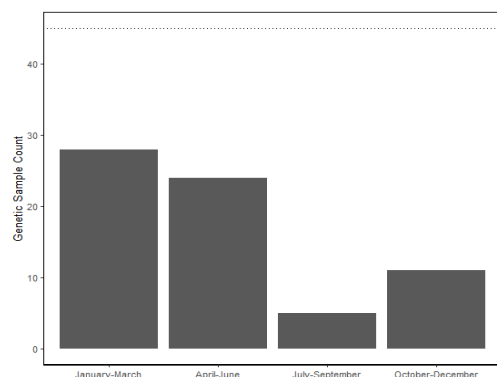


Figure 5. Counts of Atlantic swordfish (*Xiphias gladius*) tissue samples available for genetic analysis from

the south western quadrant of the North Atlantic (NSW), split by quarter of the year. A dotted line is added at 45 to represent the minimum sampling coverage for each quarter.

North Atlantic – South East (NSE) sampling area coverage

Ageing and growth: There are 596 SWO spines available from the NSE area (**Table 1**), making it among the more well-represented sampling areas. Priority should be placed on getting spines from SWO > 150 cm to fill in gaps for larger fish. Otolith coverage is slightly patchier, with gaps between 100 – 120 cm increments, in addition to a shortage of samples for larger (> 150 cm) individuals (**Figure 6**).

Genetics: The ToRs do not specify an area-specific requirement for the NSE sampling area, however, there is reasonably good representation for genetic samples from this area (n = 637; **Table 1**) from SWO between 70 – 270 cm (**Figure 6**).

Reproduction: This is the best-represented area for female SWO gonad samples, with 222 samples for SWO between 100 – 250 cm increments (**Figure 6**).

Addressing sampling coverage: Based on the mean annual catch in the NSE area, Morocco, Spain, Japan, Portugal and Brazil are candidate CPCs for filling gaps in the sampling coverage.

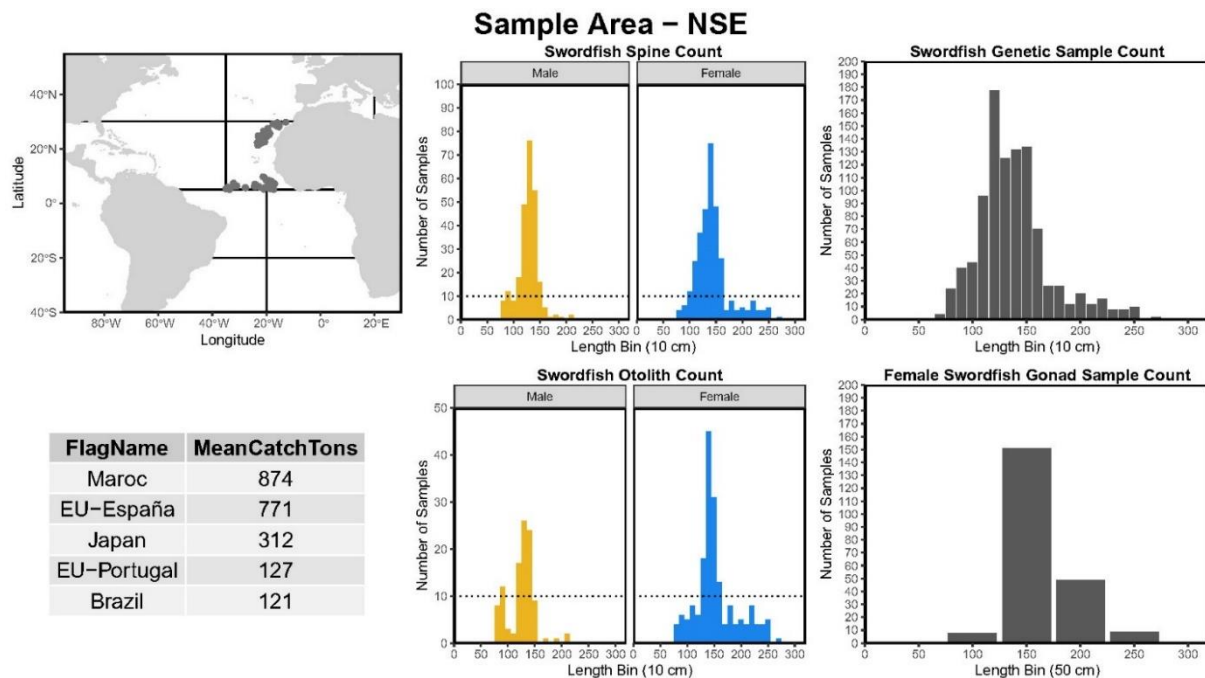


Figure 6. Swordfish sampling coverage for the North Atlantic – South East (NSE) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

South Atlantic – North West (SNW) sampling area coverage

Ageing and growth: There are 329 SWO spines available from the SNW area (**Table 1**), with acceptable coverage for males between increments 110 – 170 cm, however, more spine samples are required from most female size increments, with the exception of increments 120 – 130 cm (**Figure 7**). There is poorer otolith coverage, with most size increments falling short of the required 10 samples.

Genetics: There are 260 tissue samples available for genetic analysis for the SNW area (**Table 1**). The ToRs specify that for the SNW area, in addition to the SSW area, 35 tissue samples are required for the first quarter of the year (January to March). There are 36 SWO tissue samples available for genetic analysis from the SNW sampling area for the first quarter of the year, representing a sufficient sample size for this goal (**Figure 8**).

Reproduction: There are 30 female gonad samples available for analysis from the SNW sampling area (**Table 1; Figure 6**). This represents relatively good coverage for this area in comparison to others, however, more female gonad samples are required throughout the size range of SWO to achieve satisfactory coverage (**Figure 7**).

Addressing sampling coverage: Based on the mean annual catch in the SNW area, Brazil, Spain, Chinese Taipei, China and Japan are candidate CPCs for filling gaps in the sampling coverage.

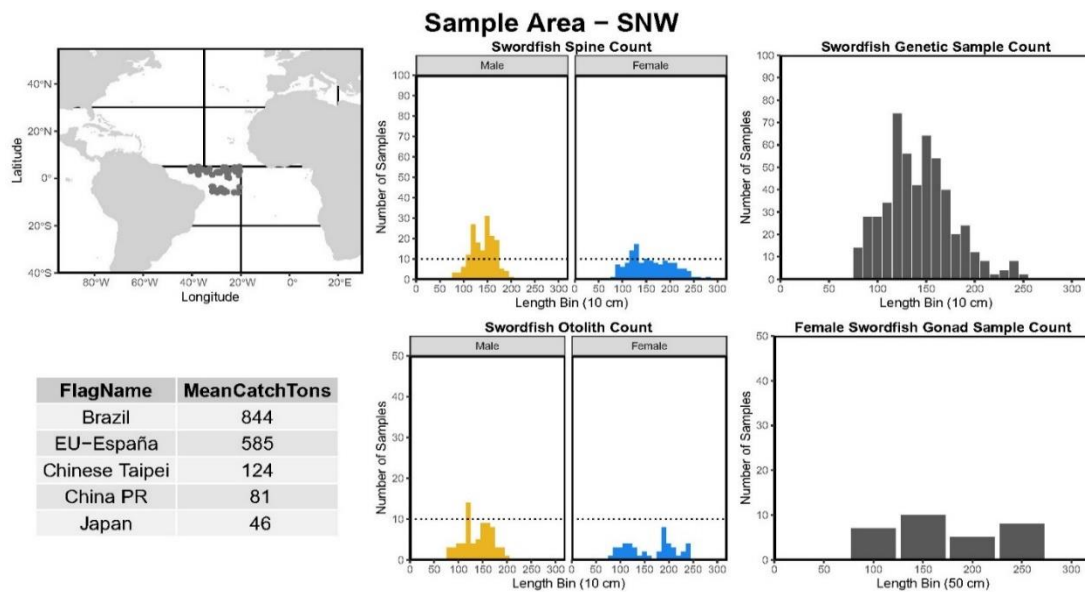


Figure 7. Swordfish sampling coverage for the South Atlantic – North West (SNW) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

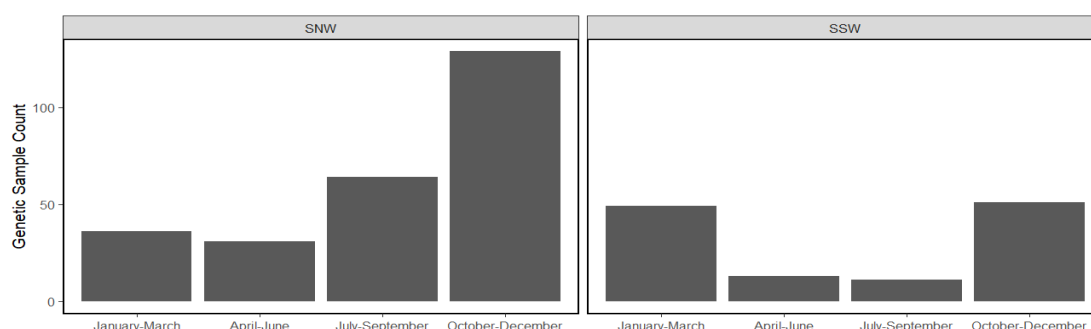


Figure 8. Counts of Atlantic swordfish (*Xiphias gladius*) tissue samples available for genetic analysis from the two western sampling quadrants of the South Atlantic, split by quarter of the year.

South Atlantic – North East (SNE) sampling area coverage

Ageing and growth: There are 1124 SWO spines and 624 otoliths available from the SNE area (**Table 1**), making it the most well-represented sampling with respect to samples supporting ageing and growth analysis. There is very strong coverage for SWO spines from the SNE area for males between 90 – 200 cm, and for females between 110 – 230 cm (**Figure 9**). Coverage for SWO otoliths from the SNE area is similar, however, there is a small gap for females in the 140 cm increment (**Figure 9**).

Genetics: The ToRs do not specify an area-specific requirement for the SNE sampling area, however, there are 1163 tissue samples available for genetic analysis for this area (**Table 1**), which is the greatest number of genetic samples available for any area. Given the strong representation of both genetic and ageing samples from the SNE, samples from this area are likely well-suited to supporting the epigenetic ageing efforts.

Reproduction: There are 52 female gonad samples available for analysis from the SNE sampling area. This represents relatively good coverage for this area in comparison to others, however, more female gonad samples are required, particularly for individuals < 150 cm and > 200 cm, to achieve satisfactory coverage (**Figure 9**).

Addressing sampling coverage: Based on the mean annual catch in the SNE area, Spain, Japan, Chinese Taipei, Namibia and China are candidate CPCs for filling gaps in the sampling coverage.

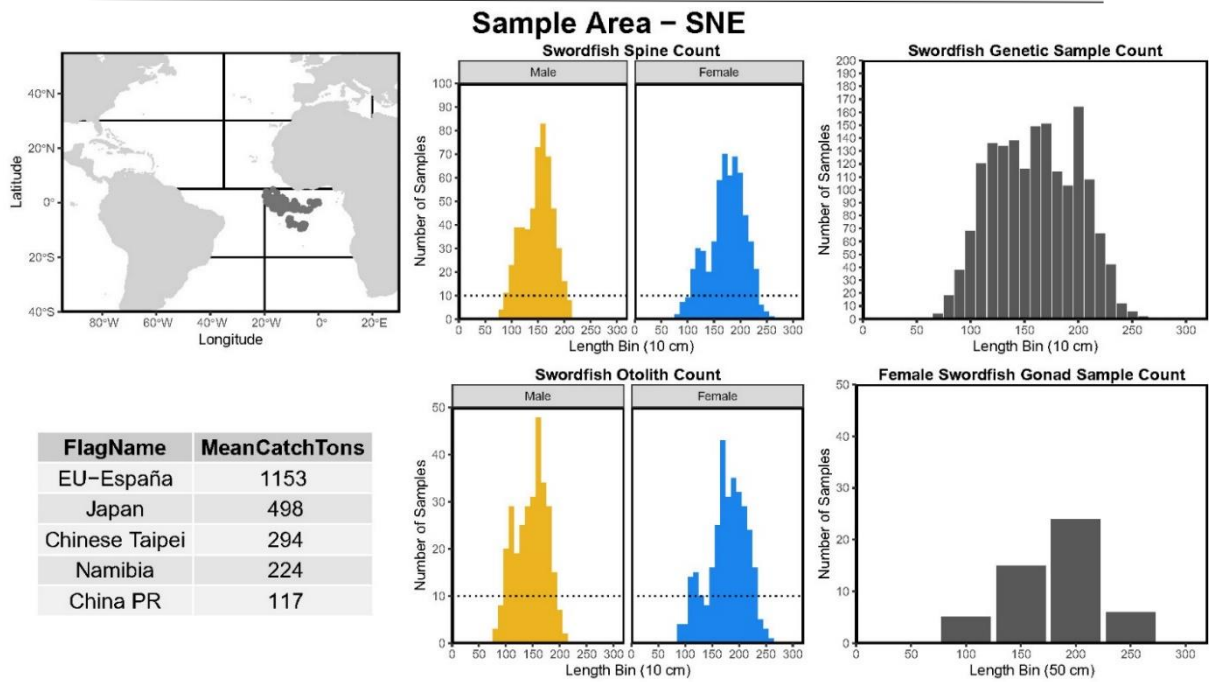


Figure 9. Swordfish sampling coverage for the South Atlantic – North East (SNE) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.



South Atlantic – South West (SSW) sampling area coverage

Ageing and growth: There are 73 SWO spines available from the SSW area, but no otoliths available for the area (**Table 1**). More spine and otolith samples are required for all size ranges to achieve satisfactory coverage for the SSW sampling area (**Figure 10**).

Genetics: There are 124 tissue samples available for genetic analysis for the SSW area (**Table 1**). The ToRs specify that for the SSW area, in addition to the SNW area, 35 tissue samples are required for the first quarter of the year (January to March). There are 49 SWO tissue samples available for genetic analysis from the SSW sampling area for the first quarter of the year, representing a sufficient sample size for this goal (**Figure 8**).

Reproduction: There are no female gonad samples from the SSW sampling area, so many more samples are required throughout the size range to address this gap in coverage (**Figure 10**).

Addressing sampling coverage: Based on the mean annual catch in the SSW area, Spain, Brazil, Portugal, Belize and Chinese Taipei are well-suited to filling gaps in the sampling coverage.

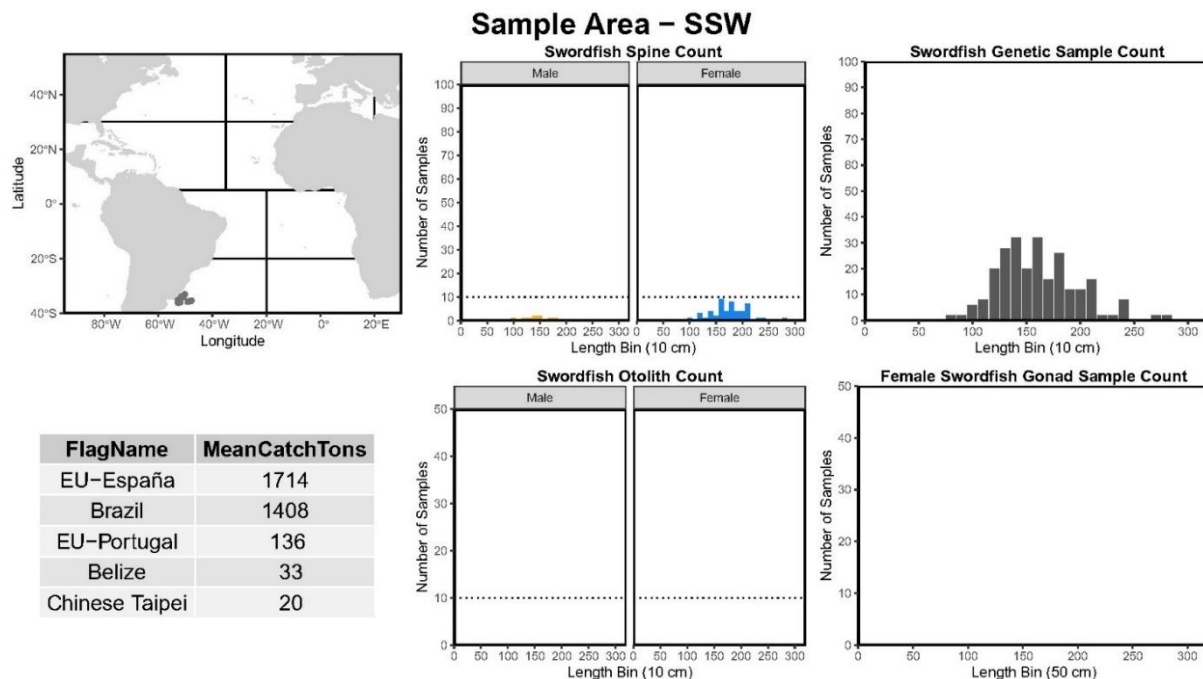


Figure 10. Swordfish sampling coverage for the South Atlantic – South West (SSW) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

South Atlantic – South East (SSE) sampling area coverage

Ageing and growth: There are 76 SWO spines available from the SSE area, but no otoliths available for the area (**Table 1**). More spine and otolith samples are required for all size ranges to achieve satisfactory coverage for the SSW sampling area (**Figure 11**).

Genetics: The ToRs do not specify an area-specific requirement for the SSE sampling area, however, there are 76 tissue samples available for genetic analysis (**Table 1**).

Reproduction: There are no female gonad samples from the SSE sampling area, so many more samples are required throughout the size range to address this gap in coverage (**Figure 11**).

Addressing sampling coverage: Based on the mean annual catch in the SSE area, Spain, Namibia, South Africa, Japan and Portugal are candidate CPCs for filling gaps in the sampling coverage.

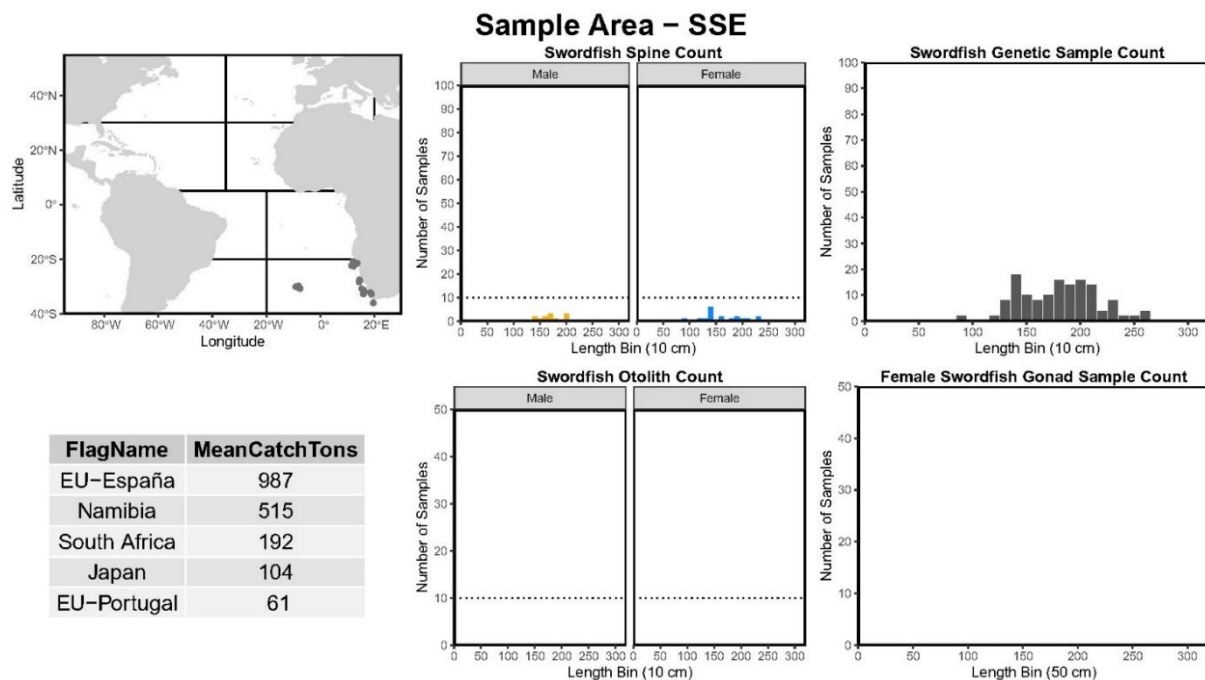


Figure 11. Swordfish sampling coverage for the South Atlantic – South East (SSE) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

Mediterranean – West (MED-W) sampling area coverage

Ageing and growth: There are 288 SWO spines available from the MED-W area (**Table 1**), and although there is some representation throughout 90 – 180 cm for both sexes, there are not sufficiently high sample counts for most of these increments (**Figure 12**). Similarly for otoliths, more samples from all lengths would be helpful in addressing sampling gaps (**Figure 12**).

Genetics: There are currently 865 tissue samples available for genetic analysis of SWO from the MED-W sampling area, making it one of the more well-represented areas for SWO genetics (**Table 1**). Although there is a large number of samples from this area overall, more samples are required that are closer to the Strait of Gibraltar, since only 4 samples have been collected within 200 km east of the Strait (**Figure 3**).

Reproduction: There is quite strong coverage for female gonad samples from the MED-W area, with 129 samples available (**Table 1**). These samples cover lengths ranging from 100 – 200 cm increments (**Figure 12**).

Addressing sampling coverage: Based on the mean annual catch in the MED-W area, Italy, Spain, Morocco, Tunisia and Algeria are candidate CPCs for filling gaps in the sampling coverage.

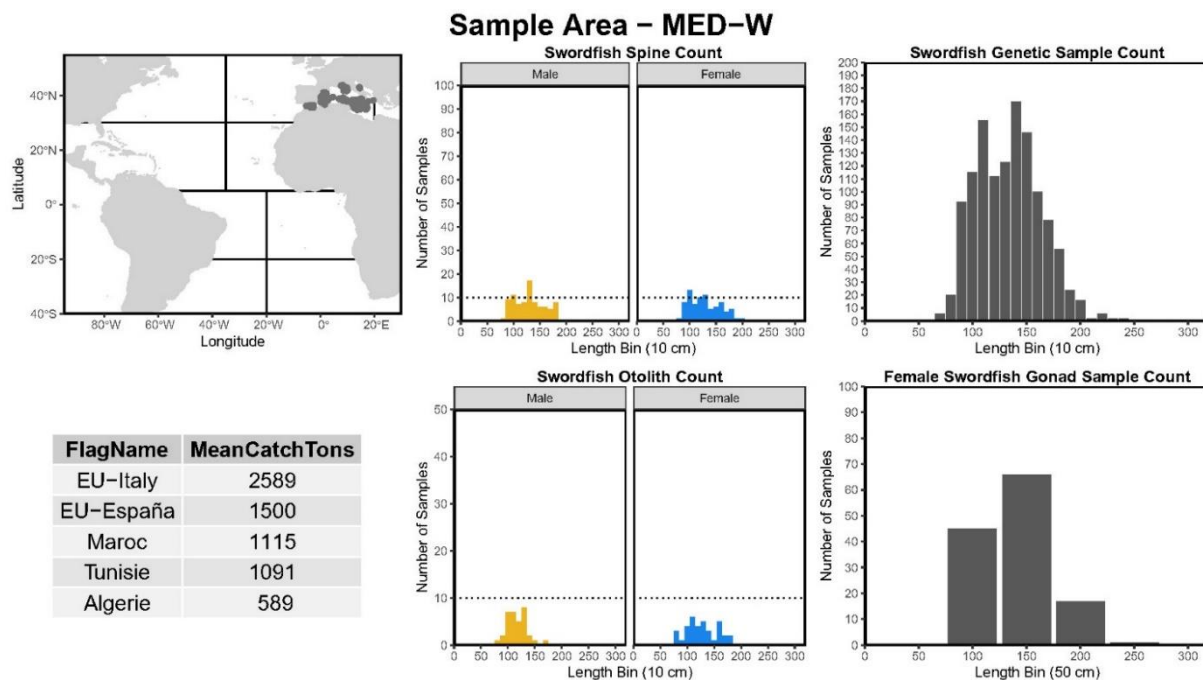


Figure 12. Swordfish sampling coverage for the Mediterranean – West (MED-W) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

Mediterranean – East (MED-E) sampling area coverage

Ageing and growth: There are no SWO spines or otoliths available from the MED-E sampling area (**Table 1**). Therefore, more samples are required from all size ranges to address these gaps in coverage (**Figure 13**).

Genetics: The ToRs specify a goal for the MED-E area of collecting 35 tissue samples spanning from November through May. There are currently 41 samples overall (**Table 1**), with representation from the months of November through May being only 3 of those samples. Prioritizing the collection of samples for genetic analysis during the winter and spring months in the MED-E area is therefore important for addressing this goal.

Reproduction: There are no female gonad samples available from the MED-E sampling area, so more samples are required from all size ranges to address this gap in coverage (**Figure 13**).

Addressing sampling coverage: Based on the mean annual catch in the MED-E area, Greece, Türkiye, Cyprus, Malta and Egypt are candidate CPCs for filling gaps in the sampling coverage.

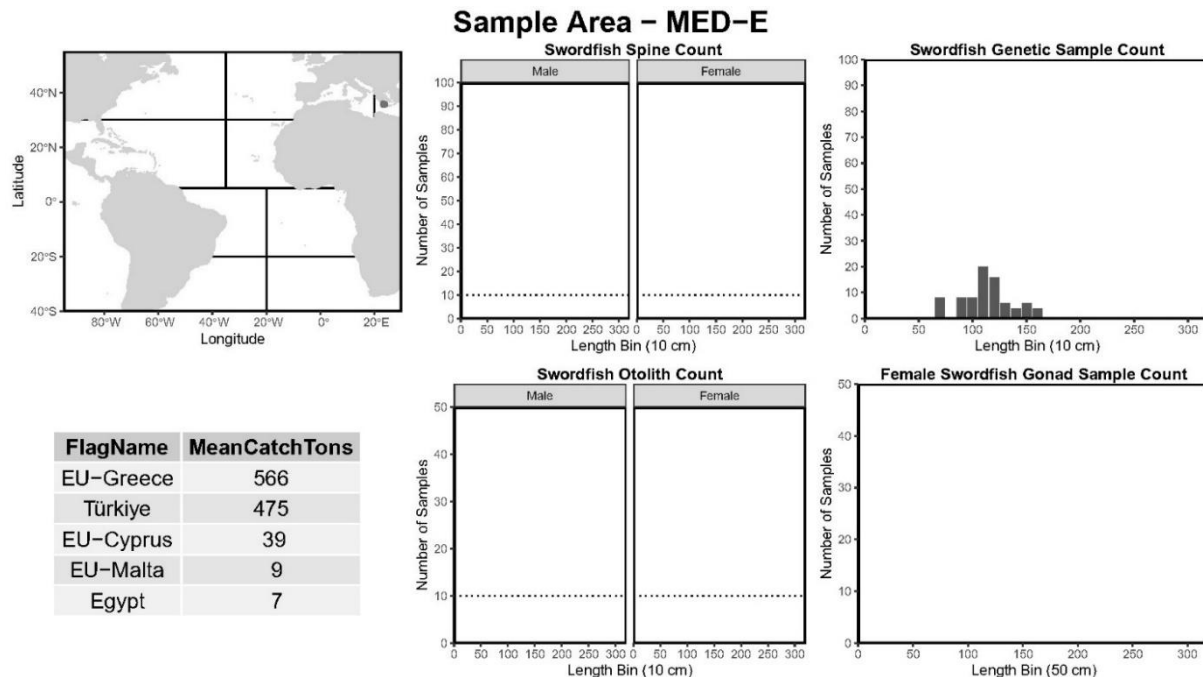


Figure 13. Swordfish sampling coverage for the Mediterranean – West (MED-W) sampling area. The dotted lines on the age-related structure figures represent the minimum size requirement for each 10 cm increment.

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