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Draft work plan for *R/V Nansen* cruise in the Indian Ocean (20 November – 10 December 2025)

The Deep-sea Fisheries Project and the SIOFA Secretariat

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Abstract	<p>The Common Oceans Deep-sea Fisheries Project is coordinating a research cruise in the Southern Indian Ocean with members of the Southern Indian Ocean Fisheries Agreement (SIOFA) and the FAO/IMR/Norad EAF Nansen Project. The cruise dates have been changed and are now from 20 November to 10 December 2025. The work will be principally carried out from the <i>R/V Nansen</i> with support from the <i>F/V Will Watch</i> if available. The cruise will look at developing methodologies to undertake acoustic biomass estimates of alfoncino, improve benthos mapping for better identification of VMEs, and improve the identification of deepwater sharks.</p> <p>The cruise was approved at MoP11, and the MoP requested that SC10 reviews and approves the specific scientific work, and the SC is given the opportunity to provide commentary on the work and specific tasks that are proposed in the cruise plan (Para 108c, MoP11 Report). This document outlines the draft cruise plan that will be presented, discussed and further developed at SC10. It will also provide an opportunity for members from SIOFA contracting parties to join the cruise to receive training.</p>

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² Documents available only to members invited to closed sessions.

Recommendations

The Deep-sea Fisheries Project and the SIOFA Secretariat recommend that the SC10:

- **notes** that SIOFA is the principal partner to this collaboration with the EAF Nansen programme and will benefit from the information acquired during the cruise.
- **notes** that the R/V Nansen will operate according to the conditions approved by MoP (Para 108 of the MoP11 Report), including:
 - Data is submitted to SIOFA within 9 months of the cruise (i.e. by October 2026).
 - Information placed in public domain must be in accordance with SIOFA data rules.
 - SC10 reviews and approves the specific scientific work (i.e. information this paper)
 - CCPs participate in work and capacity building.
- **considers and approves** this draft work plan, subject to further development in collaboration with the EAF Nansen programme and key scientists.

Draft work plan for *R/V Nansen* cruise in the Indian Ocean (20 November – 10 December 2025)

Introduction

The EAF Nansen programme is a collaboration between FAO, the Norwegian Agency for Development Cooperation (Norad) and the Institute of Marine Research (IMR) of Bergen, Norway. It operates a research vessel, the *R/V Dr Fridtjof Nansen*, that undertakes assessment and training trips in the Atlantic and Indian Oceans. In partnership with the Southern Indian Ocean Fisheries Agreement (SIOFA) and its cooperating and cooperating non-Contracting Parties (CCPs), a cruise is planned to take place in the southern Indian Ocean from 20 November to 10 December 2025 (21 days) (note that there is a change from to original dates of 12–30 June 2025 (19 days)).

Subject to availability, work will be conducted alongside the *F/V Will Watch*.

The objective of the survey is to:

- Improve acoustic biomass estimates for alfonsino and/or orange roughy
- Undertake benthic surveys to study the distribution of vulnerable marine ecosystems and improve the distribution modelling.
- Extend work on deepwater shark identification and further trial the smart identification key
- Provide opportunity for the training of up to 19 officers, crew, deckhands, scientists and/observers from SIOFA members

This cruise was included in the Deep-sea Fisheries (DSF) Project document and plans have been discussed with SIOFA at a number of meetings over the past few years. A more detailed plan was submitted to scientific committee SC09 in March 2024 (SC-09-32 Rev1; Annex A) and to the meeting of the Parties MoP11 in June 2024 (MOP-11-27-Rev1 [1]).

MoP11 [2] approved the work plan [1], specifically:

- acoustic sampling for alfonsino and orange roughy,
- bottom trawls (in the case that the *F/V Will Watch* is not available) and midwater trawls, to validate acoustic signals and carry out biological sampling down to 800 m, and
- benthic mapping, including bottom profiling echosounders, video cameras on towed sledges and grab samples

with the following conditions [2, para 108]:

- Data submitted to SIOFA within 9 months of the cruise (i.e. by October 2026).
- Information placed in public domain must be in accordance with SIOFA data rules.
- SC10 reviews and approves the specific scientific work (i.e. information this paper)
- CCPs participate in work and capacity building.

The full text is given in Annex A. We have confirmed with the EAF Nansen programme that the above conditions are in accord with the programme's protocols (N. Nikolioudakis, Email, 4 July 2024).

Other acoustic work on alfonsino

There has been some work planned or undertaken on using acoustics to survey alfonsino. A plan was submitted for a survey in the Northwest Atlantic in 2020 [3] and another in the eastern South Pacific in 2022 [4]. It is not clear that either of these surveys went ahead. There are also some other studies cited within these two papers.

Methods

The cruise is being coordinated by the DSF Project in partnership with SIOFA to support work in its area of application in the ABNJ of the Southern Indian Ocean in line with the proposed objectives outlined above. The work is divided into three components:

- Alfonsino acoustics (coordinated by Cook Islands)
- Benthic surveys (coordinated by France on behalf of its Indian Ocean Territories)
- Deepwater shark identification (coordinated by SIOFA Secretariat through grants from EU and DSF Project to the Virginia Institute of Marine Science (VIMS), USA)

Acoustic work for alfonsino has been previously discussed by SIOFA. SC08 noted that acoustic surveys may be useful in stock assessments and harvest strategy development for alfonsino (para 168), but that there remains uncertainty about the feasibility of acoustic surveys for alfonsino. The SC recommended continuing with the planned experimental studies to explore the feasibility of acoustic surveys. (para 136). Alfonsino acoustic work was included in the SC workplan for 2024-2025 which has now been postponed to 2026 subject to the results arising from the Nansen cruise. An information document submitted to SC09 [5] and personal discussions with Steve Brouwer (Cook Islands) and Gavin Macaulay (Aqualyd Ltd) indicate that estimating alfonsino biomass using acoustic methods is still at the exploratory phase. This is in line with the acoustic work plan of the Nansen to explore these possibilities.

Benthic sampling in the Indian Ocean has been very limited. Alexis Martin (FR-OT) noted that “There is a need to provide a good species inventory and characterization of benthic habitats and VMEs. In addition, by comparing the results obtained (species list and abundance for each protocol, accuracy of data and information), this could enable us to define a robust method for extrapolating results when a single protocol is deployed. This would be of major interest for SIOFA for future surveys that could be carried out with smaller, more economical resources from a commercial vessel (for example a single camera quickly deployed during a transit) (A. Martin, pers. com.).

There has been very little published on the benthic fauna in the ABNJ of the Indian Ocean. The hydrography above selected seamounts, including Walter’s shoal, Coral Point, Middle of What, and Atlantic Bank that are SIOFA Benthic Protected Areas (BPAs), has been studied [6]. There are also descriptions of the benthos for Atlantis, Corel and Walter’s shoal EBSAs [7], although detailed information is lacking in these descriptions.

The deepwater shark reporting in the southern Indian Ocean is among the best reported anywhere but is still subject to challenges as far as identification is concerned. SIOFA and the DSF Project supported a consultancy with VIMS to improve the identification of deepwater sharks and develop a digital “smart” key on the *F/V Will Watch* during August to October 2024. The work was undertaken by Paul Clerkin and results will be reported to SC soon.

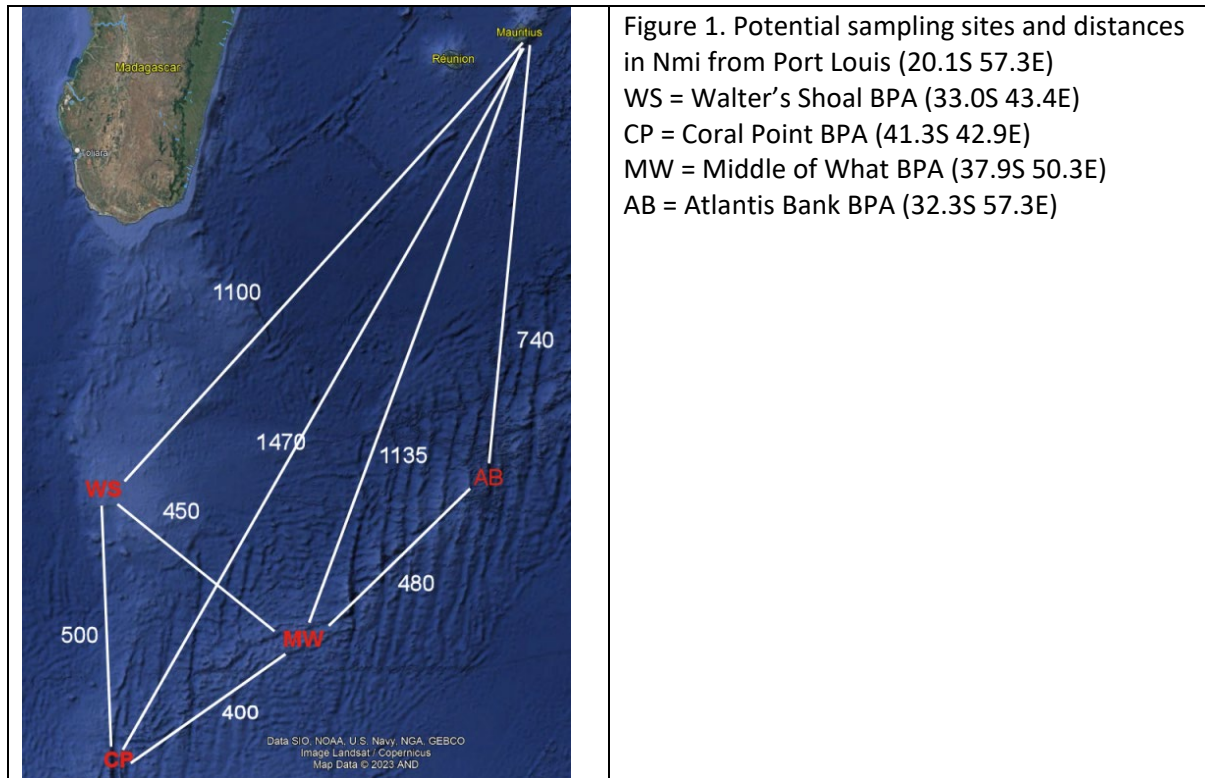
The details of the draft cruise plan for each of these three components is provided in Annex A.

Cruise plan summary

Details of the R/V Nansen and the gear carried onboard can be found on its wiki site [8].

Sampling locations

These are to be decided, but tentative options are:



The table below is for sampling three BPAs Walter's Shoal BPA, Middle of What BPA, and Atlantis Bank BPA. Total steaming time is 11.5 days.

Trip	Nmi	Steaming speed	Hours	days
PL-AB	740	10	74.0	3.1
AB-MW	480	10	48.0	2.0
MW-WS	450	10	45.0	1.9
WS-PL	1100	10	110.0	4.6
Total	2770	10	277.0	11.5

The table below is for sampling two BPAs Walter's Shoal BPA and Coral Point BPA. Total steaming time is 12.8 days.

Trip	Nmi	Steaming speed	Hours	days
PL-WS	1100	10	110.0	4.6
WS-CP	500	10	50.0	2.1
CP-PL	1470	10	147.0	6.1

Trip	Nmi	Steaming speed	Hours	days
Total	3070	10	307.0	12.8

The table below is for sampling two BPAs Walter’s Shoal BPA and Atlantis Bank BPA. Total steaming time is 10.6 days.

Trip	Nmi	Steaming speed	Hours	days
PL-WS	1100	10	110.0	4.6
WS-AB	700	10	70.0	2.9
AB-PL	740	10	74.0	3.1
Total	2540	10	254.0	10.6

Summary of draft work plan

A more detailed work plan is given in Annex B. The actual implementation of this will depend on a number of factors. We will plan to sample two BPAs, with the long steaming times it is not feasible to sample more. Walter’s shoal is a priority, and then we will decide on the second site (which may depend on where the F/V Will Watch is fishing).

Work task	Sampling per BPA	Total sampling (2 BPAs)
Acoustics	2	4
Mid-water trawling	4	8
Bottom trawling (outside of BPAs only) (as possible)	2	4
Multibeam profiles	2	4
CTDs	2	4
Video transects (benthic)	6	12
Grabs	9	18
BRUVs (sharks)	6	12
Acoustic Doppler Current Profiler and thermosalinograph	Continuous	

Risk assessments

Acoustics, Multibeam, CTDs, ADCP and thermosalinograph

These are non-invasive. No risks to benthos.

Mid-water trawls

Required to validate acoustic work, and acquire samples of alfonso for biological work and stock discrimination and deepwater sharks for taxonomy. These catches will also be used for training purposes. 8 tows in total expected. No risk to benthos. Max catch of 20 tonnes, (expected catch like <1 tonne). Catch will mostly be discarded at sea.

Bottom trawls

Bottom trawls will be conducted in place of mid-water trawls if necessary and if viable outside of the BPAs only. A maximum of four bottom trawls is anticipated. The impacts on the sea floor will be less

than for normal commercial operations owing to the small size of the trawl. Catches limits will be included in the above mid-water trawl limits. Any VME indicator species will be recorded and reported to SIOFA Secretariat and the vessel will be subject to the move-on rule (CMM 01 (2024))

Video transects

A total of 12 video transects is expected, 6 outside of BPAs and 6 within BPAs. The total distance towed will be 6 km and the tow line will be 1 m wide. The maximum impact will cover 6000m² or a square with 77m sides. This is likely the same impact as a small bottom trawl towed for only a few meters. It is considered not significant.

Grabs

A total of 18 grabs are expected, giving a maximum bottom footprint of 18m². This is not considered a large surface and it is unlikely to cause any significant impact.

BRUVs

A total of 12 BRUV sets are expected. These sit on the seafloor and have an maximum impact of 12m². This is not considered significant.

Participating in the cruise

The *R/V Nansen* will carry appropriate experts from IMR Norway to manage all the operations required for the cruise. The Scientist in charge is an acoustics specialist. There is space for 19 other participants from SIOFA and Nansen partner countries to assist in various activities and receive training. This will potentially involve the following:

- Counter-part scientist in charge (needs previous cruise leadership experience)
- Counter-part skipper (if available, with extensive experience in commercial fishing for alfonso/roughy in the Indian Ocean)
- Acoustics lead (familiar with undertaking acoustic surveys)
- Benthic lead (familiar with undertaking benthic sampling work at sea)
- Deepwater shark taxonomist (with expertise in the Indian Ocean)
- 9 others to assist in the above work and receive training in at-sea fisheries scientific work, sampling catches, and recording data.

From *F/V Will Watch* activities

The *F/V Will Watch*, in any paired work, will follow its normal commercial fishing protocols according to its licence and SIOFA CMMs. There may be small amounts of fish (alfonso and incidental catches of deepwater sharks)

Discussion

This paper was developed following consultation with Steve Brouwer (on acoustics), Alexis Martin (on benthos) and Paul Clerkin (deepwater sharks) to cooperatively develop a cruise plan. Whereas some of the details need to be further elaborated, the sampling plan is more-or-less agreed.

In summary, and with the plan as developed, we will only have time to sample two BPAs, either Walter's Shoal and Atlantis Bank, or Walter's Shoal and Coral Point. The decision may be made at sea after Walter's Shoal has been sampled, and may depend on the location of the *F/V Will Watch* and sea conditions.

The risk assessment provided indicates that there will not be any significant impact on the benthos, indeed very little impacts at all. The highest impact will come from the possible use of a bottom trawl, but this will only be a few tows at most and will have much less impact than the much larger number of commercial bottom trawls undertaken annually.

The information provided by the *R/V Nansen* cruise will be very helpful for the sustainable management of fish stocks in the Indian Ocean, and particularly in the:

- Use of acoustics for the biomass estimation of alfonsino,
- Identification of benthic habitats for improved mapping of VMEs, and
- Improved knowledge of the identification and distribution of deepwater sharks.

We welcome suggestions from SC to improve this work plan.

Conclusions

- (1) We request that SC note that SIOFA is the principal partner to this collaboration with the EAF Nansen programme and will benefit from the information acquired during the cruise.
- (2) Note that the *R/V Nansen* will operate according to the conditions approved by MoP at MoP11, including:
 - Data submitted to SIOFA within 9 months of the cruise (i.e. by October 2026).
 - Information placed in public domain must be in accordance with SIOFA data rules.
 - SC10 reviews and approves the specific scientific work (i.e. information this paper)
 - CCPs participate in work and capacity building.
- (3) That SC approves this draft work plan, subject to further development in collaboration with the EAF Nansen programme and key scientists (Steve Brouwer, Alexis Martin, Paul Clerkin).

Acknowledgments

This work is being coordinated by the Deep-sea Fisheries Project (2022-2027) that is funded by the Global Environmental Facility, implemented by FAO and executed by the General Fisheries Commission for the Mediterranean. We thank SIOFA as a partner to the DSF Project, and the SIOFA MoP and SC for their work and support for this work in the Indian Ocean.

References

- [1] SIOFA MoP (2024) Research cruise of the R/V Dr Fridtjof Nansen. 8th Meeting of the Compliance Committee (CC8) and 11th Meeting of the Parties (MoP11). MOP-11-27-Rev1. Clean version (https://siofa.org/sites/default/files/meetings/mop/MoP-11-27-Rev1-Research-Cruise-RV-Nansen-DSF-Project_CleanVersion.pdf). Tracked version ([Microsoft Word - MoP-11-27-Rev1-Research-Cruise-RV-Nansen-DSF-Project_final.docx](#))
- [2] Report of the 11th Meeting of the Parties to the Southern Indian Ocean Fisheries Agreement (SIOFA). Hotel President, Seoul, Republic of Korea 1–5 July 2024. [SIOFA-MoP11-Final-Report-without-annexes.pdf](#)

[3] Pablo Carrera and Fernando González-Costas (2020) Sampling Plan for an Acoustic Survey of Kükenthal Peak (NAFO Division 6G) to Quantify Alfonsino (*Beryx splendens*) Biomass, Abundance and Size Composition. Scientific Council Meeting, June 2020. Serial No. N7084 NAFO SCR Doc. 20/036. [scr20-036.pdf](#)

[4] European Union (2022) Fisheries Operation Plan for Acoustic Survey on Alfonsino and Redbait European Union. 10th Meeting of the SPRFMO Commission, 24-28 January 2022 COMM 10 – Prop 06.1. [COMM10-Prop06-v2.1-Plan-for-acoustic-survey-alfonsino-and-redbait.pdf](#)

[5] SIODFA (2024) Can acoustic methods be used to assess the abundance of alfonsino in the SIOFA area? SC-09-INFO-22. <https://siofa.org/sites/default/files/documents/sc-meetings/SC-09-INFO-22-SIODFA-Alfonsino-Acoustics.pdf>

[6] Jane Read, Raymond Pollard, An introduction to the physical oceanography of six seamounts in the southwest Indian ocean, Deep-Sea Research II, <http://dx.doi.org/10.1016/j.dsr2.2015.06.022>

[7] [Ecologically or Biologically Significant Marine Areas \(EBSAs\)](#)

[8] https://nansen-surveys.imr.no/doku.php?id=oceanography_instrumentation.

Annex A. Relevant Text from the Report of the 11th Meeting of the SIOFA Parties

[SIOFA-MoP11-Final-Report-without-annexes.pdf](#)

106. The MoP NOTED the recommendation in paragraph 393 of the SC9 report to consider the type of fishing gear, the areas proposed to be fished, potential benthic impacts, the species proposed to be caught and the amount of catch proposed to be taken before approving the R.V. Dr Fridtjof Nansen research cruise.

107. The FAO DSF Project presented MoP-11-27 rev1, which detailed the plans for a research cruise by the R.V. Dr Fridtjof Nansen in the Agreement Area. The FAO summarised the proposed activities, the impact assessment, and the potential benefits to SIOFA, and sought the approval of the MoP for the research cruise plan.

108. The MoP NOTED the potential benefits of the R.V. Dr Fridtjof Nansen research cruise and AGREED to approve the cruise plan, with the following conditions:

a. The Nansen Programme provides all the data gathered from this cruise to the SIOFA Secretariat within 9 months of the cruise end date.

b. That all Nansen Programme publications (including cruise reports and popular articles) and data that would be put in the public domain emanating from the research cruise must be approved by the SC or an SC advisory panel under the SIOFA data rules.

c. SC10 reviews and approves the specific scientific work, and the SC is given the opportunity to provide commentary on the work and specific tasks that are proposed in the cruise plan.

d. CCPs have opportunities to participate in the proposed work and CCP staff are given capacity building opportunities.

109. The MoP NOTED that the R.V. Dr Fridtjof Nansen has conducted research cruises in the Agreement Area in the past, REQUESTED that the Nansen Programme share data and key reports arising from these past research cruises, and TASKED the SC to review these data and reports.

110. The MoP RECOMMENDED that the data to be provided by the Nansen Programme follows the reporting standards established in CMM 02(2023) to the extent possible.

111. The FAO thanked the MoP for approving the research cruise and expressed its commitment to present an updated research plan with further details based on the points raised by the MoP.

112. One of the CCPs raised concern on the proposed discards at sea of the catch emanating from the research cruise and suggested that all measures be taken to reduce or avoid any discards in line with the sustainable use of marine resources.

113. It was clarified that the vessel, like most research vessels, does not have the storage capacity to retain fish and attempts will be made to use a commercial vessel to catch the fish when mark-ID tows are undertaken.

114. The MoP NOTED that SIOFA currently does not have a measure addressing discards at sea and NOTED that consideration could be given to the establishment of such a measure in future if needed. The MoP NOTED that there would be value in the SC providing advice on the extent of discarding in SIOFA and the impacts of restrictions on this practice.

161. The MoP reviewed and revised the draft SC workplan. In particular: a. The MoP TASKED the workshop “to progress future protected area designation” (WS2024-PAD) to evaluate existing and

interim BPAs within SIOFA and provide advice to the SC9 and MoP12 on their application as effective spatial management tools and for providing clarity for BPA adoption within SIOFA benthic management framework. b. The MoP AGREED, in light of the proposed research cruise of the R.V. Dr Fridtjof Nansen to undertake the survey in question, that the alfonsino acoustic project ALF-2024-01, as indicated in Table 5, would be deferred to a later stage.

Annex B - Details of sampling work per BPA sampled

The information below details the work to be undertaken at each BPA.

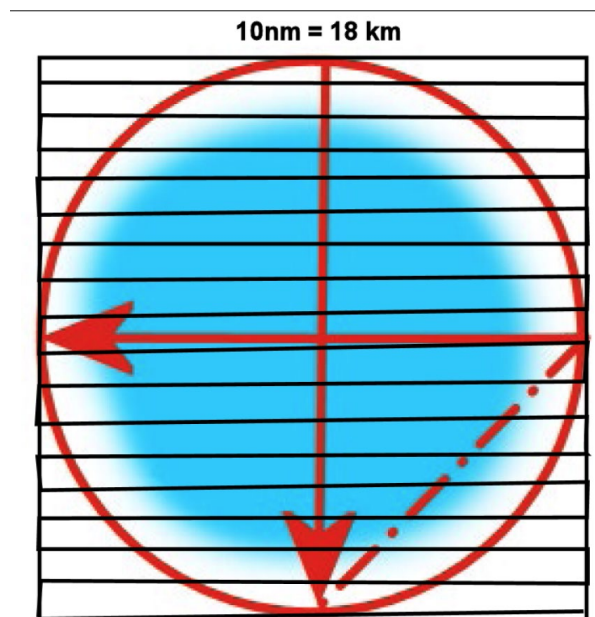
This includes two sampling sites, one inside the BPA and one outside of the BPA. At each site, there will be one acoustic survey and one multibeam survey.

Each site will also have 3 sampling areas for benthos and shark work.

Note that the Acoustic Doppler Current Profiler (ADCP) and thermosalinograph will operate throughout the trip. The ADCP is essentially echosounding, so it does not interfere with any sampling design. It is a tool to measure the direction and speed of currents. The thermosalinograph is used to measure temperature, salinity and fluorescence of the sea surface (at 4m depth). Both are mounted on the vessel and operate as it moves without causing any delays. Both ADCP and thermosalinograph data are not strictly necessary, but they come for free, so why not collect them.

Acoustic work

This would be conducted at nights at two sites per BPA, one inside and one outside. The acoustic work involves the acoustic transects and shooting mid-water hauls on any fish traces. We are uncertain if the R/V Nansen will conduct any benthic tows. The proposed acoustic sampling design here assumed to be a square of 10nm (18 km) sides. It is developed for orange roughy which forms tight aggregations that do not disperse after being sailed over by the ship. Alfonsino are known to disperse and this sampling design may not be optimal for that species.



This will be conducted inside and outside of each BPA. Two nights work in total.

Action	Details	Time (h)	Purpose	Comments
Acoustic survey	2 times 10nm transect (see above)	5.5	Determine biomass of alfonsino	This may need to be done as the first sampling operation at each site as the alfonsino fish tend to scatter

Action	Details	Time (h)	Purpose	Comments
Mid-water tows	2 tows	4	ID fish in acoustic data. Biological sampling of catch, including DNA on alfonsino.	
Total (inside and outside of BPA)		9.5 x 2 2 nights		

Benthic profiling (Multibeam mapping)

This would be conducted inside and outside of each BPA sampled. If we can do a reduced 10Nmi x 10Nmi survey (as below), then its one nights work at each site and so two nights per BPA. Double this if a full benthos profile survey is needed.

The table below is approximate times to undertake 10Nmi x 10Nmi surveys at different depths.

Water depth (m)	Hrs	Turn lengths (Nmi)	Coverage (m)	Distance between line spacing (Nmi, m)	Time for 10nm x 10nm survey (h)
100	1.43	1.02	346	0.17, 0 311	90 (59 transects)
500	1.43	1.31	1732	0.84, 0 1559	20 (12 transects)
1000	1.43	2.51	3464	1.68, 0 3118	10 (6 transects)

Action	Details	Time (h)	Purpose	Comments
Benthic profiling	8 times 10nm transects at 7 kts (2 km spacing)	13 (night)	<u>Benthos</u> Habitat modelling Plus pre-request for choosing sites for other work	Needs done after acoustics but before benthos and shark work. Needed for benthos sampling, habitat modelling and dw-shark work. This design is trying for a reduced resolution survey so will have 1km gaps.
Total (inside and outside of BPA)		13 x 2 2 nights		

Benthos and shark work

The following benthic and deepwater shark work will be undertaken at sites inside and outside of each BPA (with 3 areas sampled per site). In total, that means 6 areas sampled per BPA. Each area takes 18 hours, so a total of 4.5 days per BPA.

Action	Details	Time (h)	Purpose	Comments
Hydrographic sampling	CTD including bottles	1	<u>Sharks and benthos</u> CTD and shark eDNA work and species distribution models	Routine Nansen work??
Baited remote underwater video system (BRUV) : deploy	To c. 1000m and soak time of 4 hrs. Video taken.	1	<u>Sharks</u> Deepwater shark identification in situ	
Tow video rig along seafloor	3 parallel transects of 500 m	6	<u>Benthos</u> Benthic mapping	Need towed video camera on board What spacing?
BRUV recovery		1 recovery	<u>Sharks</u>	
Van Veen grabs	3 grabs per transect = 9 grabs	7	<u>Benthos</u> Identify benthos	Sample collection for DNA barcoding analysis and stable isotope sampling.
"bendicam" cameras		In above	<u>Benthos</u>	Check if this is on the grab and if needed if we do video transects.
TOTAL		16 x 6 4 days		