



## Fishing for Data Webinar Q & A sessions

This document contains all questions asked, and their answers, during the two Fishing for Data Webinars on 20 May 2020. The questions are organized according to topic.

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## Sensors

- **How often does the NKE CTD need calibration? SD**
  - Michela: at least in the case of commercial NKE probes, proper calibration is done at their labs before releasing the probes at purchase or battery changes, see these links for procedure examples:
    - A. [Configuration and calibration handbook for new RECOPECA sensors](#)
    - B. [Report on Calibration Best Practices](#)

Calibration is usually done at lab in calibration facilities, furthermore periodical tests in operational conditions are suggested following (*Martinelli et al. 2016*) prior their use and periodically to check drifting; this may be applied to all brands sensors.

Also of note is that FOOS uses a slightly older version of the probes than the current WiSens range.
  - Yearly is preferably advised for the conductivity sensor. Other sensors (temp, oxygen, etc) do not require this recurrence and generally do not drift. (Luc from NKE)
  
- **Question on the sensors to be used: do sensors exist that go deeper than 300m? MP**
  - Michela: yes, NKE examples [here](#).
  - But there are other brands. SRMU at St Andrews in the UK makes tags that will go down to about 2200m.
  
- **Would like to know the price of the NKE and Zebra tech sensors please SM**
- **How much money are the sensors ? MM**
  - JiM: Prices range from 100s to 1000s US dollars but this is going down fast as demand rises and technology develops.
  - For more information about sensors see also the websites:
    - [NKE](#) contact: [lsimon@nke.fr](mailto:lsimon@nke.fr)
    - [Zebra-Tech](#) contact [john@zebra-tech.co.nz](mailto:john@zebra-tech.co.nz)
    - [Lowell](#) contact [nick@lowellinstruments.com](mailto:nick@lowellinstruments.com)
  
- **Regarding the issue of large-scale deployment of sensors. How does sensor calibration and quality assurance factor in? Is this limiting on the number of vessels that can be managed in such a data collection program? EF**
  - Berthe: The number of vessels that can be managed is not necessarily limited by sensor calibration activities, but we need to work with regional and local partners for maintenance and logistics.
  - JiM: As Cooper mentioned, calibration is easier in this fishing industry data collection because the sensors are routinely returned to the dock. We can subject sets of instruments to an ice-bath calibration check.



- Michela: Calibration is usually done at lab in calibration facilities, furthermore periodical tests in operational conditions are suggested following (*Martinelli et al. 2016*) prior their use and periodically to check drifting; this may be applied to all brands sensors.
  
- **I appreciated the brief overview of a couple specific loggers. I'd like to know what other brands or models of loggers that people have used on mobile fishing gear that have worked and held up well over time. Has anyone used Star Oddi gear loggers before? JB**
  - JiM: Cooper did not show one but he mentioned “Lowell Instruments” in his slide presentation. Their temperature and depth probe has performed well for the last 3-4 years of eMOLT. We have also used the “Aquatec Loggers” from England but there was a problem with
    - a) having to mail them across the ocean for calibrations and
    - b) not having easy control of the acquisition software.We have used the small “Star Oddi” but they seem more designed for animal tagging applications.
  - JiM: We have used Star Oddi but to a limited extent since the Lowell Instruments were developed local to our area in Woods Hole. It is good to have direct contact with Nick Lowell.
  - For Zebra-Tech, the contact would be [john@zebra-tech.co.nz](mailto:john@zebra-tech.co.nz)
  - Highest resolution option that is being used, but was not mentioned in the webinar is [RBR Concerto CTDs](#).
  - Also [JFE](#) is what is used by the Kyushu Japanese program.
  - Michela: yes for staroddi on FOS from 2003 to 2013 see (*Martinelli et al. 2016*), and (*Falco et al. 2007*) and (*Aydogdu et al. 2016*).
  
- **Vitalii Sheremet (eMOLT): How do you calibrate the sensors in the EU? For example, eMOLT uses Woods Hole Oceanographic Institution facilities to calibrate temperature sensors. VS**
  - Michela: as said above normally calibration is intended for the operations done in the lab at calibration facilities (see comment above from Jim about calibration bath). The operations suggested in (*Martinelli et al. 2016*) is more validation, operational conditions evaluation and best practice.
  
- **Could you make use of sensors already present on fishing vessels? E.g. temperature sensors on fishing equipment (SIMRAD etc) MP**
  - JiM: Yes, this is a good idea but, when I looked into doing this on the NE coast of the US, I found that only a few vessels had the temperature sensors and it wasn't yet worth the effort. I was also not sure we could get the 0.1 degC accuracy we needed.
  - Michela: Similarly in Italy it is not so common to use this fishing equipment on commercial vessels, their use on commercial vessels is more common on big vessels in e.g. Northern Europe.



- **Berthe:** With BDC we have done some preliminary tests to look at temperature data from Marport sensors. The sampling frequency and sensor settings were in this case not sufficient to measure vertical profiles, but results at depth looked okay compared to an NKE TD. There were some outliers, but they could all be removed with standard QC procedures.  
Those sensors might be mainly useful for fisheries where you need measurements during fishing rather than the up and down profiles. More tests with other sensor settings are necessary to assess the use for oceanographic purposes.
- **In the Recopesca project, each sensor is equipped with a radio device transferring the data to a receiver on-board, which sends automatically data to a data center at land (by GPRS). Does any project use a similar device developed by another company than NKE Instrumentation ? JD**
  - **Michela:** For FOOS the same NKE probes are used, the purpose was to be harmonized in the EU, with radio link on board and GPRS near-real time transmission to an in land datacenter. The only difference is that RECOPECA concentrators send the data collected by RECOPECA tools to Ifremer datacenter while for FOOS it is the e-logbook to send all the various type and brands probes data to the CNR datacenter (see *Patti et al. 2016*).
  - **Berthe:** In Belgium work is being done to develop an alternative within the Belgian [VISTools project](#), led by ILVO.
  - **Cooper:** eMOLT and BDC both use RockBlock, a modular Iridium satellite modem.
- **Have comparisons been done with other sensors/ ocean profilers to see the effects of e.g. the protective casing on the MKE sensor? RK**
  - **Michela:** See (*Martinelli et al 2016*).
- **In terms of standards / efficiency in sensors procurement - who should take the lead - at least in Europe ? Something for COM ? AS**
  - **Cooper:** My apologies as none of us are exactly sure what you are asking on this one. In terms of sensor suppliers, I feel it is a distinct advantage to have multiple companies in order to foster continued progress and innovation. However, with this generalized sampling scheme being more 'strength in numbers' rather than strength in high-precision, sensor meta-data is of the utmost importance in order to quantify measurement uncertainty. In terms of the logistics of coordinating calibration and servicing sensors and on-board systems at fishing ports: that is something that BDC can do via local marine electronics and port handlers, or via regional program partners.

Other data types



- **Have any studies been made on sedimentary flows in the ocean? DS**
  - Berthe: Turbidity sensors available, e.g. from NKE, but at BDC we haven't worked with those yet. This data will also be affected by the position on the fishing gear, and fixed gear will likely be more suitable than mobile gear.
  - Cooper: Bottom currents are also measurable by current tilt-meters mounted on fixed gears, see Lowell Instrumentation.
  - Antonio: In [EMODnet Physics](#), we do not have any specific product on that, we do have a Total Suspended Matter gridded product (300m resolution) covering EU sea basins - 2012-2016. if you click a given position you get the time series of TSM for that position.
- **What about also collecting data on the behaviour of the vessel (roll and pitch)? We are building a prototype system to calculate waves based on these data under the OBSERVA.FISH project. AMS**
  - Michela: sure very interesting, on the FOOS there is a weather station that collects pitch and roll as well but we never really worked with those data (see *Patti et al. 2016*)
  - Berthe: The [VISTools program](#) by ILVO and Omni-C in Belgium collects all kinds of different vessel data streams. The ocean data is the small component that we collaborate on, but most of this data is used to optimize vessel operations, fish quality assurance, and traceability.
- **Is there a concept to integrate other physics (at the Baltic Sea e.g. dissolved oxygen is essential) from remote sensors? AH/AB**
  - JiM: Lowell Instruments has developed one recently.
  - Michela: Wisens DOxygen (with Temp and Depth) was recently added to NKE range.
  - Cooper: Andreas, I think this is an excellent fit for the oxygen related fisheries in the Baltic, combined with difficulties installing more traditional platforms due to high maritime traffic. I talked to a couple guys at Thunen a year ago, but nothing recently. [For Inspiration](#).
- **Hi, might it be required to also use sensors on board the fishing vessels to collect more data (ocean surface data)? E.g. using the navigational X-band radar to collect data about surface currents and individual waves (wave heights)? IA**
  - JiM: For surface currents, we have fishermen deploy student-built satellite-tracked surface drifters (see [studentdrifters.org](#)).
  - Cooper: Absolutely. We are looking to build off of the knowledge of e.g. the VOS and SOOP programs where I believe this is relatively well established? I quite like this type of data collection as there are immediate benefits to the vessels who do this.
- **I am interested in how biological data from fisheries can be collected as well e.g. catch data and how have you managed to get the industry to cooperate. TR**



- Michela: see (*Patti et al. 2016*) and (*Carpi et al. 2015*), firstly involved fishermen know that FOOS e-logbook is not meant for control purposes, there are confidential agreements, secondly we only work with people willing to cooperate and thus producing reliable results, we also do quality control on collected data
  - JiM: For a few examples in the US, see:
    - [Cooperative Research in the Northeast](#)
    - [Cooperative Fisheries Research Foundation](#)
  - Cooper: The ICES Workshop on Science with Industry Initiatives ([WKSCINDI](#)) last year had many interesting presentations on this subject, with our ocean data focus being the odd one out of many successful self-sampling projects. I believe there is a follow up workshop being planned for setting standards and guidelines for fisheries dependent data.
- **Noting that ocean bathymetry is of significance to the fishing industry, is there any potential for the collection of bathymetry and for it to be made freely available for wider use? DW**
    - JiM: see [http://www.olex.no/dybdekart\\_e.html](http://www.olex.no/dybdekart_e.html) as an example.
    - Antonio: [EMODnet Bathymetry](#) is working on that, European Seas are very well covered with high resolution.
    - Paul: The World Ocean Council, through the SMART Ocean-SMART Industries program, is reaching out to all sectors to increase their involvement in collecting and sharing data of all sorts, including bathymetric data. To help advance the latter, WOC is an accredited observer to the International Hydrographic Organization and is a formal partner of the Seabed 2030 initiative.
    - Cooper: I second JiM and Pauls suggestions of looking into Olex and Seabed 2030. However, a large problem with any acoustic data, bathymetric or other, from fishing vessels are standards and calibration documentation. Quite a lot of good discussion on this at the ICES [WKSCINDI](#), specific to fishing vessels.

## Industry involvement

- **What benefits do the fishers get from putting sensors on their gears? Are there particular incentives for them doing this? JC**
  - JiM: Real time view of bottom conditions after they haul, comparisons with climatology and models.
  - Cooper: Many fishing fleets are beginning to log this type of data, along with many other data streams, as they explore making their businesses more data driven.
  - Cooper: I have always been a proponent of paying fishers for the data that they catch, just like the fish. Fishing vessels as ocean observation platforms are extremely cost effective, even when compared to automated technologies such as Argo floats, which are considered quite cost effective at ~\$200 USD

per profile. This tends to be a controversial opinion among the oceanography and ocean obs community.

- Paul: Participating in data collection and sharing by fishers is a direct contribution to Sustainable Development Goal 14a 'to increase scientific knowledge' of the ocean. Fishing companies participating in data collection can thus show that they are implementing SDG 14.
- **What is the immediate benefit for the fishermen to carry the sensors in their fishing boats? VF**
  - See previous
- **What is the benefit for the fishing community? MH**
  - See previous
- **Is the vessel owner willing to cooperate to collect some of this data, do we need a certain regulation to put it on? MAN**
  - Cooper: All vessels that BDC, FOOS, and eMOLT collect data with are voluntary, although some receive financial incentives. From my experience finding fishing vessels willing to collect data is far easier than finding the scientific funding to get this instrumentation on the vessels. However, as this grows larger, the legality and data ownership, especially in differing national waters, will be a challenge.
- **What is the model used for commercial fishing vessels to capture data and make it available for coastal states? Does it come with a cost or free? SN**
  - JiM: In eMOLT case, government funding mandates data is public and free while exact fishing locations are not displayed on public websites (10 mile bins).
- **Are you talking to Industry about quality and accreditation schemes? E.g. a FAIR fish on your table - where the activity has been carried out sustainably as well as contributing to our understanding of the oceans? JR**
  - Cooper: I think this is a great idea, along the lines of MSC but for contributions to oceanography and climate sciences? Many fishing industry professionals that I speak with are extremely concerned about climate change induced shifts they observe in marine ecosystems. In addition, the generalized public opinion of commercial fishing is often that it is bad, and that everyone is overfishing. Therefore, many fishers are quite receptive to green branding opportunities in order to demonstrate their compliance with regulations and environmental stewardship.
- **Do fishermen receive a remuneration for the data they collect? OR**
  - JiM: Realtime eMOLT participants are sometimes provided a small stipend depending on their effort but, once the instruments become robust and working well, most will be on a volunteer basis and, in fact, fishermen may want to pay to participate.
  - See previous.
- **Are fishermen responsible for logging location(s) of the sensor(s)? HH**
  - JiM: This is done automatically with GPS receivers and transmitters.
  - Michela: both in eMOLT and FOOS this is automatic, not requiring locations logging; in FOOS to fishermen is requested to input catch data.



**What is the data policy for fishing boat data distribution? Fishermen may be reluctant to make their boat positions publicly available or being identified. How do you manage this ?** *LP*

- Michela: privacy should always be respected, because this kind of data collection should only have scientific purposes and is not meant for control such as VMS tools, official log books etc.
  - JiM: Ditto in eMOLT case. Maps of data are binned to 10 mile grids and no vessel names are posted on the map
  - Cooper: The response I get most of the time is roughly that “there are no more secrets in fishing, with AIS everyone already knows 3x over where everyone else is.” However, my experiences are mostly in Northern Europe and the US. The situation is very different in some other seas.
  - Antonio: Not specifically, the goal is to create a win-win approach where the fishermen help with the collection and this data feeds models and forecasts they can use for their daily work. we have an example at local scale - [SINDBAND project](#) - where local actors are working together to improve metocean forecasts.
- **Any thoughts on how to get fishermen to get involved and deploy more sensors with their gears? e.g. electronic monitoring is advancing today but the main challenge is to have fishermen buy-in.** *HM*
    - Cooper: In many ways I see this as the antithesis to EM. While ultimately working towards many of the same goals, but from the bottom up on the fishers’ own terms and in a way that benefits them, rather than the feeling that it is being forced from the top down.
    - Antonio: The best is to show the benefit they can get: the more data the better the models outcome so the better the forecasts they can use.
- **Do you provide feedback to the fishers? eg monthly summary of temperature etc** *LB*
    - JiM: In the eMOLT case, we provide
      - a) wheelhouse display,
      - b) an [online map](#),
      - c) a weekly update via email,
      - d) a semi-annual hardcopy report in the mail.In the coming year, we plan to provide password-protected individual pages w/details for each captain
    - Michela: the initial purpose for FOS was to provide some products (eg. maps) to the fishermen, instead with FOOS fishermen can see on board the data on the logbook and can receive weather forecasts ... but this has not revealed to be always enough as incentive.
    - Berthe: The Belgian VISTools project connected a number of instruments and sensors on board to a concentrator. Data is shown in easy to use tools for the skipper, scientists can use the data in return (see comment Lancelot Blondeel).



- **Will you provide a platform app to view the outputs of the data in a interactive maybe arcgis map app that displays the data in open source? *RL***
  - See previous question response
- **Ideally maps would be made available to fishermen in an easily accessible form (web page; smartphone web page) so that maps could be consulted out of interest and on a whim. This could generate interest in contributing from the fishing community. Are you planning such an interface? *WB***
  - See previous question response.
  - Cooper: Yes; however to really do this properly is quite an undertaking.

## Data management

- **I'm interested in knowing what (meta)data standards Berring Data Collective are working to and how the data can be easily incorporated into other portals? *AL***
  - Cooper: Working towards the standard COARDS, CF, ACDD, as well as International Standard Statistical Classification of Fishing Gears (ISSCFG), plus SensorML. I see the sensor classification standards as particularly important due to our 'strength in numbers' approach with many lower resolution sensors. We rely heavily on experts to steer this process and help guide us towards additional standards needed for each field, so if you have further suggestions, we'd be thrilled to have your input.
- **Have you published your data standards and ingest protocol somewhere (GitHub would be nice)? *KW***
  - JiM: we have a draft 100 page "Dockside Technician Manual" in a googledoc form along with Python code on GitHub. Email [james.manning@noaa.gov](mailto:james.manning@noaa.gov) for access.
  - Michela: CNR working on a data paper to come along with data in Penna et al 2020.
- **The discussion on data is excellent. Have you documented the methods and best practices related to the observations? If yes, where are they available to scientists and fishermen *JP***
  - JiM: Good idea, I need to add a link at [emolt.org](http://emolt.org)
  - Cooper: we all have a lot of work to do on BPs. Different gear types, weights of gear, bottom types all affect the produced data. Vessel operators should be engaged in future development of BPs as they are quite well attuned to their gear behaviors. Ultimately, the development of more universally BP are held back by a lack of funding.
  - Patrick: BPs will be on the agenda for the main workshop planned for next year.
  - Michela: some work has been done on it through UE projects (see the links in the pdf) but as the network goes bigger and the variety of applications increase, further protocols will be needed.



- **Given your comments on client confidentiality vs. FAIR - do you have a publically available Data Policy we can read? AL**
  - Cooper: No we do not, although this will undoubtedly be necessary. For our work with individual vessels, it's all on a relatively informal case by case basis at this early stage. Inevitably this will become quite complex as data privacy laws vary between nations, and vessels often have quota from multiple nations' exclusive economic zones.
- **Also - how are you managing your dataset dois? AL**
  - Antonio: Preliminary data are already available in the EMODnet Physics erddap, <https://erddap.emodnet-physics.eu/erddap/index.html>, more details can follow by direct interactions (mails/calls).
  - Antonio: The idea is to follow an already designed process and procedure, e.g. within the ARGO community they defined a method to have incremental doi, that is a strategy, another is to directly exploit the channels that have been developed by EMODnet Ingestion - SEANOE.
- **Will the API link to call data be free if you subscribe to sharing the data to the platform? RL**
  - Antonio: Yes, they are, and once the data is flowing into the system, you may find the data via all the dissemination channels - i.e. you are going to have the APIs, the widgets ... etc
  - Cooper: Yes. Everything that goes to EMODnet is anonymized but is publicly available. But then as a theoretical 'data producer,' you would have access to your own data, as well as all authority to stop data flows to anywhere, for any reason. We can also talk about lat-lon and time binning for publicly available versions of your data.
- **Is there docs you can suggest for post processing of net CTD data that helps deal with sensor lag vs. Net speeds and also issues of wakeshed associated with the net movement through the water. CW**
  - JiM: In the eMOLT case, we throw out the profile because our sensors are not fast response. We report "bottom temp" as that being >85% of the water depth.
  - Cooper: Unfortunately there is not. Even on the heaviest (fastest falling) gears, we have not been able to detect any lag due to sensor response time with the new generation NKE WiSens that we use. Many other sensors types however, do have this issue. The wake shed issue, as well as other dynamic pressure components, need more work. We have a project proposal in the works to test many different sensor types on the trawl net of a R/V during a trawl survey, which at the beginning of each tow a rosette CTD profile is taken, which would give us an opportunity to properly ground-truth these measurements.
  - Michela: see (*Martinelli et al 2016*). Work has been done toward this direction also within EU projects (e.g. JERICO), the goal was to harmonize this kind of data sets with classic oceanographic standards; it is important to define



operational conditions for each sensor/gear combination. See the SEANOE just published FOOS casts (Penna et al 2020), a data description paper is in preparation. Furthermore some nets may work more as a glider than a classic CTD cast.

- **Do you extract temperature and salinity vertical profiles from FOS observations ? Vertical profiles are "easy" to manage (for example by modellers). TC**
  - Antonio: The idea is to manage this data such as either CTD or glider (depending on the specific type of the configuration) so then it would be easier to uptake into models, so yes the idea is work in that direction.
  - Cooper: the down and then up profiles of the mobile gears (I described as analogous to gliders) happen over a short distance, so assigning the profile to one mean lat-lon location would generally be a valid simplification.
  - Michela: in FOS we only had T/P probes, while in FOOS the majority of the probes we installed were as well T/P, but we also had some salinity/temperature/depth and we also trialled some O2 and Chl probes; again I suggest to have a look at (*Martinelli et al 2016*), Penna et al 2020 and (*Aydogdu et al 2016*)... stay tuned for more materials.

## Data use

- **Apart from the fishing Industry, have you thought about dedicated applications for the Aquaculture industry? JAG**
  - JiM: Yes, we have submitted proposals to US Aquaculture programs
  - Cooper: I see aquaculture as a very exciting opportunity to collect coastal data, but from a technical perspective, a different challenge: sensor response time does not matter, biofouling is a much larger issue, and the biogeochemical data opportunities I see as particularly exciting.
  - Paul: Through the SMART Ocean-SMART Industries program, the WOC has been reaching out to the aquaculture industry to get more involved in hosting sensors, as well as sharing data from baseline studies and ongoing monitoring that are often already required for aquaculture permits. The fouling of instruments is a problem for all sectors, and the WOC is tackling this through the GloFouling project with IMO. We are compiling Best Practices re the prevention and treatment of fouling on instruments, as well as spurring innovation and investment in solutions.
- **Sensors on nets can be used to trace lost gear. Is that considered in combination with data collection sensors? AE**
  - JiM: If you mean acoustically, I suppose, but then that takes more power.
  - Cooper: From a mechanical and electrical design perspective it does not make a lot of sense to me to integrate these sensors into the same unit. That being said, I do see a lot of synergy to have both of these sensors on the same piece of gear.



- Berthe: <https://blueoceangear.com/> might be interesting.
- **Is the data mostly used for environmental monitoring? To what extent is your data used by States for monitoring, control, surveillance and enforcement? KC**
  - Michela: see my comments above, control purposes should be kept separate in my opinion.
  - Cooper: From vessels that we work with individually, this data will never be used for control or enforcement. Our ethos is about doing this in a bottom up way that works for the fishing industry as a way to build bridges for future trust and collaboration. Not another top-down mandate.
- **How do you envision the different datasets being utilized in decision making processes? NA**
  - JiM: If a fisherman has not been catching much and sees the bottom temperatures collected by others in his area are not changing much, he may not bother getting underway.
  - Cooper: For example: locating the thermocline is key for many fishing practices. It's generally believed by the fishing community that ocean models are inaccurate (true, but of course to varying degrees) so in-situ measurements are much preferred.
  - Paul: The increased data from fisheries will of course improve modeling and forecasting of oceanographic and weather events, e.g. storms and cyclones/hurricanes. These outputs will be critical in decision making for voyage planning that protects lives, vessels and equipment.

## Other programs

- **We have had really good success with the CTD tags developed for seals by SMRU at st-andrews on longlines down to 2000m. The issues we have run into with data collected by fishing vessels is getting oceanographers interested in using the data, is this something others run into as well? DM**
  - Cooper: Yes! a key goal of this and future initiatives. I see a lot of similarities between marine mammals and fishing vessels as ocean observation platforms: spatial and temporal irregularity, multi-disciplinary data uses, well suited for shelf/coastal regions & marginal ice zones, yet a strange idea for the more traditional oceanographers..
- **Hi everyone, I am Miguel Cabanellas Reboredo, postdoctoral researcher at the Spanish Institute of Oceanography. Under the framework of COST-ACTION (CA18102)-The European Aquatic Animal Tracking Network (ETN) we are trying to enlarge acoustic telemetry structures to track marine species. Based on your experience attaching data recording systems on fishing gears, I would like to know if it could be possible, and obviously, if it would be reliable to attach acoustic receivers to fishing gears. This could enlarge the data**



collection not only oceanographic variables but also eco-biological data. Thank you very much! **MC**

- JiM: See [Goulette et al 2014](#)
- Cooper: I think this is a great idea for fixed gear deployments, and would like to see this employed for mitigating right whale entanglement issues.
- Michela: we already investigated this option in the Adriatic and yes is good idea for fixed gears (there are as well experiments planned with probes in development), but I see it as not feasible on vessels operating with engine switched on.

## Regional differences

- **Do you have access to the fishing data related to China waters?** **PR**
  - JiM: No, but a former intern is now working for Fish Company in China so I will get that information.
  - Paul: The WOC SMART Ocean-SMART Industries program provides a global platform for advancing and coordinating industry collaboration on data collection around the world, encompassing all sectors. We have a WOC Associate for China.
- **Is this network interested in data from anywhere in the world? I see that our area was a blank on the first map. How would an institution (e.g. university or iniversity-based centre) go about getting involved?** **AM**
  - Cooper: send me an email and let's have a call about it? [cooper@beringdatacollective.com](mailto:cooper@beringdatacollective.com)
  - Patrick: Yes, we are interested in data from all over the world. Please also send to [ffd@emodnet-physics.eu](mailto:ffd@emodnet-physics.eu)
  - Paul: A key role in the WOC interaction with the ocean observation/science community is to have them identify the "blank areas", i.e. data deficient areas on the map for various data collection programs (we can provide examples of this). The WOC SMART Ocean-SMART Industries program then reaches out to various industries to see who has vessels or platforms in these areas and are interested to consider hosting or deploying instruments that can collect data to "fill in the blank".
- **Are you collecting (accepting) data also from small scale experiments which are using data loggers from coastal areas ? Even if they are sparse (e.g. only T)** **MS**
  - Patrick: Yes definitely! Please contact us at [ffd@emodnet-physics.eu](mailto:ffd@emodnet-physics.eu) to initiate discussions.
- **Have you been collaborating in more tropical seas in the Americas?**  
**We have the Pole to Pole Program for the Americas in the GEO BON initiative**  
**EE**



- Cooper: BDC has primarily been working in the North Atlantic as well as a little bit in the North Pacific, but I would be thrilled to help out in any way for some tropical focused programs, given the opportunity.
  - Patrick: Please contact us at [ffd@emodnet-physics.eu](mailto:ffd@emodnet-physics.eu) to initiate discussions
  - Paul: Many of the companies in the WOC network operate in the waters of the Americas. The WOC SMART Ocean-SMART Industries program provides a global platform for advancing and coordinating industry collaboration on data collection around the world and across the sectors.
- **Hi, a question for Cooper: are you collecting/planning to collect data in Southeast Asia? Thank you so much! PB**
    - Cooper: I feel that we really need a local partner organization for something like this, given the language and other barriers. That being said I would love to help facilitate this and even to go out fishing for a few days to observe gear behavior and vessel operations to evaluate and test sensor deployment options. (We spend way too much time in the North Atlantic)
    - Paul: At WOC, we have in our network many companies that operate in SE Asia. The WOC SMART Ocean-SMART Industries program provides a global platform for advancing and coordinating industry collaboration on data collection around the world, encompassing all sectors.
- **At which scale did you collect the data via the fishing vessels in the Med area? And how many industrial vessels have been involved if any? MS**
    - Michela: when fully operational the CNR-IRBIM AdriFOOS fleet fishing daily in the Adriatic Sea was composed by 10 commercial vessels (using various fishing gears and targeting different species), especially in the northern and central areas this setting has revealed to be representative from an oceanographic point of view (see *Aydogdu et al 2016, Penna et al 2020.*), furthermore from a biological point of view the focus was mainly on small pelagic species and the number of vessels targeting this assemblage again showed to be representative (*Carpi et al 2015*). As far as I know other experiences in the Mediterranean are: CNR-IAS has some commercial vessels equipped with FOOS working mainly in the Sicilian Channel and Ifremer has more vessels (also small artisanal fisheries vessels) equipped with RECOPECA mainly operating in the Gulf of Lion.

## Other

- **Hi, is there already any collaboration with the financial sector eg banks, insurance or inciting communities? PR**



- Antonio: I can answer for EMOdnet Physics and there is not yet.
- Paul: The WOC has active engagement with the finance community on the potential for investing in the development and deployment of sensors, the development of programs, software, and initiatives to aggregate and analyse the data from industry observation programs (in addition to data from other sources) and develop actionable, operational intelligence in support of safe, sustainable, responsible ocean economic activity.
  
- **Are you working with the Ocean Data Foundation?**  
<https://www.oceandata.earth/> **KW**
  - Patrick: From EMOdnet Physics, not yet but definitely something to consider. Thank you for the link!
  - Paul: The World Ocean Council has been in contact with the proponents of the Ocean Data Foundation since its inception, with more direct interaction following the launch of the program. In 2019, the Ocean Data Foundation spoke at the annual WOC Sustainable Ocean Summit, at our recurring SOS session on “Digital Ocean, Big Ocean Data, and the Ocean Cloud”.
  
- **I saw Human Activities was one of your icons, but when you listed the coverage areas you did not mention human activities. Could you speak to this area or provide a contact person with email or a web link?** **PC**
  - <https://www.emodnet.eu/human-activities>
  
- **Any possibility of connecting with Global Fishing Watch?** **GW**
  - Patrick: Good idea. Something to consider for the future
  - Cooper: I’ve bothered David Kroodsma a few times, and we use their data quite a lot to show the opportunity that fishing vessels could contribute (fishing maps in webinar are from GFW).
  
- **Any possibility of collaboration with the subsea cable (telecoms) industry regarding sensors to avoid entanglement between fishing gear & cables ... which are so important for international webinars like this today** **JB**
  - Cooper: Certainly, this could be mutually beneficial as losing a net on an undersea cable is quite expensive for a vessel.
  - Paul: The World Ocean Council is a part of a major international initiative called “Smart Cables” which is working to develop sensor packages to integrate into submarine telecoms cables for collecting oceanographic data (temperature, salinity, etc.) and tsunami detection capabilities. Having the sensor packages include an instrument which could help avoid the entanglement of fishing gear is an interesting idea that I will bring to the group, as this would clearly be beneficial to both the fishing and cable industries.
  
- **Why are light CTD sensors, as those you showed, not used on small other boats such as sailing boats ?** **LP**



- Cooper: Sailing boats don't have anything that regularly goes down to the bottom and comes back up. From my perspective sailing vessels are better suited to collect sea surface and surface met parameters. Several notable sailing citizen science projects. Quite a nice example with [AtlantOS and Volvo Ocean Race](#). But lots of other [exciting citizen science opportunities](#), especially for coastal waters. We're particularly excited about using similar CTDs with scuba divers, as they concentrate at biodiversity hotspots, and can manually add visual observations to automated physical data collection.
  
- **I plan to reconstitute a breeding and feeding area which is currently over-exploited by the artisanal fishery in Côte d'Ivoire. What alternatives for the benefit of these fishermen could allow me to achieve my objective of sustainable management of the resources of this environment ?** **YS**
  - Michela: from a scientific (as well as a management) point of view, coupling environmental variables directly with fish distribution may help you to develop an ecosystem approach to fisheries management, have look at Carpi et al 2015, but it's plenty of literature on this subject and for different species various variables may be relevant
  - Cooper: For artisanal and/or data-poor fish stock management I might start with looking through [FAO resources](#). I'm sure ICES also has some relevant resources, both on breeding/stocking programs and implementation, as well as balancing socio-economic needs. For example: the [Working Group on Balancing Economic, Social and Ecological Objectives](#).
  
- **The use of fish aggregating devices (FAD) is more and more common today, while the assessment of their catch effort still seems complex to me. Is this technology favorable to the sustainable management of biological resources ?** **YS**
  - Cooper: Quite a nice paper on FADs, and more from the stock assessment and fisheries perspective that looks like you may be interested in: <http://dx.doi.org/10.1016/j.fishres.2015.09.021>
  - Paul: Many FADs have sensors that collect data, usually temperature and salinity. The WOC has been in contact with major fishing fleets that deploy FADs and hold the data that have been logged by the FADs. We are working with them to get them to share the data into the appropriate public databases as an ongoing effort within the WOC SMART Ocean-SMART Industries program.
  
- **Regarding the data collection. Do you foresee that this would be something done by all harvesters or just a small subset? Also, do you foresee the oversight of the harvester data collection as an industry or government run activity?** **JP**
  - Michela: there are proofs that a representative subset of a fleet working daily in a particular area can provide enough data e.g to enhance a model (see



*Aydogdu et al 2016*) as well as for other purposes (eg. *CPUE Carpi et al. 2015*).

- Antonio: Once you have them integrated in EMODnet Physics they are available and accessible to any user. The overall goal is to have a community approach to manage this data so you can easily connect more systems that are harvesting and making these data available.

## Comments

- In France , the operational data system Coriolis have been collaborating closely with Recopesca that is one of the networks mentioned by Cooper and these data are sent to modellers as Copernicus Marine for a long time. It has been shown that these data , as they are collected in areas where other global networks such as Argo , even if they are lower quality than Argo, have an impact on the model output. Because Recopesca worked closely with fishermen they understood that with more accurate model ocean outputs they will have more information on the area where they fish because they understand that changes in ocean are gradually becoming as important as atmosphere forecasts. As the CMEMS INSTAC coordinator I fully support this initiative and encourage this community to facilitate integrated access to these data. One benefit of sharing with CMEMS and Emodnet will be to benefit from QC on environmental data as they will be compared with other datastream especially when more sensors will be added. *SP*
- My compliments to a very interesting program, and to Berring Data Initiative for providing some "glue" between different scientific and industrial driven local initiatives. The "packaging" and delivery of data is definitely key to demonstrate utility of the data. The key will be to get the agreement with WMO to get the data on the GTS, that is a potentially very important "superuser". *TT*
- In Belgium we have connected a number of instruments and sensors on board to a data concentrator and we present these data in easy to use, so called intelligence tools for the skipper. In return we, as scientists, can use the data, including subsurface data from a sensor on the fishing gear. The skipper and vessel owner are very enthusiastic. *LB*
- Under OBSERVA.FISH project we are also testing the Undersee system (type of ferrybox but much smaller and easy to operate) to collect surface data on board fishing vessels. *AS*
- Thanks a lot for these quality presentations. Would love to get connected to some of the present persons, in particular oceanographic scientists and fisheries interested in identifying sustainable fishing grounds and optimize their route. Take care, Vincent Brenier, Deep Blue Globe *VB*

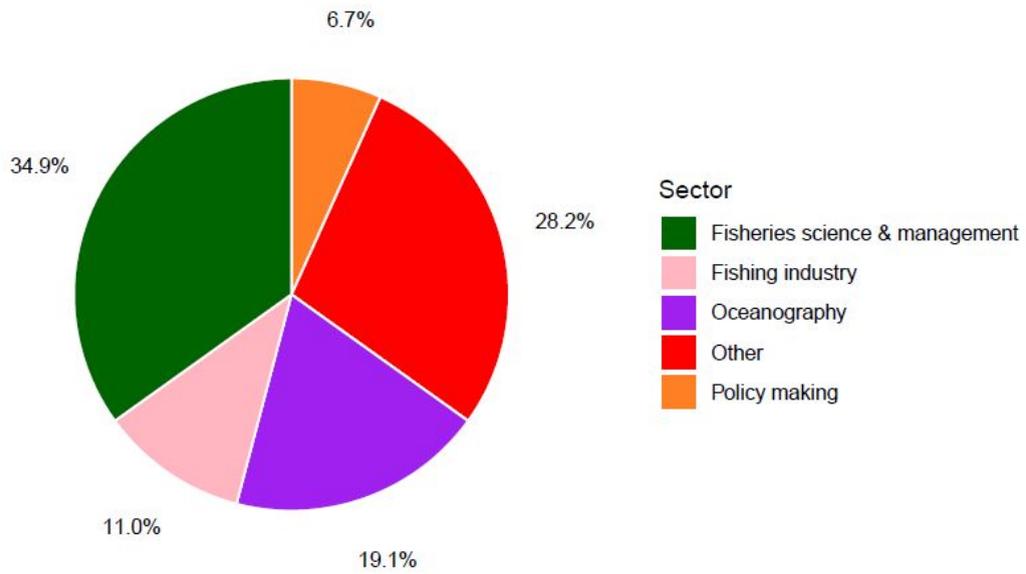


- The fact that EMODNET-Physics is working closely with CMEMS , seadatanet and ICES means that providers could benefit from QC performed by these integrators in addition to what providers can do *SP*
- FYI - here's a report outlining the policy and technical requirements for a design for a fishermen's data portal which provides access and confidentiality controls <https://em4.fish/our-library/2019-digital-public-report-1-fishermen-first-data-ecosystem/> *KW*
- I maintain a list of fish tech companies and devices (including sensors) so pls let me know if you have items to add <https://docs.google.com/spreadsheets/d/1G4XX7WB5dt4D5SFQmecEKVk2xSDRxWVpPOgTDHZf9-M/> *KW*
  - JiM: I would like to talk with you. [james.manning@noaa.gov](mailto:james.manning@noaa.gov)
  - Paul: Hi Kate. It would be great to get your efforts and your information greater exposure and integration into the global platform WOC has with our SMART Ocean-SMART Industries program. Please contact me at [paul.holthus@oceancouncil.org](mailto:paul.holthus@oceancouncil.org)
- This is an opportunity to create fisheries observing initiative under OceanObs Research Coordination Network. Cooper is aware. *HM*
  - JiM: I am interested. Gerard at MARACOOS pointed me to this.
  - Paul: The WOC has been a participant in the OceanObs Research Coordination Network for many years. I am happy to help provide linkages and coordination with this group.
- from a fisheries perspective broad coverage is the goal - but it may be better operationally to focus on the highliners and vessels that account for a disproportionate amount of fishing effort -- 30% or 40% of vessels that account for > 80% of the total catch. *JH*

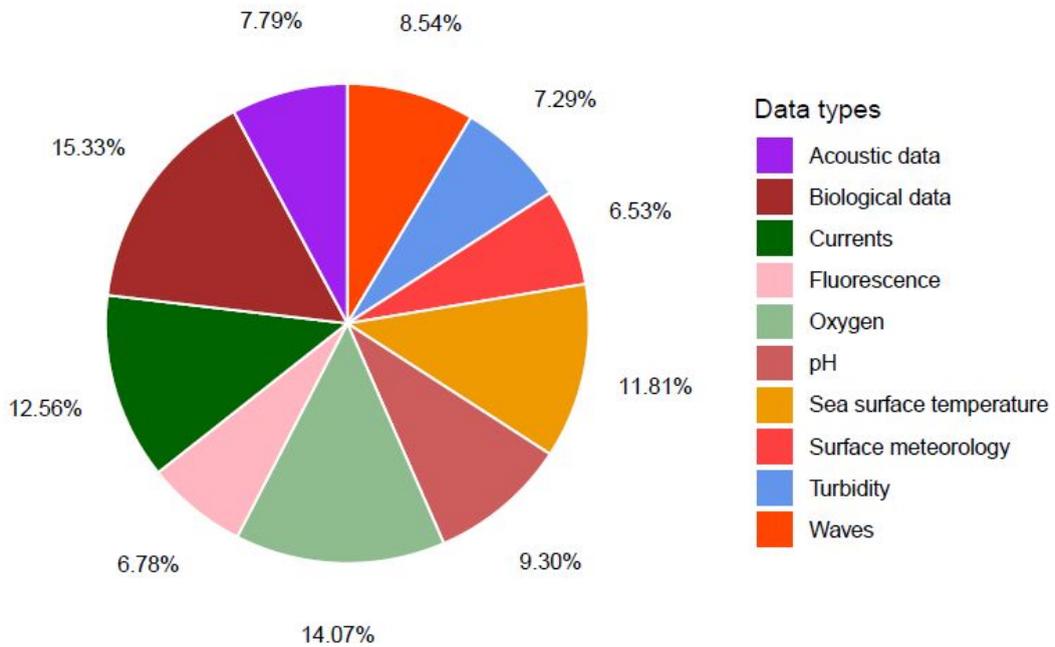
## Poll Results

Poll results include the aggregated responses for both morning and afternoon webinars.

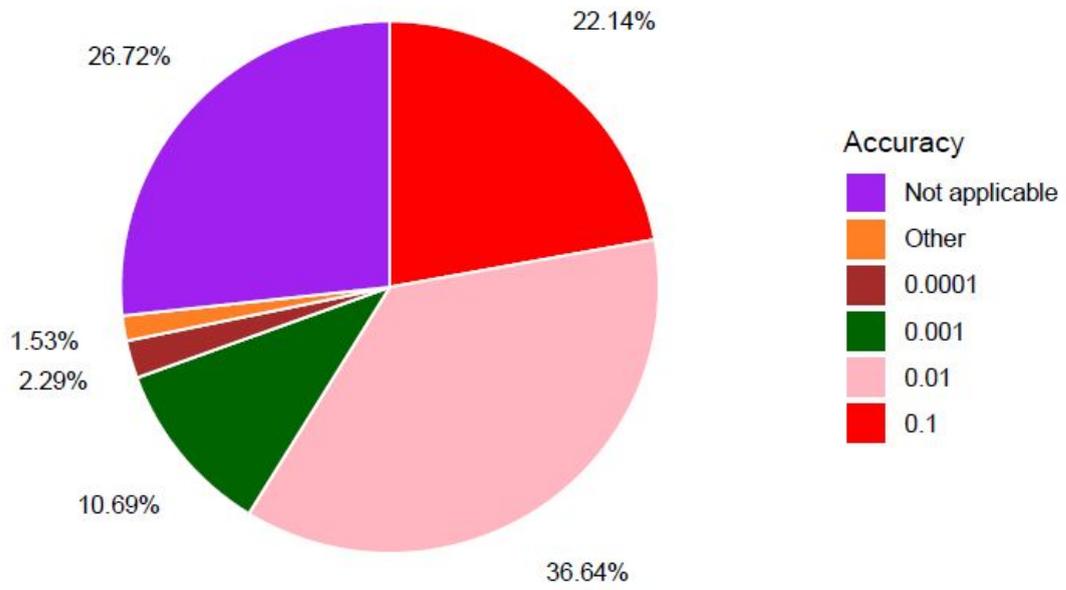
1.) What is your background?



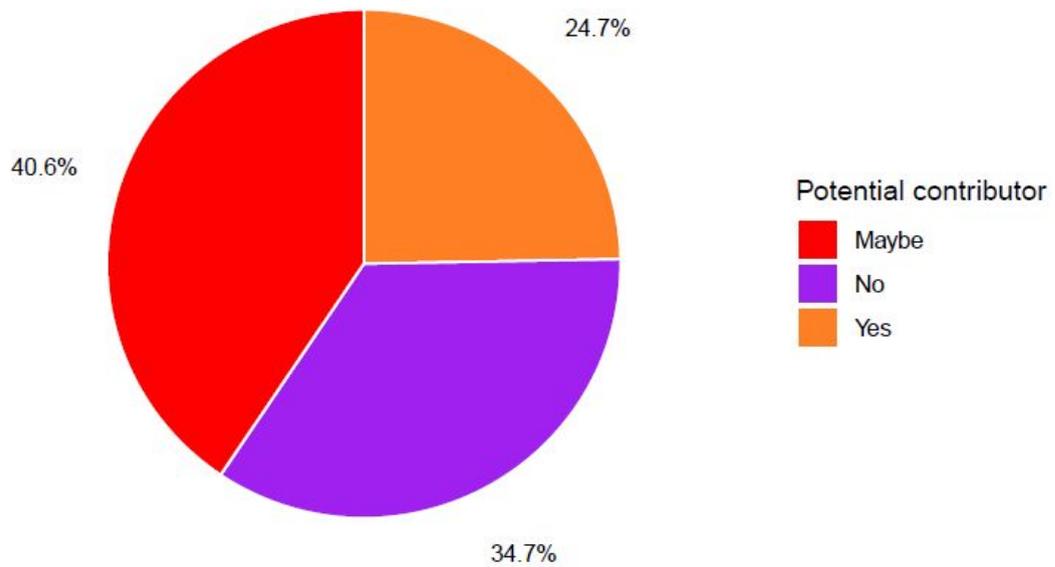
2.) What are other variables (apart from CTD) you would like to see collected by fishing vessels?



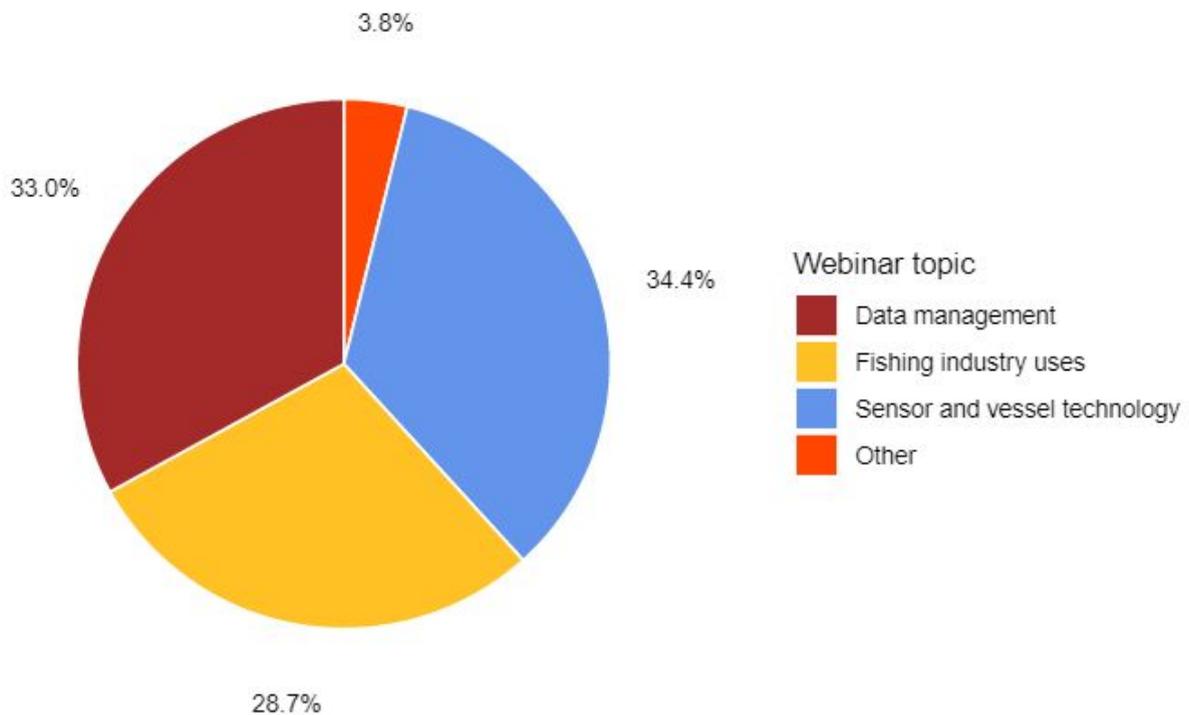
3.) *Temperature accuracy requirement?*



4.) *Are you a new party potentially willing to contribute data as part of a global network?*



5.) Future webinar on which topics you might be interested in?



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