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**Papers published in the Special Issue of  
FISHERIES RESEARCH 178: THE USE OF FISHING VESSELS AS SCIENTIFIC PLATFORMS**

***Francois Gerlotto***

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During the 2<sup>nd</sup> meeting of the SPRFMO Scientific Committee in Hawaii (2014), a task group was organized for studying scientific acoustic data from fishing vessels. One of the terms of reference was to evaluate the capacities of "fishing vessels as scientific platforms". The IREA (Instituto de Recursos Acuáticos, *Institute of Marine Resources*) was committed as organizer of a workshop on this topic, which was held in Lima, 8-11 Sept. 2015. Among the conclusion of this workshop the project of publishing a special issue on this theme in a scientific journal was decided, and an Editorial Committee was constituted under the chairmanship of Dr Gary Melvin (DFO, Canada) with Francois Gerlotto (IREA, France), Carolina Lang (IFOP, Chile) and Pedro Trillo (IREA, Peru). The journal Fisheries Research was contacted and accepted to host this special issue.

More than 30 abstracts were received, among which 15 were published in Fisheries Research after peer review process. We present below the list of these papers with their abstracts and bibliographical references.

Fisheries Research, Volume 178

**SPECIAL ISSUE: THE USE OF FISHING VESSELS AS SCIENTIFIC PLATFORMS**

June 2016, ISSN 0165-7836, [http://dx.doi.org/10.1016/S0165-7836\(16\)30075-3](http://dx.doi.org/10.1016/S0165-7836(16)30075-3).

(<http://www.sciencedirect.com/science/article/pii/S0165783616300753>)

**Gary D. Melvin, François Gerlotto, Carolina Lang, Pedro Trillo. Fishing vessels as scientific platforms: An introduction.**

Fisheries Research, Volume 178, June 2016, Pages 1-3, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2016.02.022>.

(<http://www.sciencedirect.com/science/article/pii/S0165783616300522>)

**Pablo Pita, Duarte Fernández-Vidal, Javier García-Galdo, Ramón Muíño. The use of the traditional ecological knowledge of fishermen, cost-effective tools and participatory models in artisanal fisheries: Towards the co-management of common octopus in Galicia (NW Spain).**

Fisheries Research, Volume 178, June 2016, Pages 4-12, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.07.021>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300308>)

**Abstract:** The fishery of octopus *Octopus vulgaris* in Galicia (NW Spain) is a paradigmatic example of top-down management that generates conflicts between fishermen and policy makers. In the absence of scientific information to support the management of this data poor artisanal fishery, the traditional ecological knowledge (TEK) of fishermen was tested to map the distribution of fishing grounds and GPS data-loggers and log-books in order to estimate the intensity of effort and CPUE. Furthermore, a description of the social, technical and ecological features of the fishery was obtained to be used in conjunction with the results of questionnaires answered by experts, to improve the current management and to ensure the long-term sustainability of one of the most traditional and economically relevant fisheries in Galicia. Approximately, 700 vessels use traps in Galician coastal waters to catch 2000 t of octopus annually, with a market value of 13 M €. Octopus vessels also use gillnets, hooks and lines and shellfish gathering to target common spider crab *Maja brachydactyla*, goose barnacle *Pollicipes pollicipes* and other species. The fishermen operating in the study area of the Ría of Arousa identified 174 km<sup>2</sup> of octopus fishing grounds, mainly distributed in the mid and outer parts of the study area. The fishing effort was exerted on the same rocky reefs, also the most valuable fishing grounds in terms of CPUE. The use of new techniques and tools based on participatory models is encouraged to obtain cost-effective information of this fishery and in general of other fisheries in data poor environments. Likewise, the creation of a long-term co-management plan is recommended to ensure the sustainability of stocks and the profitability of this artisanal fleet.

Keywords: Artisanal fisheries; Fisheries conflicts; Common octopus; TEK mapping; GPS data-loggers

**Gary D. Melvin, Rudy Kloser, Taina Honkalehto. The adaptation of acoustic data from commercial fishing vessels in resource assessment and ecosystem monitoring.**

Fisheries Research, Volume 178, June 2016, Pages 13-25, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.09.010>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300862>)

#### **Abstract**

The collection of scientific data from commercial fishing vessels will play an important role in the future assessment of fish stocks and ecosystem monitoring. Currently fishing vessel acoustic data collections range from fully structured random/systematic surveys to the ad hoc search patterns of pelagic vessels during standard fishing operations, and are used primarily in single species stock assessment. To effectively use these data a good understanding of the data collection methods, analytical procedures, and the limitations of the data is required. Consideration of the limitations and interpretation of the data are a major factor in evaluating the validity of the outputs, the uncertainties associated with the data and the acceptance of the results by the scientific community. In this paper we provide 3 case studies of how acoustic data from commercial fishing vessels are being used to provide information on fish resources and advice to management. We categorize a fishing trip into 3 phases: transiting, searching, and fishing, and we discuss the attributes and limitations of data collected during each phase. Examples of current fishing vessel data collections and their application in resource assessment and environmental monitoring are presented. In addition, we explore opportunities for acoustics to support broad-scale ecosystems monitoring, without interfering with the day-to-day operations of the vessels.

Keywords: Fishing vessels; Methods; Ecosystems

**J. Massé, F. Sanchez, D. Delaunay, J.M. Robert, P. Petitgas. A partnership between science and industry for a monitoring of anchovy & sardine in the Bay of Biscay: When fishermen are actors of science.**

Fisheries Research, Volume 178, June 2016, Pages 26-38, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.11.018>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615301417>)

#### **Abstract**

Anchovy and sardine are small pelagic species occupying similar geographic areas in the Bay of Biscay (North-East Atlantic). Their biomass is strongly dependent on recruitment, making the annual assessment of TAC (Total Allowable Catch) a risky strategy due to uncertainty in predicting the magnitude of recruitment. Monitoring these resources more often and throughout their life cycle could allow management strategies to be adjusted based on observations which indicate the level of recruitment. In order to achieve a more frequent monitoring, an innovative data collection strategy involving a partnership between fishermen and

scientists, was developed in 2009 and 2010 called "pilot sentinel surveys". This paper details the partnership, the information such a partnership can provide and how it can be useful for adaptively managing such resources. The method was based on short surveys undertaken by commercial vessels several times per year, in two spatially limited "key areas" known to be potential recruitment habitats. Acoustic surveys and fishing operations enabling biological sampling, were combined in each key area. Only one scientist was on board and an ad hoc sampling strategy was adopted during each survey by the Captain-Scientist team depending on the local conditions. This partnership allowed scientists to benefit from fishermen's experience and therefore adopt a sampling strategy which was optimized in time and space. The sentinel survey data were complemented with data collected during annual spring acoustic surveys carried out by the research vessel (RV) Thalassa. The RV was accompanied by commercial vessels allowing additional fishing operations and acoustic echo interpretation to be performed. This experiment showed that the sentinel observations in limited areas cannot provide reliable abundance indices, but are adequate to provide significant biological information on the seasonal progress of the life cycle of each species, such as growth, timing of in-coming recruitment and migration pattern. In addition, these "pilot sentinel surveys" significantly improved the mutual understanding between fishermen and scientists.

Keywords: Sporadic acoustic surveys; Bay of Biscay; Small pelagic monitoring; Recruitment indicators; Fishermen's surveys

**Sascha M.M. Fässler, Thomas Brunel, Sven Gastauer, Dirk Burggraaf. Acoustic data collected on pelagic fishing vessels throughout an annual cycle: Operational framework, interpretation of observations, and future perspectives.**

Fisheries Research, Volume 178, June 2016, Pages 39-46, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.10.020>.

(<http://www.sciencedirect.com/science/article/pii/S016578361530117X>)

## **Abstract**

Acoustic data collection trials on pelagic freezer-trawlers were realised in 2012 during several fishing trips targeting blue whiting west of the British Isles in spring, North Sea herring in summer, and horse mackerel in the English Channel and Celtic Sea in autumn. Echosounders were calibrated and time- and position-stamped data logged along the path covered by the vessels. The acoustic detections recorded during different types of trawler activity within a fishing trip ('searching', 'stationary', and 'fishing') were compared between target species. The highest proportion of time spent for activity 'fishing' was observed in the blue whiting fishery (82%), while that value was lower in the horse mackerel and herring fishery (68% and 54%). In all fisheries the quantified mean fish densities recorded were significantly higher during 'fishing' than during 'searching'. Changes in recorded fish density magnitudes over time before and after trawling also showed different patterns between fisheries. The quantified peculiarities exhibited by the specific fishing trip data is discussed in light of incorporating them in monitoring programs and analysis methods that can advance ecosystem understanding. Potential future approaches for analysis methods of opportunistically recorded acoustic fishing vessel data are discussed.

Keywords: Acoustic data; Blue whiting; Echosounder; Fishing vessel; Freezer-trawler; Herring; Horse mackerel

**Gang Li, Jie Cao, Xiaorong Zou, Xinjun Chen, Jocelyn Runnebaum.  
Modeling habitat suitability index for Chilean jack mackerel  
(Trachurus murphyi) in the South East Pacific.**

Fisheries Research, Volume 178, June 2016, Pages 47-60, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.11.012>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615301351>)

### **Abstract**

Habitat models, such as the habitat suitable index (HSI), have been extensively used to estimate the spatial distribution of fish species based on the quality of habitat. Fishery dependent data from commercial fishing vessels are an important or potentially the only source of scientific information available in these fisheries, especially for the highly migratory stocks in the high seas. In this study we use catch and effort data from the Chinese trawl fishery combined with remote sensing data including sea surface temperature (SST), sea surface height (SSH) and sea surface chlorophyll-a concentration (Chl-a) to define suitable index (SI) for jack mackerel (*Trachurus murphyi*) in the South East Pacific Ocean. Observed SI values were calculated based on the frequency distribution of fishing effort for each environmental variable, and parameters of the SI models were estimated using nonlinear regression. SI models for SST, SSH, and Chl-a were combined into two empirical HSI models, the arithmetic mean model (AMM) and the geometric mean model (GMM). Results indicate that the AMM performs better than the GMM model to quantify the scale of best available habitat for jack mackerel. Catch distribution fit well with the predicted high-quality habitat in 2013: 85.5%, 100.0% and 97.0% of total catch in fall, winter and spring respectively, were caught in areas predicted with better habitat. The seasonal variation of suitable habitat in latitude is consistent with that of the gravity centers of fishing effort and the 15 °C isotherm. There is strong agreement between annual total catch by the international trawl fishery and mean suitable habitat area during the period 2001-2010, but an opposite tendency from 2011 to 2013. This may be related to the lowest biomass of jack mackerel and catch quota introduced by the South Pacific Regional Fisheries Management Organization since 2010.

Keywords: Habitat suitability index; Satellite remote sensing; Chilean jack mackerel; Fishing vessels; South East Pacific

**Richard L. O'Driscoll, Adam J. Dunford, Alistair Dunn.**

**Industry acoustic surveys of spawning southern blue whiting on the  
Bounty Platform, New Zealand.**

Fisheries Research, Volume 178, June 2016, Pages 61-70, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.05.007>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615001484>)

**Abstract**

Annual acoustic surveys of spawning southern blue whiting (*Micromesistius australis*) on the Bounty Platform, southeast of New Zealand, have been carried out using industry vessels since 2004. In most years, surveys were carried out from a single vessel, while in 2009, acoustic data were collected from three vessels. The survey approach in all years was the same—vessels with calibrated Simrad ES60/ES70 echosounders and hull-mounted 38 kHz transducers conducted aggregation-based surveys using an adaptive design. Surveys attempted to cover all areas of high southern blue whiting density. In most years there were multiple snapshots of the same aggregation. The resulting biomass was used as a relative estimate of spawning southern blue whiting abundance. There was a very large (seven-fold) increase in estimated biomass of southern blue whiting at the Bounty Platform from 2006 to 2007, which was due to the recruitment of one very strong year class (2002) into the spawning population. The estimated biomass from 2008 was also high, but biomass declined by a factor of four in 2009. The observed decline in acoustic estimates between 2008 and 2009 was too great to be explained solely by fishing and average levels of natural mortality. The very large changes in estimated abundance between years, and also between snapshots within a year, are related mainly to changes in survey temporal and spatial coverage, and illustrate an important limitation on interpretation of aggregation-based acoustic abundance estimates. In each snapshot an unknown proportion of the spawning aggregation is surveyed, and almost certainly not the entire spawning stock. Survey coverage depended on both the amount of survey time available (which is often limited by commercial constraints) and the behaviour of the fish (e.g., the extent and density of the aggregation, and the timing of spawning). It is therefore difficult to incorporate the resulting series of abundance estimates into a formal stock assessment model as a time series. Despite this, industry acoustic surveys of the Bounty Platform have led directly to management decisions and changes in catch limits.

Keywords: Fishing vessel; Acoustics; Blue whiting; Survey design; Stock assessment

**Katharine V. Wurtzell, Adam Baukus, Curtis J. Brown, J. Michael Jech, Andrew J. Pershing, Graham D. Sherwood.**

**Industry-based acoustic survey of Atlantic herring distribution and spawning dynamics in coastal Maine waters.**

Fisheries Research, Volume 178, June 2016, Pages 71-81, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.11.011>.

(<http://www.sciencedirect.com/science/article/pii/S016578361530134X>)

**Abstract**

We describe a unique survey method that is able to cover a wide spatial and temporal range at a low cost. We utilised 10 individual small fishing vessels (lobster vessels) as acoustic research platforms to systematically survey a coastal population of Atlantic herring (*Clupea harengus*) in the Gulf of Maine. We examined 38 transects spanning more than 200 miles of coastline. Due to the low cost of chartering the vessels, the survey was repeated weekly for nine weeks, resulting in over 2300 nautical miles of on-transect data. We calibrated single beam systems using a split beam

guiding transducer to increase our confidence in the accuracy of the data and allow inter-ship comparisons. Although only one year of data has been analysed, the large spatial and temporal coverage of this survey provides preliminary information on herring population dynamics including spatial distribution throughout the survey area, timing of spawning and habitat associations of spawning aggregations. This survey will provide the template for longer term monitoring of herring spawning dynamics in Coastal Maine and how this may respond to climate and ocean variability.

Keywords: Fisheries acoustics; Hydroacoustics; Cooperative research; Spawning phenology; Survey design; Herring

**Rudy J. Kloser, Tim E. Ryan, Geoffrey N. Tuck, Gerry Geen.**

**Influence on management advice of fishers acoustics—10 year review of blue grenadier monitoring.**

Fisheries Research, Volume 178, June 2016, Pages 82-92, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.09.015>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300916>)

#### **Abstract**

An industry-based acoustic observation program was developed and applied to the austral winter spawning blue grenadier fishery from 2002. Blue grenadier has the highest Total Allowable Catch (TAC) among fished stocks of Australia's Southern and Eastern Scalefish and Shark Fishery (SESSF). High recruitment variability and stock size uncertainty motivated development of an industry-based cost-effective acoustic monitoring program in 2002 to optimise harvest while ensuring sustainability. The development of industry-based acoustic methods resulted in "routine" surveying being carried out by skippers on industry vessels since 2006. During this time an incentive based management approach was introduced by allocation of research quota to assist in the long term implementation and delivery of the biomass indicator. The survey strategy of the industry-based method differed significantly from chartered vessel based surveys; fishers were tasked with recording the maximum biomass during the spawning season. This monitoring method shifted the "burden of proof" to industry and reinforced the need for both local and broad scale surveys to estimate the stock size. Survey results have been used for management advice by reducing uncertainty in stock size, inclusion in the stock assessment model and informing spatial planning for the region. An associated outcome was the confidence by industry that fishers' observations of the spawning biomass were recorded and used in the stock assessment process for management of the fishery.

Keywords: Blue grenadier; Acoustic survey; Biomass; Stock assessment; Fishing vessels

**J.L. Watkins, K. Reid, D. Ramm, X.Y. Zhao, M. Cox, G. Skaret, S. Fielding, X.L. Wang, E. Niklitschek.**

**The use of fishing vessels to provide acoustic data on the distribution and abundance of Antarctic krill and other pelagic species.**

Fisheries Research, Volume 178, June 2016, Pages 93-100, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.07.013>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300229>)

### **Abstract**

A fishery for Antarctic krill (*Euphausia superba*) has existed for over 3 decades and the Commission for Conservation of Antarctic Marine Living Resources (CCAMLR) manages this fishery using precautionary catch limits, fishery data collection and a scientific observer programme operating on the fishing vessels. A recent increase in the number of vessels fishing and the rising costs of undertaking scientific research cruises have focussed attention on being able to use fishing vessels to collect more extensive scientific data sets. In 2011, CCAMLR's Subgroup on Acoustic Survey and Analysis Methods (SG-ASAM) was tasked with assessing the use of acoustic data collected from fishing vessels to provide qualitative and quantitative information on the distribution and relative abundance of Antarctic krill and other pelagic species. SG-ASAM conceived a proof of concept programme and implemented the first stage in 2013 to determine the current setup of acoustic equipment on participating fishing vessels and to establish whether these vessels could collect geo- and time-referenced acoustic data. To date data have been received from 7 krill fishing vessels and SG-ASAM has now focussed on the development of data collection protocols to enable fishing vessels to collect quantitative acoustic data along prescribed transects. While this development work continues, the willingness of fishing industry to participate in such studies has already been demonstrated by several fishing companies, and Norwegian- and Chinese-flagged fishing vessels are undertaking krill biomass surveys in two key fishery Areas in the South Atlantic sector of the Southern Ocean.

Keywords: *Euphausia superba*; Acoustic survey; Acoustic biomass assessment; Acoustic protocols; Fishing vessel acoustics

**Cleridy E. Lennert-Cody, Mark N. Maunder, Paul C. Fiedler, Mihoko Minami, Tim Gerrodette, Jeremy Rusin, Carolina V. Minte-Vera, Michael Scott, Stephen T. Buckland.**

**Purse-seine vessels as platforms for monitoring the population status of dolphin species in the eastern tropical Pacific Ocean.**

Fisheries Research, Volume 178, June 2016, Pages 101-113, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.10.005>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615301028>)

### **Abstract**

In the eastern tropical Pacific Ocean, yellowfin tuna (*Thunnus albacares*) are often found in association with spotted (*Stenella attenuata*) and spinner (*Stenella longirostris*) dolphins. Purse-seine vessels use this co-occurrence to locate the tuna by searching for dolphins and associated birds. Data collected by onboard observers since the late 1970s were used to develop indices of relative abundance for dolphins, based on line-transect methodology, when the primary method of detection of dolphin herds was with binoculars. However, trend estimation was subsequently



discontinued in 2000 due to concerns about changes in reporting rates of dolphin herd detections with increased use of helicopter and radar search. At present, as a result of a hiatus in fishery-independent surveys since 2006, fisheries observer data are the only source of information with which to monitor the status of eastern tropical Pacific Ocean dolphin populations. In this paper, trend estimation with the onboard observer data is revisited using a sightings-per-unit-effort approach. Despite different assumptions and model structure, the results indicate a lack of independence between the distribution of search effort and the search methods used, and the abundance of dolphin herds associated with tunas, on several spatial and temporal scales. This lack of independence poses a considerable challenge to the development of a reliable index of relative abundance for dolphins with these data. Given these results, alternatives for dolphin abundance estimation are discussed. One alternative is the use of purse-seine vessels for line-transect surveys during fishery closure periods. Another alternative is the use of purse-seine vessels during normal fishing operations as platforms for the collection of mark-recapture data (e.g., passive integrated transponder tags or genetics sampling). Life-history data collection, as a supplement to the collection of other data types, is also discussed. Further research and development is needed to assess whether these alternative methods will be useful.

Keywords: Dolphin abundance; Line-transect; CPUE; Bycatch; Generalized additive model

**E.J. Niklitschek, G. Skaret.**

Distribution, density and relative abundance of Antarctic krill estimated by maximum likelihood geostatistics on acoustic data collected during commercial fishing operations.

Fisheries Research, Volume 178, June 2016, Pages 114-121, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.09.017>.

(<http://www.sciencedirect.com/science/article/pii/S016578361530093X>)

## **Abstract**

There is a substantial harvest for Antarctic krill in the Southern Ocean, but little regular scientific monitoring of the resource. Recently, however, the Commission for the Conservation of Marine Living Resources (CCAMLR) has initialised a process to make use of acoustic data from commercial fisheries to increase the amount of relevant information available for making management decisions. We here provide an example where 34 days of acoustic data, collected during commercial krill fishing operations on the vessel 'Saga Sea' were processed to produce probability of presence, conditional density and relative abundance estimates on monthly, weekly and daily basis. Data were analyzed using a maximum likelihood time-series and geostatistical approaches, selected to account for the lack of sampling design, and likely correlation in space and time. The applied method showed low sensitivity of monthly estimates to different repeated measure criteria and location sub-settings. Most weekly estimates, but the last one, were also consistent with the full data (monthly) estimate. Highly variable and lower estimates were obtained, however, from daily data sets. Although our results suggest the method had provided an adequate treatment for time and space correlation, we were not able to evaluate potential bias due to preferential sampling of high

density krill aggregations and/or limited area coverage within short time periods. The results suggest that this method, combined with some additional design based coverage by the fishing vessels, can be useful to obtain quantitative evaluations of krill density and distribution for management purposes.

Keywords: Euphausia superba; Acoustics; Surveys; Geostatistics; Fishing vessels

**G. Moreno, L. Dagorn, M. Capello, J. Lopez, J. Filmalter, F. Forget, I. Sancristobal, K. Holland.**

**Fish aggregating devices (FADs) as scientific platforms.**

Fisheries Research, Volume 178, June 2016, Pages 122-129, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.09.021>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300977>)

**Abstract**

Fish aggregating devices (FADs) are floating objects used by fishers to aggregate pelagic fish such as tunas, and enhance the catch of these species. Because this is so important for tuna fisheries, nearly 100,000 FADs are deployed by fishers every year in the world's tropical oceans. Fishers use geo-locating buoys to track and maintain these FADs by visiting them regularly, reinforcing them if they are weak or replacing them. Many of these buoys are now equipped with echo-sounders in order to provide remote information on the aggregated biomass. FADs are currently only used for fishing purposes but they can also serve scientific objectives. In this paper, we investigate the potential of these data for improving our knowledge on the ecology of tunas and other pelagic animals as well as to obtain fishery-independent indices of distribution and abundance. These FADs also represent platforms for scientists to deploy scientific instruments, such as electronic tag receivers, cameras and hydrophones. Because FADs naturally aggregate several pelagic species other than tuna, these instrumented FADs can be a unique opportunity to observe pelagic ecosystem dynamics that are not possible from conventional research vessels. The amount of cost-effective data that they can provide would make a significant contribution to the scientific understanding of pelagic ecosystems. This information is vital for improved conservation and management of pelagic fisheries.

Keywords: FAD; Echo-sounder buoy; Tuna; Abundance; Acoustic tags; Pelagic ecosystem; Fishing technology

**Frederic Mosca, Guillaume Matte, Olivier Lerda, Florent Naud, Didier Charlot, Maxence Rioblanc, Christophe Corbières.**

**Scientific potential of a new 3D multibeam echosounder in fisheries and ecosystem research.**

Fisheries Research, Volume 178, June 2016, Pages 130-141, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.10.017>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615301144>)

**Abstract**

SEAPIX is a new multibeam echosounder (MBES) with an original architecture using a steerable symmetric Mills Cross. This configuration allows to image water column and sea bottom in both athwartship and fore-and-aft direction. Furthermore, steering capability in transmit and receive allows a volume coverage of  $120^\circ \times 120^\circ$  under ship with  $1.6^\circ \times 1.6^\circ$  beam aperture on the antenna axis. 64 beams are acquired per ping in the frequency range of 145–155 kHz using monochromatic or frequency modulated burst. Transmitted beams are stabilized in roll or pitch according with the transmitted mode and receiving beams are motion compensated using an embedded inertial motion unit. This MBES has been designed to be installed on fishing vessel and to help fishing strategies as long as to provide useable data for fish scientist. First part of this paper describes hardware main characteristics of the SEAPIX. We then describe signal processing and functionalities of SEAPIX. Finally, we illustrate first sea results on typical case.

Keywords: Multibeam echosounder; Fishing vessel data; 3D water column imaging; Bathymetry; Bottom mapping; TS detection

**Camilla Piras, Monica Mion, Tomaso Fortibuoni, Gianluca Franceschini, Elisa Punzo, Pierluigi Strafella, Marija Despalatović, Ivan Cvitković, Saša Raicevich.**

**A photographic method to identify benthic assemblages based on demersal trawler discards.**

Fisheries Research, Volume 178, June 2016, Pages 142–151, ISSN 0165-7836, <http://dx.doi.org/10.1016/j.fishres.2015.08.019>.

(<http://www.sciencedirect.com/science/article/pii/S0165783615300655>)

**Abstract**

Knowledge of the distribution of benthic assemblages is important for monitoring the environmental status of the seafloor and understanding the spatial pattern of demersal fish species and their essential habitats. This knowledge may allow for the enforcement of spatially explicit management approaches, such as those requested by the Marine Strategy Framework Directive. However, traditional methods for benthic fauna sampling are time consuming and expensive, especially when surveying wide areas and relying on expensive sampling platforms, such as research vessels. We developed and tested a photographic method based on mega-epifauna identification and quantification through the analysis of pictures of demersal trawler discards. The method was tested with samples collected in the Northern Adriatic Sea (Mediterranean Sea) at different spatial scales. In this framework, species compositions and abundance were determined through analysis of discard pictures. These samples were compared to those derived from discard samples simultaneously collected during field activities whose specific composition was analysed in the laboratory. The direct comparison between the photographic and laboratory data highlighted a significantly strong correlation in abundance estimates, although the photographic method was less effective for the detection of small-sized or hidden species. The multivariate comparisons

of species-site matrices obtained with the two methods also showed a strong, significant correlation, and the spatial patterns of assemblages were significantly consistent. Our results indicate that epifauna discarded by commercial demersal trawlers can be efficiently characterized and quantified using the photographic method, thereby halving the time needed for sample processing and easing practical barriers for sample collection and storage. These data may be used to identify different benthic assemblages and their distributions. This approach could take advantage of ongoing monitoring of commercial fishing activities and/or direct involvement of the fishing industry to allow the collection of benthic species/assemblage data over a wide spatial scale and with a high spatial/temporal resolution, thus making use of fishing vessels as an efficient sampling platform for benthic habitat investigations.

Keywords: Photographic method; Discard; Benthic habitat; Fishery-dependent data; Marine Strategy Framework Directive