Report on underwater noise monitoring system Operator's training

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Summary

1 Abstract

Document describes all activities leading to the adoption of all understanding, knowledge and skills needed for the implementation of the recommended monitoring system, specialy operations with autonomous passive underwater acoustic recorder SomoVault. The report also contain all documentation and manuals provided with the equipment procured.

2 Introduction

According to the project work plan, the network of the underwater noise monitoring stations is to be set up in the Northern Adriatic Sea (Activity 3.2). The continuous underwater noise produced by anthropogenic activities such as marine traffic (both commercial and recreational) and hydrocarbon exploitation will be monitored.

To be able to do that, partners involved in noise measurement acquired, through the bidding process, the equipment needed. The equipment specifications were agreed upon and defined (Deliverable D-3.2.1). Based on that, the bidding process was launched, proposals from various manufacturers received and processed. After the assessment, SonoVault acoustic recorder manufactured by company Develogic from Hamburg, Germany was chosen as the best option and ordered.

The crucial element in implementing underwater acoustic monitoring system and performing accurate and reliable measurements is the equipment operator's skill and the ability to work with the equipment in a proper and correct manner. Therefore the training of the operators was considered very important and treated accordingly.

3 Training activities

The training plan was to have first basic and hands-on training at manufacturer's premises in Hamburg and after that, when all equipment arrive to partners, to have advanced training, exchange of experiences and trial deployment in Venice during already scheduled meetings of Scientific and Monitoring committee. But due to the delayed process of procurement and delivery of the equipment, the delivery was scheduled after already scheduled Venice meeting. Because of that, it was decided to split training in three stages:

1. Basic theoretical and hands-on training workshop in Venice 26th – 28th November 2019 together with already scheduled committee's meeting and workshops on measurement uncertainty and processing. As leading partner (IOF) already has one older SonoVault which
2. is very similar to those that have been ordered, it was decided to bring it to Venice to enable other partners the possibility of basic hands on training.
3. Official manufacturer's training in Hamburg on 12th December 2019.
4. Advanced training, exchange of experiences and trial deployment in Venice on 23rd January 2020.

3.1 Operator's training workshop, CNR/ISMAR, Venice, 26th November 2019

The first operator's training workshop was held in Venice on 26th November 2019. in the premises of project partner CNR/ISMAR. The workshop was held during the partners three days meeting on which workshops on measurement uncertainty and processing as well as meetings of Scientific and Monitoring committee were held. The leading partner IOF already had one older SonoVault which is very similar to those that have been ordered and also three years experience in using it, therefore experts from IOF brought its SonoVault on the workshop and conducted the session. Due to the lack of knowledge and experience of other partner's stuff theoretical issues was addressed including:

- underwater noise monitoring system description
- technical requirements and specifications for autonomous passive acoustic recorder
- technical specifications of SonoVault
- theory and practice of SonoVault functions
- main parts and features of SonoVault (including hands on by partner's stuff)

Planned hands on work with SonoVault that was to include recording signal from the pistonophone and its playback was not entirely accomplished due to the organizational problems of the meeting. Incidentally the meeting took place during the period of extreme tides (aqua alta) in Venice which caused transportation problems and the delay of the part of participants. Therefore the beginning of the whole event was delayed by almost two hours. The time for the whole event was limited and it was decided that operator's training is to be shortened as it was to be continued in Hamburg and the final workshop in Venice, so there will be enough time for its completing. However, the training was regarded successful as many introductionary issues were settled and the basic understanding of the underwater noise monitoring and acoustic recorders established.

The workshop was attended by 31 participants including partner's stuff planned for working with the equipment, external experts as well as the wider scientific stuff interested in gaining knowledge on underwater noise measurement (Table 1 and Figure 1).

Table 1 Number of participants per PP and subcontractors at the Operator's training in Venice

No.	Project partner name	Number of participants
1	ARPA FVG	4
2	Fondazione Cetacea	2
3	CNR - IRBIM	4
4	IOF	6
5	BWI	4
6	CNR - ISMAR	6
7	CNR - INM	1
8	Regiona Marche	1
9	University of Gdanjsk	2
10	Quiet ocean	1

Figure 1 The participants of the first operator's training workshop held in CNR/ISMAR, Venice on 26th November 2019

3.2 Operator's training workshop, Develogic, Hamburg, 12th December 2019

The second operator's training workshop was held in Hamburg on 12th December 2019. in the premises of Develogic the manufacturer of SonoVault. The workshop served as FAT in the same time, as instruments for all partners were completed and ready for the operation. The training was structured as Develogic generic training course in two sections. First section was about mechanical part and included:

- description of SonoVault construction and main parts
- description of the underwater housing mooring frame that was the part of the delivery
- dissembling and reassembling of the mooring frame
- opening and closing of the underwater housing
- O-ring fitting and care
- dissembling and reassembling of the battery container
- filling and refilling of the batteries into the container

All participants were working with its own instruments and had full hands on experience in assembling all mechanical parts that are needed for the proper operation of the SonoVault as well as proper filling of the battery container. No problems were encountered during that part of the workshop. At the end of that part all instruments remained disassembled, opened equipped with batteries and ready for the operation.

Figure 2 Hands on instrument disassembling on the second operator's training workshop held in Develogic, Hamburg on 12th December 2019

After the launch, the second part of the workshop was about the operation of the SonoVault. This part included:

- structure and basic description of operator's software
- placing and working with memory cards
- additional software (freeware) needed for the overall procedure of noise measurement
- setting up the configuration file
- working with and saving of the configuration file
- recording of the acoustic signal
- reproducing (recovering from the memory card) recorded signal.

The manufacturer provided memory cards for all as well as two pistonophones (one of their own, one as the part of the delivery for IOF) so it was possible to record and play back actual signals. All participant worked hands on with their instrument(s) and individually to some extent mastered the whole process of setting up the instrument for the various measurement scenarios, recording and recovering signals. The participants from IOF that were already experienced with the most of the SonoVault features tried to check the calibration of at least one of their instruments. Unfortunately it was not possible due to the fact that calibration parameters were not known to Develogic personnel conducting the training and responsible person was away from the office. The calibration parameters was sent to us later but were not correct which caused some problems in the preparation of the whole deployment. Fortunately it was settled on time.

The workshop was attended by 10 participants from all partners involved in underwater noise measurements is shown on Table 2.

Table 2 Number of participants per PP at workshoop at the premisess of Develogic firm, Hamburg

No.	Project partner name	Number of participants
1	ARPA FVG	2
2	Fondazione Cetacea	1
3	CNR - IRBIM	2
4	IOF	2
5	BWI	1
6	CNR - ISMAR	2

3.3 Calibration check IOF, Split, 13th January 2020

Due to the fact that calibration parameters were not given at the training workshop in Hamburg but were sent later, the calibration check was performed in IOF laboratory in Split on 13th January 2020 (Figure 5). The setup for the calibration check is displayed on Figure 5. The calibration check was performed by pistonophone calibrator Grass 42AC mounted on the hydrophone with the hydrophone adapter SV.PA. The pressure inside adapter chamber was checked with calibrated ½" microphone BK 4149. With the calibration parameters provided by the manufacturer, recorded signal and calculated amplitudes did not match. The problem was communicated with the manufacturer and after parameter corrections, calculation matches recorded amplitude levels. All four instruments were tested for the full functionality and the calibration files for all gain setting and all four instruments were recorded and stored. These files will be the references for calibration files that are to be recorded before and after each deployment.

Figure 3 The setup for the calibration check

3.4 Operator's training workshop, CNR/ISMAR, Venice, 23rd January 2020

The third operator's training workshop was held in Venice on 23rd January 2020. in the premises of project partner CNR/ISMAR. Participants from all partners to be involved in underwater noise monitoring gathered after previous operator's training workshops to exchange the knowledge and experience acquired through previous workshops and to perform trial deployment. The workshop included hands on work on four instruments of project partners CNR, ARPA FVG and FC which have been available. All partners have already transported their instruments from manufacturer's to their own premises and had trials in setting up configuration files, recording and playing back signals recorded in the air using natural sound sources (yelling, singing, clapping etc.). Also, some partners already conducted trial deployments in the sense of checking buoyancy needed for the deployment and checked deployment gear. The main issues addressed during the workshop included:

- Sharing experiences in mechanical issues

  All participants demonstrated its ability in assembling and disassembling the mooring frame and underwater housing as well as filling the batteries in the battery container
- Basic SonoVault functions

  It included powering on/off and starting/stopping recording using both possibilities, software and external magnet switch, memory card placing and removing and uploading of

  the configuration file.
- Setting up the configuration file

  All settings were discussed and agreed upon, so the unique configuration file is defined for all participants (except for the gain setting which is measurement site dependent)
- Recording the calibration files for various gain settings

  As still only one pistonophone was available, all participants use it to record calibration files for all gain settings for their own instruments. These files will be the references for calibration files that are to be recorded before and after each deployment.
- Calculation of the buoyancy of the deployment gear

  Based on the data obtained from the manufacturer and participant's experience with deployment and recovery of various oceanographic instrumentation, the weight of the anchor and the buoyancy to be added were calculated and agreed upon

- Practical implementation of the deployment gear

  One instrument was set up and equipped with improvised gear for the deployment (anchor, buoyancy) and deployed from the pier of CNR/ISMAR premises. It was there left for approximately an hour while there were some noisy activities (pass by of some boats) in the Arsenale basin. The instrument was recovered, opened, memory cards removed and data downloaded and inspected. Noisy events were identified in the recording as well as recorded noise from deployment and recovery at the beginning and the end of the recording.

The workshop was evaluated as very successful by all participants and it was judged that the level of knowledge for successful deployment and implementation of underwater noise measurements was obtained.

The workshop was attended by 12 participants from all partners involved in underwater noise measurements shown in Table 3 and Figure 4.

Table 3 Number of participants per PP at workshoop held at the premisess of CNR/ISMAR, Venice on 23rd January 2020

No.	Project partner name	Number of participants
1	ARPA FVG	2
2	Fondazione Cetacea	1
3	CNR - IRBIM	4
4	IOF	2
5	BWI	3

Figure 4 Hands on instrument setting up on the third operator's training workshop held in CNR/ISMAR, Venice on 23rd January 2020

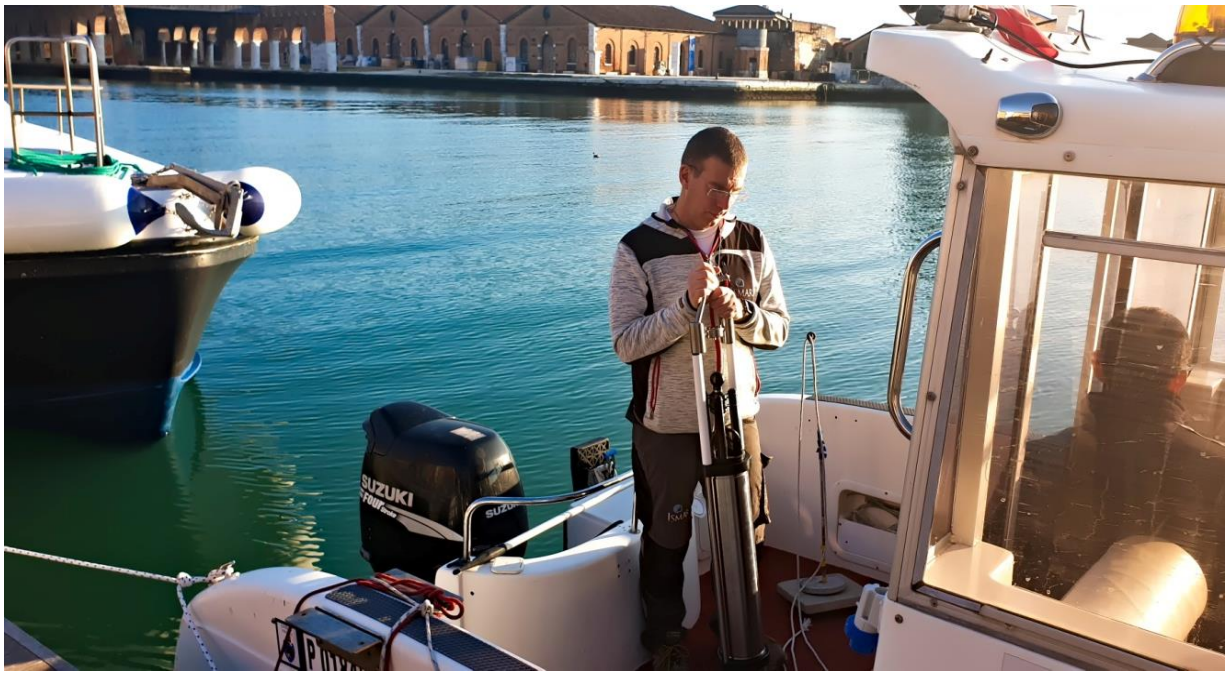

Figure 5 Preparation for the test deployment in Arsenale basin on the third operator's training workshop held in CNR/ISMAR, Venice on 23rd January 2020