

# Guidelines for Scientific Diving from large Research Vessels



## ESDP Consultation Document Nb. 3

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This consultation document is a product of the European Scientific Diving Panel (ESDP) which receives organizational support from the Marine Board. The information and advice provided herein does not necessarily reflect the broader opinion of all Marine Board member organizations.

The document is designed to provide general guidelines to assist national diving agencies and practitioners to develop standards and codes of practice for scientific diving from large research vessels. While the document aims to promote the best interests of safety and the advancement of scientific diving in Europe, the responsibility for safe and legal diving operations lies entirely with the user of this information.

## 1 - Preface

### 1.1 - Rationale

Scientific Diving is an increasingly important methodology in underwater sciences, providing a safe, efficient and resilient methodology for selective sampling and complex experimental work underwater. Scientific diving is also consistent with the international demand for a responsible, resource-conserving, and sustainable research methodology in Europe.

In order to facilitate the use of scientific diving as an efficient and low impact research method, it is necessary to support the development of protocols which will allow its practice from large<sup>1</sup> research vessels, from which such diving is not traditionally supported. Such standard protocols can also facilitate international scientific collaboration by providing the basis for consistent practices and easy collaboration between teams from different European countries.

This *ESDP Consultation Document Number 3: Guidelines for Scientific Diving from large research vessels* has been developed by ESDP members based on experience gained from numerous research cruises with large research vessels from which scientific diving supported research projects were performed in the North Sea and the Polar regions.

### 1.2 Aims and Objectives

**The overarching aim of this ESDP consultation document is to provide information on how to perform scientific diving supported research programmes using large research vessels as a platform.**

The specific objectives are:

- To provide operational guidelines for scientific diving from large research vessels;
- To provide a consistent set of guidelines for scientists and scientific divers from across Europe to facilitate efficient and safe diving operations by international teams;
- To give support to scientific project leaders, ship commanders and dive mission leaders in planning a ship-supported dive mission;
- To promote and encourage stakeholders, scientific project leaders and scientists to use scientific diving, even from large research vessels, instead of using damaging sampling methods like dredges or bottom trawls.

It gives advice for both divers and non-divers on how to plan and operate dive missions from large research vessels as well as identify the issues and problems which a dive team, ship commander or project leader may face when diving as part of the scientific program during a research cruise.

## 2 - ESDP Guidelines for Scientific Diving from large research vessels

### 2.1- Personal requirements of the dive team

As with “normal” dive operations, scientific divers involved in ship supported dives must be in good medical condition and training status and must meet their respective national regulations for scientific diving.

The preparation of scientific dives from a large RV’s should be carried out in a similar way to dive expeditions in remote areas and **must follow relevant national regulations**. In addition to medical clearance and the (A)ESD certification, it is recommended that:

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<sup>1</sup> In this context, the term “large” refers to research vessels from which standard diving operations are not possible due to a high freeboard, which prevents easy access or return of the diver to the deck.

- a) A diver has logged at least 12 dives and 300 minutes dive time under water within the last 12 months within which 4 dives should be at the target depth of the mission.
- b) All relevant trainings MUST be logged and recorded by valid licences / log-entries prior to the cruise and shall not be done during the cruise. (e.g. dry-suit diving, full face mask, helmet diving, surface supplied diving, mixed gas diving)
- c) All divers are well trained in CPR and oxygen administration and have received a refresher course not more than 1 year prior to the mission.

It is recommended to set up a diver list with all necessary information for every diver. The list may be adapted according to the specific needs of the mission and the equipment to be used:

The information for each diver on the list may include, inter alia:

- Date of certification
- Affiliation (Institute or company where the diver is employed during the cruise)
- Last medical exam
- Personal ICE (In Case of Emergency) phone numbers for the divers
- Number of dives over the last 12 month
- Last RCP and Oxygen provider training

## **2.2 - Planning and preparation of a scientific dive cruise: Basic Procedures**

As a general statement, the ESDP highly recommends the use of Rigid Hull Inflatable Boats (RHIBs) to perform dive operations from large RV's. Diving from large research vessels without a RHIB as the operation platform (i.e. diving directly from the RV) is not recommended because of numerous potential hazards (large propeller, deck not close to the sea surface, difficulty to recover diver with a problem, drift with wind, movement not following waves, etc...).

***The ESDP recommends using a Rigid Hull Inflatable Boat (RHIB) as the diving platform when diving from a large research vessel.***

As for any other scientific dive, dives from large RV's are also subject to national regulations for scientific diving. In case no national regulation exists, ESDP here highlights key actions/steps of paramount importance.

### **2.2.1 - Dive mission leader and relation with RV Commander**

For each dive mission, the sending institute must nominate an experienced scientific diver as dive mission leader. To ensure a safe and efficient mission, the ESDP recommends:

- a) A minimum level of AESD as certification for the dive mission leader
- b) Proven experience in diving from research vessels (e.g. having participated at least five times as diver in a dive mission operated from a research vessel).

***The ESDP recommends that only experienced divers with proven experience in diving from research vessels should be nominated as dive mission leader.***

The dive mission leader should have experience in RV cruises in general so that she/he knows about the normal daily routine of life and work aboard an RV. Furthermore, the dive mission leader must maintain a constant communication with the RV's commander and officers and be able to present the planned dive mission to the ships commander and the ships officers. In this presentation, the dive mission leader should explain the needs and requirements of the dive team in detail and present

a plan of safe dive operations for the cruise. Based on this presentation, the dive mission leader shall prepare a dive plan and provide this plan in written form to the ship commander.

***The ESDP recommends that the dive mission leader maintains a constant communication with the RV's commander to inform him/her about all dive operations which are planned for the following day. The commander shall have the last decision on a dive operation and gives the final GO/NO GO to the dive mission leader.***

Each dive mission (series of dives carried out during a single deployment of a RHIB from the RV) has to be confirmed by the commander or the officer in charge of the research vessel. The commander (or officer in charge) gives the GO/NO GO to the dive leader and also has the competence and authority to terminate the mission and call the dive crew back to the RV if necessary. In case of an emergency situation, the dive mission leader initiates the necessary first-aid measures and supports the commander (or officer in charge) in coordinating all further rescue operations.

### **2.2.2 - Planning a cruise**

The dive mission leader should work out a thorough risk analysis for the mission. In addition to "normal" dive operations, there are several specific issues which should be specifically addressed when diving from a large RV, including:

Potential risks and countermeasures to be taken into account during dive planning:

- a) Due to swell condition, all dive equipment must be stored safely, i.e. protected against rolling and pitching of the ship. This is especially important for dive tanks. Tanks must always be stored horizontally (a lashed euro-pallet up-side down is well suited for storing tanks) and never shall be stored unclamped in a standing position;
- b) Ships often have stumbling-pitches (ropes, steep staircases etc. etc.). Dive equipment, especially tanks, must be carried carefully and distances between the dive locker and e.g. the compressor should be as short as possible;
- c) Most RVs do not include a diving compressor as standard equipment and a portable compressor is usually necessary. The compressor should be tightly fastened even during use to prevent accidents caused by a moving compressor due to roll and pitch movements of the ship. The compressor should not be operated in heavy sea conditions. All documents including filling and service log, air quality data sheet (Follow EN 12021), spare parts (filter cartridges) and routine service instructions must be available on board;
- d) During compressor operation, a person trained in its use MUST be present at all times;
- e) Compressor users must always be aware of changing wind direction due to a changing course of the ship. This may lead to the aspiration of ship emissions (CO etc.) leading to severe diving accidents;
- f) It is recommended to test HP compressor or a tank (batch mode) using an air-test (e.g. DRÄGER Simultant HP). Follow EN 12021;

***The ESDP recommends the compressor is operated only by persons trained in its use and that tank filling and air quality are routinely controlled.***

Potential risks and countermeasures to be taken into account during the dive:

- g) Diving from large RV's may be in areas with strong tidal currents (e.g. North Sea). Diving operations should be timed around the tidal window and these timings should be strictly respected. It is also recommended to plan the dives during neap tide periods for some locations.
- h) A drift line (e.g. 30m with red signal buoy at one end) as well as a deco line adapted to the planned dive should be available and ready to use on the RHIB.
- i) For the sometimes extended periods of dive missions, protection against cold or warm conditions

should be taken into consideration and sufficient drinking water must be available on the RHIB at all times.

- j) The RHIB must have radio contact at all times with the bridge of the RV. This can be ensured by carrying a spare portable radio in the RHIB in case the main radio fails. The dive mission leader must inform the bridge when the dive operations start and when the dive operations have ended and the RHIB will return to the RV.

***The RHIB must have radio contact with the bridge of the RV at all times.***

### **2.2.3 - The dive team**

The basic dive group should consist of a minimum of three divers. It is recommended to have one diver in the water, one stand-by diver (for emergencies) and one dive mission leader onboard the RHIB. Depending on national regulations, adaptation can be made.

### **2.2.4 - RHIB operation**

A most critical point in diving from large RV's is the deployment and retrieval of the RHIB. This is mostly done with a crane and may need to be executed while the RV is subject to the effects of wind and sea swell. It is therefore highly recommended that an experienced member of the ship's crew is operating the boat handling during deployment and recovery. All crew or dive team members involved in deployment and recovery of the boat by a crane must wear head protection and safety shoes.

***The ESDP recommends that only experienced boat handlers operate the RHIB and that protective gear be worn by the dive and RV deck crew during the RHIB deployment and recovery procedure.***

→ If the boat stability allows, it is recommended that all equipment should be stored in the RHIB itself during deployment and recovery to avoid loading the equipment over the side of the ship into a potentially moving RHIB.

→ If the boat is in the water, special attention should be given when divers are moving from or to the RHIB.

For diving from a large RV by using a RHIB, it is additionally recommended:

- a) To employ a propeller protection (casket) during diving operations;
- b) To always carry a spare tank ready for use by the diver in the RHIB (e.g. in case the diver runs out of air on the decompression stop due to an unexpected physical exertion);
- c) To have full safety equipment onboard the RHIB, including Crew-Finder and radio communication.

### **2.2.5 - Rescue chain**

On RV based diving operations, special attention must be paid to the rescue chain because the rescue of an injured person will normally require a helicopter. This scenario must be planned for in advance in close cooperation with the helicopter service and the RV Commander.

The following equipment should be present on a large RV's for dive operations:

- a) A portable VHF radio and/or VHF aviation to ensure bidirectional permanent communication with the RV.
- b) Small oxygen unit on the RHIB with capacity for at least 20 min supply of 100% oxygen. Ideally this unit should be also usable underwater to a max of 6m deep.
- c) On the RV, pure oxygen in sufficient quantity should be available (plan according to worst case

scenario).

- d) Phone numbers / satellite phone numbers of the helicopter service AND a decompression chamber ready for operation must be available. The operating state of the decompression chamber must be validated daily prior to dive operations.

***The ESDP recommends keeping a rescue chain operating to ensure that a diver with signs of a decompression sickness can be transported rapidly to an operating decompression chamber. In case of emergency, normobar oxygen breathing<sup>2</sup> must be possible for a maximum of 3 hours. In addition, phone number of a helicopter service AND a decompression chamber ready for operation must be available.***

During a scientific dive mission from a large RV, it is recommended that the emergency procedure should be subject to a practice drill at least once at the beginning of the cruise and every 14 days during longer cruises.

Emergency training must involve all persons involved in a dive operation including the RV's crew (e.g. the crewmember that operates the crane, the RHIB or other equipment which may be employed in an emergency situation). Special attention must be paid to the RHIB recovery procedure onboard the RV. This should be practiced according to the available equipment onboard the RV. If such a recovery procedure fails or cannot be performed for safety or medical reasons, an air-lift transfer from the RHIB to the helicopter may be considered.

#### **2.2.6 Further medical issues**

Special attention shall be paid to divers with seasickness. Seasickness can affect divers of all experience levels and must be taken seriously. Seasick divers lose their ability to work and a dive shall be aborted if one of the divers involved (i.e. the emergency diver or the dive mission leader) becomes sea sick.

Furthermore, all divers should be reminded to drink sufficient liquids (water or tea) especially in tropical regions to prevent dehydration and the associated increased risk of decompression sickness.

#### **2.2.8 Further recommendations**

Decompression shall be done after international / national procedures using decompression computer or decompression tables for occupational diving according to national regulations. Specific safety equipment for open sea diving need to be considered like power whistle, SMB, strobe light, etc...

The use of a Nitrox gas mixture is encouraged in order to enhance the no-decompression bottom time inside similar safety envelope or for specific scientific missions. In this case, all divers in the team must be well trained and certified for diving with the gas used (see 2.1 b).

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<sup>2</sup> "Normobar oxygen breathing": allow oxygen breathing under normal atmospheric pressure till a decompression chamber is reached

Annex 1 – ESDP 2011 membership

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