



CMAS

SCIENTIFIC COMMITTEE

SCIENTIFIC DIVER EN



CMAS

SCIENTIFIC DIVER

SCIENTIFIC COMMITTEE

1. AIMS OF THE COURSE

The aims of the course are to:

- a. Train divers related with scientific institutions to safely and competently participate in scientific diving activities in accordance with CMAS standards and within the limits of their diving qualifications.
- b. Provide students with the theoretical knowledge required to understand the principles, methodologies, risks, safety and ethical considerations associated with scientific diving.
- c. Develop practical diving and scientific skills necessary to conduct underwater scientific tasks while maintaining safe diving practices and environmental responsibility.
- d. Ensure that students are capable of applying appropriate risk assessment, safety procedures, and emergency response measures during scientific diving operations.
- e. Enable students to effectively support and participate in scientific projects through the use of standard survey techniques, data collection methods, and underwater documentation tools.
- f. Prepare students to work as part of a scientific diving team under appropriate supervision, in a variety of diving environments and conditions.

2. COMPETENCIES OF A CERTIFIED CMAS SCIENTIFIC DIVER

- 2.1. A CMAS Scientific Diver shall be trained such that when evaluated in accordance this standard they are deemed to have knowledge, skill and experience with regard to diving as well as underwater scientific methodologies and protocols to participate in scientific diving activities.
- 2.2. A CMAS Scientific Diver trained according this standard are competent to participate in scientific diving activities within the limits of their diving qualifications.

SCIENTIFIC COMMITTEE

3. PREREQUISITES FOR STUDENTS

3.1. The pre-requisites for students are:

- 3.1.1. A minimum age of 18 years old.
- 3.1.2. Hold the CMAS One Star Diver or an equivalent certification.
- 3.1.3. Hold the CMAS Advanced Skills Diver or an equivalent certification.
- 3.1.4. Hold the CMAS Rescue Diver or an equivalent certification.
- 3.1.5. Hold a valid First-aid and Basic Life Support certification.
- 3.1.6. Hold the CMAS Oxygen Administration or an equivalent certification.

3.2. The health requirements pre-requisites for students are:

- 3.2.1. Complete the medical history/statement form required by the CMAS Federation prior to participating in any in-water activities.
- 3.2.2. Sign the appropriate form(s) as required by the CMAS Federation acknowledging and assuming the risks of SCUBA diving prior to participating in any in-water activities.

3.3. The experience requirements pre-requisites for students are:

- 3.3.1. Have a minimum of thirty (30) total dives in the logbook, with a minimum of:
 - a. Eight (8) dives in pool or restricted/confined waters of training buoyancy and trim control, to master domain the locomotion and positioning techniques, and tasks proficiency.
 - b. Ten (10) dives in open water at depths between 15-24 meters and minimum of twenty (20) minutes of dive time.
 - c. Twelve (12) dives in the last 12 months.

4. INSTRUCTORS REQUIREMENTS

4.1. The requirements for the course director and scientific diving instructors are:

- 4.1.1. Hold the CMAS Scientific Diving Instructor certification.
- 4.1.2. Comply with all the administrative requirements of the national federation.
- 4.1.3. Comply with the legal framework for the training of recreational diving courses in the country where the course is being held.

SCIENTIFIC COMMITTEE

4.2. The requirements for assistants are:

- 4.2.1. Hold the CMAS Scientific Diving Project Leader certification.
- 4.2.2. Hold a Basic Life Support valid certification.
- 4.2.3. Hold the CMAS Oxygen Administration or an equivalent certification.
- 4.2.4. Comply with all the administrative requirements of the national federation.
- 4.2.5. Comply with the legal framework for dive leader of recreational diving in the country where the course is being held.
- 4.2.6. At no time will the assistant leader be allowed to coordinate the students during the scientific task training, they shall be responsible only for the safety of the team.

4.3. Invited Experts:

- 4.3.1. The course director may invite experts to instruct with proven academic or technical training, in theoretical or practical subjects of this course.
- 4.3.2. For the practical in-water diving sessions, the invited experts must have the CMAS Scientific Diving Project Leader certification.
- 4.3.3. At no time will the invited experts be allowed to coordinate the practical sessions autonomously, need always to be under supervision of one CMAS Scientific Diving Instructor.

5. INSTRUCTOR / STUDENTS RATIO

- 5.1. The ratio of students should be defined by the course director according to the environmental conditions and the level of certification of the students, and should never exceed a maximum of three (3) students per CMAS scientific diving instructor.
- 5.2. For each assistant according 4.2 of this standard, the number of students can be increased by two (2).

6. COURSE PROGRAMME

6.1. The course programme includes:

- 6.1.1. The recommended course duration is 10 to 15 days duration, corresponding to 80 to 120 hours of education.
- 6.1.2. The minimum of ten (10) scientific dives with a minimum of threehundred (300) minutes total logged diving time.

7. THEORETICAL KNOWLEDGE

7.1. Diving related theoretical knowledge

7.1.1. General

The training programme shall ensure that students have knowledge concerning:

- a. How diving tanks are filled, including safety procedures.
- b. Requirements on safe handling, storage and transportation of diving tanks.
- c. Requirements for recurring diving cylinder testing.
- d. Testing breathing gas quality.
- e. Different types of diving equipment configurations used in scientific diving operations and recognised the key features of each.
- f. Basics of diving equipment maintenance.

7.1.2. Risk assessment

The training programme shall ensure that trainees have knowledge concerning assessment of risk involved in scientific diving activities:

- a. Identifying site and task specific hazards.
- b. Undertaking site and task-specific risk assessment.
- c. Selecting appropriate measures to mitigate and/or control the risks.

7.2. Scientific methodologies and protocols

7.2.1. General

The training programme shall ensure that students have knowledge concerning:

- a. Ethics of Science.
- b. Sustainable practices in scientific diving.
- c. Experimental Design.
- d. Underwater work conducted by scientific divers.
- e. Core responsibilities involved in the administration and safety of scientific diving.

7.2.2. Generic Methods

The training programme shall ensure that students have basic knowledge concerning:

- a. Site selection, site marking and assessment.
- b. Marking and measuring.
- c. Underwater photo and video camera use.
- d. Lifting bags.
- e. Airlifts.
- f. Visual and video census.
- g. Measuring visibility.
- h. Tethred diving techniques
- i. Sampling and recording.
- j. Processing, evaluation and archiving data
- k. Creating a site report.
- l. Aquatic life identification.
- m. Deployment and recovery of scientific equipment.

7.2.3. Survey Techniques

The training programme shall ensure that students have knowledge concerning the following survey techniques:

- a. Line survey and transect methodologies.
- b. Quadrats.
- c. Establishing a grid.
- d. Mapping, sketching, drafting map.
- e. Coring.

SCIENTIFIC COMMITTEE

- f. Photography, photogrammetry, photoquadrat.
- g. Tagging.
- h. Collecting.
- i. Estimating percent coverage.
- j. Location, re-location.
- k. Geolocation, geo referencing.

7.2.4. Diving Environments and conditions

The training programme shall ensure that students have knowledge concerning diving in the following environments and conditions and their possible effects on the objectives of the scientific dives:

- a. Altitude.
- b. Depth of the dive.
- c. Limited visibility.
- d. Ice.
- e. Water temperature.
- f. Blue Water.
- g. Remote locations.
- h. Ports, harbours, and marinas.
- i. Overhead environments.
- j. Water movement.
- k. Polluted Water.
- l. Salinity.

7.2.5. Navigation Techniques

The training programme shall ensure that students have basic knowledge concerning navigation techniques:

- a. Line work (knots, reels and spools).
- b. Establishing a datum.
- c. Establishing transects and baselines.
- d. Use of GNSS, surface and underwater positioning techniques.
- e. Use of a compass.
- f. Dealing with effects of currents and other environmental conditions.
- g. Means of assessing distance.

8. PRACTICAL

8.1. Diving Skills

The student in the beginning of the course should demonstrate competencies of all the subjects of the CMAS certifications described in the point 3. Pre-requisites for students.

8.2. Scientific Skills

The training programme shall ensure that students have basic skills in at least four tasks in the following survey techniques:

- a. Transects and quadrats.
- b. Mapping.
- c. Coring.
- d. Photography.
- e. Tagging.
- f. Sample or data collecting.
- g. Installation, maintenance, and removal of scientific probes and equipment

These scientific skills shall be demonstrated whilst maintaining good and safe diving practices including:

- a. Always putting safety first before the scientific objectives.
- b. Maintaining good trim and buoyancy control.
- c. Master proficiency of underwater positioning and locomotion
- d. Maintaining the buddy system.
- e. Monitoring depth, time and gas supplies.

9. REQUIREMENTS FOR TRAINING

9.1. Teaching Methodologies and Instructional Strategies

9.1.1. Classroom instruction shall be based on affirmative teaching methods, including expository and demonstrative approaches. The instructor shall emphasise practical demonstration, enabling students to acquire knowledge and skills through observation, guided practice, and replication. Instruction shall follow a structured, step-by-step progression, applying the principle of “learning by doing” and using concrete, discipline-relevant examples relevant to scientific diving activities.

SCIENTIFIC COMMITTEE

- 9.1.2. Confined water training shall build progressively upon classroom instruction and shall be based on structured land drills and confined water exercises. The training programme shall ensure student competence in scientific methodologies, Safety Drills, and Donation Drills. All skills shall be demonstrated first by the instructor and subsequently practised by the students under direct supervision, ensuring correct technique, situational awareness, and safety.
- 9.1.3. Open water training shall represent the final stage of skill integration and application. During open water sessions, students shall demonstrate the ability to safely conduct, and complete scientific dives in accordance with an approved dive plan. All open water activities shall be conducted under the supervision of a CMAS Scientific Diving Instructor or a CMAS Scientific Diving Project Leader, who shall be responsible for overall dive safety, supervision, and task oversight.

9.2. Risk Assessment

The scientific diving instructor shall ensure that a site and task specific risk assessment is conducted before each in-water activity and shall adopt procedures to ensure that all risks are controlled as far as is reasonably possible. The following factors shall be considered as part of this assessment taking into account the capability of the participants and available equipment:

- a. Water movement (e.g. high water flow rates, wave action, tides and currents).
- b. Depth.
- c. Underwater visibility.
- d. Temperature.
- e. Pollution.
- f. Entry/exit methods.
- g. Surface traffic, restricted zones (e.g. ports, harbours, and marinas, differential pressure hazards).
- h. Sustainability of the site for the planned activities including hazardous fauna and flora.
- i. Emergency action plan.
- j. Special hazards associated with the specific scientific diving project.

9.3. Surface support procedures

SCIENTIFIC COMMITTEE

- 9.3.1. The scientific diving instructor shall ensure that each person is recorded on entering the water and accounted for on exit.
- 9.3.2. For each group entering open water, a maximum time for the activity shall be agreed upon. Provisions shall be made to trigger search and rescue operations should this time be exceeded.

9.4. Emergency equipment and procedures

9.4.1. Emergency equipment

For all locations where diving activities take place, the service provider shall ensure the availability of the following:

- a. A first aid kit suitable for the planned activities.
- b. A communication system suitable for alerting emergency services.
- c. An emergency oxygen unit with capacity of delivering at least 15L / min of pure oxygen with sufficient capacity to continue delivering oxygen until alternative emergency medical care is available.

Note: It is considered good practice that, wherever possible, the service provider provides an emergency oxygen system delivering and inspired oxygen concentration of up to 100% and to a non-breathing patient receiving respiratory resuscitation at an inspired oxygen concentration of at least 50%.

9.4.2. Emergency procedures

At each site where in-water activities take place, a document emergency plan comprising at least the following information shall be available:

- a. Diver recall procedures.
- b. Procedures for casualty recovery, resuscitation and evacuation.
- c. Use of the emergency oxygen supply.
- d. Information (including contact details) on emergency medical advice (e.g. a suitable diving emergency "hotline") and the nearest medical resources (including data about the availability of a hyperbaric recompression chamber).

SCIENTIFIC COMMITTEE

9.5. Practical training parameters

The students may conduct training dives under the indirect, surface supervision of an instructor, who shall be present at the dive site, and for in-water activities under the supervision of a three star diver or a higher-level certification holder, who shall follow the students during the scientific task training and shall be responsible for the safety of the team.

An open water dive shall comprise at least the following activities:

- a. Briefing.
- b. Preparation to dive.
- c. Pre-dive checks.
- d. Entry into water.
- e. Descent procedures.
- f. Underwater activity.
- g. Ascent and surfacing procedures.
- h. Exit from water.
- i. Debriefing.
- j. Post dive procedures.
- k. Recording the dive.

No more than 180 minutes of accumulated diving time shall be conducted within any 24h period.

The course director shall ensure that a dive is canceled or aborted if environmental conditions, equipment problems or a student physical or mental condition make this necessary.

10. CERTIFICATION CRITERIA

10.1. Knowledge

The training programme shall ensure that in order to be qualified, students demonstrate knowledge of scientific diving. This examination shall test theoretical knowledge in accordance with clause 7 and knowledge of skills in accordance with clause 8.

10.2. Skills

- a. The training programme shall ensure that students fulfill the skill requirements of clause 8.
- b. The minimum of ten (10) scientific dives with a minimum of threehundred (300) minutes total logged diving time.

10.3. CMAS certification

- 10.3.1. Certification is issued by a national organization recognized by CMAS.
- 10.3.2. All students successfully completed all program of the course will be issued the CMAS Scientific Diver certification.