

2010

Reef Check Australia Dive Policy and Procedures



REEF CHECK
AUSTRALIA

Reef Check Australia Dive Policy & Procedures

Contents

1. Overview	3
2. Training and Requirements	3
2.1. Reef Check Course Participant.....	4
2.2. Reef Check Volunteer Research Assistant.....	4
2.3. Reef Check Volunteer Researcher.....	4
2.4. Reef Check Team DiveMaster.....	4
2.5. Reef Check Team Scientist.....	5
2.6. Reef Check Trainer.....	5
3. Roles and Responsibilities	5
3.1. Reef Check Course Participant.....	5
3.2. Reef Check Volunteer Research Assistant.....	6
3.3. Reef Check Volunteer Researcher.....	6
3.4. Reef Check Team DiveMaster (Supervisor).....	6
3.5. Reef Check Team Scientist	6
3.6. Reef Check Trainer.....	7
4. Diving Procedures	7
4.1. Safety Procedures.....	7
4.2. Emergency Action Plan.....	8
4.3. Surface Watch.....	8
4.4. Surface Markers.....	9
4.5. Buddy Distance.....	9
4.6. Safety Stop.....	9
4.7. Ascent Rate.....	9
4.8. Survey Procedure.....	9
4.9. Head Count.....	9
4.10. Dive Tables.....	10
4.11. Dive Computers.....	10
4.12. Diver's Log.....	10
4.13. Surface Intervals.....	10
4.14. Dive Restrictions.....	10
5. Equipment and Maintenance	10
5.1. Equipment.....	10
5.2 Maintenance.....	11
6. Risk Assessment	11
6.1. Pre-Dive Risk Assessment	11
6.2. Risk Management Guide.....	11
6.3. Risk Management and Controls.....	11
Appendix	11

1. Overview

At Reef Check Australia (RCA) we are committed to a high standard of Work Place Health and Safety and the safety of volunteers and employees is our number one priority. This manual has been created to provide policies and procedures which ensure that RCA diving activities are conducted in a safe manner and minimise exposure to risks associated with diving activities. This manual provides the minimum requirements for all diving activities conducted by Reef Check Australia volunteers and employees. It should be read carefully by every RCA survey participant, as there is also a responsibility placed upon participants to ensure that they dive safely.

RCA survey activities are classed under occupational diving and therefore must comply with safe diving practices outlined by state and federal guidelines. The RCA Diving Policy & Procedures meet requirements under the Workplace Health and Safety Queensland (*Occupational Diving Work Code of Practice*) and relevant Australian Standards (*The Australian/ New Zealand Standard Occupational diving operations Part 1: Standard operational practice*). Anyone participating on a Reef Check survey team must comply with the policies and procedures included in this document. This policy should be regularly reviewed and updated (at least every 2 years).

Relevant publications:

AS2299.1 Occupational diving operations – Standard operational practice

AS2299.2 Occupational diving operations – Scientific diving

AS2815 Training and certification of occupational divers (Parts 1 to 4)

AS4005 Recreation diving set (Parts 1 to 5)

2. Training and Requirements

In accordance with the *Occupational Diving Work Code of Practice 2005* divers undertaking coral reef surveys must demonstrate their competence through one of the following 5 training options. (Please note further requirements under the Code such as risk assessment are detailed in following sections).

- 1) **(Commercial Diver)**; A relevant certificate from the ADAS (Australian Diver Accreditation Scheme).
- 2) **(Scientific Diver)**; The relevant scientific diver qualification issued by a Registered Training Organisation under the Australian Qualifications Framework.
- 3) **(Accredited Rescue Diver)**; A recreational Rescue Diver certificate that has been issued under the Australian Qualifications Framework. In addition the diver must prove that s/he has acquired, through training, qualifications or experience, specific knowledge and skills relevant to the work being undertaken.
- 4) **(DiveMaster or higher)**; Training in specific, relevant DiveMaster related subject areas. In addition, the diver must prove that s/he has acquired, through training, qualifications or experience, specific knowledge and skills relevant to the work being undertaken.
- 5) **(Recreational Certificate)**; A recreational open-water certificate; and at least 15 hours relevant underwater experience. In addition the diver must prove that s/he has acquired through training, qualifications or experience, specific knowledge and skills relevant to the work being undertaken. These divers **MUST** be supervised in the water by a person who is qualified under Options 1-4 and they must do scientific diving on a maximum of 28 days in the 6 months immediately before diving work is done.

In addition to this Reef Check Australia requires that all divers be at least a Rescue Diver and have 30 hours of logged dives (unless participating as a Volunteer Research Assistant). Proof of training is gained from completion of a Reef Check Australia Training course. This training course provides the knowledge and skills to participate in RCA survey activities. Those falling into option 5 will be supervised by the DiveMaster who is required on every Reef Check Australia survey.

Under the *Occupational Diving Work Code of Practice 2005* Reef Check Australia divers **MUST** also have a:

- **Medical Fitness to dive:** A current Certificate of Medical Fitness to Dive (Occupational Dive Medical AS2299). The certificate must not be more than one year old and cannot have been replaced or revoked.
- **Evidence of Gear Servicing:** All Reef Check participants are responsible for supplying required diving equipment (as listed in the AS/NZS 2299 Occupational Diving Operations - Part 1 Standard Operational Practice). Divers are responsible for equipment maintenance and regular servicing, and must provide Reef Check Australia with service reports showing the up to date servicing of equipment as specified by manufacturers' requirements.

Details of specific diver role requirements are detailed in the following sections.

2.1 Reef Check Course Participant

A Reef Check Course Participant is a diver who is currently enrolled in the Reef Check Training Course.

Criteria:

- Enrolled in the Reef Check Australia Training Course (this includes the PADI Coral Reef Surveyor Specialty certification).
- Reef Check Course Participant must have in water supervision by a Reef Check Trainer or Divemaster.
- PADI Advanced Open Water diver (or equivalent) and 18 years of age or older.
- Must have logged proof of 25 dives, and one logged dive within the last year.
- Currently fit and healthy to dive.
- Completed appropriate liability paperwork for PADI and RCA.
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Recommended First Aid, Oxygen Provider and CPR certifications.

2.2 Reef Check Volunteer Research Assistant

A Reef Check Volunteer Research Assistant is a diver who has completed the Reef Check Training Course, but does not yet have Rescue Diver certification to participate as a Volunteer Researcher. However, they may join the survey team as a research assistant, to accompany an active Volunteer Researcher without taking part in the survey.

Criteria:

- Completed the Reef Check Australia Training Course (which includes the PADI Coral Reef Surveyor Specialty certification)
- Reef Check Course Participant must have in water supervision by a Reef Check TDM or Instructor
- PADI Advanced Open Water (or equivalent) and 18 years of age or older
- Must have logged proof of 30 dives, including 15 hours diving (of which at least 8 hours 20mins must be spent within a maximum depth of 22 m) and one logged dive within the last year
- Current Certificate of Medical Fitness to Dive (AS2299)
- Evidence of current gear servicing (including Regulator with secondary air source and Buoyancy Compensator Device), as dictated by manufacturers standards
- Completed appropriate liability paperwork for PADI and RCA
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Recommended First Aid, Oxygen Provider and CPR certifications
- Note: Volunteer research assistants are not allowed to collect data independently and are limited in their use of survey equipment.

2.3 Reef Check Volunteer Researcher

A Volunteer Researcher collects Reef Check data following the Reef Check protocol. We recommend that new volunteer researchers buddy with an experienced volunteer researcher or a Divemaster/Instructor for their first 2 Reef Check surveys.

Criteria:

- Completed the Reef Check Australia Training Course
- PADI Rescue Diver (or equivalent)
- Must have logged proof of 30 dives, including 15 hours diving (of which at least 8 hours 20mins must be spent within a maximum depth of 22 m) and one logged dive within the last year
- Current Certificate of Medical Fitness to Dive (AS2299)
- Evidence of current gear servicing (including Regulator with secondary air source and Buoyancy Compensator Device), as dictated by manufacturers standards
- Recommended First Aid, Oxygen Provider and CPR certifications
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Recommended First Aid, Oxygen Provider and CPR certifications
- Volunteer Researcher must have in water supervision by a Team Divemaster
- Note: a Volunteer Researcher under option 5 cannot dive more than 28 days per 6 month period without further qualification.

2.4 Reef Check Team Divemaster

The Team Divemaster (TDM) is responsible for dive safety and ensuring that all participants follow the Reef Check Dive Procedures on a survey expedition. The Team Divemaster also acts as dive supervisor for volunteer researchers.

Criteria:

- Completed the Reef Check Australia Training Course & Reef Check Australia Team Scientist Training
- Current PADI Divemaster or equivalent certification, current PADI Divemaster or Instructor liability insurance and PADI Professional Membership
- Must have logged proof of 50 dives and recent diving experience (at least four dives logged in the past 12 months, or at least 6 dives logged in the past 18 months including at least one dive in the past 6 months)
- Current Certificate of Medical Fitness to Dive (AS2299)
- Evidence of current gear servicing (including Regulator with secondary air source and Buoyancy Compensator Device), as dictated by manufacturers standards
- Current First Aid, Oxygen Provider and CPR certifications
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Completed appropriate liability paperwork for PADI and RCA
- Training and competency in RCA risk assessment procedures

2.5 Reef Check Team Scientist

The Team Scientist is responsible for leading the research activities on a survey expedition.

Criteria:

- Completed the Reef Check Australia Training Course & Reef Check Australia Team Scientist Training
- PADI Rescue Diver (or equivalent)
- Current Certificate of Medical Fitness to Dive (AS2299)
- Evidence of current gear servicing (including Regulator with secondary air source and Buoyancy Compensator Device), as dictated by manufacturers standards
- Recommended First Aid, Oxygen Provider and CPR certifications
- Must have logged proof of 30 dives or 15 hours diving, and one logged dive within the last year (of which at least 8 hours 20mins must be spent within a maximum depth of 22 m).
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Completed appropriate liability paperwork for PADI and RCA
- Marine Biology tertiary training, preferably to Masters level and proven experience with coral reef monitoring
- Note: a Team Scientist under option 5 cannot dive more than 28 days per 6 month period without further qualification.

2.6 Reef Check Trainer

The Reef Check Trainer is responsible for leading RCA Training Programs.

Criteria:

- Completed the Reef Check Australia Training Course & Reef Check Australia Team Scientist Training
- PADI Open Water SCUBA Instructor
- Current Instructor liability insurance and PADI Professional Membership
- Current First Aid, Oxygen Provider and CPR certifications
- Current Certificate of Medical Fitness to Dive (AS2299)
- Evidence of current gear servicing (including Regulator with secondary air source and Buoyancy Compensator Device), as dictated by manufacturers standards
- Ambulance & hospital cover (e.g. DAN Dive Accident Insurance or Queensland Ambulance cover)
- Current signed RCA liability paperwork
- Training and competency in RCA risk assessment procedures
- Marine Biology tertiary training, preferably to Masters level and proven experience with coral reef monitoring (although not required).

3. Roles and Responsibilities

All divers are responsible for their own safety by abiding with these policies and procedures, and not putting other divers at risk. All divers should keep their own logs.

3.1 Reef Check Course Participant

The role of a Course Participant is to actively engage in the Reef Check Training Course by listening, asking questions and gaining competency in the knowledge and skills required to be a Volunteer Researcher.

Course Participants are responsible for abiding by RCA Dive Policy and Procedures, diving within their own ability and following instructions from the Reef Check Trainer. Course Participants are also responsible for having appropriate personal dive gear, checking gear before entering the water and maintaining their gear appropriately. They must also apply their dive skills and training in a responsible manner. Volunteers are also responsible for ensuring they are medically and physically fit for each dive. If a Volunteer does not feel capable of diving or performing a task at any time, it is their responsibility to notify the Trainer. All RCA divers have a responsibility not to put themselves or others at risk.

3.2 Reef Check Volunteer Research Assistant

The role of a Volunteer Research Assistant is to accompany a Volunteer Researcher while they collect Reef Check data following Reef Check Protocol.

Volunteer research assistants are responsible for abiding by RCA Dive Policy and Procedures, diving within their own ability and following instructions of the TDM or Team Scientist. Research assistants are also responsible for having appropriate personal dive gear, checking gear before entering the water and maintaining their gear appropriately. They must also apply their dive skills and training in a responsible manner. Research assistants are also responsible for ensuring they are medically and physically fit for each dive. If a research assistant does not feel capable of diving, it is their responsibility to notify the Team Divemaster. Volunteer Research Assistants may not at any time collect data independently and are limited in their use of survey equipment. All RCA divers have a responsibility not to put themselves or others at risk.

3.3 Reef Check Volunteer Researcher (Volunteer)

The role of a Volunteer Researcher is to collect Reef Check data following the Reef Check protocol.

Volunteers are responsible for abiding by RCA Dive Policy and Procedures, diving within their own ability and following instructions of the TDM or Team Scientist. Volunteers are also responsible for having appropriate personal dive gear, checking gear before entering the water and maintaining their gear appropriately. They must also apply their dive skills and training in a responsible manner. Volunteers are also responsible for ensuring they are medically and physically fit for each dive. If a Volunteer does not feel capable of diving or performing a task at any time, it is their responsibility to notify the Team Divemaster. All RCA divers have a responsibility not to put themselves or others at risk.

3.4 Reef Check Team Divemaster (Supervisor)

The role of the Team Divemaster (TDM) is to be responsible for in-water supervision of Volunteer Researchers, the dive safety of the survey team, and ensuring that all participants follow the Reef Check Dive Procedures on a survey expedition. Those Volunteer Researchers falling under Options 1-4 do not have to be supervised by the Reef Check Team Divemaster.

The TDM assesses each member of the team and verifies they are allocated tasks that they feel comfortable with, and are within their capability and dive experience. It is the responsibility of the divers to confirm that they are happy with the tasks they are allocated. Factors to be taken into account include:

- Volunteers' last dive and their last Reef Check dive (if any)
- The diving experience of the Volunteer Researcher since the dive certificate was gained and since the Reef Check training certificate was gained, for example, as contained in log books. Volunteers with less than 2 Reef Check dives should dive with a more experienced Volunteer, Divemaster or Instructor.
- It is the responsibility of the Volunteer to know their own level of experience and fitness and to let the TDM know if they do not feel fit enough to do the survey in the current conditions.

If there are doubts as to the competence of the diver to complete a particular dive, the Team Divemaster should accompany them or assess them during an assessment dive.

The TDM will record Volunteers' dive details from their computer and calculate DCIEM tables based on depth, bottom time and surface intervals. Dive computers will be used by all survey team members to record dive information and details. The TDM will calculate pressure groups, required surface intervals and allowable dive times based on DCIEM tables and follow the guidance of the most conservative calculation.

The TDM is also responsible for conducting the diving risk assessment, in accordance with the RCA risk assessment policy and training.

The TDM must deliver a comprehensive safety briefing, as per the Reef Check guidelines (see Section 4.1). All RCA divers have a responsibility not to put themselves or others at risk.

3.5 Reef Check Team Scientist

The role of the Team Scientist is to lead the research activities on a survey expedition and confirm accuracy of collected data.

The Team Scientist will examine collected data after a dive and revise any mistakes or missing information with the Volunteer Researcher who collected it. The team scientist may be responsible for laying out the transect tape for the survey site and can act as a Volunteer Researcher during a dive to collect data.

The Team Scientist is responsible for abiding by RCA Dive Policy and Procedures, diving within their own ability and following instructions of the TDM. Volunteers are also responsible for having appropriate personal dive gear, checking gear before entering the water and maintaining their gear appropriately. They must also apply their dive skills and training in a responsible manner. Volunteers are also responsible for ensuring they are medically and physically fit for each dive. If a Volunteer does not feel capable of diving or performing a task at any time, it is their responsibility to notify the Team Divemaster. All RCA divers have a responsibility not to put themselves or others at risk.

3.6 Reef Check Trainer

The role of the Reef Check Trainer is to be responsible for knowledgeable training in and out of water for Reef Check Course Participants. This includes Reef Check theory sessions, in-water supervision of Course Participants, supervision of skill practicing and survey tool use, certification of Course Participant competency, dive safety of the training team, and ensuring that all participants follow the Reef Check Dive Procedures on a training dive. All RCA divers have a responsibility not to put themselves or others at risk.

4. Dive Procedures

4.1 Safety Briefing

The Team Divemaster completes a safety briefing before each dive to ensure the divers are advised of the following by the boat crew or themselves. The TDM should remind buddy pairs to perform a thorough, pre-dive buddy check.

Although there will likely be a dive briefing on the boat (which Reef Check teams must listen to) the TDM must remind divers to dive safely and comply with the instructions they are given by the boat crew as well as the Reef Check TDM and Team Scientist. This includes:

- Location and roles of supervisory staff, e.g., dive instructors, dive supervisors, and surface watch.
- Emergency procedures, such as recall, distress and rescue procedures, and the use of signalling devices
- Lost contact procedure (buddy or team) – search for 1 min underwater by looking 360° looking for diver and bubbles, then ascending slightly for better view, if no contact surface to reunite
- Emergency action plan

Reef Check diving activities must take into consideration environmental conditions, task-related hazards, physiological factors, associated activity factors and other hazards. In light of these factors, the TDM needs to complete the RCA risk assessment matrix before choosing to dive at a particular location (Section 6). Please note that it is the responsibility of all team members to actively participate in the risk assessment and verify that they feel comfortable to dive. If diving is acceptable, then the TDM must deliver a safety briefing to divers, which incorporates a review of the factors listed below.

Environmental conditions

- Any anticipated hazards including dangerous marine life
- Wind strength, currents and tides
- Visibility
- Entrapment hazards
- Depth of dive site, entry and exit points, dive site boundaries
- Water temperature
- Underwater terrain
- Isolation of the dive site

Task-related hazards

- Attention to air consumption throughout survey

Physiological factors

- Frequency of diving, including repetitive diving, multi-day diving
- Depth of dive (Divers should not exceed depths greater than that to which they have been trained, or beyond 18m and

- no Reef Check survey should be conducted below 12m)
- Duration of dive (Maximum dive time not to exceed 65 min)
- Breathing gas (Regularly monitor air levels in air cylinders and return to the surface with no less than 50 bar, taking into account the depth of the dive and exertion levels, e.g., when diving against a current)
- Exertion required to reach dive site or conduct task
- Excessive noise
- Immediate pre-dive fitness (prior dives, prior physical exertion, fatigue, recent illness, hydration)
- Altitude exposure (the minimum recommended surface interval prior to flying is 24 hours)
- Dive in dive buddy pairs and with the team and know appropriate procedures if separated from buddy and/or team
- Divers must do a safety stop if divers descend below 10m and always ascend slowly from dives (no faster than 18m per min)
- Divers should not make multiple ascents during a dive. An ascent is defined as coming within 1m of the surface.

Associated activity factors

- Each survey team member should be clear about the objectives of the survey and the assigned tasks of each team member
- Caution using underwater transect tapes
- Caution with buoyancy control to minimise risk from coral or other marine organisms
- Review of communication, e.g., hand signals and the use of dive slates

Other hazards

- Be cautious of boat traffic
- Be mindful of hazardous marine organisms—hydroids, stonefish, urchins etc.

Depending on certain factors, such as the experience of divers, consideration should be given to reviewing factors that can promote decompression illness:

- Severe exercise during or after decompression
- Poor physical fitness
- Extreme water temperature, for example cold water and hot showers
- Dehydration
- Increased carbon dioxide pressures
- Alcohol intake (No consumption of alcohol less than 12 hours before diving)
- Physical injury
- Dive profiles
- Rapid and multiple ascents
- Repetitive and multi day diving
- Altitude exposure

If a diver does not feel capable of a dive at any time they should notify the Team Divemaster. If environmental conditions are not ideal for a survey, the TDM (or any diver of the team who does not feel capable) may choose to abort the survey. Examples include strong currents or low visibility and the risk assessment should be used initially to assess this.

After hearing the briefing and all questions about the dive are answered, each team member will then sign to verify they have heard and understood the briefing and risk assessment. This must be completed before each dive.

4.2 Emergency Action Plan

The Emergency Action Plan (EAP) outlines what to do in case of emergency and is located in the RCA field survey pack. Each RCA diver should be familiar with the emergency action plan and know where to find it in case of an emergency. If diving aboard an operator vessel the TDM will inquire about the operator's Emergency Action Plan and inform the team of its whereabouts.

4.3 Surface Watch

A surface watch is mandatory for Reef Check dives. This may be a member of the boat crew on a commercial vessel. The surface watch must:

- Be positioned out of the water where the lookout can see the whole area where the diving is taking place
- Be solely engaged in being the lookout
- Be responsible for completing the Dive Log
- Be able to recognise relevant hazards and divers in difficulty

- Be able to either
 - Rescue a diver (demonstrated through proof of Rescue Diver certification); or
 - Direct a person who is immediately available and capable of rescuing a diver
- Be able to either:
 - Provide first aid including expired air resuscitation, oxygen resuscitation and external cardiac compression; or
 - Direct a person who is immediately available and capable of providing the first aid

This means that there must be oxygen available plus someone trained to administer it and the equipment set up for a rescuer to enter the water. The recommended minimum volume of oxygen available should be at least 1500 liters. There must also be a means of communication with an emergency team, e.g., phone or radio.

4.4 Surface Markers

In areas where boat traffic is likely, divers must take a surface marker buoy (SMB) and dive flag. The Team Divemaster is responsible for deploying and carrying the SMB during the dive and each diver should stay within 8m of the TDM as covered by buddy distance procedures. At no point should the SMB be attached to a diver or tied off to the substrate. Surface marker buoys are required for all shore dives.

4.5 Buddy Distance

All Reef Check divers are required to dive in buddy pairs of two or three, and to remain in a group as a team throughout the dive. The following are distances for diving procedure:

- A buddy pair should remain as close together as possible with a maximum distance of 5m from each other. Closer proximity should be applied to low visibility situations.
- The dive team will remain together under the supervision of the TDM (unless divers are qualified under options 1-4 when they may dive in their buddies without supervision).
- Each buddy pair should remain in sight of the TDM with a maximum distance of 8m

If a diver loses contact with their buddy or the team they are to search for 1 min underwater by looking 360° looking for diver and bubbles, then ascending slightly for better view; if no contact surface to continue search and reunite. Solo diving is not permitted on RCA survey dives.

4.6 Safety Stop

A safety stop should be performed if divers descend below 10m depth. This requires divers stop their ascent at 3-5 metres for at least 3 minutes before surfacing after a dive.

Note: A Safety Stop should be forgone if it increases the risk of other hazards or if divers are in an emergency situation, but divers should still follow general practice ascent rates of no faster than 18m per minute.

4.7 Ascent Rate

Divers are required to ascend slowly at a recommended rate of 12 metres per minute. The maximum allowed ascent rate is 18 metres per minute.

4.8 Survey Procedure

The survey procedure may change due to factors like number of team members, and experience levels. The recommended survey procedure is as follows:

- The survey team led by the Team Divemaster will descend together after signalled by the TDM
- The Team Divemaster or Team Scientist will be responsible for deploying the tape as well as supervising the team underwater.
- After the tape is secured the TDM signals to the team to start the survey. If there is a Volunteer surveying fish they will begin in the lead with the TDM/TS laying taped directly behind them.
- Substrate surveyor(s) follow behind the TDM/TS followed directly by the Invertebrate surveyor(s).
- When the end of the transect is reached the TDM/TS signals that the team is OK; then the designated team member may retrieve the tape.
- The survey ends where it began and the TDM signals that the team is OK to ascend.
- After surfacing the team signals OK to the surface watch and swims back to the boat/shore.

Survey roles, buddy grouping, and dive order depend on the number of team members present and can be found in the appendix (Table 1).

4.9 Head Counts

To ensure no persons are left behind all Reef Check Survey participants (Course Participants, Volunteer Research Assistants, Volunteer Researchers, Team Divemasters, Team Scientists, and Trainers) must sign the dive log form as soon as practicable. This verifies that they are back on board the boat or back to shore.

4.10 Dive Tables

In order to ensure safe, low-risk diving, RCA requires the Team Divemaster to use DCIEM (Canadian Defence and Civil Institute for Environmental Medicine) Short Standard Air Decompression Tables to plan and control all RCA survey dives. Reef Check Australia does not allow decompression diving and ensures divers always stay within DCIEM tables.

Note: Dive tables are only a guide for the physiological processes involved with breathing compressed gases at depth and do not take into account many factors that can affect an individual's susceptibility to decompression illness, e.g., age, sex, physical fitness, recent illnesses, etc.

4.11 Dive Computers

In order to comply with the rules for diving aboard operator vessels, RCA requires all divers to use a dive computer. Divers should be familiar with the operation & displays of their computer. All divers will dive under the plan of the Team Divemaster, who will be using DCIEM tables to plan and control all dives. Each member of the dive team will follow the advice of the more conservative plan.

4.12 Diver's Log

Apart from completing the RCA dive log, Volunteers are also responsible for keeping their own logged record of RCA dives.

4.13 Surface Intervals

Surface intervals will be calculated by the Team Divemaster using DCIEM tables. The minimum surface interval between dives should be no less than 30 minutes.

4.14 Dive Restrictions

Reef Check Australia has put into place the following restrictions to ensure the safety of divers:

- No Reef Check survey should be conducted below 12m and no RCA diver is to descend below 18m depth.
- No RCA surveys will be conducted at night; any dive should be finished before dusk.
- Reef Check survey dives are not to exceed 65 minutes.
- RCA does not allow solo diving; all divers are to dive in dive buddy pairs and with the team.
- RCA does not allow decompression diving or surface air supply dives.
- RCA does not allow the use of any underwater tools other than those which the diver has been trained to use in the Reef Check Training Course (e.g. underwater slates & recording sheets, underwater cameras, plumb line, transect tape, dive knife/divers tool and emergency signalling device).

5. Equipment and Maintenance

5.1 Equipment

Reef Check divers must provide their own dive equipment (except for the compressed gas cylinder, weight system, and weights). All Reef Check participants are responsible for supplying required diving equipment (as listed in the AS/NZS 2299 Occupational Diving Operations - Part 1 Standard Operational Practice). Those without appropriate equipment will not be permitted to take part in RCA survey activities.

Equipment used must include the following:

- Mask, snorkel and fins
- Compressed gas cylinder and valve
- Regulator and alternate air source
- Submersible pressure gauge
- Exposure suit appropriate for the local diving environment
- Buoyancy control device and low pressure inflator mechanism
- Weight system and weights
- Complete instrumentation, including a means to monitor depth and time underwater.
- Knife/divers tool

- Emergency signaling device (we require divers carry a safety sausage and whistle)
- Dive computer

5.2 Maintenance

Reef Check divers are responsible for equipment maintenance and regular servicing, and must provide Reef Check Australia with service reports showing the up to date servicing of equipment as specified by manufacturers requirements. Invoices or other receipts are not acceptable forms of evidence of gear servicing.

Equipment that requires regular servicing includes:

- Regulator and alternate air source
- Buoyancy control device and low pressure inflator mechanism

6. Risk Assessment

Under the Occupational Diving Work Code of Practice (2005), risk assessments must be undertaken, including identification of hazards with associated risk levels and relevant control measures. Factors of consideration in the risk assessment must include: environmental conditions, task-related hazards, physiological factors, associated activity factors and other hazards. These will be addressed using a formatted risk assessment matrix, dive briefing and relevant control measures (included in the Appendix). For Reef Check Australia activities please note different risk assessments should be undertaken depending upon whether the dives are being conducted from a commercial diving boat or independently from the shore. Most RCA survey dives take place on commercial vessels.

6.1 Pre-Dive Risk Assessment

Before each dive The TDM will assess environmental conditions to determine minimal risks are involved (Table 2). Conditions to be considered are: environmental conditions, task-related hazards, physiological factors, associated activity factors and other hazards. Each condition will be assigned a value which will be added together to determine if the dive will proceed as planned or be aborted due to hazardous conditions. A score of 5-14 indicates minimal risks involved, whereas a score of 15-20 indicates too many hazardous conditions involved and to abort the dive until conditions improve.

6.2 Risk Management Guide

Possible dive risks at existing survey locations are to be assessed each year or again if dive procedures or conditions are altered in a way that may increase a particular risk. If there is significant change in the diving procedure or environmental conditions affecting dive procedures, all diving will cease until the Risk Assessment process is reviewed. New survey sites must be assessed prior to planning any diving activities.

A current risk management guide outlining RCA diving risks can be found in the appendix.

Risk levels are determined by using a Risk Assessment Matrix to assign numbers to likelihood and consequences of a particular risk. A current risk level is then calculated for each risk by adding together likelihood and consequence values and deemed acceptable (A) or unacceptable (U). Risks deemed acceptable were those with a moderate (5-6) or low (2-4) risk level.

6.3 Risk Management & Controls

Appropriate control measures should be applied to risks, using the hierarchy of controls in the following order:

- **Elimination:** where the level of risk cannot be controlled to an acceptable level, no diving should take place.
- **Substitution:** where the risk can be controlled by performing the task using alternative methods of diving, consideration should be given to using these alternative methods.
- **Design:** plant and procedures should be designed to minimize risk.
- **Isolation:** persons should be isolated from the identified hazards.
- **Administrative:** every dive plan should seek to minimize the degree and duration of the diver's exposure to risk.

Appendix

Table 1. Survey roles, buddy grouping and order depending on number of team members present.

Team Members	Survey Roles	Buddy Group	Order
TDM and 1 Research Vol.	Tape and Substrate	(Tape and Substrate)	Tape, Substrate
TDM and 2 Research Vols.	Tape, 1 X Substrate, 1 X Inverts	(Tape, Substrate, Inverts)	Tape, Substrate, Inverts
TDM and 3 Research Vols.	Tape, 1 X Substrate, 2 X Inverts	(Tape and Substrate) (2 X Inverts)	Tape, Substrate, Inverts
TDM and 4 Research Vols.	Tape, 2 X Substrate, 2 X Inverts	(Tape and 2 X Substrate) (2 X Inverts)	Tape, Substrate, Inverts
TDM and 5 Research Vols.	Tape, 1 X Fish, 2 X Substrate, 2 X Inverts	(Tape and Fish) (2 X Substrate) (2 X Inverts)	Fish, Tape, Substrate, Inverts

Table 2. Environmental conditions risk assessment with corresponding values (1 = ideal condition, 4 = hazardous condition)

Environmental Condition	Value			
	4	3	2	1
Current	Strong	Medium	Low	None
Visibility	2-3m	4-5m	5-10m	>10m
Experience of least qualified team member	0 RCA dives	1-2 RCA dives	2-5 RCA dives	>5 RCA dives
Survey Depth	12m	8-11m	5-7m	3-5m
Nearest First Aid, O2, and Surface Watch	>100m	50-100m	20-50m	<20m

Table 3. Risk Assessment Matrix (Downloaded from: http://www.griffith.edu.au/hrm/health_and_safety/pdf/risk_matrix.pdf)

Risk Assessment Matrix

For use with the Risk Management guide

This is one example of a number of tools that can assist with your risk assessment process.

What you need to do

1. Consider what can go wrong
2. Determine how bad the outcome would be - Consequences
3. Determine how likely it is to happen - Likelihood
4. Calculate the risk level

LIKELIHOOD	CONSEQUENCES				
	Catastrophic 5	Major 4	Moderate 3	Minor 2	Insignificant 1
Almost certain 5	10	9	8	7	6
Likely 4	9	8	7	6	5
Possible 3	8	7	6	5	4
Unlikely 2	7	6	5	4	3
Rare 1	6	5	4	3	2

Risk Score	Risk Level	What should I do?
9-10	Extreme	Immediate action required
7-8	High	Action plan required, senior management attention needed
5-6	Moderate	Specific monitoring or procedures required, management responsibility must be specified
2-4	Low	Manage through routine procedures

CONSEQUENCES: How severely could it hurt someone/cause damage?

Catastrophic death or large number of serious injuries, environmental disaster, huge cost

Major serious injury, extensive injuries, severe environmental damage, major cost

Moderate medical treatment required, contained environmental impact, high cost

Minor first aid treatment required, some environmental and/or financial impact

Insignificant No injuries, low financial/environmental impact

LIKELIHOOD: How likely is it to happen?

Almost Certain expected to occur in most circumstances

Likely will probably occur in most circumstances

Possible might possibly occur at some time

Unlikely could occur at some time

Rare may occur only in exceptional circumstances

Table 4. Environmental risk assessment and management guide outlining RCA diving risks, sources, response, and mitigation. (To be completed at site)

Risk - What can happen?	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
			Likelihood	Consequence	Current Risk Level	Risk Category	
ENVIRONMENTAL							
Strength & direction of wind	Do not dive in winds that make diving conditions unsafe	Determine if waiting will allow wind to decrease and the dive to continue or move to a sheltered site					
Current & tide	If the area is tidal, dive at slack tide	Wait until conditions allow for safe diving, or move sites					
Underwater visibility	TDM should discuss with dive operator if visibility is suitable for diving	Only dive if visual contact with other divers can be maintained					
Water temperature	Cold water temperatures should be taken into account during dive planning	Divers need appropriate personal protection (for above and underwater)					
Time of Day	No diving after dusk	All surveys completed in daylight					
Underwater terrain	Dives are generally done on	No penetration of caves					
Temperature & humidity	Extreme temperatures should be considered in the dive plans to make sure participants are not too hot or cold	Participants should feel comfortable in ambient temperature					
Contaminants	N/A	N/A					
Isolation of dive site	All sites accessible from shore or commercial dive boat	ERPs include first aid and contact information for relevant authorities					
Dive site entry/exit	Assess that conditions are safe	Only dive in conditions where safe dive entry and exit can be carried out					

Table 5. Physiological risk assessment and management guide outlining RCA diving risks, sources, response, and mitigation. (To be completed at site)

Risk - What can happen?	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
			Likelihood	Consequence	Current Risk Level	Risk Category	
PHYSIOLOGICAL							
Frequency of Diving	No more dives than DCIEM tables allow	DCIEM tables					
Depth of dive	All survey dives 12m or less	Participants monitor depth levels throughout dive					
Duration of dive	Bottom time for dives 65 minutes or less	Participants must adhere to dive time limits					
Breathing gas	Supplied by reputable dive operations	Divers should test gas before diving					
Exertion required to reach site	TDM is informed by local crew about conditions. Participants must be comfortable with surface or underwater swim to site or not participate or TDM will cancel dive.	If needed, abort dive, surface and inflate safety sausage, blow whistle and signal surface watch if far away.					
Exertion required to conduct dive	Participants must be able to safely carry out their duty in conditions	Divers must indicate if exertion is too great and/or TDM will cancel dive.					
Excessive Noise	N/A	N/A					
Immediate pre-dive fitness	Divers responsible for reporting pre-dive issues	Divers feeling unwell will not participate in dive, TDM should assess signs & symptoms					
Altitude exposure	N/A	N/A					
Isolation of dive site	Generally dives are within 2hrs of medical treatment	Dives are from shore or on commercial dive boat					

Table 6. Emergency Response and Other risk assessment and management guide outlining RCA diving risks, sources, response, and mitigation. (To be completed at site)

Risk - What can happen?	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
			Likelihood	Consequence	Current Risk Level	Risk Category	
OTHER							
Dangerous marine animals	If injury occurs, apply appropriate first aid procedures	Make divers aware of how to identify potentially dangerous marine animals. Divers should practice good buoyancy & other dive skills to avoid interaction.					
Non-associated boat traffic	Make sure diver is visible on surface (using signalling device) and surface as close to the dive boat as possible	Divers carry signalling device, try to surface close to dive boat, divers look and listen upon surfacing					
Hazards peculiar to dive site	Identify factors unique to the specific dive site	Enact appropriate control measures if necessary					
EMERGENCY RESPONSE FACTORS							
Location of appropriate emergency systems	If risk occurs, enact emergency plan, working with the dive staff on the boat (if available)	Follow dive protocol to reduce the need for emergency actions					
Emergency Response Procedures	Contact appropriate authorities and initiate relevant first aid, search procedures etc	Follow dive protocol to reduce the need for emergency actions. Make sure participants are aware of ERP.					

Table 7. Other risk assessment and management guide outlining RCA diving risks, sources, response, and mitigation.

Risk - What can happen?	Source - How can this happen	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
				Likelihood	Consequence	Current Risk Level	Risk Category	
OTHER								
Diver loses buddy	Low visibility	Search for no more than 1 minute before slowly ascending to surface to reunite.	Divers maintain close buddy distance with added precaution in low visibility situations.	3	2	5	Moderate	A
Buddy pair loses group	Low visibility	Pair searches together for no more than 1 minute then slowly ascends to surface to reunite with group.	Dive group maintains close buddy distance with added precaution in low visibility situations.	2	2	4	Low	A
Diver entanglement	Diver could become entangled in SMB rope	Remain calm and still, remove rope if possible otherwise cut rope to free diver	Divers are required to carry a dive knife in case of entanglement.	2	2	4	Low	A
Diver injured (minor)	Coral cut, sea urchin, fire coral, cramp	Abort dive if diver cannot continue, get diver back to boat/shore and administer first aid.	Divers are trained for a high competency of buoyancy skills and taught to stay off the bottom.	1	4	5	Moderate	A
Diver injured (major)	Shark attack, marine stinger, sting ray	Abort dive, get diver back to boat/shore and administer first aid.	Divers are required to wear full stinger suits to minimize exposure. Divers have been trained in dangerous marine life first aid.	2	2	4	Low	A

Table 8. Other risk management guide outlining RCA diving risks, sources, response, and mitigation.

Risk - What can happen?	Source - How can this happen	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
				Likelihood	Consequence	Current Risk Level	Risk Category	
OTHER HAZARDS								
Diver/pair loses buddy/group in a boat traffic area	Low visibility	Search for no more than 1 minute before inflating safety sausage and slowly ascending to surface to reunite.	Divers carry safety sausage in order to signal the safety watch or warn boats of their whereabouts if separated from TDM and the SMB.	2	1	3	Low	A
Equipment malfunction underwater	Loose tank strap, broken fin/mask strap,	Remain calm and still, signal buddy/TDM to replace or fix problem, abort dive if cannot be resolved	Divers are required to perform a thorough buddy check before each dive to check that all equipment is working properly	2	2	4	Low	A
Lost diver/pair not on surface after minute of searching	Strong current, Low visibility	Signal safety watch tell them you have a lost diver/pair and where and when you last saw them, refer to Emergency action Plan	Safety watch appointed to keep a lookout for divers, all divers trained in rescue procedures, EAP outlines what to do in case of emergency	1	4	5	Moderate	A
Shipping movements	N/A			1	1	2	Low	A
Water inlets	N/A			1	1	2	Low	A
Use of hazardous substances	N/A			1	1	2	Low	A

Table 9. Task-related risk management guide outlining RCA diving risks, sources, response, and mitigation.

Risk - What can happen?	Source - How can this happen	Response - What should be done if risk occurs	Mitigation - Current control strategies	Current Risk Level				Acceptable (A) OR Unacceptable (U)?
				Likelihood	Consequence	Current Risk Level	Risk Category	
TASK RELATED								
Dive runs past 65 minute time limit	Environmental conditions, longer swim to dive site	Abort dive, only partially complete survey	TDM is responsible for continuously checking dive time and monitoring survey progress	2	3	5	Moderate	A
Diver runs low on air	Overexertion	Signal low on air to buddy and group; end dive	Divers regularly monitor air supply and end dive at 70 bar.	3	2	5	Moderate	A
Diver runs out of air	Burst hose	Signal out of air to buddy and switch to buddy's alternate; end dive.	Regular equipment maintenance and servicing to ensure working order.	2	3	5	Moderate	A
Dive computer failure	Battery dies	Signal team, abort dive, no diving for 24 hours, if diving again use DCIEM tables	TDM calculated dives using DCIEM tables to ensure conservative profile.	1	3	4	Low	A
Diver is unclear about tasks or confused about their role in-water	Miscommunication during dive briefing, need for altered plans in-water	Use slates or hand signals to verify that all team members understand task and dive plan	Make sure dive briefing is comprehensive and all divers are clear on their role, use in-water communication to clarify questions	2	3	5	Moderate	A

Equipment malfunction on surface	burst o-ring, broken fin/mask strap	Replace broken part if possible or use spare equipment	Regular equipment maintenance and servicing to ensure working order. Basic spares kit included in Survey pack	3	1	4	Low	A
Survey tape breaks underwater	General wear of survey gear	Wind up broken tape and secure, use spare survey tape	TDM carries a spare survey tape, tapes are properly rinsed and maintained after every day's diving.	2	1	3	Low	A
ASSOCIATED ACTIVITY FACTORS								
Manual Handling	N/A			1	1	2	Low	A
Boat handling	N/A			1	1	2	Low	A
Dive platforms	N/A			1	1	2	Low	A
Crane operation	N/A			1	1	2	Low	A
Rigging	N/A			1	1	2	Low	A