Reef Watch Benthic Quadrat Survey Manual

Version 4 (17th August, 2004)

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Background

This survey aims to record the benthic flora and fauna that are present on the reef surface and how abundant they are. The term 'benthic' simply means 'on the bottom'. In the case of reefs, this means the flora and fauna that live attached to or on the surface of the reef.

Divers will lay out a one square metre 'quadrat' on the reef surface and record the number and/or the percentage cover of each flora and fauna lifeform. It is not possible to provide divers with a comprehensive identification chart for each different fauna and flora species due to large number of species and the difficulty of identifying many of them in the field, which is why a number of lifeform codes are used. These lifeform codes are explained separately in the Reef Watch Benthic Lifeform Identification Manual. In addition to the manual you may find some of the books listed in its "Recommended Reading" section, as well as the tutorials and quizzes on the Reef Watch website (www.reefwatch.asn.au, "Reef Health Monitoring -> Manuals -> Benthic Survey" section), to be of great value.

Although Reef Watch uses lifeform codes, you can of course include the species name as a note if you know it!

Uses

Provides a general indication of benthic lifeforms present on the reef.

Skill

Requires basic diving proficiency and the completion of the quadrat survey dive of the PADI Reef Watch Survey Diver specialty course.

Time

A single quadrat survey should be comfortably completed within 15 minutes.

Equipment

- Benthic flora and fauna identification chart, with attached pencil
- Quadrat survey sheet
- Weighted quadrat rope

Method

Prior to getting into the water you should do the following:

1. Ensure that you have all of the necessary equipment. Clip your survey form to the opposite side of your benthic code identification slate (covering the fish ID slate), which will allow you to simply flip the slate over when you use the chart to identify a species.
2. Plan your dive. Discuss with your buddy how you intend to approach the dive. It is important to decide (a) which part of the reef you intend survey i.e. leeward or seaward and (b) the depth at which you intend to conduct your survey (e.g. 5m, 10m or 15m). For example your decision whether to dive on the leeward or seaward side of the reef may be affected by the state of the weather or tide.
3. Decide how much bottom time can be practically allocated to the survey, giving consideration to both dive tables and air consumption.

To set up survey:

1. Divers working in a buddy pair descend to the sea floor (at the pre-arranged survey depth), ensure that they are within reef habitat and then choose a random survey location within the reef (see box).
2. Adjust your buoyancy to ensure minimal contact with the surface of the reef.
3. With both divers working together, spread out the weighted quadrat rope to form a square metre. The weights are fastened one metre apart, so simply position the weights as corners of a square. If each diver takes a corner in each hand, the rope can be lowered onto the reef surface, rather than dragged across it and into position, which will minimise disturbance. As you're aware, few reefs have flat surfaces over which a rope can be laid to form a perfect square, so you will have to make the best you can of the situation. It will not matter if part of the quadrat hangs vertically as this area can discounted from the survey using the DDD code (see below).
4. More experienced quadrat surveyors can complete a quadrat each, but should ensure they are positioned so that they can see each other and are close enough to each other to lend assistance if required.

To ensure we are building up a true understanding of the reef, it is important not to conciously or sub-conciously choose certain interesting features for the survey.

One way to ensure that this doesn't happen is to choose a random number between five and ten and then swim that number of fin kicks in a random direction before dropping the quadrat rope without looking down.

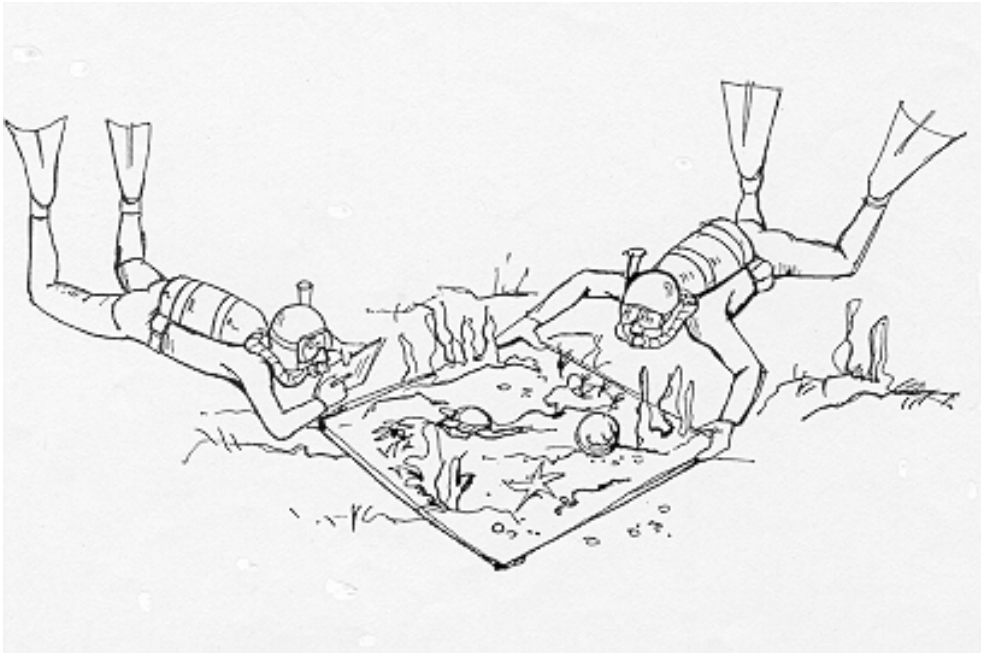


Figure 1 – Survey of benthic reef communities using the quadrat method

Completing the Survey

Now you are ready to record the percentage cover and/or count of the different flora, fauna lifeform types found within your quadrat (see box for hints on estimating area). Some flora and fauna are best recorded as area coverages, e.g. encrusting algae or mussel beds, others are better as counts, e.g. STAR (seastars) or GLUMP (green lumpy algae), while for some you can do both, e.g. BLEATH (kelp).

The lifeform codes used by Reef Watch are found in the Benthic Identification manual. Note that this manual also contains codes for bare substrate, e.g ROCK(bare rock with no encrusting algae) or SAND (bare sand).

Any part of the quadrat that is more than 20cm below the quadrat level or that hangs vertically over an edge should be recorded as DDD.

Two types of percentage covers are used to describe the benthic environment, and are illustated in Figure 2:

1. Canopy cover

   This is the "Plan View", the view a jellyfish would have whilst hovering above the quadrat. For example, in Figure 2, the jellyfish would observe BLEATH on the left hand side RFOLI in the middle and GTURF on the right hand side (although GTURF and RFOLI may not be in the uppermost "canopy", if they show through from above then they are counted as canopy). Note that the percentages should add up to 100%.

   The two-dimensional (plan view) situation will enable us to:

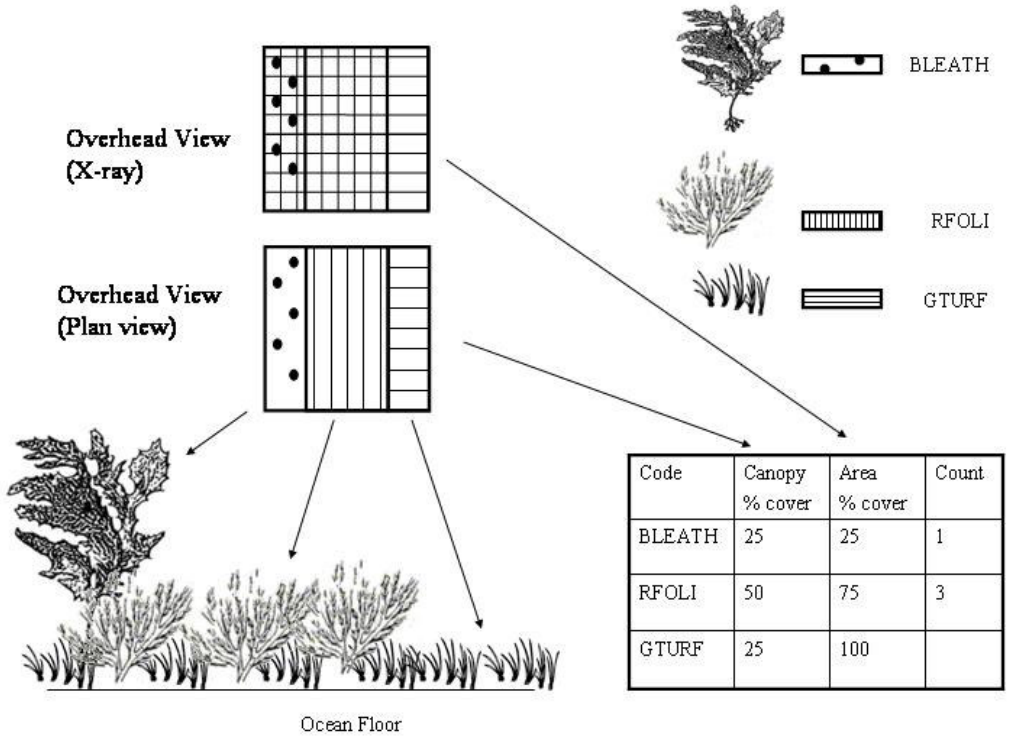
   - compare the quadrat data with Line Intercept Transect (LIT) data
   - compare the data with quadrat data obtained in earlier years when only canopy percentages were recorded.

Estimating the percentage cover of an organism can be difficult but the following guides will help:

- obviously the entire quadrat covers 100%, and it should be easy to visualise that a corner quarter of the quadrat covers 25% and half covers 50%.
- the Reef Watch lifeform identification slate covers approximately 7%; and
- the palm of your hand covers approximately 1%
- Anything smaller than 1% can be ignored

2. Area cover

   Because the benthic environment is not strictly two-dimensional, the total percentage cover will probably not add up to 100%. For example, in Figure 2, imagine if the jellyfish hovering above had X-ray vision. It would see that BLEATH covers 25% (the same as the "canopy" cover), but it would be able to see RFOLI covering 50% and GTURF covering 100%. The total percentage would therefore be more than 100% (it is 200%).



Code	Canopy % cover	Area % cover	Count
BLEATH	25	25	1
RFOLI	50	75	3
GTURF	25	100	

Figure 2: Recording percentage cover in a benthic quadrat – the difference between canopy and area.

Advanced Quadrat Surveys

As you become more experienced you will find that you are able to complete a quadrat quite quickly. In this case, you may wish to complete one or more additional ("replicate") quadrats in the same dive. Space is provided on the survey form for 3 quadrats, and then another 3 on the reverse side. The optimum number of replicates is four per reef site (i.e. conducted at the same depth). Perhaps view this as a goal to aim for in the long term, but don't overdo it and compromise the enjoyment of your dive!

Another possibility for the experienced survey diver is to do vertical quadrats. It will quickly become apparent that the range of lifeforms generally present is quite different for a vertical quadrat!

Data Entry

The survey is not complete until your data has been submitted!

The ideal way to enter your data is via the Reef Watch website (www.reefwatch.asn.au, choose "Enter survey data" quick link).

However, if you do not have internet access, you can fax (8232 4782) or mail (120 Wakefield St, Adelaide SA 5000) your datasheet (or a copy) through to Reef Watch.