

Buoys are used for a variety of purposes in an MPA, including mooring boats to prevent damage to the seabed from anchors. All buoys require careful installation and proper maintenance to ensure a long life. This sheet provides guidance, with particular emphasis on the Halas embedment mooring system that is recommended for MPAs.

The main uses for buoys in an MPA are for:

- Marking navigation channels, and the boundary and zones of the MPA;
- Marking a specific location (e.g. a wreck);
- Mooring boats and thus eliminating the need to drop and haul anchors.

Colour is often used to indicate buoy purpose, and should conform to the International Association of Lighthouses (IALA) system. Colour and shape can also designate type of service, such as for short stays, day use only or overnight mooring, with spar or pole buoys to designate boundary marks or obstructions.

Moorings are particularly important in an MPA to protect the seabed from anchor damage, especially in coral areas, and to reduce overcrowding (e.g. at popular dive sites where anchoring is prohibited and the number of buoys can be limited). Fishers may use the moorings as well as tourist boats and competition over the buoys can be reduced by requiring different users to use different buoys or different times of day. The Great Barrier Reef Marine Park has both public and private moorings, the latter for regular and guaranteed access by users such as dive operators. Before installation, it is thus important to estimate expected frequency and type of use and to carry out a site survey (depth, seabed conditions, tidal range, currents, wave and wind factors).

HALAS MOORING SYSTEM

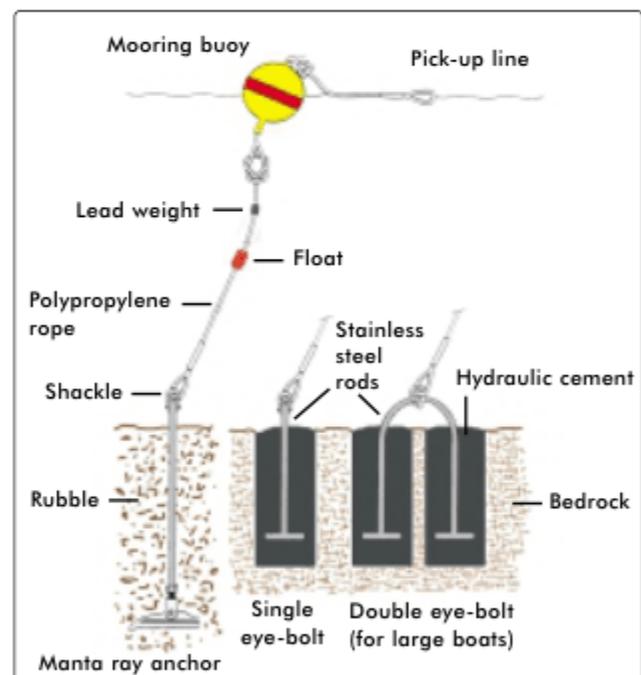
Halas embedment moorings are strongly recommended for MPAs, and were designed specifically to prevent environmental damage whilst providing robust and safe mooring (see www.reefmoorings.com).

Components

- **Floats or buoys** - 46cm diameter, made from polypropylene plastic filled with polyurethane. Moulded medium density polyethylene floats with ultraviolet (UV) stabilisers can also be used; plastic containers are sometimes used, but UV damage significantly reduces their durability.
- **Pick-up line** - A small, floating, polypropylene pick-up line (with an eye-splice at the end) should be attached to the main float. The line should be 3m long (rather than the standard 5m) to encourage users to pass their own mooring line through the eye and pay out sufficient scope.
- **Mooring line** - The main anchor line should be 20% longer than the maximum high tide depth. Three-strand, 20mm, polypropylene line is ideal. Chain can be used but is not recommended for the Halas system.

To minimise chafing, protective sheaths, thimbles, and shackles are used at all attachment points. The Halas design ensures that the mooring line is kept off the seabed by a float several meters above the anchor point, and away from the surface (to prevent entanglement by boats) by a weight several meters below the mooring float.

- **Anchor** - Options include a single (or double for larger boats) stainless steel eyebolt cemented into cores drilled into bedrock, or a Manta Ray anchor forced into a cored hole in rubble or sand bottoms. An anchor cone of resistance, known as a helix mooring system, may also be used, screwed into the rubble or sand seabed. Anchors of cast concrete, engine blocks or scrap metal should be avoided as they may damage the seabed.



Variations of the Halas mooring system.

Maintenance

Specifications of each mooring should be recorded. All components require regular maintenance, including visual inspection (using SCUBA) and immediate replacement of worn parts, a pull test on the system and cleaning from fouling. A monitoring schedule might involve:

Monthly - Inspect all buoys and pick-up lines; clean pick-up lines of growth or replace if necessary; clean, wax and polish buoy, check for cracks and replace where needed; inspect and clean exposed portions of buoy through-line and replace as needed.

Three months – Inspect mooring line and protective sheaths for wear and replace as needed; inspect shackles and mooring, especially contact area between the two.

Six months – Inspect anchor mountings and surrounding area, checking for signs of movement; replace buoy through-line and pick-up line if system is regularly used.

Twelve months – Replace pin in mooring line shackle.

Twenty-four months – Replace mooring line if needed.

COSTS

Depending on local materials, components for a single mooring might cost US\$200-2000, with labour, boat use and fuel costs on top. Maintenance costs can also be expensive. In many WIO countries, donors have funded installation costs. Some MPAs in the Caribbean have set up 'Adopt a Mooring Buoy' programmes to raise funds, and dive operations often contribute financially or in kind. In the Seychelles, the MPAs themselves help to cover costs (see case study).

LEGAL LIABILITY

Since mooring buoys are expected to provide a vessel with a safe anchorage, an accident may have legal repercussions against those who install and maintain them. Disclaimers in writing, with terms such as 'use at your own risk' and 'non-mandatory use' may reduce the risk of liability but are inappropriate in an MPA that requires mooring buoy use. Insurance is possible but is usually dependent on the ability to show compliance with 'Best Practice'.

KEY POINTS FOR THE MPA

- Provide information on positions of buoys (particularly MPA boundary marker buoys). This can be done through a Notice to Mariners issued by the relevant charting institutions (e.g. Harbour Master); or by marking positions (determined using GPS) on charts which can then be made widely available and lodged with local authorities (e.g. Police, District Administration, Fisheries Officer).
- Disseminate information on mooring buoys and boundary markers, and their purpose, widely to reduce conflict.
- Endeavour to install moorings even if it requires securing external funds.
- Provide written guidance and training (if required) on the use of mooring buoys for all boat operators and ensure a proper maintenance schedule to reduce accidents and minimise repairs.
- Establish a monitoring programme to determine the use and impact of mooring buoys.
- Develop a fee system for use of any moorings that is harmonised with other MPA user fees.
- Carefully examine insurance and legal liability issues for mooring buoy use; ensure that the MPA can provide evidence of proper design and installation, inspection and maintenance, and provision of clear and detailed advice on use to boat operators, based on 'Best Practice'.

Sources of further information

Breda van, A. & Gjerde, K.M. 1992. *The use of mooring buoys as a management tool*. Centre for Marine Conservation, Washington DC. 56pp.

Environmental Moorings International: www.reefmoorings.com

Gjerde, K.M. 1991. *Mooring buoys and legal liability*. Centre for Marine Conservation, Environmental Solutions International and The World Conservation Union. 12pp.

Marine Conservation Society Seychelles (MCSS) moorings project: www.mcsc.sc/moorings.htm

International Association of Lighthouses: www.iala-aism.org - information on the IALA Maritime Buoyage System.

PADI International Project Aware: document on Mooring Buoy Program Planning: www.projectaware.org

CASE STUDY

The Seychelles mooring buoy programme

The Marine Conservation Society Seychelles (MCSS), with assistance from other organisations, is installing a national mooring buoy system in and adjacent to MPAs. 100 moorings and buoys (the Halas type) were purchased with donor funding from the Netherlands. An installation training course was carried out by John Halas for about 12 staff from the Marine Parks Authority, the Marine Unit of the Department of Environment, and the MCSS.

Yellow mooring buoys are designated for large boats and white for smaller boats. The programme has resulted in some useful lessons learned and modifications to the design. The Seychelles is the first place where Halas embedment moorings are being used for large vessels (35m length, GRT up to 250 tonnes). On Aldabra, the hard limestone substrate required modification to the installation technique, and the difficult diving conditions due to depth and strong currents required Nitrox diving.

Following initial installation, a public and stakeholder workshop was held to develop a framework for further installations and maintenance. A Mooring Stakeholder Steering Committee, comprising agency and MPA representatives, was established to oversee the long-term process. The Marine Parks Authority and the NGOs running the MPAs at Aldabra, Aride and Cousin maintain the moorings. Under a memorandum of understanding with the MCSS, the MPAs are responsible for routine maintenance with MCSS responsible for six monthly inspections and other essential maintenance. Entrance and overnight mooring fees fund maintenance and sometimes installation.

The port and coastguard authorities were worried about liability if an accident occurred to a vessel moored to a buoy. Reassurance was provided through information about the situation in other countries and by obtaining insurance. The buoys are now serving their immediate purpose, providing a much-needed service in many areas used by tourist boats and yachts.