Boats and engines F5

All MPAs need some form of vessel to carry out many of the management activities. The choice of boat design depends on its use, the sea-conditions it will be operating in, and operation and maintenance costs. With this information, the design options available can be matched against the budget. This sheet outlines some of the issues to be considered.

Within an MPA, boats are used for many activities including: patrols; transporting equipment, personnel and visitors; search and rescue operations; and research, surveys and monitoring. A boat for transporting equipment needs a large cargo area but few furnishings, but a boat for personnel transport should have seating and preferably shade. Boats used for SCUBA diving should have space for equipment and diver access. Rough open sea conditions require boats with greater stability, higher freeboard, stronger hulls and more powerful engines than those operating in sheltered waters. Where boats have to operate in both situations, the design should be appropriate for the more difficult conditions. Multi-purpose boats may be appropriate but, in some cases, it is more efficient and cost effective to have different boats, each for a specific purpose.

PERFORMANCE AND RANGE

The requirements for boat speed and range will be determined by the distances to be covered, whether fuel has to be carried (e.g. for the return journey or for days away from base), and whether daytime trips only are essential (for navigation and safety reasons). Suppliers can offer a boat and engine package to meet the expected operating scenarios. Note that the top speed quoted by suppliers will be that obtained in flat calm conditions; the top speed in open sea conditions may be less than half this.

S. Wells

Launching a fibreglass boat bought for the Moheli Marine Park in the Comores (note two engines).

BOAT MATERIALS

Materials commonly used to build the main structure (the hull), are wood (including marine ply), rubber, fibreglass, ferrocement, aluminium and steel, some of which can be combined, e.g. fibreglass hulls with rubber sponsons (called semi-rigid inflatables). Weight is a consideration; for example, an aluminium dinghy is lighter than a fibreglass one of the same size, and so is easier to transport on land and haul ashore. In general, select hulls that are the thickest and strongest that the construction material will allow to ensure a long service life. The material used also influences the maintenance schedule and the need for spares; wooden hulls (e.g. dhows) may require more maintenance. Fibreglass hulls are vulnerable to rapid wearing when boats are dragged over sand without using protective boards or runners.

MODES OF PROPULSION

The length and weight of the vessel determines the minimum power unit required. Outboard engines are now common in boats up to 10m. They come in sizes from 6 to 250 HP (horse power), and should be selected in relation to the expected hull speed, but taking account of fuel consumption. A large engine used at 50% of its power will generally consume less fuel than a smaller engine used at full throttle to achieve the same speed. Outboard engines are usually 2-stroke, and run on a mixture of 1:50 (1 litre oil to 50 litres of petrol) or 1:40. 4-stroke outboard engines are more expensive and require more skilled maintenance but are generally more economical to operate and quieter. If budgets allow, twin engines should be purchased to provide additional security for offshore operations in case one of the engines fails. If the boat is to travel long distances in the open ocean and has a single outboard, a small backup should be carried. Manufacturers of outboard engines include Yamaha, Mariner, Evinrude, Honda and increasingly Suzuki. Agents for these are present in most WIO countries and should stock spare parts.

Larger, heavier boats usually have inboard diesel engines which are efficient in fuel consumption but slower. Common names are Yanmar, Lister-Petter, Volvo-Penta and Mitsubishi, but there are fewer back-up agents in the WIO. The operator must fully understand the engine which may be more complex to run than outboards (e.g. complicated electrical systems and some are turbo powered). For shallow waters, where propellers are regularly damaged or cause damage to marine life, water jet propulsion systems should be considered. Sail is unlikely to be the main means of propulsion, for reasons of efficiency and convenience, but can be a useful backup to engines and thus provide a safety measure.

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Inflatable boat being used for educational activities.

HULL DESIGN

The design and shape of the hull is very important to consider, especially in relation to:

- Shallow keel - preferable where the mooring dries out at low tide.
- Flat bottom shallow draft - ideal for shallow waters.
- Solid shallow keel - preferable for regular beaching.
- Flared bow, with high stability and freeboard - safer, more efficient and more comfortable in rough, open seas.
- Large hold or seating capacity, good stability, and a high freeboard - preferable for transportation of large amounts of cargo or passengers.
- Twin hull - useful when a large working deck area is needed for research or diving.

MAINTENANCE

As with any equipment used in the sea, washing engine(s), hull, and trailer (where this is used to remove the boat from the sea) with freshwater (if available) is essential. Regular freshwater rinsing of the internal cooling system after use will prolong engine life. A small outboard engine can be rinsed by running it for a few minutes in a drum of freshwater. Rinsing the internal part of a larger engine requires connecting a freshwater hose to the water intakes of the engine. Large outboards, inboards and diesel engines are not rinsed.

Outboard engines should be maintained in accordance with the users manual, original spare parts used where possible, and regular services carried out by an experienced mechanic. Check fuel is of good quality and not dirty or mixed with oil, and use fuel filters. Ensure the right mixture of oil and petrol is used. Marine grease must be used on external moving parts of the engine.

KEY POINTS FOR THE MPA

- ❑ **Boats are a major investment, so think carefully and consult colleagues and other MPAs on what is really needed.**
- ❑ **In selecting the type of boat, look carefully at the skills available for both maintaining and using it, and the distance of the MPA from maintenance and support facilities.**
- ❑ **Ensure all personnel who use or maintain boats are adequately trained, and that their responsibilities are clearly defined. Ideally have one main boat operator per boat and where necessary a deck hand. If possible have a trained boat mechanic on staff.**
- ❑ **Funding for boat purchase is often not available in the MPA's operating budget, and comes from external sources. In such situations, it is important that donor requirements or the interests of a commercial sponsor do not result in a compromise in the type of vessel selected.**
- ❑ **Develop operational and maintenance routines for all MPA boats and have key spares available (e.g. propeller pins, propellers, fuel filters).**

CASE STUDY

Boats in Aldabra Special Reserve and World Heritage Site - Lessons Learned

Aldabra is one of the remotest and largest MPAs in the region. Numerous activities, ranging from research and monitoring, to tourism and education, are undertaken from the combined management base and research station. Acquiring and maintaining appropriate vessels is a major preoccupation for the management agency, the Seychelles Island Foundation (SIF).

Boat transport is needed for:

- Transferring visitors, personnel and cargo to shore from vessels that have to anchor outside the reef;
- Patrols in the lagoon (many shallow areas but also deep channels with extremely fast tidal currents) and the open waters (deep and often rough);
- Monitoring and research;
- Visits by tourists and school children;
- Occassional transfer of people to and from the nearest airstrip, on Assumption, about 30 km away;
- Rescue and emergency evacuations;
- Subsistence fishing.

SIF has several boats including a very large zodiac, a fibreglass catamaran and small tenders. Strong aluminium heavy-duty hulls (although fibreglass is easier to repair if damaged) are used as the boats are regularly beached. One of the most successful boats is the 'Bumboat' (see Toolkit folder cover) which has been used for over 35 years and continues to transport stores to and from the supply ship, visitors and researchers around the atoll, and is even used for medical evacuations to the airstrip. With a heavy aluminium hull including a solid 30mm keel, it is powered by an 85 HP outboard engine. SIF has a policy of replacing all outboards every two years, as this means lower maintenance costs and a higher re-sale value, but this is not always possible. Older style engines (although not as environmentally friendly as 4-stroke engines) tend to be used, as the boatmen and mechanics are familiar with these and can maintain them in the remote location.

All the boats receive careful operation and regular maintenance, as spares and fuel are only available through the supply boat that visits every two months. The Warden ensures that daily operations (laid out in an operations manual) are carefully followed, and each boat is allocated to a particular boatman. The mechanic and head boatman are recruited with basic skills (e.g. graduates from the national School of Maritime Studies) and sent for further training in engine maintenance, navigation skills and sometimes diving. SIF pays for this, which adds to the MPA's costs, but is considered essential.

Sources of further information

Corfield, T. 1993. *The Wilderness Guardian: A Practical Handbook.* African Wildlife Foundation/The David Sheldrick Wildlife Trust. Longman, Kenya. 701pp.

Use a search engine to find websites for manufacturers of engines, boats and accessories.