CHAPTER 3

Types of lights and power sources commonly used

A. Lights and lamps

B. Lead acid batteries

Traditional fishermen created light for night fishing by burning tightly bound coconut fronds, setting bonfires on beaches and shorelines, and by burning wax in lamps. Today, the majority of fishermen use modern lanterns and lamps that are fuelled by petroleum-based products or are powered by batteries or electricity, although fishermen in some remote coastal areas still use fire to attract fish.

The use of lights in lift net operations was made popular in the Pacific Islands region by the tuna pole-and-line industry. The bouke-ami stick-held dip net method uses light to catch small baitfish that are then used by catcher boats to draw skipjack tuna schools close to their vessels. The skipjack tuna in turn are caught using a pole-and-line with an artificial lure and barbless hook.

Before the bouke-ami method was introduced, the fish species typically caught at night were those susceptible to capture by gill nets, baited hooks and lures. Smaller baitfish species such as anchovies, banana fusiliers, hardy-heads/silversides, ponyfish and sprats were primarily ignored.

Some Pacific Island fishermen currently use lights with gill nets, scoop nets and throw nets to snare garfish, sardines, herrings, scads and flyingfish. Handlining and jigging for live bait are also commonly done using light.

This chapter highlights some night fishing techniques and provides general information on the equipment needed to carry out these fishing methods. These methods are adapted for use on small vessels such as canoes, outboard-powered boats, open banana boats, and inboard diesel-powered boats that are less than 12 m (39 ft) long.

The catch methods focus on manual operations rather than machinery-operated gear. However, commercial fishermen who have plenty of capital should upgrade their operations to include electrical or hydraulic mechanical gear to improve their catch.

A. Lights and lamps

There are two main light sources used for night fishing: kerosene lamps and battery-powered lights. Kerosene lamps have the advantage of using fuel that is inexpensive and readily available, even in remote coastal villages. Battery-powered lights, on the other hand, are considerably brighter than kerosene lamps and are safer to use, but both the light and the batteries are more expensive. (See the diagrams of each of these lights.)

Kerosene lamps come in three different types: wick, mantle and pressure. Wick lamps are simple to use and are fairly inexpensive. Mantle lamps are brighter than wick lamps, but require considerable care so as not to damage the delicate mantle. Pressure lamps, which are the preferred lamps for night fishing, are the brightest of the three kerosene lamps, but are more complicated to use than the other two.

A detailed description of each of these lamps can be found in the text box entitled “Lights used for night fishing”.

Lights used for night fishing

Kerosene lamps

The most commonly used lamps in rural coastal communities are those fuelled by kerosene. Both the lamps and the fuel are readily obtainable in local trading stores, and are generally safe to use, providing the instructions are strictly adhered to and the lamps are properly maintained. Caution should be exercised when using these lamps because they pose a fire hazard. Special attention must be given to where the lamp is positioned on the vessel and how it is secured. When carrying the lamp from one location to another, care must be taken so that the fuel does not spill or that the heated parts of the lamp do not come into contact with combustible materials or with a person's skin and clothing.

Three types of kerosene lamps are commonly used: the "wick lamp", "mantle lamp" and "pressure lamp".

The wick lamp has a cotton wick that is dipped inside a small kerosene tank at the bottom of the lamp. When the wick is ignited, the kerosene that has been absorbed by the wick burns and produces a bright flame. The flame's brightness is controlled by adjusting the wick's length. This is done by turning a knob known as a cric. The cric – a small sprocket wheel that controls a geared metal disk – presses against the wick and pushes or pulls the wick when turned. The flame is protected by a glass chimney (flute) that is open at both ends. The base of the chimney sits firmly on top of the fuel tank leaving the top end open to draw in air that produces a brighter light than an exposed flame, such as a candle.

On fishing vessels, a wick lamp provides a light to work by in fine weather conditions and – in cases where better lamps are not available or are too costly to buy – can be used for attracting fish. A wick lamp should be positioned securely and safely in areas blocked off from the wind, and so that fuel cannot spill onto flammable parts of the vessel.

The mantle lamp burns much brighter light than a standard wick lamp and operates at a higher temperature so it produces more heat and burns more fuel. The mantle lamp has a round wick that burns beneath a conical mantle made of incandescent material. Like a wick lamp, the mantle lamp can be adjusted for brightness; if it is adjusted too high, the glass chimney and mantle will get sooty. Although the lamp has a mantle, it is not a pressure lamp and is mainly suitable for in-house use.

The mantle lamp is slightly more complicated to use than a conventional wick lamp but is much less complicated than a pressure lamp. The proper procedures need to be followed in order to achieve the full benefits of the mantle lamp. There are slight variations between brands but they all operate in the same way.

Pressure kerosene lamps, gas lamps, or hurricane lamps as they are sometimes called, are the preferred fuel lamps for fishing and outdoor use, but are more complicated to use than a simple wick lamp. These lamps are basically blow torches with a screen and mantle at the flame end of the torch. Without the mantle there would be no bright light. The pressure lamp has three main parts: the fuel tank, generator and mantle.

The fuel tank has a manual pump that pressurises the tank and pushes the fuel through to a generator that preheats and mixes the fuel and air so that the combination will combust when it reaches the mantle. (This is similar to what a carburettor does for a car engine.) The fuel boils and turns to vapour in the generator so that it can spread evenly onto the mantle where it combusts. At the generator outlet where fuel and air pour into the mantle there is a screen that evenly spreads the vaporised fuel over the mantle. The screen retains heat so that combustion takes place on or around its surface. If this screen is damaged, the combustion becomes uneven and the lamp will give off a raucous sound.

The pressure lamp can operate without a mantle but would be more like a blowtorch with a considerable amount of heat and little light from the flame. With a mantle connected to the flame end, the light glows brightly as the heat from the flame heats the mantle, thus changing most of the heat energy to light energy.

Since most of the original mantle types contain radioactive properties it is prudent to burn new mantles in the open air and avoid breathing the fumes unless you know that the mantle is made from one of the more modern non-toxic materials.

Battery-powered overhead lamps

Battery powered overhead lamps are becoming popular throughout fishing communities in the Pacific, especially in areas close to urban and rural trading centres. The advantages of these lamps over kerosene lamps are that they are: 1) easy to operate, 2) watertight for all weather use, 3) less messy because the operator doesn't have to worry about spilling fuel; and 4) safe to use on board.

Changing batteries on a light does not pose any risks the way re-fuelling a heated pressure lamp does.

The disadvantages of a battery-powered lamp are that the batteries are more expensive than kerosene fuel, and the lamp itself is more expensive than a pressure kerosene lamp of the same candela (a measure of candle power). However, the advantages of a battery-powered lamp far outweigh that of either a pressure kerosene lamp or a simple wick lamp.

The long-term popularity of these lamps will depend on the consistent availability of the right batteries and the cost of both the lamp and the batteries.

The most common battery-powered lamp is one that uses D-cell batteries. Alkaline batteries are best because they last longer than standard D-cell batteries and are equally available in local trading stores. Different lamp brands use different battery systems; some take lithium batteries and some use lead acid batteries.

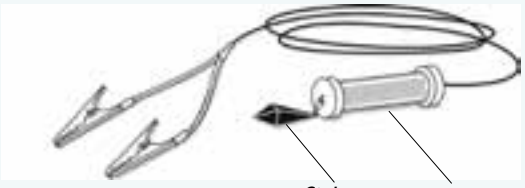
Lithium batteries have a shelf life of up to 10 years, have better performance in extreme weather conditions, and offer longer operating times than standard alkaline batteries of similar power output. Fishermen who have an electrical power supply prefer to use lamps that operate on dual battery systems that include D-cell batteries and rechargeable sealed lead acid batteries (or similar battery power sources).

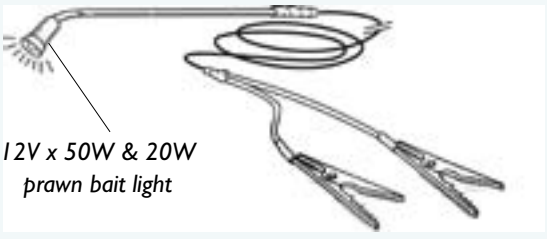
The main things to ask yourself before buying a battery-powered lamp are: 1) Is the lamp durable and does it produce a similar amount of light to a gas pressure lamp? 2) Are the lamp and batteries available locally? 3) Are the batteries easily replaceable or rechargeable? 4) Can I afford the lamp and batteries?

Underwater lights

Hawaii's ika shibi fishery has used overhead lights as well as underwater lights to attract fish since the 1920s when Okinawan immigrant fishermen devised this fishing method to attract squid and scad, which were used as live bait to catch tuna.

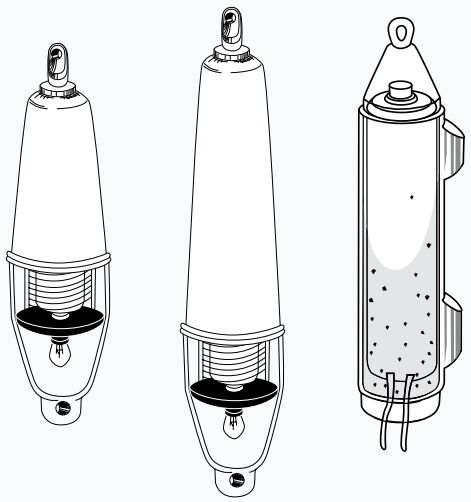
The use of underwater lights became widespread in the Pacific with the introduction of commercial swordfish longline fishing, where disposable submersible light sticks were used to attract swordfish to baited hooks, and with the development of the tuna pole-and-line industry, where high-powered overhead and underwater electric lights were used to attract live baitfish for pole-and-line fishing. For small-scale fishing, the use of underwater lights is still in the developing stages in many Pacific Islands; especially ones that have fishing gear shops with a diverse range of fishing gear.





The most practical underwater lights for small boat owners in the Pacific are watertight battery-powered lights. The most efficient of these are powered by lead acid batteries, preferably deep cycle batteries.

Disposable light sticks are handy and cheap underwater lights that work well with overhead lights in small craft operations. Disposable light sticks produce light through a chemical reaction. One chemical is contained in the light stick case itself while the second solution is contained in a glass vial within the body of the light stick. When a fisherman bends the light stick, the inner vial breaks and the two chemicals mix and light is produced. The colour of the light depends on the type of dye within the light stick. Commercial swordfish fishermen rely on light sticks to increase their catches, and bottomfish and recreational fishers experiment with them to attract particular bottomfish species to their lures. Disposable light sticks stay lit for up to 24 hours. Do not dispose of used light sticks into the sea.



Some underwater lights are powered by dry-cell batteries that work well with bright overhead lights to draw fish to the vessel. The light stick concept was used to produce small, durable, coloured underwater lights powered by "AA" batteries. The batteries are in hard transparent plastic cases that are water resistant as well as able to withstand pressure at varying depths. These battery-powered lights are sometimes used in hand-lining for bottomfish, and are mainly used by urban recreational fishermen. Another innovation is the Micro flashing LED units that are water-activated and can be used in depths of up to 300 m.

B. Lead acid batteries

Lead acid batteries allow fishermen to use bright lights for a longer period of time, and gives them greater flexibility in alternating the brightness of the light by using a dimmer switch. A good understanding of lead acid batteries will assist fishermen when they go to buy batteries, and will help them determine the amount of light to load on them for any fishing operation.

There are two types of lead acid batteries for fishing: a standard lead acid **start battery** commonly used to start car and boat engines, and a **deep cycle battery** commonly used with solar panels and battery-powered lights.

A start battery provides large power surges for a short period, which is ideal for turning over an engine when it is being started. After starting the engine the alternator provides all the power that the vehicle needs without draining the battery more than 20% of its total capacity. The start battery has thin lead plates that give it a large surface area, thus allowing it to produce the large amount of power needed to create the power surge.

A deep cycle battery, on the other hand, has thicker plates that enable it to provide a steady amount of current over a long period of time and allows the battery to be totally discharged repeatedly. It can deliver a power surge when needed but this won't be as forceful as that of a start battery.

Because it is the heart of a small craft's electrical system, a battery needs an alternator to keep it charged otherwise it loses its charge and cuts electricity supply. The alternator, which converts alternating current (or AC) electrical power to direct current (or DC) electrical power, produces the electricity required to keep the vessel's DC voltage electrical systems working and the battery banks charged. The alternator voltage output must be within the range of 13.5–14.5 volts (V). If the voltage output exceeds this, the battery(s) can quickly be ruined. A voltage regulator keeps the voltage output within 13.5–14.5 V. If, during charging, the battery's voltage reaches 14.5 V, the voltage regulator cuts off the field terminal to prevent the battery from overcharging and overheating.

If a start battery is used to power fishing lights, it is recommended that the engine driving the alternator be left on to ensure that the battery is not drained to more than 20% of its capacity. However, several precautions need to be observed while doing this.

The amperes drawn by the lights should be less than the alternator ampere output in order to keep the batteries charged; otherwise, the lights will drain the battery. In most instances, an idle engine will not allow the alternator to generate enough amperes to keep the lights burning brightly and keep the batteries charged at the same time, so the idling engine's rpm will have to be increased. This may, however, result in increased fuel consumption and increased engine maintenance expenses in the long run. When an engine idles for a prolonged period, the engine oil becomes contaminated quicker than when the engine is in full running mode. The excess air intake during combustion cools the cylinder liners, causing incomplete combustion and condensation of unburned fuel residue on the cylinder wall. This eventually gets deposited in the engine sump where the engine oil becomes contaminated and its effectiveness as a lubricant is reduced.

If a start battery is used in any other way that will periodically drain the battery to more than 20% of its total capacity, this will shorten the battery's life because it is not meant to withstand repeated recharging from a heavily drained state.

A deep cycle battery, on the other hand, has thicker and more solid lead plates that allow it to be deeply discharged repeatedly then recharged again. It is designed to provide a steady amount of current over long periods. Even though it can provide a power surge to start an engine, it should not be used for this purpose.

In practice, it is prudent to use marine deep cycle batteries for powering lights and other fishing equipment, and use marine start batteries for everything else that can be run off the alternator without limiting its battery charging capability. The start battery should always be in good working order and should never be drained below 20% of its capacity, otherwise the fisherman runs the risk of not being able to start his engine to get back home and possibly being adrift at sea.

To find the approximate time that a light or several lights can run off a particular battery, the battery's amp-hour rating needs to be divided by the average load in amps. For example, a 100 amp-hour battery that powers an 8 amp light should last approximately (100/8 = 12.5) 12.5 hours.