Give 'em enough rope

A fouled prop causes no end of grief, so is it worth fitting a rope cutter, and if so which one? **Keith Colwell** and the ***ST* Test Team** put five contenders through some gruelling tasks to see which make the cut

Photo Julian Dacre; Image Manipulation Chris Stocker

Why do propellers have such an affinity for submerged rope? And not just rope. Despite acres of open sea, a whole variety of debris – ranging from semi-submerged nets, polythene fertiliser bags, old bits of tarpaulin and unlit pot marks to huge lengths of dense seaweed – tends to throw itself into the path of the propeller with potentially disastrous effects. As the flotsam suddenly wraps itself around the prop, it can cause any amount of damage – loss of thrust, stripping gears in the gearbox or even ripping the engine from its mounts can all result from a fouled prop.

It's fortunate, then, that several marine manufacturers offer a solution in the form of a propeller protector – a cutter which is designed to slice through the offending article so that it falls away harmlessly. There are two basic types of protector: discs and scissor-action cutters. Both are designed to fit on to the propeller shaft between the propeller and the stern bearing; and Ambassador Marine, manufacturer of the Stripper, also makes versions suitable for saildrives.

Each manufacturer produces a range of cutters to fit different diameter shafts, and it's important to specify the exact size of shaft when ordering. They can be fitted in front of folding props as well as fixed propellers, although the cutter will create a little extra drag compared to a folding prop on its own.

Disc cutters rely on the pressure of a trapped rope against the cutting edge of a single blade

(importer of the Spurs), provide spacers suitable for different gearbox flanges. In some cases, it may be possible to use a flexible coupling instead of a spacer.

Because the propeller moves forward a few millimetres when the engine is put into ahead, it's important to leave a small space (usually about 6 to 10 mm or so on yachts of 25 to 35ft) between the front of the cutter and the bearing. If the cutter is too close, the propeller thrust will cause the cutter to rub on the end of the P-bracket or shaft bearing. It may also prevent water from passing through the cutless bearing and cause it to wear excessively.

In most cases, the cutter can fit behind any kind of bearing including the traditional type fitted in the deadwood or, for more modern designs, one fitted into a P-bracket. Ben Campbell of Harold Hayles, the importer of the Spurs, says: "We can usually accommodate most situations. For example, we can even fit the Spurs behind a glassfibre stern tube where we would make up special clamps for securing the cutter's fixed blade."

Yachtsman Les Harris tells us:

"I knew a lone fisherman who fitted one after nearly drowning when he caught the rope off one of his own pots."

In some installations, and particularly when fitting scissor-type cutters, it may be necessary to create more space between the prop and the shaft bearing for the cutter to fit. This can be achieved by fitting a spacer between the gearbox flange and the propshaft coupling. Both Ambassador Marine and Harold Hayles

Scissor-type cutters use the action of rotating blades passing across fixed ones

Disc cutters

Disc cutters are very simple and cost about a third of the price of scissor-types. We tried three models, all of which are made from marine grade stainless steel. All three come in versions which slide over the shaft, which means the propeller has to be removed when fitting. However, the ProProtector (you may also see it written as 'Prop Protector') also comes in a clamp-on version which is easier to fit because it enables the propeller to remain in place. The three models are locked in position by a small grub screw which either locks on to a flat filed-off piece on the side of the shaft or a pre-drilled hole.

Disc cutters are also much thinner than scissor cutters, so it's less likely you'll need a spacer. They also work in a completely different way. Instead of trapping material between two blades, they cut like a knife. To be effective, therefore, the rope has to be caught around the shaft or P-bracket and then entangled in the prop so that it is pulled on to the disc's cutting blade. We did find, in general, that if too much material becomes trapped around the cutter, it can be overwhelmed and the prop jams.

One disadvantage of a disc cutter is that it gets in the way when removing the propeller (see 'Tips for removing the prop', overleaf). If you plan to use a prop puller, leave a sufficient gap between the cutter and the propeller boss.

Scissor cutters

There are two established models of this type – the Spurs and the Stripper. Both are similar in operation, although there are some significant differences in design.

They consist of two to four rotating blades (depending on the size and make of the cutter) which are clamped to the shaft. A fixed blade is held in place by a V-block which is fastened to the bearing housing. All of the blades are double-sided so that they will cut whether the engine is running ahead or astern, and for both left-hand (anti-clockwise when looked at from astern) or right-hand turning propellers. When the shaft turns, the rotating blades pass across the fixed blade, giving a scissoring action. Unlike the disc cutters, no downward pressure is needed – the aim is to clear any rope *before* it becomes entangled. ▶▶

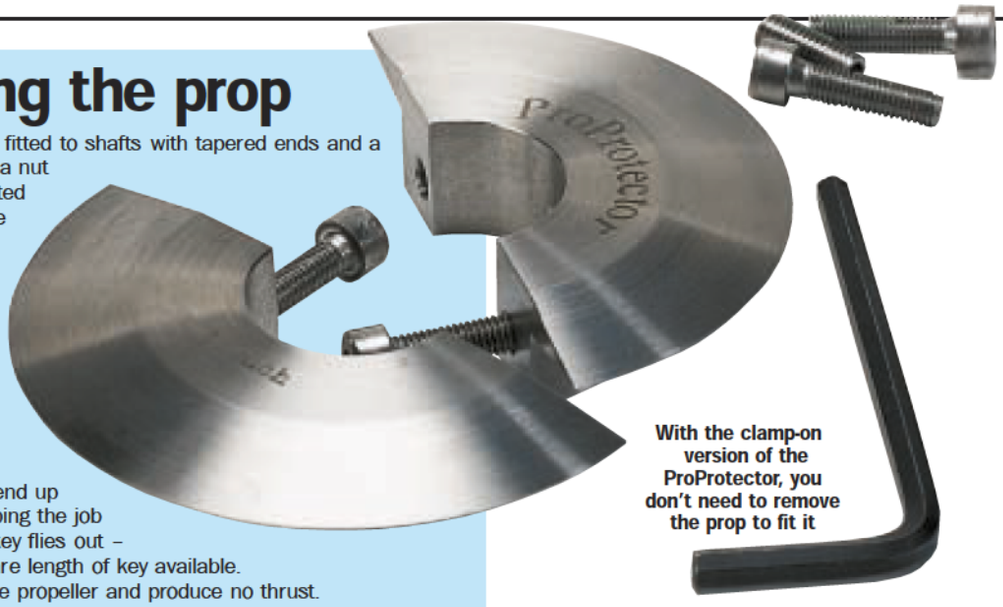
Thanks to: E P Barrus Ltd, the UK distributor of Yanmar diesel engines for lending us a 10hp Yanmar L100AE diesel engine ✦ 01869 363636; and second-hand specialist The Chandlery Barge, Bursledon, for the hire of the stern gear.

Tips for removing the prop

In conventional installations, propellers are fitted to shafts with tapered ends and a key. The prop is pushed on to the taper by a nut screwed on to the end of the shaft, prevented from unscrewing (usually) by a split pin. The propeller binds on the taper and can be extremely difficult to remove. While it's possible to use a puller, the prop can also be removed by a hammer and stout length of metal bar.

To do this, place the bar so that the end is positioned by the end of the keyway and hit it firmly with the hammer (taking care that the prop doesn't fall on to your feet!).

The key can be removed by tapping its end up with an old screwdriver or blunt chisel. If doing the job between tides, keep an eye on where the key flies out – you'll need it later. Alternatively, have a spare length of key available. Without the key, the shaft will slip inside the propeller and produce no thrust.



With the clamp-on version of the ProProtector, you don't need to remove the prop to fit it

With a battery-powered drill, you can even fit a cutter between tides on a drying mooring

Because there are moving parts, scissor-type cutters are more sophisticated than disc cutters and made to within relatively close tolerances. Like the disc cutters, the Spurs and Stripper are both made from stainless steel.

The most significant difference between these two makes is the shape of the blades. The Spurs has only two anvil-shaped blades, the idea being that the rope will be trapped by the points of the blade so that it can be cut. The Stripper, on the other hand, can have two to four blades with sharp serrated teeth that separate the rope into easily cut bunches. The designer claims that the open design allows it to 'eat' into the offending article.

Are they easy to fit?

To fit either the Spurs or the Stripper the P-bracket or stern bearing must be drilled and tapped to accept the fastening bolts of the V-block. Both makes can be supplied with an optional drill bit and tap. The Spurs came to us with a tapered tap which, although easier to

SPURS

Performance ★★★★☆ Value for money ★★★★☆

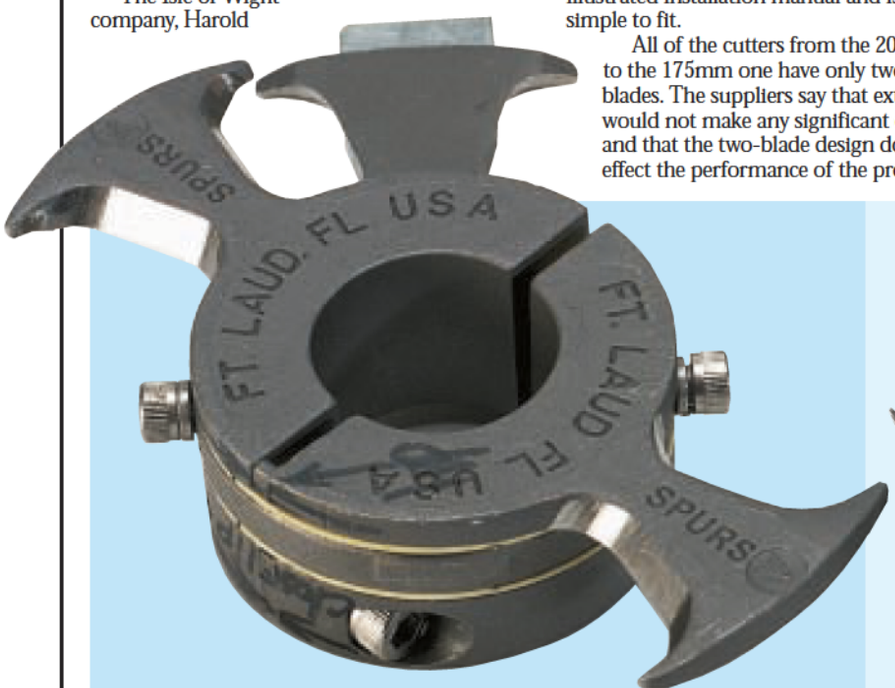
Designed in Florida more than 15 years ago, the Spurs were the first propeller shaft cutters, and they are fitted to RNLI vessels.

The Isle of Wight company, Harold Hayles, assembles the product for the UK market and provides fitting advice and service. The cutter comes with a detailed and well-illustrated installation manual and is relatively simple to fit.

All of the cutters from the 20mm model to the 175mm one have only two rotating blades. The suppliers say that extra blades would not make any significant difference and that the two-blade design does not effect the performance of the propeller.

When fitted properly, the cutter is very effective, snipping its way easily through all the rope samples from the monofilament line to the 20mm polyester.

Both the netting and plastic sheet wrapped themselves around the prop, but the shaft was still able to rotate freely. We lost a little bit of drive, and when we stopped the engine, the netting and sheet pulled away easily.



Specifications

- **Metric sizes** for shafts from 20mm to 175mm
- **Imperial sizes** from 0.75in to 7in
-
- **Model tested** A
- **Shaft size** 1in
- **External diameter** 102mm
- **Thickness** 24mm

start, was unable to cut a thread to the bottom of the hole which meant drilling a deeper hole than needed for the fixing bolts. Both the Spurs and the Stripper can be assembled with the propeller in place.

Whether or not you decide to fit a scissor-type cutter as a DIY job depends on your skill with a drill and tap. It's not particularly difficult in most yacht installations because of the relatively small size of stern gear. Most yachtsmen should be able to fit one with the boat dried out between tides. You'll need a battery-powered drill if you're doing this.

Disc cutters are even easier to fit. The only drilling needed is a small hole to create a dimple in the shaft to hold the grub screw.

Measuring up

As we've already intimated, it's important to get exactly the right size cutter for your propeller shaft. Check whether your shaft is imperial or metric. For example, the small difference between 25mm and 1in (just 0.4mm) is sufficient to prevent a cutter from fitting an apparently equivalent size of shaft. Some makers recommend measuring the shaft diameter with vernier callipers or a micrometer.

Check the gap between the front of the propeller boss and the back of the shaft bearing or P-bracket. You'll need at least another 5mm on top of the width of the cutter to ensure proper water flow through the cutless bearing.

If you're buying a scissor-type cutter, you'll also require the diameter of the bearing housing and the propeller hub to ensure that the hub of the cutter lines up correctly.

But do they work?

Anecdotal reports seem to suggest that they do. Or at least owners who have fitted a cutter now no longer report becoming snagged on underwater obstructions.

Retired sea school administrator Steve White comments that: "We fitted a Stripper to our boat about three years ago. Prior to that we had several occasions when the propeller became wrapped in rope. Now, it just doesn't happen, so I guess it must be working".

Yachtsman Les Harris tells us: "I knew a lone fisherman who fitted one after nearly drowning when he caught the rope off one of his own pots. He was trying to pull the rope free when his hand became entwined and the engine almost pulled him over the side."

Maintenance

Apart from the occasional sharpen, the disc cutters should require no maintenance. Scissor cutters will need to have their bearings replaced periodically. The manufacturers are unable to give specific times since, they say, it depends on the amount of silt in the waters in which you sail. When pressed, they told us it could be as often as once a year, although in most situations, they would expect a service life of two to three years. You can tell when the bearings should be replaced by measuring the gap between the rotating blade and fixed blade.

Spurs cutters are also fitted with a replaceable sacrificial anode.

Both Ambassador Marine and Harold Hayles supply service kits.

How the cutters were tested

The rig...

To test the cutters, we constructed a simple test rig comprising a 1 x 1.2 x 1.2m, plywood water tank with an inspection window let into the side. Inside the tank, we mounted a P-bracket with a 1in diameter shaft and a 12 x 8in left-hand propeller. The shaft went through a further bearing and a stern gland in the end wall of the tank and was connected via pulleys to a Yanmar diesel engine rated at 10hp at 3,600rpm. Since the engine had no gearbox, our pulley system was designed to reduce the engine revs by a ratio of 2.5:1 – giving a similar output and speed to that of a marine engine.

The debris...

We fitted each cutter in turn, filled the tank and fed the same selection of materials into the propeller. We chose a broad assortment of potential 'prop-stoppers' – 1.5mm monofilament line, 6mm nylon 3-core rope, 10mm polyester 3-core rope, 15mm polyester 3-core rope and old 20mm polyester rope. We also fed the cutters with polyester netting and heavy-gauge polythene (plastic) sheet. We've heard several reports of cutters unable to cope with netting and sheet, allegedly cutting away only the middle of the bundle, and suspected that these might prove the toughest test.

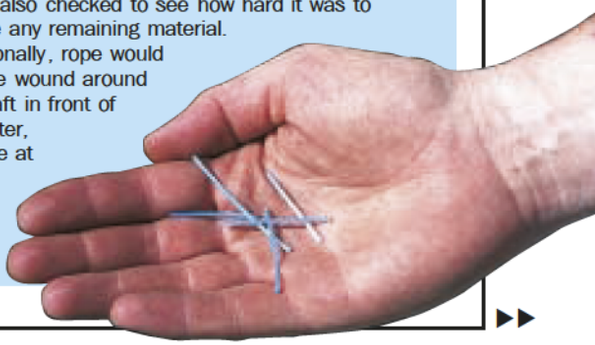
The ropes were cut into equal lengths of about 2.5m while the netting and plastic sheet was cut into 1m squares. The engine was started and run at a fast idle of around 1,200rpm. Each sample was fed into the flow of the rotating propeller. The ropes were held at one end to simulate the extra drag created when anchored to a pot, and the ability of each rope to wrap itself around the P-bracket as it was pulled into the propeller.

Our sheet and net samples were allowed to float free within the tank and to flow naturally into the propeller.

The criteria...

Our criteria were simple. If the rope, plastic sheet or net managed to jam the propeller and stop the engine, the cutter had failed the test. If the propeller still turned but the thrust was so significantly reduced that it would be unable to push a boat, the cutter had also failed.

We also checked to see how hard it was to remove any remaining material. Occasionally, rope would become wound around the shaft in front of the cutter, restricting water flow through the bearing, while at other times rope would snag the rear of the propeller. In most cases, it would pull away easily. At sea, a burst of reverse thrust would have been sufficient to clear the prop.



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PLASTIMO EMERGENCY ROPE CUTTER

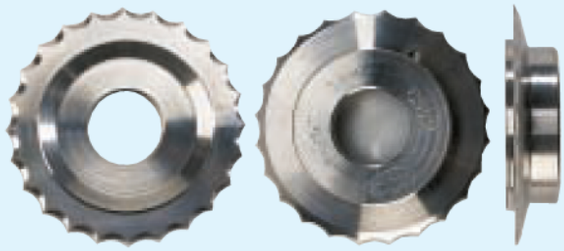
Performance ★★☆☆☆ Value for money ★☆☆☆☆

Made from 'high-quality stainless steel', the Plastimo is a slide-on cutter and the only one of those that we tested to have a serrated edge – which is extremely sharp. No fitting instructions are supplied.

It coped well with the 6mm rope, cutting our sample into five separate pieces which stayed loosely wrapped around the cutter. The rope pulled away easily when the engine was stopped. It cut through the 10mm rope in one place and through two of the three strands in another, but the rope still got entangled around the prop and caught between the cutter and P-bracket.

It had a good go at both the 15mm and 20mm ropes, cutting them away when the ends first became entangled. However, the rope eventually overwhelmed the cutter when we released the fixed end. Both test samples wrapped themselves around the prop and stopped the engine.

Netting and polythene sheet also proved to be the Plastimo's downfall. Although the cutter protected the engine from overload, the materials wrapped around the prop, preventing it from producing significant thrust.



Specifications

- **Metric sizes** for shafts from 22mm to 80mm plus
- **Imperial sizes** from 1in to 3in

- **Model tested** Ref number 24709
- **Shaft size** 1in
- **External diameter** 79mm
- **Thickness** 18mm

PROPROTECTOR

Performance ★★★☆☆ Value for money ★★★☆☆

Introduced in 1993 and available in two versions – clamp-on and slide-on. (Models for shafts over 2in/50mm diameter are available in clamp-on version only.)

The ProProtector is remarkably thin. The 1in shaft models measure just 12mm for the slide-on and 17mm for the clamp-on.

One of the clamp-on's unique features is that it can be installed underwater by a diver, thereby saving lifting-out costs. Self-locking screws, provided as an optional extra, replace the plain fasteners and screwlock fluid, which would wash away. This was the only cutter to come with a warning sticker to alert swimmers/divers that a cutter was fitted.

We tried a clamp-on model which performed extremely well – better than the other disc cutters. It had no real problems with any of the rope, cutting it cleanly and quickly.

A few remnants remained attached to the prop, but these pulled away easily. However, the ProProtector didn't work so well with the net and sheet. The net wrapped itself around the cutter and slowed the engine, while the plastic sheet completely enveloped the prop and cutter and stopped the engine. This model is worth considering if your budget won't stretch to a scissor-type cutter.

SAILING TODAY Budget Buy

Specifications

- **Metric sizes** for shafts from 20mm to 100mm plus
- **Imperial sizes** from 0.75in to 4in

- **Model tested** Clamp-on standard 'A'
- **Shaft size** 1in
- **External diameter** 80mm
- **Thickness** 17mm

SHAFT KNIFE

Performance ★★★★★ Value for money ★★★★★

Surprisingly disappointing results for T Norris' Shaft Knife. Its design is different from other disc cutters. Instead of a flat blade, the Shaft Knife has a wedge section which, in theory, should make it exceedingly strong. But we wonder if the section has affected the Knife's ability to cut. The blade didn't feel as sharp as that of the other disc cutters.

In our tests, it failed to make a serious impression on the monofilament line or rope samples up to 15mm. It did, however, cut through two strands of the 20mm but the rope became entangled and stopped the engine before the cutter could inflict any further serious damage.

The netting and polythene sheet both wrapped themselves around the cutter and appeared to be virtually unharmed when we removed them.

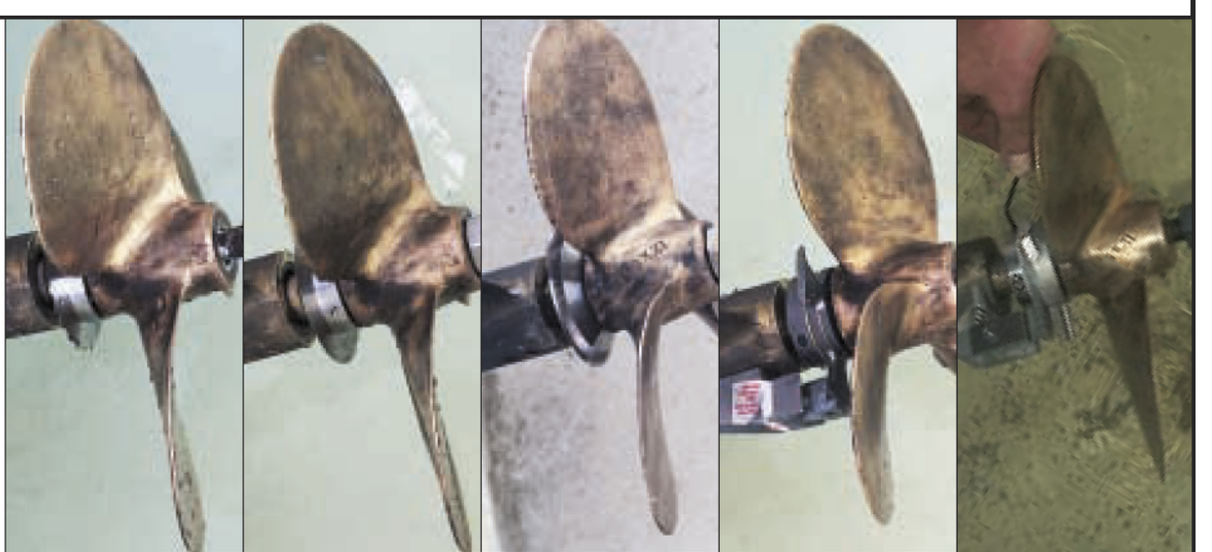
Concerned that we may have left too much shaft exposed in front of the cutter when we installed the device, we shortened the shaft and repositioned the knife three times. But we were still unable to achieve any improvement at all. While surprised, on this performance we felt unable to award it any points.

Specifications

- **Metric sizes** for shafts from 20mm to 65mm plus
- **Imperial sizes** from 0.75in to 2.5in

- **Model tested** SK1
- **Shaft size** 1in
- **External diameter** 80mm
- **Thickness** 12.5mm

What materials the five devices did and didn't cut



	Plastimo	ProProtector	Shaft Knife	Spurs	Stripper
Monofilament	yes	yes	no	yes	yes
6mm nylon	yes	yes	no	yes	yes
10mm polyester	yes	yes	no	yes	yes
15mm polyester	no	yes	no	yes	yes
20mm polyester	no	yes	no	yes	yes
Polyester netting	no	no	no	yes	yes
Polythene sheet	no	no	no	yes	yes

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STRIPPER

Performance ★★★★★ Value for money ★★★★½

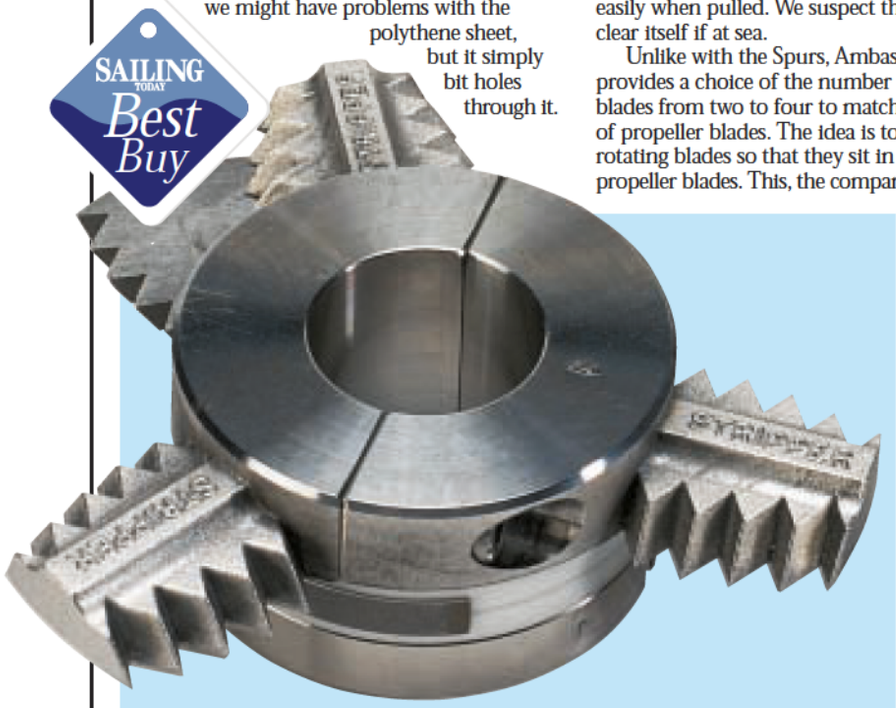
The Stripper proved to be very effective and ripped through everything we threw at it. The ragged teeth are very sharp and seem to tear apart anything in their path. We thought we might have problems with the polythene sheet, but it simply bit holes through it.

One small snag was that we noticed the rope would sometimes become caught between the Stripper and the P-bracket bearing, however, it was insufficient to stop the engine and fell away easily when pulled. We suspect that it would clear itself if at sea.

Unlike with the Spurs, Ambassador Marine provides a choice of the number of cutting blades from two to four to match the number of propeller blades. The idea is to position the rotating blades so that they sit in front of the propeller blades. This, the company says, reduces interference of water flow over the propeller.

We were impressed – not only by the Stripper's performance – but also by the high quality of its build. Made from 316 grade stainless steel, it's finished to a high standard.

All in all, we found this to be a very impressive piece of gear and, although the most expensive on test, we felt it was thoroughly worth the extra money.



Specifications

- **Metric sizes** for shafts from 20 to 100mm,
- **Imperial sizes** 0.75in-4in.
- **Saildrive models** Volvo SD110 & SD120, Yanmar & Bukh

- **Model tested** AM 5 3-blade
- **Shaft size** 1in
- **External diameter** 100mm
- **Thickness** 28mm

Sailing Today Verdict

The Stripper might be the most expensive of the five cutters tested, but it also proved to be the most efficient. If you want a cutter that will see off most materials, then we would recommend this product. Although it was a close run thing between it and the Spurs, the quality of the Stripper and its ability to shred everything we chucked at it, definitely gave it the edge.

We were also impressed with the **ProProtector**. At less than £100, it performed extremely well against all our rope samples, and if you are restricted by budget it's well worth considering.

Of course, cutters will not be able to cope with every piece of flotsam and jetsam, and yachtsman shouldn't be led into a false sense of security. Many fishermen, for instance, now use wire cable for their lobster pots. ST

Rope we used