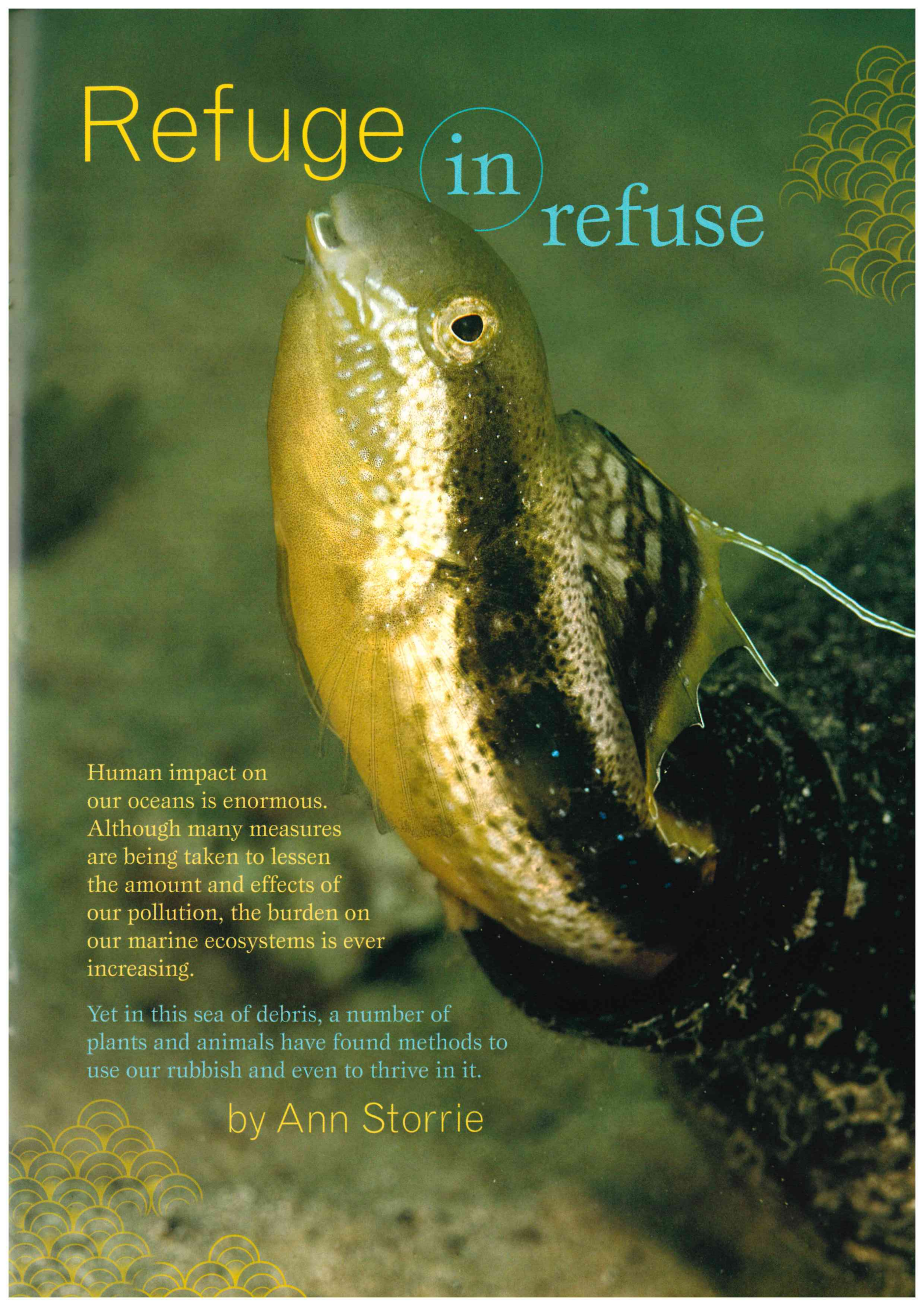
Refuge in refuse



Human impact on our oceans is enormous. Although many measures are being taken to lessen the amount and effects of our pollution, the burden on our marine ecosystems is ever increasing.

Yet in this sea of debris, a number of plants and animals have found methods to use our rubbish and even to thrive in it.

by Ann Storrie

Floating islands of debris now cover massive areas of our oceans. Fishing lines and nets may float for years until they finally wind around coral reefs or wash up on the shore. During their journey, they entangle thousands of animals including fish, whales, dolphins, turtles and seabirds. Plastics that take hundreds of years to decompose leach toxic chemicals into the water. Tiny balls of plastic resin are mistakenly thought to be fish eggs. These and their fragmented particles are consumed by everything from the smallest crustaceans to marine mammals. Turtles and fish mistake plastic bags for jellyfish and whales mistake them for squid. Seabirds feed all kinds of plastic to their chicks and even adults consume it while feeding on natural foods. After the tsunami that affected Japan in 2011, hundreds of kilometres of debris covered the surface of the Pacific Ocean. Parts of vehicles, fences, sheds and even entire houses floated and caused havoc, not only to marine life, but also in shipping lanes where they entangled propellers and blocked ships' paths. Floating marine debris is now more common than driftwood.

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Sabretooth blenny emerging from a bottle.
Photo – Shannon Conway

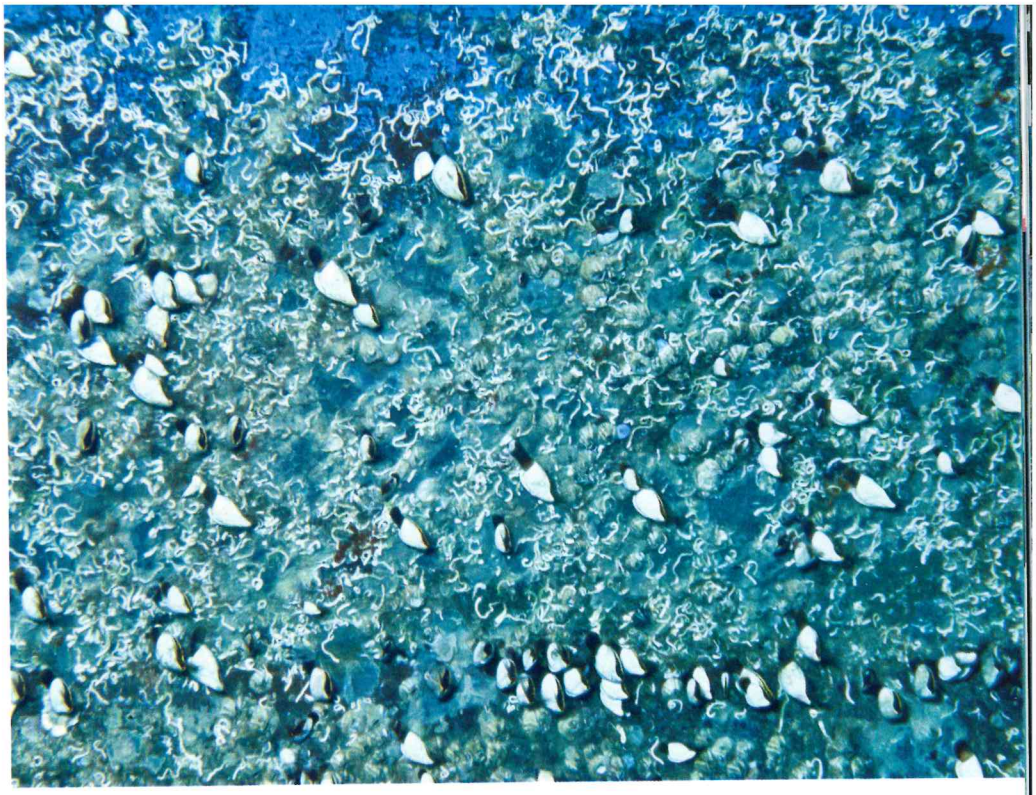
Left Floating refuse.

Below Plastic bags are often mistaken for food by sea animals and birds.
Photos – Ann Storrie

Surviving on the surface

Marine plants and animals have always colonised and used driftwood. Micro-organisms and marine worms bore into the wood, while encrusting invertebrates such as bryozoans and sponges attach and grow on its surface. Many of these animals have adapted to live in and on the floating waste. Pick up a piece of debris that has been afloat in the ocean for a few months and it will be covered in algae and marine animals. Many of these creatures are minute, others are very visible.

One group of crustaceans, the barnacles, has very successfully adapted to life in the intertidal zones, living on rocks and reefs on the shoreline, or cemented onto ships' hulls and floating debris. Several species of these strange creatures can attach themselves to almost any surface. They belong to the same phylum as crabs and shrimps, although as adults barnacles look more like molluscs with a hard shell and a valve at the top. It is in their larval stage that their resemblance to crustaceans is more obvious. Barnacle larvae are free-swimming and similar to the larvae of several other crustacean groups. After numerous moults, the larvae settle on a hard surface and their bodies and limbs change dramatically. Their jointed legs become feathery feeding tentacles known as 'cirri', their



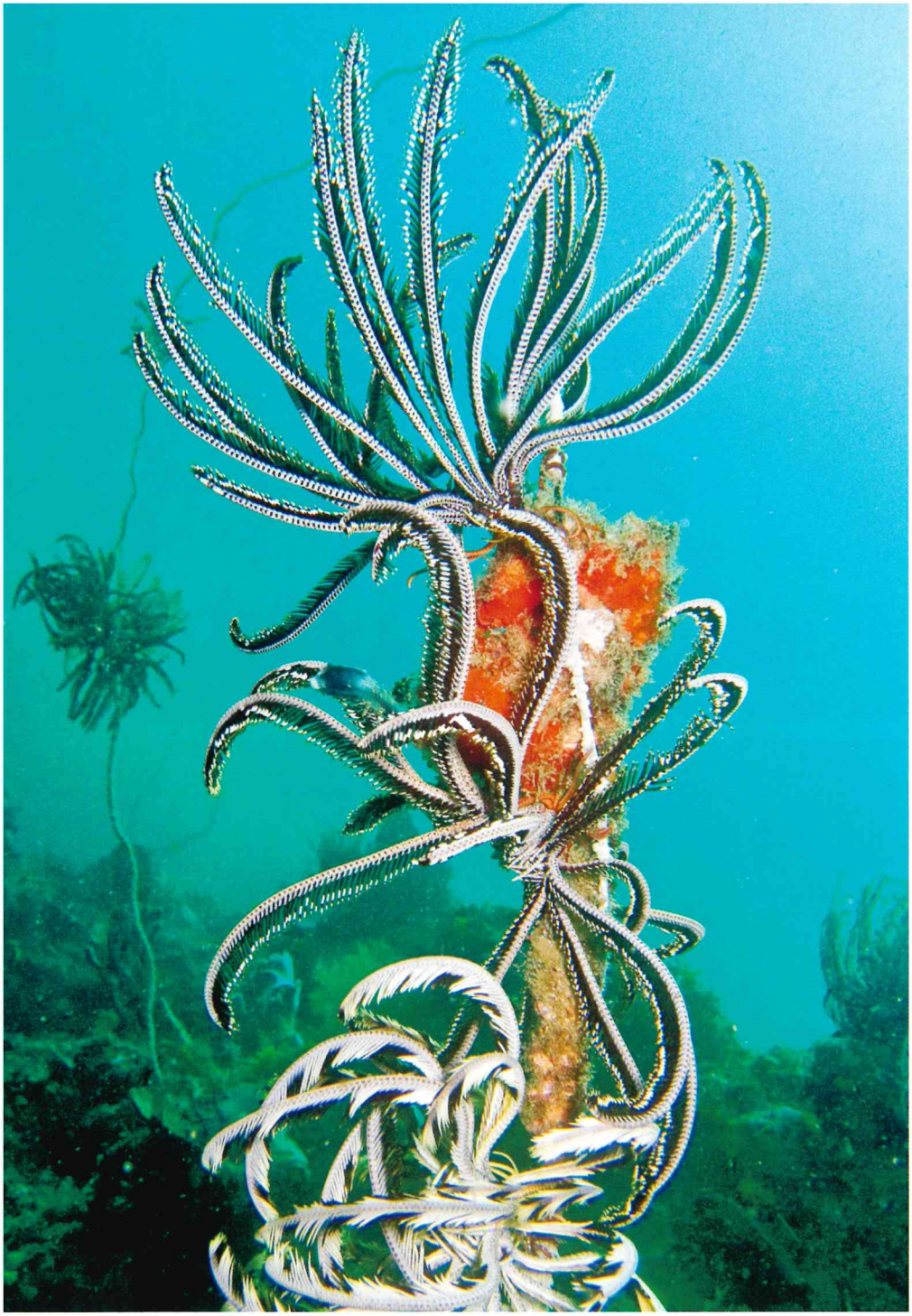
Right Goose barnacles on a boat keel.
Photo – Ann Storrie

Below right False Tasmanian blenny on HMAS *Swan*.
Photo – Tammy Gibbs

external skeleton becomes a series of hard plates and their head disappears. To add to this queer transformation, cement glands near the head secrete one of the strongest adhesives known to man. In fact, during the 1960s, the National Institute of Dental Research in America investigated the properties of barnacle cement with the possibility of using it for filling teeth! It is almost impossible to pull a live barnacle from its attachment point. The barnacle feeds with its feathery cirri that protrude from a slit-like opening between the top plates. They scoop the water, straining plankton and transferring it into an upturned 'mouth'. If exposed to air, the top opening closes tightly, enabling the barnacles to survive for several hours out of the water, some even surviving in direct sunlight. The most common barnacles that live on driftwood and refuse are the stalked or goose-necked barnacles.

Bivalve molluscs such as clams, oysters and mussels are also found on floating debris. Their shells (often referred to as valves) are joined by a flexible ligament and are hinged. They usually have interlocking teeth and pits that provide very efficient closure of the shell, enabling them to survive prolonged periods out of the water. Some burrowing species have long siphons for the entry and exit of sea water, enabling them to live several centimetres inside a jetty pile or piece of driftwood.

Tiny tubeworms vie for space among the barnacles and molluscs. *Hydroides elegans* is not a particularly elegant worm and all that can be seen is a tiny, pale, limy tube. In fact, you would probably never see it at all if not for the fact that they live in groups of hundreds and look like lifeless droppings left by a larger marine creature. A closer inspection reveals masses of straight or twisted



Left Crinoids, sponges and algae occupy an old pipe.
Photo – Ann Storrie

tubes with a pair of long tentacles protruding from the end. These, plus several other species of tube worm, are common fouling organisms of boats. They can attach and grow on most metals, wood and even hard plastic. Their waving tentacles trap plankton, which is transferred to the animal's mouth and body that is encased in the tube and is never seen unless the tube is broken.

Many fish, crustaceans and other creatures live and drift in floating debris for shelter and protection from predators. The sargassum fish (*Histrio histrio*) now floats in the weed combined with rubbish. It is an odd-looking fish that is a member of the anglerfish family. Its pelvic and pectoral fins are modified into finger-like projections used for 'walking' and holding onto the weed. Its patterns and colours blend in beautifully with both the sargassum and the rubbish around it. As with other species of anglerfish, it has a lure, called an 'esca', protruding on an appendage above its mouth. Like bait on the end of a fishing rod, the esca is wriggled to attract small fish. As these come close to the bait, the sargassum fish ingests them in a split second simply by opening its enormous mouth and allowing the pressure difference to suck in water and fish.

Several other species of fish use marine refuse as hiding places, while crustaceans such as crabs and shrimps hitch rides on refuse, or float along under refuse for protection. Their larvae, together with myriads of other microscopic animals that make up zooplankton and plants that form the phytoplankton, are taken along with the debris in the major currents of the oceans. These plants and animals provide food for larger invertebrates such as jellyfish, comb jellies (ctenophores) and blue bottles, or Portuguese man-o-war (*Physalia utriculus*), which in turn are preyed upon by turtles and pelagic (open ocean) fish. Seabirds may be drawn to these floating islands to hunt and to rest on a solid surface in the middle of a long flight across the ocean. The whole floating rubbish dump ends up with an ecosystem of its own. However, if you add oil slick and chemical pollutants to the mix, the strange habitat may be very dangerous to those who try to reside there.

Bottles and beer cans for benthic dwellers

Benthic animals are marine creatures that live on the bottom of the ocean, in contrast to pelagic animals that spend their lives swimming in the open water. The bottom can be shallow, on sand, in seagrasses, on reefs, or at the very depths of massive crevasses and in caves. Unfortunately, wherever these animals live, there will now be human refuse.

Most marine debris eventually sinks to the bottom. It is amazing how such items as shopping trolleys, chairs, shovels, road signs, toilets, jumpers and sand shoes can end up at the bottom of the ocean, sometimes many kilometres from shore. Cans and bottles are often the most numerous items and, ironically, they provide shelter and homes for thousands of sea creatures. Small fish such as gobies and blennies usually favour bottles and cans that are dumped in the shallows. They also like old sawn-off pipes such as the railings of ships. The HMAS *Swan,* that was sunk as a dive wreck in Geographe Bay in the state's south-west, has a

Right Blue-ringed octopus commonly use cans for their homes.

Below A gloomy octopus (*Octopus tetricus*) in a pipe.
Photos – Ann Storrie

false Tasmanian blenny (*Parablennius postoculomaculatus*) poking out of nearly every piece of railing on the bridge and crows nest. The Busselton Jetty hosts many blennies in the old timbers and empty mussel shells close to the surface. These small fish with attitudes swim backwards into their home, their beady eyes and fluffy antennae protruding from the opening where they keep watch for prey, predators and mates. They perform kamikaze moves, darting out to ward off intruders or to catch prey. The female lays her eggs in and on the male's 'house', leaving the male to guard and aerate them by wafting water over the eggs with its fins.

So frequently does the species use refuse for homes that one almost wonders where a blue-ringed octopus (*Hapalochaena* spp.) would normally live without a can. Both Western Australia's northern and southern species of blue-ringed octopus are surprisingly common, but are not often seen because of their small size, amazing camouflage and secretive habit of hiding in and under rocks and refuse during the day. Their normal colour is brown with pale blue markings. The bright blue rings are only shown when the animal is threatened or disturbed. Female blue-ringed octopus do not use their refuse home for egg attachment as they usually carry their eggs under their arms for about six months. After the eggs hatch the female dies.

Most large octopus make their homes under rocks, reef or refuse. Their lair is often given away by the discarded shells of creatures the octopus has eaten. The shells pile up around the entrance and occasionally an octopus will pull a shell up against the opening or even over itself for camouflage if it is in the open. Octopus are inquisitive of any new piece of debris that might be put to good use. Items such as clothing, bags, shoes, toys and building materials are all possible homes, with old pipes and flower pots particularly in demand.

Pick up any piece of tin or wood from the bottom and there will be a scurry of small creatures racing to hide under the next piece of debris. Bristle worms, flat worms, peanut worms, pebble crabs, spider crabs, shrimps, snails and other molluscs live under the rubble during the day and emerge at night to feed. Echinoderms such as sea urchins, sea stars, sea cucumbers and, occasionally, yellow feather stars (crinoids) may also be hiding under the refuse. If the refuse is solid and relatively stable, you may find eggs attached to it. Brightly coloured coiled, gelatinous ribbons or rosettes consisting of thousands of

Above A stonefish camouflaged among refuse.
Photo – Ann Storrie

Below Jewel anemones on HMAS *Perth*.
Photo – Tammy Gibbs

eggs are laid by nudibranchs (sea slugs), while squid egg capsules are white and cylindrical. Each capsule contains several eggs. Cuttlefish lay individual, pale eggs in bunches.

Sedentary invertebrates such as sponges, bryozoans and ascidians (sea squirts) quickly grow on many of these hard objects. They form a thin layer over the surface and are known as encrusting invertebrates. All are filter feeders, drawing water into their cells and extracting nutrients. Sponges are renowned for filtering bacteria and organic particles from the water and releasing the 'purified' water back into the environment. A bryozoan colony is made up of many tiny animals called zooids. There are more than 5,000 species of bryozoans, yet most are mistaken for corals, sponges or algae due to their many different forms that range in appearance from lacy corals to fluffy tufts of algae. The encrusting forms are usually the first animals to grow on hard surfaces and will coat timber and metal very quickly. They play an important role in the ecology of the environment as many species of mollusc, crustacean and sea spider feed solely on bryozoans. Encrusting ascidians are also mistaken for other animals, especially sponges. Ascidians, however, have a rudimentary nervous system and distinct organs and respond to stimuli by closing their siphons. Sponges do not. Encrusting ascidians are composed of many animals that have their own inlet siphons, but sometimes share larger outlet siphons.

It is no wonder that we have created artificial reefs to attract this bevy of marine life. Ships such as the HMAS *Swan* and HMAS *Perth* (following being stripped of all wiring and loose fittings, having oil removed and being scrubbed spotless) have been sunk and have created a haven for thousands of invertebrates and fish that would normally not be found on the otherwise bare sand. Old tyres and dinghies have been sunk along dive trails to provide a vibrant community of marine life to interest divers. Jetties, oil rigs, shipping markers, in fact almost anything that we build in the ocean is colonised very quickly by all manner of marine life. Even mooring ropes provide anchorage for many animals, including the Western Australian sea horse (*Hippolampus subelongatus*) that is a favourite of divers in the Swan River. So next time, when on a clean-up day in the ocean, spare a thought for the animals that are living on the refuse. By all means pick up plastic, nets, fishing lines and other rubbish, but please check those bottles and cans for little blue rings before stuffing them into your goody bag.

Ann Storrie has written and contributed photographs to several Department of Environment and Conservation books and countless *LANDSCOPE* articles. She can be contacted by email (naturescapes.au@hotmail.com).

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Executive editor Madeleine Clews.
Editors Rhianna King, Joanna Moore.
Scientific/technical advice Lachie McCaw, Keith Morris, Kevin Thiele, Alan Kendrick.
Design and production Natalie Jolakoski, Gooitzen van der Meer, Peter Nicholas, Lynne Whittle.
Illustration Gooitzen van der Meer.
Cartography Promaco Geodraft.
Marketing Cathy Birch.
Phone (08) 9334 0296 or *fax* (08) 9334 0432.
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