C’MON AND EMBRACE THE SMELL

OR HOW SEA WRACK PLAYS A VITAL ROLE IN RAISING FISH

Sea wrack left over from winter at Forrest Beach in the State’s South West. Photo: Michael Burgess
Walking along a beach on the south-western coastline, you sometimes find small remnants of last year’s winter storms. The odd handful of decomposing seaweed (what biologists call macroalgae) lies in a pocket of sand, while strands of dried-out seagrass poke through undulations on the higher parts of beach.

While the large piles of seaweed and seagrass that littered the high-tide mark the previous winter on beaches open to the ocean may have long disappeared from view, out in the near-shore waters the remnants of these piles are knotted together in semi-submerged mats. These have a major influence on the stocks of large numbers of fish species, in particular their juvenile members.

That is, unless these sometimes-smelly heaps have been removed from the beach and surf zone – removing what some term a ‘public nuisance’ but what is also a source of food and shelter to a whole host of marine creatures.

Every year, the death of seagrass and seaweed brings life to well over 30 species of fish that grow up in the surf zone of Western Australian beaches.

Studies carried out in the late 1970s and early 1980s revealed that along much of the State’s south-western coastline, there are many large meadows of seagrasses that are protected by the limestone reefs that fringe many areas of the coast. In particular, the meadows, which grow on sandy areas on the shore-side of the reefs, are protected by what is known as the Three-Mile Reef, which formed the shoreline back in the Holocene age.

In turn, these limestone reefs support large beds of macroalgae species, which grow on the reefs’ surfaces.

During the regular storms and heavy swells that are the trademark of Western Australia’s south-west coast, enormous amounts of these seagrasses and seaweeds break away and accumulate in the surf zone forming large mats or ‘rafts’, some of which are washed ashore and lay in banks on beaches and rocks.

If you pick up a ball of the knotted rotting seagrass and algae commonly known as ‘sea wrack’ – usually disturbing several flies in the process – you are likely to notice what looks like white bugs crawling and jumping around. These include sand fleas and sea lice, which live happily in the wrack by shredding it and living off the results – and anything else they find in the process.

If you are lucky and are a fisher who likes to catch a feed of herring – or unlucky, as some others not inclined in this manner may consider themselves – and pick up a clump of wrack lying on the beach within the tidal zone, you may even find the odd maggot or two. What has happened is that blowflies are attracted by the decomposition of the wrack and lay their eggs in the pile, which then hatch into maggots.

While the ball of wrack you have picked up may be becoming more and more unattractive by the second, this is because you are a human and not a fish. What lies in your hand is the equivalent of a nutritional haven for many marine species. Steve Ireland explains why removal of seaweed from beaches for ‘aesthetic’ reasons is a questionable practice for ecological reasons.
a ‘hamburger with the lot’ if you are a herring, whiting or yellow-eyed mullet.

Further up the beach, you will find a second lot of flies – ‘beach flies’ – which are buzzing around the drier wrack that lies at the farthest reaches of the tide and doing their bit to live in it and break it down.

One of the pioneering researchers who became interested during the late 1970s in this sea wrack as a source of food and shelter for juvenile fish was Dr Rod Lenanton, now a Senior Principal Research Scientist at the Department of Fisheries.

By comparing the abundance of juvenile fish found in an estuary with those in the near-shore surf zone, Dr Lenanton and two local CSIRO researchers were able to show that young fish from a number of species used the near-shore area as an alternative to estuaries as nursery areas – and that a major attraction was the sheltered ‘take-away food’ area provided by rafts of sea wrack.

“The rafts are made up of seagrass and macroalgae and at different times of the year, different bits break off,” explains Dr Lenanton. “Some of this storm wrack sits offshore. While the seagrass in it isn’t usually living, the macroalgae is often still alive.

“The red algae are where the amphipods live. These amphipods are omnivorous crustaceans and feed on the large brown kelp *Ecklonia*, and in turn are consumed by fish. Other invertebrates are also involved, but amphipods are the key ones. We found there is a correlation between the composition of the wrack and the juvenile fish species that use it for food and shelter.”

For well over a decade, a considerable amount of the work undertaken by Dr Lenanton and colleagues into the effects of sea wrack on juvenile fish was carried out at the well-known beaches at Mullaloo and Sorrento, near Perth. The beaches are conveniently located about one kilometre apart, but are completely different in terms of what washes up in the surf zone. Whilst the one at Mullaloo is nearly always full of broken-off macrophytes – the name given by biologists in general to aquatic plants – the ‘swash’ zone at Sorrento is mostly free of vegetation.

This gave the researchers the chance to look at what fish were present in a surf zone usually full of wrack and one where hardly any wrack was present – and compare the results.

The wrack was sorted into eight different categories of macroalgae and seagrass, which are typically found in most south-west sea wracks. First there were fine red algae (*Hynea*, *Pterocladia* and *Dasyclonia*); other red algae (such as *Laurencia* and other *Pterocladia*); green algae (such as *Ulva*, *Caulerpa*, *Codium* and *Chaetomorphia*); the free-floating algae *Sargassum*; and ‘other algae’ (brown algae, such as *Ecklonia*, and coralline algae). When it came to seagrass (such as *Heterozostera*, *Amphibolus*, *Halophila* and *Posidonia*), these were sorted into live and dead piles.
“If you look up and down the south-west coast, there is great variation in what
the wrack is made out of. For example, in Geographe Bay, seagrass dominates
the wrack, while at Seven-Mile Beach (near Dongara) you tend to get more
macroalgae,” Dr Lenanton remarks.

“The amphipods live in the fine-branching
red algae and eat the Ecklonia – the large
brown kelp. Green algae also contributes,
but there is not a lot present. When it
comes to green algae such as Ulva, this
tends to be dominant in estuaries like the
lower reaches of the Peel-Harvey.

“Seagrass is more fibrous than the
seaweeds and will form a layer on the
bottom in more protected areas, until
bacteria probably decompose it. In
contrast, Ecklonia is non-fibrous and
decomposes more quickly.”

During sampling carried out over a two-
and-a-half year period in the early 1980s
by a team led by Dr Lenanton and Dr Al
Robertson from the CSIRO, a total of 29
species were found among the 4,500-
plus fish captured. Of these, juveniles
of four species made up the majority – sea
trumpeter (Pelsartia humeralis – about 38
per cent), yellow-eyed mullet (Alidichetta
forsteri – 17 per cent), southern school
whiting (Sillago bassensis – 17 per cent)
and cobler (Cnidoglanis macrocephalus
– 16 per cent). These four were captured in
over half the nettings carried out.

“Our work showed that there was a
significant relationship between the
quantity of broken-up macrophytes in
the surf zone and the number of fishes
found during the nettings we carried
out on the two beaches. The number of
fishes in the surf-zone of the beach with
accumulations of weed was two to 10
times that of the beach that was open and
sandy, depending on the time of day we
carried out the sampling and the date,”
Dr Lenanton recalls.

During the day, these juvenile fish are the
quarry of the pied cormorant, a bird whose
presence all Western Australian anglers
and beachcombers will be very familiar
with. Some of the sharper-eyed observers
may have also noticed the tendency of
the cormorants to hang around rafts of
sea wrack, which provide shelter for the
juvenile fish from these ever-hungry birds.

As well as providing protection from
cormorants, Dr Lenanton says it is probable
that the wrack also acts as a daytime refuge
from prowling juvenile tailor (Pomatomus
salatris), which relentlessly cruise the surf
zone looking for a feed.

Those anglers who cast into gutters on the
beaches after tailor might do well to also
try fishing around the edges of rafts of sea
wrack (preferably cormorant-less ones).

Although estuaries have long been
recognised as a major nursery area for
juveniles of many of Western Australia’s
recreationally and commercially
important fish species, it is only since
the 1970s, after research by Dr Lenanton
and other Department of Fisheries and
CSIRO scientists, that it became clear
how important inshore marine areas are
as an alternative.
A sampling program was carried out to collect juvenile fish from eight protected shoreline sites between Busselton and the mouth of the Blackwood River. The sampling showed that inshore surf zone areas provided a nursery area for 13 of 16 fish species considered, including cobbler, herring and several species of whiting.

Further work by Dr Lenanton and his Department of Fisheries colleague Dr Nick Caputi during the 1980s revealed that juvenile cobbler in these inshore areas are dependent on the mats of sea wrack for shelter and food, with the amphipod *Allochestes compressa* that lives in them actually being the main food source for the fish. At the time, no other instances had been discovered of a commercially important fish species being so dependent on sea wrack and drift macrophyte species for their survival.

As a recent article in *Western Fisheries* has outlined (‘The cryptic cobbler’, September 2008), stocks of cobbler – once plentiful and a staple of WA’s fish ‘n’ chip shops – have declined sharply in the last couple of decades, owing to loss of habitat and being too tasty for their own good. Clearly, the presence of sea wrack in the surf zone can only help their survival.

However, many shire councils are often under great pressure from some parts of the community to remove sea wrack, owing to the smell that is generated as the wrack decomposes. This is looked on as ‘impeding the recreational amenity’ on those local beaches where sea wrack tends to build up after storms.

“The main swimming beach in the Shire of Greenough used to get weeded up and the waft of roting seagrass became regarded as a social problem,” says Dr Lenanton. “This also happens in areas such as the Geographe Bay Marina, Peppermint Beach and, at times, to Dunsborough. When the northern storms come and the wrack builds up, it can end up in landfill.”

What Dr Lenanton would prefer to see happening – which is done by some shire councils – is that if there is a major build-up of wrack on a popular swimming beach to the point that a council is forced to remove it, instead of it being totally removed from the marine environment, it is moved to the high water mark on a nearby less-populated beach.

“The wrack is part of a natural system and food web, and people need to realise the importance of this to the marine environment. We should think of the sea wrack that washes into the surf zone and onto the beach as the interface between the water and the land,” says Dr Lenanton.

“It is an important source of nutrients to the marine and shore environment – and animals and fish depend on it. If it is removed, then we get a lot less fish and crabs.

“When the sea wrack stinks, bacteria is working and the wrack is breaking down – like compost in the garden. Particulate and dissolved nutrients are produced. These are good for invertebrates and even some fish, which graze directly on the particulate matter.”

The nutrient-rich properties of seaweed have long been recognised by gardeners and has formed the basis of a growing industry in Tasmania – and hopefully the start of a fledgling one in Western Australia (see ‘Growing seaweed on the land’, page 33).

As well as the seaweed and seagrass providing nutrients, Dr Lenanton says the seagrass plays an important part in stabilising and holding together the State’s sandy coastal beaches, which are very prone to erosion, during storms in particular.

“The seagrass gets incorporated into the beach, and because of its fibrous nature, can form a substantial barrier against encroaching stormwater. It can prevent flooding in low tidal areas.

“Once the seagrass is up the beach and in the sand and rotting, some of it will never get back to the water, so this helps the stability of the beach and provides food and shelter for intertidal crabs. It also provides a food source for sea birds like oyster pickers.

“Geographe Bay Marina can get ‘chockers’ with macrophytes, particularly during winter storms, and the people who live around it probably didn’t count on this happening when they moved in. Huge rafts of it are formed and they can produce a major stench. However, while the smell may be temporarily uncomfortable to the residents, the algae is very important to the environment in the long term and results in a rich food source.”

Along much of WA’s south-western coastline are large areas of algae, protected by fringing limestone reefs. Photo: Michael Burgess
in a major supply of nutrients, as it gets chummed over by animals.”

Along the west coast of Western Australia, there are a number of marinas that get choked with sea wrack during the winter. While the marinas protect the boats successfully from the strong summer southerly winds, Dr Lenanton believes their design often doesn’t cope well with the northern winter storms.

When a new marina is planned, Dr Lenanton suggests that the engineers involved could carry out design modelling that considers prevailing winds the whole year round, so that the marina is built in a manner that prevents uprooted seagrass and drift algae from being driven inside it.

Dr Lenanton says what can happen in marinas in extreme cases – for example, the one at Jurien – is that large rafts of sea wrack are driven into the marina and sink to the bottom, where they decompose. This causes oxygen depletion in the water, with the result that fish living there sometimes die.

In this case, rather than the sea wrack helping fish, as it would if it was washed up on an open beach, in the close confines of a marina it can prove deadly. However, this is not the fault of the sea wrack – and can be fixed by some marina redesign.

When it comes to sea wrack, it might be dead or dying and smell bad, but it brings life to many fish, invertebrates and birds in Western Australia’s south-west surf zone.