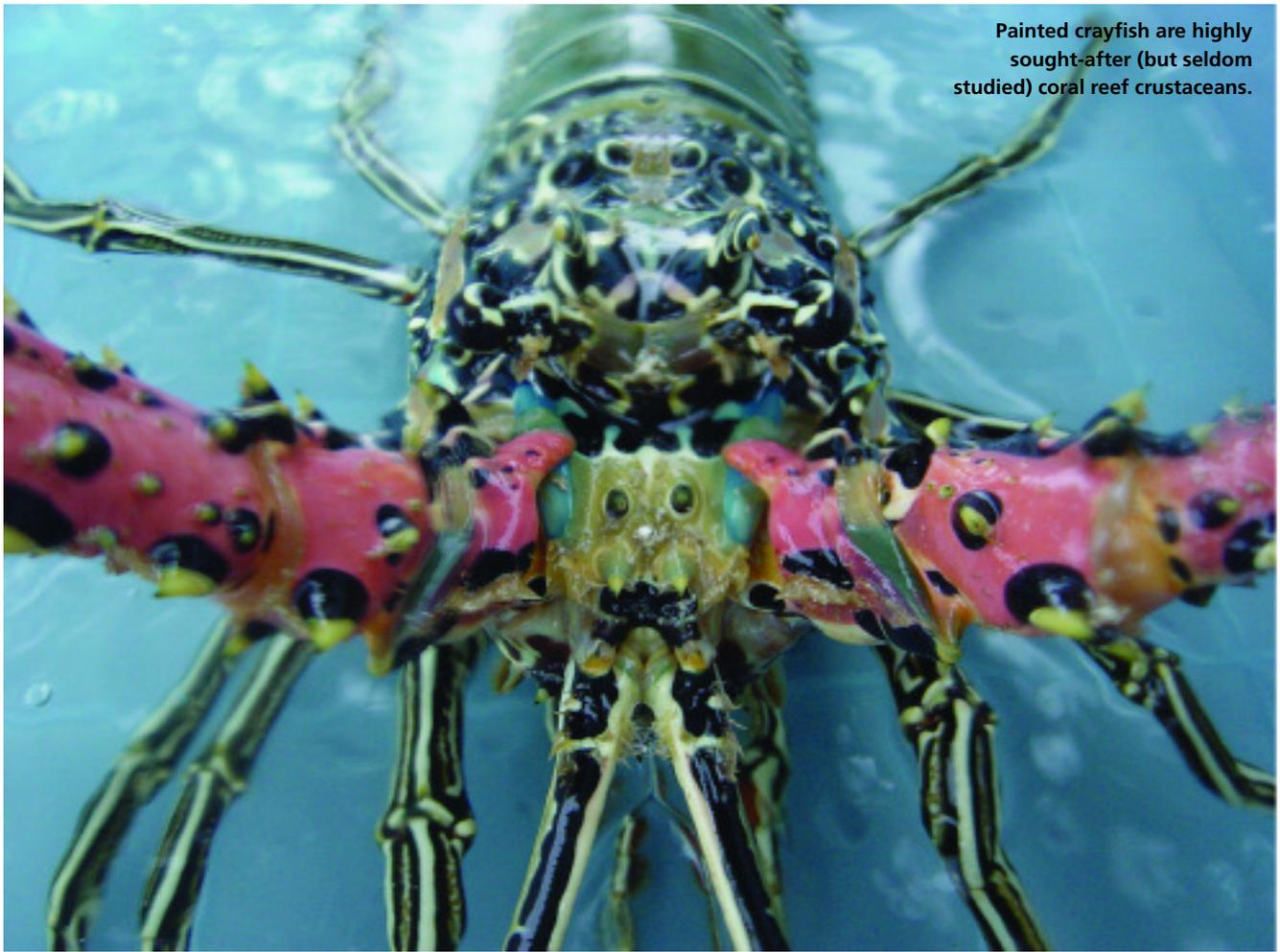

Painted crayfish are highly sought-after (but seldom studied) coral reef crustaceans.



Bachelors Seek House and Harem

Ashley Frisch reveals the cryptic world of crayfish on coral reefs.

Ornate in colour, bizarre in appearance and good to eat. Until now this was almost all that was known about the painted crayfish (*Panulirus versicolor*), a decapod crustacean that inhabits the Great Barrier Reef. In fact, an internet search reveals that we know more about *cordon bleu* recipes for this seafood than we do about its day-to-day life on coral reefs. But this is no surprise to a crustacean biologist, since crayfish are incredibly difficult to study in their natural environment.

Investigating the behaviour of mobile underwater animals requires

special techniques. In many cases, individual animals are labelled with a unique tag, and inferences about their behaviour and migrations are made when they are recaptured at a later stage.

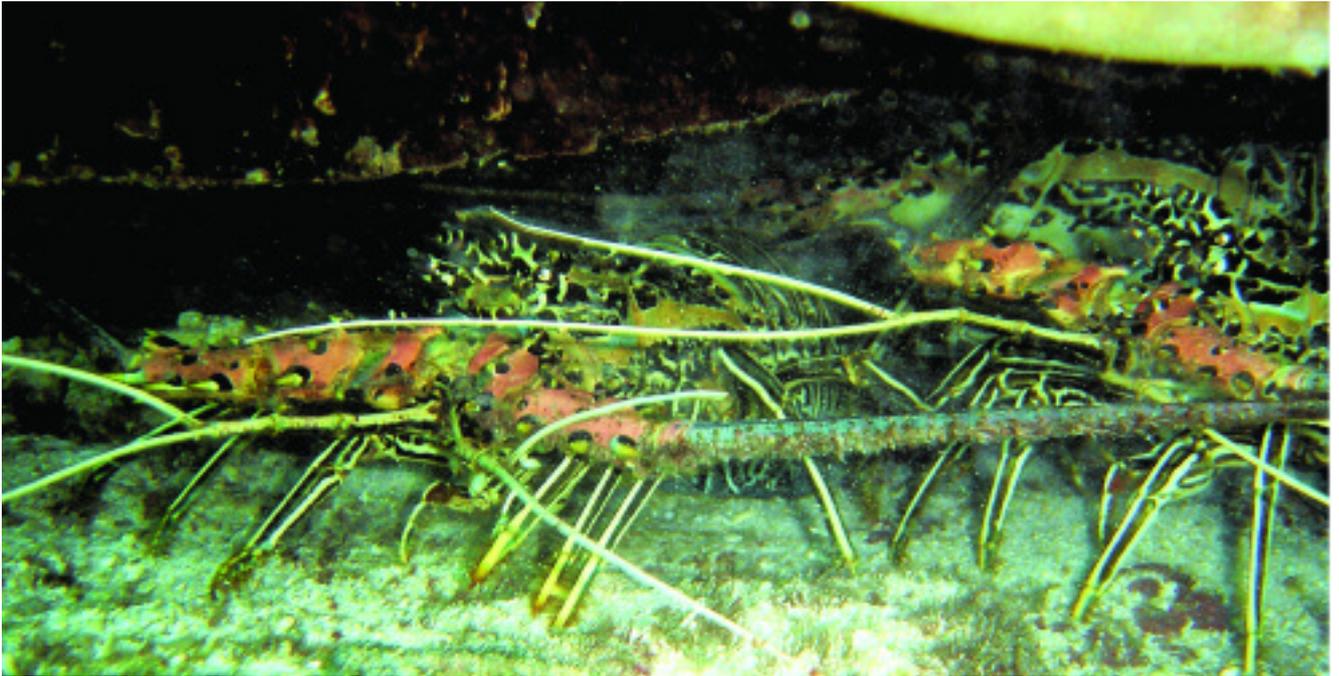
This task is relatively straightforward for most groups of marine animals, such as fish and molluscs. They are soft-bodied, so small identification tags can be applied directly to the skin or surface of individual animals, enabling them to be tracked through time and space.

Crayfish, on the other hand, have a rigid exoskeleton, not unlike the

protective armour worn by medieval cavaliers. One consequence of living within such a fortified integument is that the animal must make a new one each time it intends to grow – a process called moulting.

Unfortunately for crustacean biologists, this means that any tag or mark that is attached to the exoskeleton is shed sooner rather than later. To overcome this problem, a completely new tagging technique had to be developed for the painted crayfish – one that is internal and resistant to periodic moulting.

Elastomer is a liquid polymer that



Protective coral shelters called dens are defended by resident male crayfish. The larger the den, the more room for female partners.

cures into a brightly coloured rubber-like compound. It is also compatible with biological tissue, making it an ideal candidate for an internal tag. When small pieces of elastomer are inserted into the abdominal musculature of a crayfish it gives the impression of a tattoo – a permanent mark easily seen through the transparent exoskeleton covering the underside of the abdominal region.

Such tags were applied to a wild population of crayfish, with crafty combinations of tag colours used to identify individual animals. Not only did these tags resist moulting, but they were retained apparently indefinitely – an ideal result paving the way for long-term studies of crayfish behaviour.

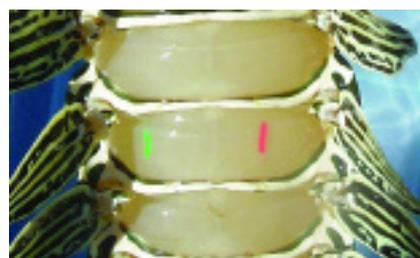
In 2003 the technique was put into practice at a location near Heron Island on the Great Barrier Reef. Two years and numerous expeditions later, the cryptic world of crayfish is finally being uncovered. It's a world where real estate rules, and bigger is always better.

Crayfish reside in coral shelters called dens, either alone or in small social groups. However, male crayfish can't be friends because there's never enough females to go around. Even

though some males harbour a harem of up to six females, sharing with your mates is not an option since each den is defended by its sole male occupant. If access to females is a measure of success, then male status among crayfish is far from egalitarian.

A man's house is his castle, and crayfish think so too. Aside from offering protection from predators, dens are the currency of wealth. Just like the Hollywood cliché, access to females is not related to the size of the man but to the size of his house. In essence, a larger den means more room for females, and each new female brings added reproductive potential.

Not surprisingly, large dens are hot



Internal elastomer tags (seen here as green and pink inserts in the abdominal muscle) are retained through successive moults. This enables individual crayfish to be identified over long-term periods.

property, and competition for them is fierce. There's no "cooling off" period either. When a male crayfish is experimentally evicted from his den, a new male tenant moves in overnight!

Around one-third of the male population are bachelors forced to make do with dens too small to share with a partner. As a result, bachelor crayfish are the movers of the crayfish world. They regularly make short journeys across the reef, presumably seeking a larger den capable of housing a partner or two.

In contrast, polygamous males are content to stay put. They rarely leave their den, taking no chances with roaming bachelors keen to upgrade their real estate.

Life for the lady-folk is much less stressful. For them the front door is always open, since they are rarely found on their own. Nor do they mind sharing their partner with others, but only if he provides the house.

It seems that looking after the kids has its trade-offs. You might get a house, but you will be made to share!

Ashley Frisch is a PhD student in Marine Biology at James Cook University, and winner of a science writing competition for JCU PhD students held in conjunction with *Australasian Science*.