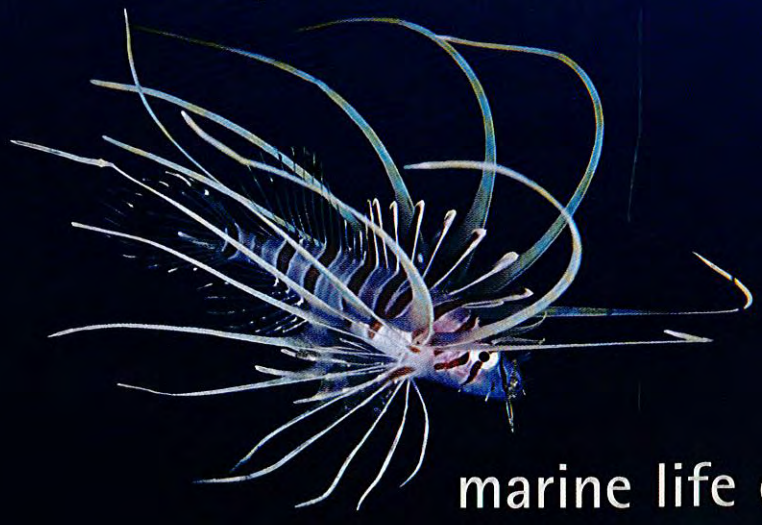
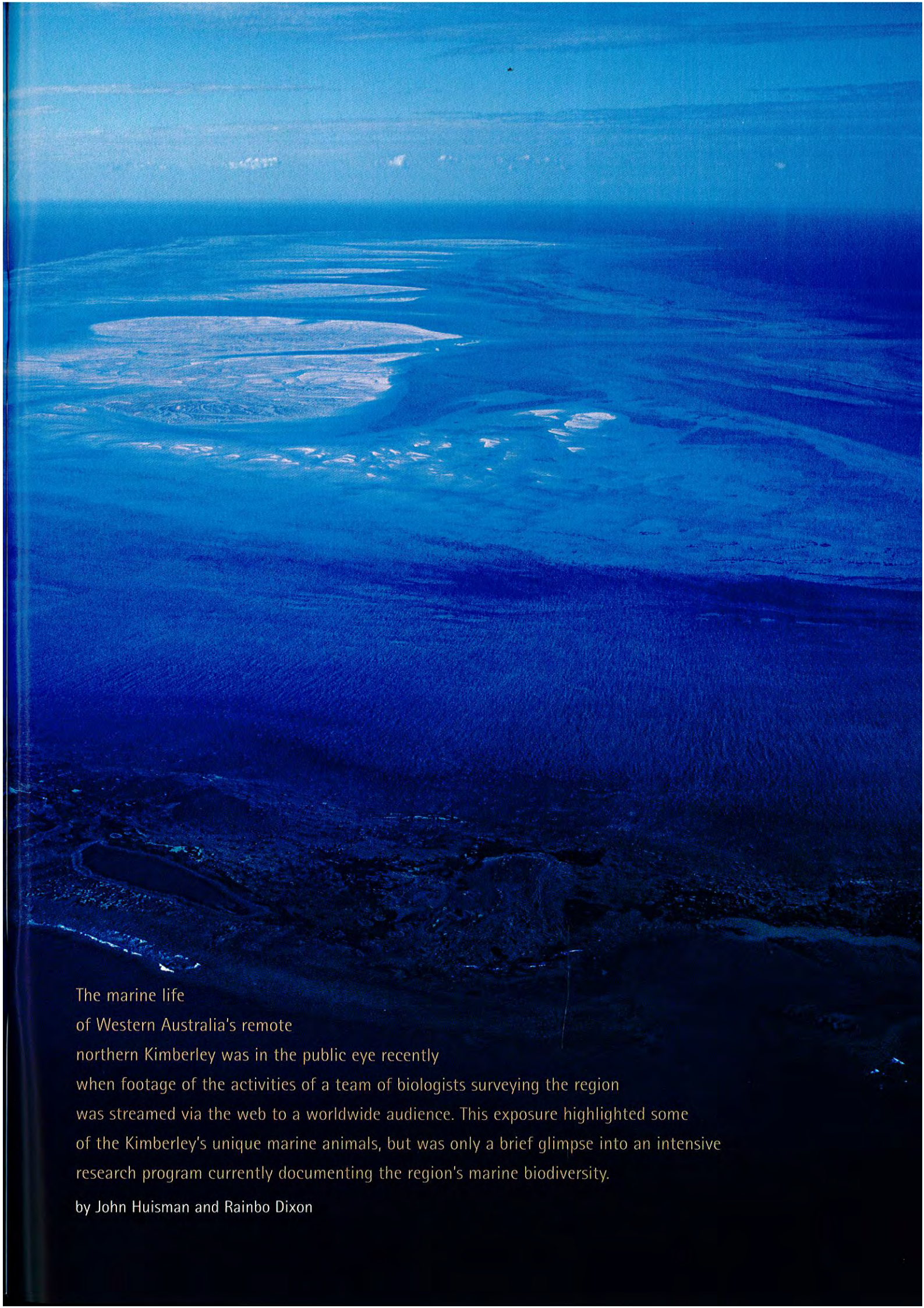
Northern exposure:

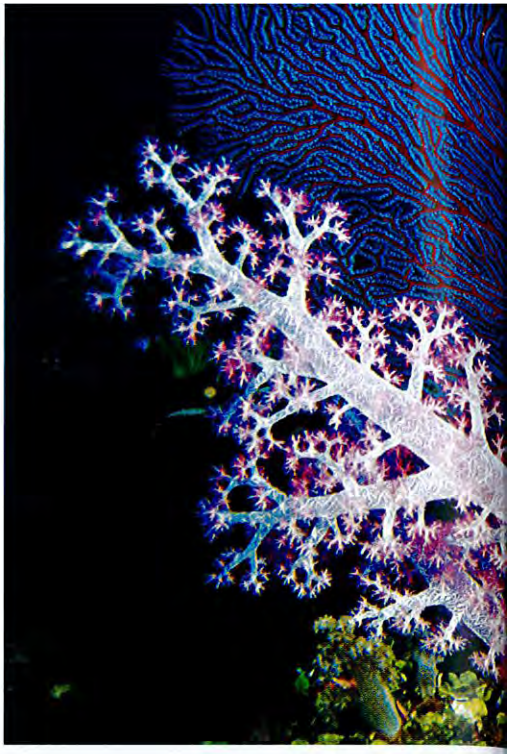


marine life of the Kimberley



The marine life
of Western Australia's remote
northern Kimberley was in the public eye recently
when footage of the activities of a team of biologists surveying the region
was streamed via the web to a worldwide audience. This exposure highlighted some
of the Kimberley's unique marine animals, but was only a brief glimpse into an intensive
research program currently documenting the region's marine biodiversity.

by John Huisman and Rainbo Dixon



During October 2010, a 14-strong group of specialist biologists, each with a specific area of expertise, participated in a two-week expedition to survey the marine biodiversity of Cassini Island and Long Reef, in Western Australia's remote northern Kimberley. This expedition—organised and led by the Western Australian Museum, with funding support from Woodside Energy—also included participants from the Queensland, Australian and Victorian museums, plus Murdoch University and the Department of Environment and Conservation's Western Australian Herbarium.

To most people, the names Cassini Island and Long Reef will not be immediately familiar. At about 2,300 kilometres from Perth, these are some of the most remote locations in WA. Cassini Island has an area of about 3.4 square kilometres and is generally flat, with much of its coastline lined by low cliffs. Long Reef—at about 30 kilometres long and 8.7 kilometres at its broadest—is considerably larger, but is only exposed at low tide.

The survey involved both scuba diving and intertidal reef walking. Diving in tropical waters is accompanied by certain preconceptions, only some of which apply to the Kimberley. The crystal clear waters one might associate with, say, the offshore Rowley Shoals (see 'On the edge: exploring the Rowley Shoals', *LANDSCOPE*, Spring 2008) are, for the most part, unknown in the Kimberley. The region experiences massive tides of more than 10 metres range, their movements creating swirling currents that stir up vast amounts of sediment, generating conditions akin to, if not quite pea soup, something like a thick broth. During neap tides (when the tide range is at a minimum), this moveable blizzard settles temporarily, and underwater visibility improves considerably but rarely approaches what might be called 'clear' water. At Cassini Island, the tidal range is less than that of the southern Kimberley, but spring tides still have a variation of around five metres, declining to around one metre during neaps.

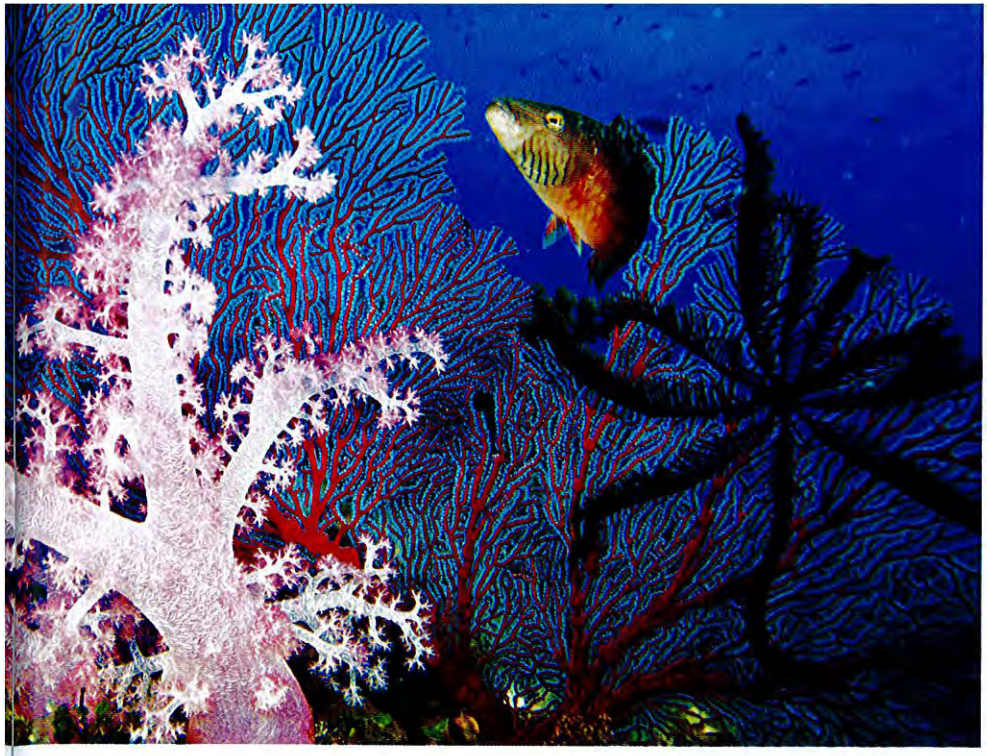
World view

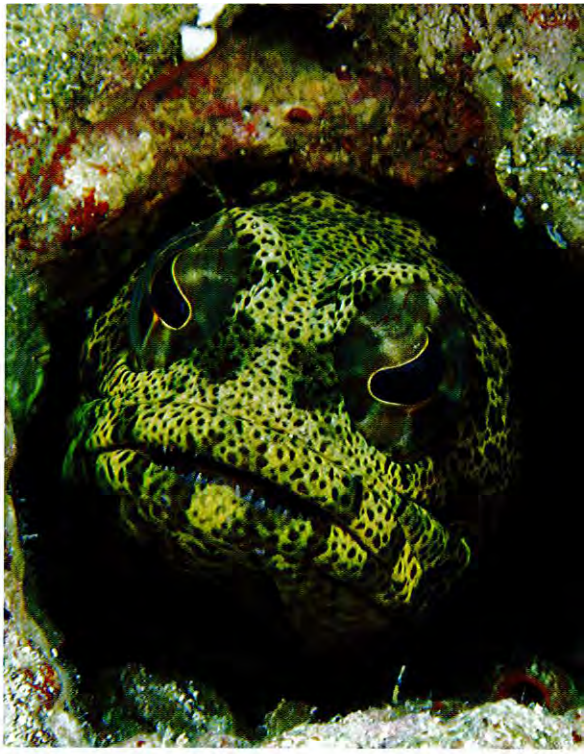
In a first for such expeditions, the biologists' activities were filmed and daily missives uploaded via satellite to the WA Museum's website. This provided the public the opportunity to follow the expedition as it was happening. It was hoped this would enable an appreciation of the importance of these surveys in understanding the Kimberley's unique marine animals and plants and, perhaps more crucially, provide an insight into the exploration and discovery process that so enthralls each of the participants. Filming the event was ably handled by Phil Tucak, who also doubled as the expedition's medical officer and stand-by diver.

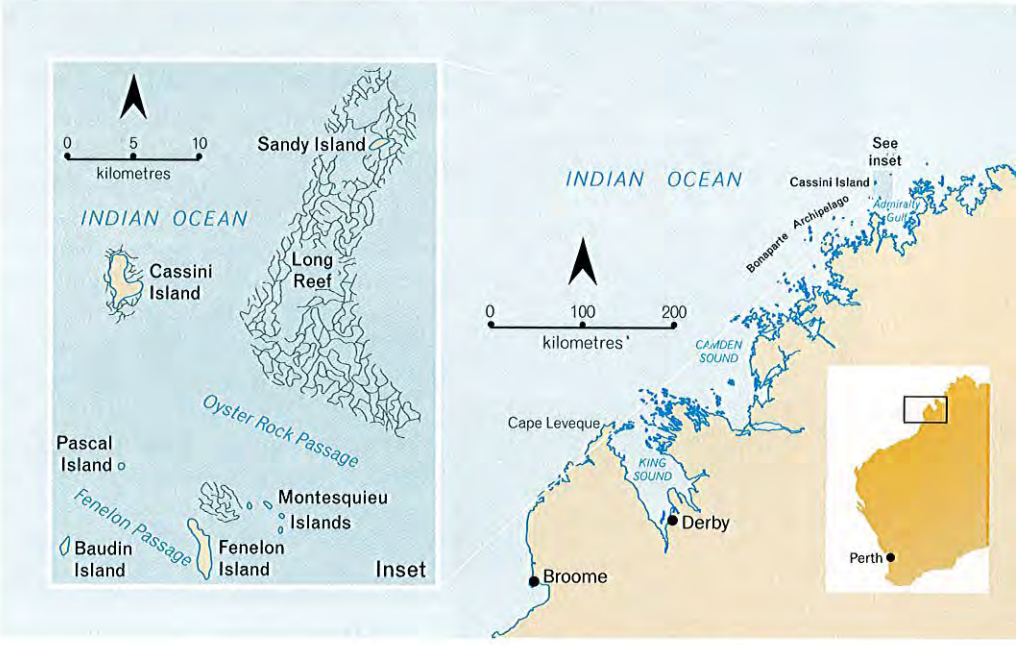
Previous page

Main Long Reef at low tide.
Photo – Col Roberts/Lochman Transparencies
Insert Common lionfish.
Photo – Alex Steffe/Lochman Transparencies

Left A feather star on gorgonian coral.
Photo – John Huisman/DEC







Above left Carnation coral (left) and gorgonian coral with a feather star attached. *Photo – Clay Bryce/Lochman Transparencies*

Above The sinister-looking Darwin jawfish. *Photo – John Huisman/DEC*

Fishy tales

Surveying the fish species was the job of the WA Museum's Sue Morrison and Glenn Moore. Their encyclopedic knowledge allowed them to undertake visual surveys while diving, which involved identifying and counting the many hundreds of fish that, for the most part, were constantly on the move. This difficult task was tackled with relish by Sue and Glenn—after each dive they compared notes and discussed the few species that tested their identification skills. Some venomous species were encountered, including the common lionfish (*Pterois volitans*). This spectacular species was often spotted languidly lurking in hollows in the reef, not at all wary of divers or predators—well protected by its array of venomous spines. Common lionfish are native to the tropical Indo-Pacific, but in the past 20 years have been introduced to the Atlantic Ocean, along the east coast of the United States of America. No-one is sure how these fish came to be in their new home, but one possible source was a beachside aquarium in Biscayne Bay, Florida, which broke open during Hurricane Andrew in 1992, accidentally releasing six lionfish.

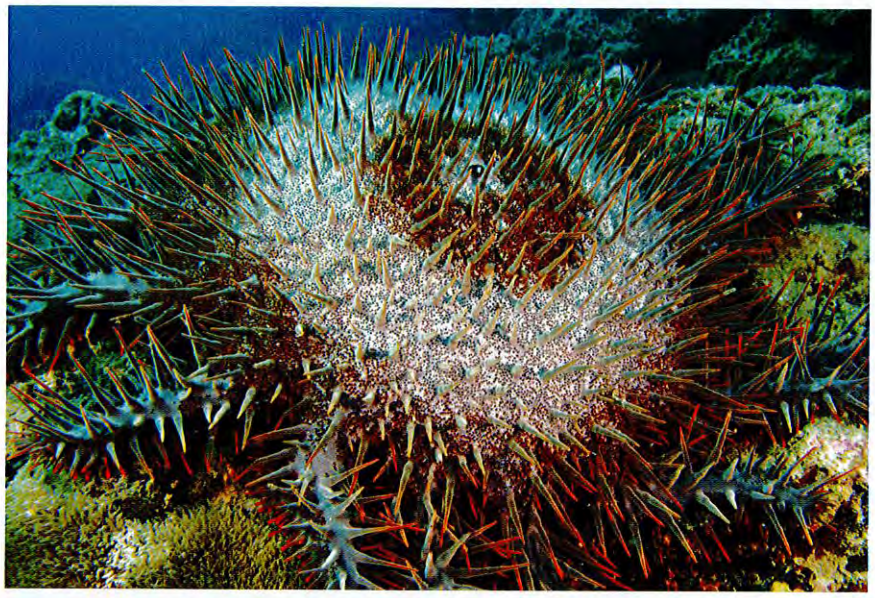
Another native of the tropical Indo-Pacific is the rather fearsome-looking Darwin jawfish (*Opistognathus darwiniensis*), which lives in elaborately constructed holes in the reef. These wary fish retreat rapidly when they feel threatened but, if approached slowly, will gaze curiously at the diver, perhaps weighing up whether a meal is in the offing! Also finding a home in the reef is the banded blenny (*Salarias fasciatus*), which lives on a diet of algae and detritus, a practice acknowledged by its alternative common name, the lawnmower blenny.

Other than the top-order predators, most reef fish are no more than a tasty snack in the eyes of many of their neighbours. Remaining constantly alert is often the only thing keeping them off the menu. The black-axil puller (*Chromis atripectoralis*) lives in small groups, typically hovering above branched corals and feeding on small zooplankton. When threatened, the fish retreat in an instant to the protection of the coral, cautiously emerging only when they feel the danger has passed.

Star watching

Echinoderms—that group of invertebrates that includes the sea stars, sea urchins, brittle stars, sea cucumbers, and feather stars (see 'Echinoderms: spiny-skinned sea animals', *LANDSCOPE*, Spring 2010)—were surveyed by Alison Sampey of the WA Museum. Feather stars (also known as crinoids) were common during the survey of these waters, often attached to gorgonian corals in areas of high

current, with their feather-like arms radiating from a small body. Feather stars feed by passively catching small particles drifting by in the water. They display a myriad of spectacular colours, often in intricate patterns. Sea stars were less commonly found, but those that were encountered were some of the largest invertebrates on the reef. The (perhaps unjustly) notorious crown-of-thorns sea star (*Acanthaster planci*) was often encountered. This species can grow up to 80 centimetres in diameter and is protected by an array of particularly fierce spines. It feeds on live coral and is a regular inhabitant of the reef, its predatory ways just one component of the unfathomably complex food web that coral reefs support. When numbers increase, however—as they do on occasions on parts of the Great Barrier Reef—the corals cannot keep pace with the voracious sea star and significant reductions in coral cover can occur. During the Kimberley survey, crown-of-thorns sea stars were often present, but never in large numbers and no significant coral damage was observed.



Less fearsome looking—in fact almost cuddly, if one could describe a sea star that way—is the pin-cushion star (*Culcita schmideliana*). These sea stars have patches of different colours on their surface, the shades and arrangement varying between individuals and, unlike most other sea stars, do not have extended arms.

Frequent on most reefs was the long-spined sea urchin (*Diadema setosum*), which often occurred in dense aggregations. This species is a grazer, feeding on small algae, and is commonly found throughout reefs in the Indo-Pacific.

The worm turns

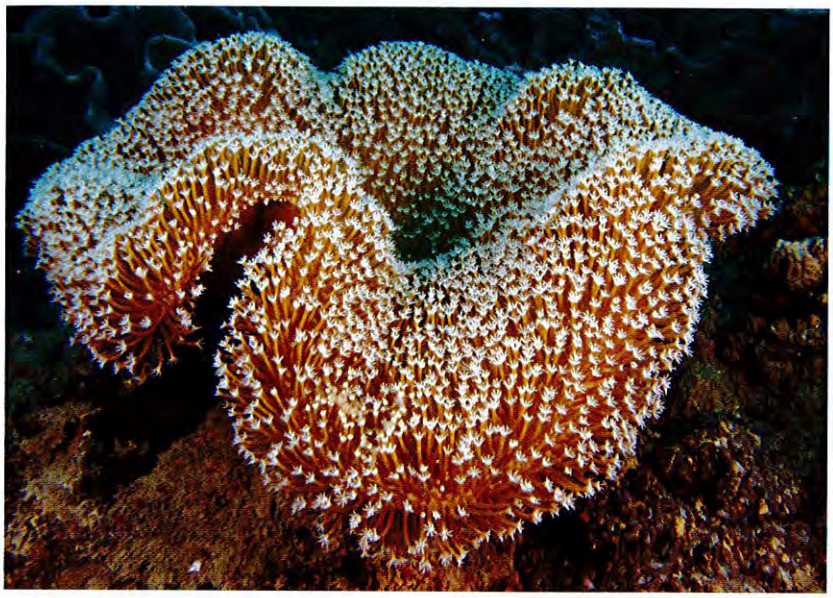
Marine worms, much like their terrestrial counterparts, don't live out in the open. They tend to hide in hollows in the reef, or among the coral rubble that accumulates in depressions or at the base of the reef wall. Most species are less than a few centimetres long, so a great surprise was seeing the massive bobbit worm (*Eunice aphroditois*) which lives in holes in the reef and was observed foraging during low tide. These polychaete worms can grow to more than three metres in length (some up to six metres have been reported), with a diameter of several centimetres, and have an iridescent sheen. They are particularly fearsome ambush predators, with an array of sharp teeth and are lightning fast, often slicing their victims in two. Bobbit worms often appear as unwelcome guests in marine aquaria, unwittingly transported there when the rock housing their lairs is used for decoration. Within a short time they will decimate the tank's inhabitants, mostly at night, catching their victims unaware. Removing bobbit worms is virtually impossible, and invariably requires removing the rock in which they are living.

Of course not all worms are as fearsome, and one of the more common sights during the survey was

Top A massive crown-of-thorns sea star feeding on coral.
Photo - John Huisman/DEC

Above left The delicate Christmas tree worm lives in tubes in hard corals.
Photo - Clay Bryce/Lochman Transparencies

Left A bobbit worm foraging on the reef flat at low tide.
Photo - John Huisman/DEC



Above The giant mushroom coral (*Sarcophyton* sp.).

Above right A pin-cushion sea star with its distinctive array of colourful patches.

Right The nudibranch *Phyllidia varicosa* accumulates toxic chemicals that protect it from predators.
Photos – John Huisman/DEC

the colourful Christmas tree worm (*Spirobranchus giganteus*). These worms live in clusters on coral heads, into which they burrow before secreting their own protective tube. Most of the worm is hidden from view in its tube, the multicoloured spiral structure that is visible is the worm's highly modified mouth, which it also uses for respiration. When disturbed, the worms quickly retract into their tubes, closing the door behind them by plugging the opening with a modified spiral known as an operculum. The task of surveying the marine worms was the responsibility of Lexie Walker (Australian Museum) and Skip Woolley (Victoria Museum), with Skip rather bravely catching a specimen of the bobbit worm at Long Reef.

Corals, soft 'n' hard

Tropical reefs are, of course, dominated by corals. Zoe Richards of the Australian Museum surveyed the hard corals (those that build firm skeletons and form the primary reef structure), while Monica Schlacher-Hoenlinger of the Queensland Museum tackled the soft corals. Considering the relatively turbid water, Zoe was taken aback by the sheer diversity of corals she encountered. Of particular interest was the high cover of the organ pipe coral (*Tubipora* sp.) in the shallow fore-reef zone at Long Reef. *Tubipora* is actually a soft coral, but it forms a firm skeleton of fused spicules, the only soft coral known to do so. The skeleton of organ pipe coral is a distinctive bright red, and it is often collected for the jewellery and aquarium trade due to its attractive colour. Zoe and Monica discovered that this normally rare coral was the dominant organism, covering nearly 28 per cent of the fore-reef zone at Long Reef, more than twice the cover reported anywhere else. In the subtidal areas, soft corals such as the spectacular carnation coral (*Dendronephthya* sp.) were common, and gorgonian corals were often dominant in areas of high current.

Slugs and snails

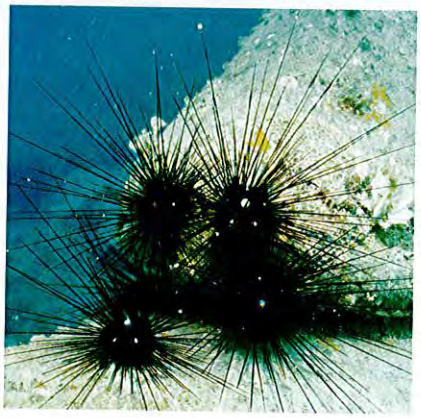
Expedition leader Clay Bryce, along with the WA Museum's Corey Whisson, were responsible for surveying the molluscs. These included the well-known gastropod snails, such as the tiger cowrie (*Cypraea tigris*), much valued by shell collectors, bivalves such as the Cock's comb oyster (*Lopha cristagalli*), and the sea slugs, the amazingly colourful and attractive nudibranchs which are related to the shelled snails but shed their shell after their larval stage. The name nudibranch means 'naked gill' and refers to the distinctive external branched gills that are often found on the animal's upper surface. In some nudibranchs, such as the exquisitely patterned *Phyllidia varicosa*, the gills are less obvious and are located on the sides of the animal.

Crabs

Surveying the crabs and other crustaceans was the responsibility of the WA Museum's Andrew Hosie and Lee Betterridge. Some large species, such as the mantis shrimp (*Stomatopoda*) and painted rock lobster (*Panulirus versicolor*), were common on reef flats and in shallow water. Like many other reef invertebrates, however, most crustacean species are small and inconspicuous, hiding away among the coral, in discarded shells, or burying themselves in coral rubble. Given this behaviour, even seeing the animals can be difficult—let alone collecting them, especially in areas with turbid water—which meant Andrew and Lee had one of the more difficult tasks. In many cases, the only option was to collect a piece of coral rubble and entice out the various crustaceans once back on board the boat.

Seaweeds

Although often thought of as unimportant, seaweeds are in fact a vital part of coral reef ecology. Crustose coralline algae form a thin, tough layer on the reef surface, appearing like a layer of pink paint and strengthening the structure, often reducing potential damage from rough seas. Seaweeds also form the diet of herbivorous fish and numerous invertebrates, therefore acting as one of the primary energy sources in the complex reef food web. Some damselfish actually tend a small garden of algae, by weeding out unpalatable species and killing off any coral that might be infringing on their patch. These damselfish are incredibly protective of their garden, and will aggressively ward off any intruders, including divers. Surveying the seaweeds, and avoiding damselfish, was the responsibility of the WA Herbarium's phycologist John Huisman.



Top The green seaweed *Caulerpa*.

Above left The distinctive cock's comb oyster was often found with an orange sponge coating.
Photos - John Huisman/DEC

Above Long-spined sea urchins typically occurred in dense aggregations.
Photo - Clay Bryce/Lochman Transparencies

Below left Collecting specimens on Long Reef at low tide.
Photo - John Huisman/DEC

Where to from here?

This expedition was the second in the current program, following a similar trip to Adele Island and Montgomery Reef in 2009. Three trips to other inshore Kimberley locations will occur in the coming years. In addition, the overarching project, the Marine Life of Kimberley Region, will assemble and analyse all known inshore Kimberley and offshore atoll marine collection data. This cache of information will be an important asset, enabling informed decision making regarding sustainable development, business and conservation policies, and assessment of national and world heritage values. In addition, the project will provide a wealth of educational resources, increasing awareness of the Kimberley's unique and exceptionally diverse marine life.

John Huisman is a phycologist (seaweed specialist) who holds a joint appointment with the Department of Environment and Conservation's Western Australian Herbarium and Murdoch University. He is a regular contributor to *LANDSCOPE* and is currently writing a book describing WA's tropical marine plants. He can be contacted on (08) 9219 9137 or by email (john.huisman@dec.wa.gov.au).

Rainbo Dixon is a PhD student at Murdoch University, examining the taxonomy of the brown seaweed genus *Sargassum*. Rainbo took part in the 2009 expedition to Adele Island and Montgomery Reef. She can be contacted by email (rains.rmd@gmail.com).

The authors thank the WA Museum (particularly Clay Bryce) and Woodside Energy for the invitation to take part in the expedition.

For more information about the Marine Life of Kimberley Region project and to view videos from the expedition visit www.museum.wa.gov.au/kimberley/marine-life-kimberley-region.

Volume 26 Number 4 WINTER 2011

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Regulars

Publishing credits

Executive editor Madeleine Clews.

Editors Joanna Moore, Samille Mitchell.

Scientific/technical advice Kevin Thiele, Lachie McCaw, Keith Morris, Kevin Bancroft, Shaun Wilson.

Design and production Gooitzen van der Meer, Peter Nicholas, Tiffany Taylor, Lauren Wright.

Illustration Gooitzen van der Meer.

Cartography Promaco Geodraft.

Marketing Cathy Birch.
Phone (08) 9334 0296 or *fax* (08) 9334 0432.

Subscription enquiries
Phone (08) 9219 8000.

Prepress and printing GEON, Western Australia.

ISSN 0815-4465

Please do not send unsolicited material, but feel free to contact the editors.

Published by the Department of Environment and Conservation (DEC), 17 Dick Perry Avenue, Kensington, Western Australia.

Visit DEC online at www.dec.wa.gov.au to search the *LANDSCOPE* catalogue.

Department of
Environment and Conservation