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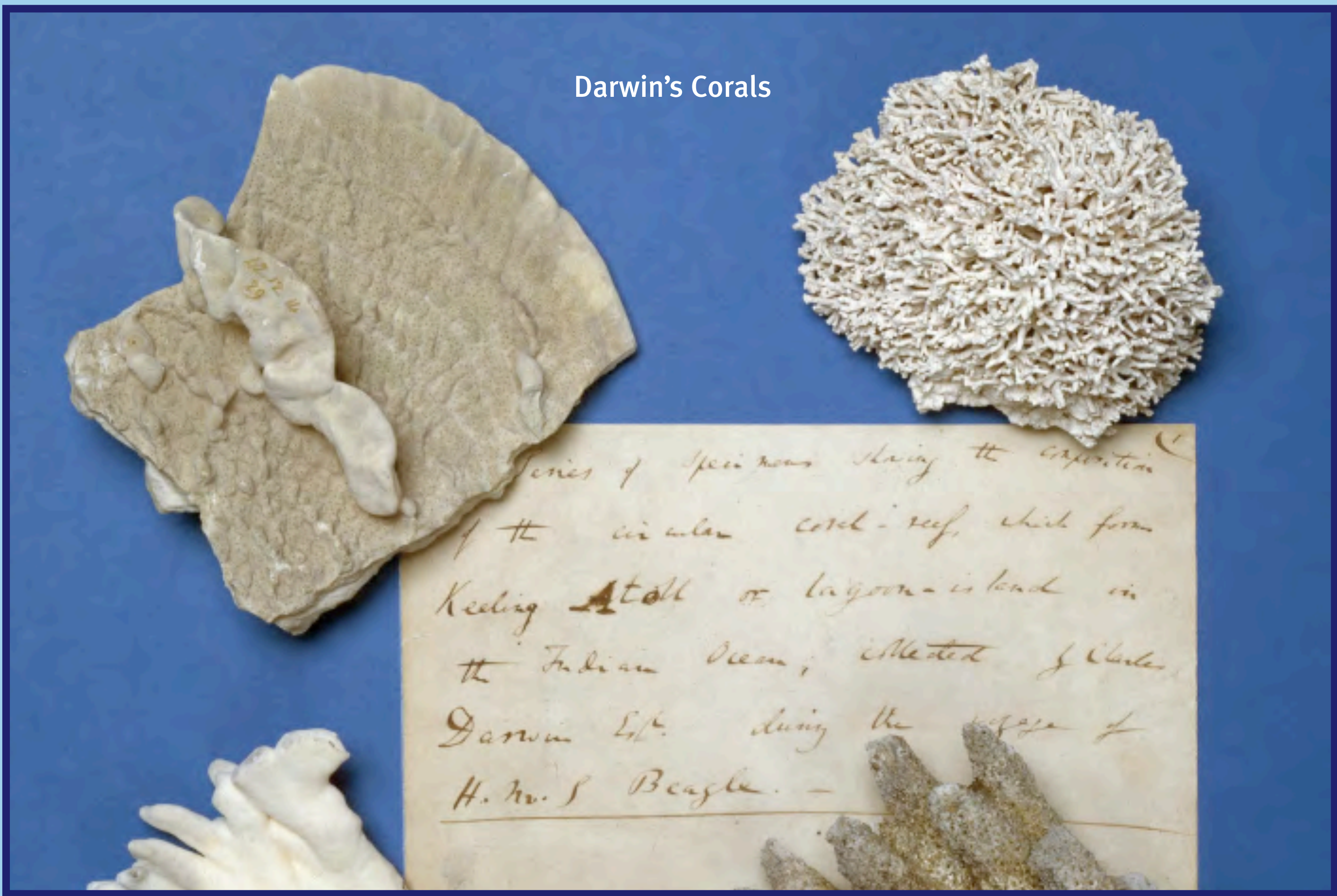

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Bay, with its vast mangrove, seagrass and coral-reef habitats, and interact importantly with the Florida Coral Reef Tract via inter-island hydrodynamic exchanges[1]. The drifting fragments, consisting mostly of the shoal grass *Halodule wrightii*, are exceptional because they can maintain viability for up to four weeks[2]. Interestingly, such extraordinary mosaic patterns of pancake-seagrass rafts are previously unreported, but commonly originate in the western region of Florida Bay under light wind and wave conditions.

To date, we have no evidence identifying the mechanisms responsible for the circular patterns, but they do appear to be analogous to cold-water pancake-ice formations (see http://en.wikipedia.org/wiki/Pancake_ice), in respect to how they take shape. As in pancake-ice, the patterns are posited to be sculpted by the bumping action of adjacent clumps, in conjunction with the nature of the curved crescent-shaped individual blades. The initial stages of formation (Fig. 3, arrows) seem to develop from a tendency for the buoyant blades to be gently shuffled inward to coalesce as overlapping/interlocking concentric rings, with the mean pancake diameter being 18 cm –4 SD. The possibility that the pancakes are rolled into shape by tidal-current shear has also been suggested. Because pancake-seagrass formations are so striking, we would welcome any further observations/insights from the readership – the suggestion of "alien crop circles in the sea" has already been proposed.

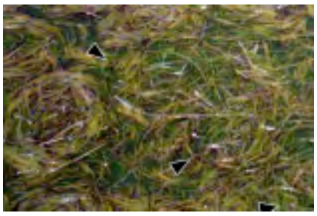

Fig. 3

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NEWS

Safeguarding temperature loggers on remote coral reefs – lessons learned from relocating loggers in the Chagos archipelago

Research into sea surface temperature and impacts of thermal stresses on coral reefs has led to the increasing use of compact sea temperature loggers on reefs. While deployment itself is easy, ensuring they survive *in situ* for 2–3 years until recovery is less so. We had received numerous accounts of disappearance of anything from 50–100% of groups of deployed loggers, sometimes as soon as a few weeks later, even with those placed in sheltered lagoons.

Underwater temperature loggers have improved enormously in recent years, with diverse products commercially available. Durable, pressure resistant, compact devices, capable of recording over 30,000 temperature samples with accuracies of up to 0.1°C and with a battery life commonly exceeding five years, are widely available for prices below US$150 each. When these are deployed at sites to which return visits are infrequent and widely spaced, we need to ensure a good recovery rate. We developed a technique to reliably secure 20 *StowAway TB132 Tidbit* data loggers. We wanted to place these on reefs at a range of depths to 25 m deep on several atolls in the Chagos Archipelago, at sites that would not be revisited for 2–3 years.

Each logger was wrapped in a layer of film to protect against fouling, then fastened within a 15cm section of 35mm PVC pipe by zip ties, through holes drilled along the pipe. It was intended that the pipe sections would protect the device and its attachment ties from potential bites by fish. The pipe section was then secured with similar ties to a 1m steel stake that had been hammered into the reef at the required monitoring depth through a zip-lock bag containing a few hundred grams of concrete powder mixed with sand. The concrete was used dry, and the holes torn by punching the stake through the bag caused water to enter and solidify the concrete. This hardened in a manner that conformed to the substrate, thus helping to lock the stake in place. The bags could be readily prepared on the surface and transported underwater to the required location sealed and watertight. Even where the stake had toppled due to storms and decay of the underlying reef, the concrete disk prevented movement away from the site.

We tried this technique with 19 loggers (one of our 20 was dud) at seven sites across four remote Chagos atolls in March 2006. Loggers were usually sited in threes; at 5, 15 and 25m depth, in lines taken straight down the reef, with a GPS fix recorded for the site of the shallowest one. Opportunity was taken to recover six loggers at two sites in early 2008, when all were retrieved in working order (results were remarkable and are published in *Coral Reefs*). The remaining 13 could not be revisited for another year when, in March 2009, 12 of them were found and collected. None of the sites were visited during the intervening two or three years to enable checking of the stakes.

When recovering, boats were stationed above each GPS reading that had been recorded during placement. Mostly the shallowest stakes were seen within 10m of the boat. Once a stake had been located, the others in each group of three were usually found in the same dive, but in several cases the shallowest stake was either on its side, missing, or the most concealed of the three by rapidly growing corals, particularly *Acropora*. Photos of the locality taken at the time of deployment proved useless as an aid for relocation given the rapidity of new coral growth in this archipelago.

The straight, perpendicular stakes usually caught the finders' eyes because they provide a striking contrast amongst shapes that, on reefs, are usually anything but straight. But in several cases even a 75cm high projection was barely sufficient. One at 25m was spotted by its 5cm projection above a *Pachyseris* plate which had reached a diameter of 1m in 3 years. Another was spotted underneath a table colony of *Acropora cytherea* that had completely overgrown the stake. But 1m stakes are usually sufficient, and only once was a second dive needed to find each group of three; when the first is seen, the others had to be nearby on these steep slopes. To several of the emplaced stakes we then attached a new logger.

Of the 19 loggers recovered, all but one were still recording after 2 or 3 years, though one failed after 14 months (though its data were retrieved). We recommend the use of this method of device protection and marking, and consider small roped buoys or reliance on particularly recognisable coral structures to be very unreliable (and the cause of many lost loggers). In this case, the resulting data set has given unprecedented insight into temperature profiles at a series of depths across this central Indian Ocean atoll system.

Alasdair Harris, Robert Gibbs, Jon Schleyer, Kirsty Taylor, Charles Sheppard

Reefs at Risk Revisited Workshop

The World Resources Institute (WRI), in collaboration with the International Coral Reef Action Network (ICRAN), hosted a workshop on the Reefs at Risk Revisited project immediately before the International Marine Conservation Congress in Fairfax, Virginia, USA, on 19 May 2009. As described in *Reef Encounter* 37, January 2009, ISRS is acting as scientific advisor to this project.

The workshop brought together 29 representatives from government agencies, non-governmental organizations, regional organizations, universities, and consultancies. Preliminary results from modelling local threats to reefs (land pollution, marine pollution, overfishing, and coastal development), and climate-related threats (past thermal stress, future thermal stress, and ocean acidification) were presented and ways to improve the indicators of these threats were discussed.

For local threats, participants recommended additions to the maps using data such as:

- Tourism centres (e.g. indicated by hotel capacity) and cruise ship visitation;
- Areas of recent/rapid development visible from satellite imagery;
- Use of fertilizer on agricultural lands;
- Dams that act as sediment traps and, conversely, mangroves that reduce sediment and nutrient delivery;
- MPAs rated as having effective management that could indicate places where threats from overfishing and destructive fishing are reduced; and
- Integrated coastal zone management (ICZM) efforts that could show where threats from coastal development have been lessened.

Individual threat indicators need to be validated using observational data (such as observed chlorophyll and sediment plumes for SeaWIFS for watershed-based threat, and data on fishing pressure from Reef Check, AGRRA, REEF, and PROCFish for overfishing). The overall Reefs at Risk (R@R) threat index will be validated against the coral reef condition index.

For climate-related threats, the indicators of past thermal stress, developed by NOAA, will be revised to include only the past 10 years of Pathfinder data and the threshold for coral bleaching will incorporate historical temperature variability. The newest publications and data sets on ocean acidification will be reviewed for comparison with the data from Cao and Caldeira (2008).

UNEP-WCMC will acquire and integrate additional sources of reef data to produce a more accurate, higher resolution global map of reefs that will be validated by partners. Workshop participants supported the concept of including an index of coral condition that integrates information on live hard coral cover, fleshy macroalgae, and level of overfishing, and a small working group will refine this index. Participants highlighted the importance of translating the final report into many languages. 'Reef stories' about threatened reefs and 'signs of promise' will be included and will range from peer-reviewed literature to 'voices of the community', all of which will be validated through third-party review.

For further information, contact Lauretta Burke, lauretta@wri.org

First Eco-health Report Card for the Mesoamerican Reef

In late 2008, the 'Healthy Reefs for Healthy People Initiative' launched the first MAR Eco-health Report Card for the Mesoamerican Reef, which provides an easy-to-understand overview of reef ecosystem condition and stewardship. It uses a five-point grading system, from 'very good' to 'critical', for seven reef indicators, which are then combined to form an Integrated