But Rodotà's biggest challenge will require the skills of a diplomat, not an industrialist: restoring harmony among the 14 member states. For some, like Germany, ESA is still the key to their ambitions in space, while others, like France, are hedging their bets by sustaining a strong national space program. Says Roger Bonnet, head of the science directorate, "We need to rediscover a European approach. If we do not, ESA will disintegrate." Adds Rodotà: "There is a consensus that Europe cannot carry on the way it has, fighting one another. ... The message I am sending is that there is no room for rivalry."

–Helen Gavaghan

Helen Gavaghan is a writer in Hebden Bridge, U.K.

MARINE SCIENCE

Australia Enters Deep Water In Devising Management Plan

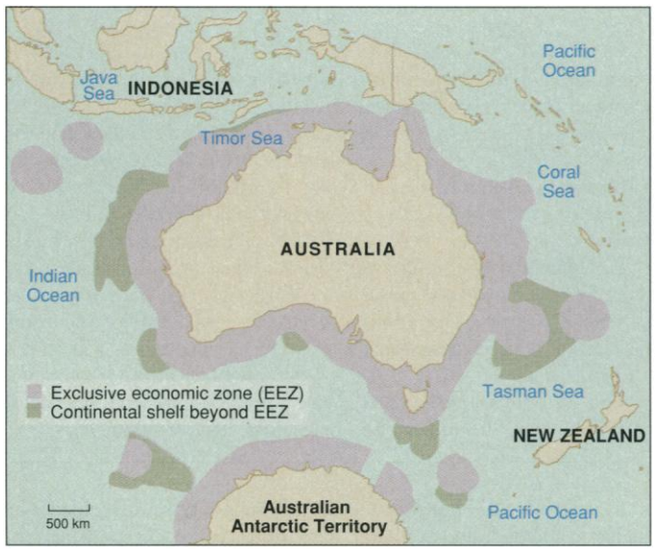
MELBOURNE—Like a gigantic bird of prey, the six-seat *Partenavia* methodically traces a path 137 meters above the waters of Moreton Bay near Brisbane on Australia's eastern coast. Sitting in the cockpit, Helene Marsh and her team from the School of Tropical Environment Studies at James Cook University in Townsville are looking for dugongs, the 2.9-meter-long marine mammals that are an endangered species. But that's not all she can see. The east coast dugong population, which has shrunk by half in the past decade, serves as a marker for the health of the sea grass that nourishes them. And the sea grass, known as the canary of the sea for its ability to signal changes in the marine environment, is losing out to the activities of farmers and developers.

For Marsh and other marine researchers, the dugong–sea grass problem is a symbol of what ails Australian marine science. No single authority is responsible for marine science policy and administration, a situation that has led to well-documented gaps and overlaps in the country's approach to marine issues. In particular, critics say the agencies involved in marine science, a score of fiefdoms ranging from tourism to defense, have been more concerned with self-interest than the common good.

But that attitude is yielding to a spirit of cooperation that bodes well for scientists. Australia was spurred into action by the 1994 U.N. Convention on the Law of the Sea (UNCLOS), under which Australia acquired one of the world's largest marine territories and an international obligation to manage its resources sustainably. Beyond securing Australia's rights to a 200-nautical-mile exclusive economic zone comprising 11 million square kilometers (see map), the treaty puts up for grabs the natural extensions of the continental shelf to 350 nautical miles. To claim its right to the extra territory, however, Australia must collect data to satisfy the United Nations that these regions fit the definition.

Spurred by the challenge, the government's premier science advisory council has devoted two of its recent meetings to marine science. And in April, the government convened two panels, one to develop an oceans policy and the second to draw up a plan for marine science and technology. In June, a report on managing the country's entire scientific portfolio by the government's chief scientist, John Stocker, urged officials to set priorities for the field.

That recommendation has widespread support. "We have a fragmented set of policies that won't do the twin jobs of exploitation and preservation, and there's an urgent need for a coherent policy," says Ken McKinnon, vice chancellor of James Cook University and author of two reports in the past decade on marine science that have castigated the government. He adds: "UNCLOS is the lever that's putting the whole thing on the national plate."



SOURCE: AUSTRALIAN GEOLOGICAL SURVEY ORGANIZATION

Ocean territory. U.N. oceans treaty has extended Australia's borders and has heightened interest in marine science.

The oceans policy group, consisting of representatives from every agency with a marine science portfolio, will take a shot at setting national priorities, as well as coordinating governance issues across local, state, and federal boundaries. That would be a first, says Russell Reichelt, director of the Australian Institute for Marine Science. "Up till now, we've had an ad hoc situation where priorities were set from the bottom up," he says. But those priorities didn't produce a consensus on how to deal with problems across disciplines and jurisdictions.

Working in concert with the oceans policy group are 10 scientists who serve on the marine science and technology plan. They will recommend broad strategies for each priority area set by the government panel and identify areas where more information is needed, says one member, Chris Pigram, chief of the petroleum and marine division of the Australian Geological Survey Organization (AGSO).

High on the scientists' list of concerns is the dearth of knowledge about Australia's marine environment. Preliminary exploration of the continental shelf suggests a wealth of natural resources, from huge oil and gas reserves and mineral deposits to novel deep-sea-floor biota. Over the past decade, AGSO has compiled enough data to claim at least six of the nine areas of extended continental shelf, with the rest to be finished by 2004. But then the agency will have to go back and fill in the details.

Another glaring deficiency concerns coastal ecology. Eighty percent of Australia's population lives along the coast or near estuaries, but the study of these environments is in its infancy. "We don't understand the system enough to manage it," says Alan Butler of the Commonwealth Scientific and Industrial Research Organization's Division of Marine Biology in Perth.

Destruction of fisheries is also a major concern. Seafood exports have doubled in the past 5 years, but Australia's fisheries remain vulnerable due to low natural nutrient levels. Aquaculture could replace the loss of the native Southern bluefin tuna population, but again, research is needed urgently.

Another mystery is the deep-sea communities. Only three studies have ever been done of the marine life of the continental shelf, and these point to large numbers of novel species. But there are concerns that deep-sea dredging and trawling along the country's northwest shelf have already altered the environment.

The size of Australia's marine territory puts a premium on efficient management. "We

need bang for bucks," says Craig Johnson, head of the department of zoology at the University of Tasmania and a member of the science and technology panel. Oceanographers, for example, have suggested that Australia team up with New Zealand in buying and operating a geological survey ship to map abutting territorial waters.

Dealing with such a range of issues is a tall order, and some worry that the government may fall back on old habits to resolve them. "There's still evidence of turf wars in the bureaucracy," says McKinnon. "There's not a strong enough sense of urgency yet."

For Marsh, a sense of urgency means providing sanctuary to the world's dugong population. The animals inhabit tropical and subtropical waters from Africa to Asia, but Marsh says Australia is the only developed nation with a low human presence along a significant coastline in tropical waters. "If we can't manage to conserve them, who can?" she wonders.

Last month the government gave the species a small break, creating a chain of dugong sanctuaries in the Southern Great Barrier Reef region with zones where gill netting is banned. But protecting the dugong's food source poses a bigger challenge. Protecting the sea grass involves not just managing the marine environment but also land-based activities. Farmers and developers inadvertently contribute to soil erosion, killing the grass with river-borne sediments and nutrients that screen the light the sea grass needs to survive. As Marsh puts it, "One thing I've learned is that we don't manage the marine environment; we manage people."

D. B. FLEETHAM/ANIMALS, ANIMALS

Warm feelings. Marsh has spent a career monitoring the dugong, an endangered marine mammal.

So far, only one Australian marine ecosystem, the Great Barrier Reef, is overseen by a single authority. Created in 1975, the Great Barrier Reef Marine Park Authority is viewed as a paragon of multiple-use ecosystem management. Members of the science panel hope the government's current review will create similar models for other areas.

The final plan, due out early next year, "should deliver a national program and the means to deliver it," says Pigram of the geological survey. If it does, it may also offer the best hope for the dugong.

–Elizabeth Finkel

Elizabeth Finkel is a science writer in Melbourne.

TRADITIONAL MEDICINE

India Applauds U.S. Patent Reversal

NEW DELHI, INDIA—It's rare for defenders of traditional Indian medicine to speak kindly of the U.S. Patent and Trademark Office (PTO), usually viewed as a tool of piratical multinational corporations. But this month, leaders of India's research establishment called a press conference to praise the PTO for its "transparency and fairness." The reason: The PTO has effectively killed a patent it granted 2 years ago on the medical uses of turmeric—a yellow-colored spice used in curry—after an Indian scientific organization asked to have the patent quashed.

The defeat of the turmeric patent is being celebrated as a national triumph by India's Council of Scientific and Industrial Research (CSIR), the consortium of 40 national laboratories that sought to block the patent. "This success is likely to enhance the confidence of the people of India and remove unfounded fears about India's helplessness in preventing biopiracy," says CSIR Director-General Raghunath A. Mashelkar.

Foreign exploitation of traditional medicines and folk technology became a rallying cry in the 1980s, when the U.S. firm W. R. Grace & Co. won a series of patents for extracts of the indigenous neem tree. Neem seeds and bark have been used for centuries in natural pesticides and medicines in India. Grace's attempt to exploit neem products aroused deep antagonism, particularly as it threatened to raise local prices (*Science*, 28 February 1992, p. 1070). Following that controversy, CSIR members were outraged when they discovered a 1995 patent (#5,401,504) had been issued to two Mississippi physicians for the traditional use of turmeric as a healing powder. The "inventors"—Suman K. Das and Hari Har Cohly—are Indian-born faculty members at the University of Mississippi's medical center in Jackson. Their patent lists the university as owner and itemizes six claims, based on the primary claim to "a method of promoting healing of a wound in a patient, which consists essentially of administering ... an effective amount of turmeric powder."

After moving to the United States and becoming chief of plastic surgery with a lab at the medical center, Das says he felt the time was right "to check out the old mother's tale" that turmeric could heal scrapes and wounds. In 1991 he and Cohly began experiments in rats. "There was definitely an enhancement of healing with turmeric," he recalls. In vitro studies with human endothelial cells also showed a growth-enhancing effect, so Das moved to clinical trials in patients with intractable leg ulcers. Again, Das says, the results indicated that using turmeric was better than no therapy in "healing some ulcers which had been written off" as untreatable. (Its efficacy was not compared to an antibiotic.)

That discovery led them to the patent office. "We felt that the compound should be popularized," says Das. "The only way to do that in this country is by developing it, and you cannot do that without a patent."

K. SCHAFER/PNI

"Obvious" value. Medicinal use of turmeric plant is widespread.

Upon learning of the patent, CSIR hired a U.S. firm and petitioned the PTO. The University of Mississippi, meanwhile, withdrew as owner of the patent, ceding rights to Das and Cohly. And in a relatively rare reexamination proceeding, the patent office agreed to look into the CSIR's contention that the "discovery" was both unoriginal and obvious in light of earlier writings in India. Among 32 references, CSIR cited an authorized translation of an ancient Sanskrit text that spoke of the medical use of turmeric. On 13 August, the patent office informed the patent holders that it was rejecting all six of their claims.

CSIR's Mashelkar believes this is "the first case" in which a patent on traditional Third World knowledge "has been contested, and the case has been won." The decision, he says, "sends the signal that if patent cases are fought on well-argued and well-supported techno-legal grounds, then there is nothing to fear about protecting our traditional knowledge base."

Das, having spent more than $15,000 on the case, is dispirited by the PTO decision, which he hasn't fully read. He says he has not decided whether to appeal but that, after this setback, "I have got my doubts as to whether it has any commercial value." He says he had hoped to make turmeric a popular alternative to antibiotics, but now, "my feeling is, why bother?"

–Eliot Marshall in Washington and Pallava Bagla in New Delhi