

KEEPERS OF

*Can Improved Marine Reserve Design
Save Both Fishermen and Marine Life
in Local Waters?*



THE FOREST

BY ROBERT MONROE

One look at the Punta Gorda State Marine Reserve and you'll understand why they make jokes about things designed by committee.

The Pacific Ocean reserve off Humboldt County was created in 1994. After taking input from a variety of emotional stakeholders ranging from environmentalists to anglers, a committee sited the reserve in an area acceptable to all parties. It was located 32 kilometers (20 miles) from the nearest port. Its effectiveness is nearly impossible to assess.

By its own admission, the State Department of Fish and Game, which oversees the reserves, acknowledges that the spirit of NIMBY (Not In My Back Yard) suffused the creation of Punta Gorda. Officials there recently recommended "relocation of the [marine protected area] to an area with habitats

more suitable for species of management concern."

It's one way of saying that this hard-won "no-take" reserve has nothing worth taking.

Some 1,130 kilometers (700 miles) to the south, the La Jolla Marine Conservation Area protects organisms of more recognizable value. It covers a sliver of the La Jolla kelp forest that extends around a point and south to San Diego's Pacific Beach, encompassing the mouth of Scripps Canyon. This area, while small, is nevertheless home to some of the area's last strongholds of green abalone and vermilion rockfish.

To Scripps Institution of Oceanography marine ecologist Ed Parnell, these waters could be a proving ground for a new concept in the design of marine reserves. He believes he has come up with a design formula not only ecologically sound but one that's a win for all parties.

Now the question is: Will anyone listen to him?

CHARGED ATMOSPHERE

Punta Gorda is emblematic of the compromises marine resource managers across the United States typically make to keep the peace. Hard science behind the design of marine protected areas—stretches of ocean in which the taking of fish, invertebrates, and even shells, sand, and water is limited or forbidden—has barely had 20 years to accumulate and still leaves several questions unanswered. In the history of marine protection, there have been a few success stories of cooperation, of restored numbers of threatened species, of fisheries remaining viable. But in the majority of cases, the business of management seems most often to unfold as a series of stalls, stalemates, and standoffs among competing interests.

In the shifting fog of morning, Scripps marine ecologist Ed Parnell surveys the La Jolla kelp forest near an existing state reserve. His work could help replace similarly opaque reserve design guidelines and destructive fishing practices with better alternatives.

Acrimony has become a staple of the negotiation process. In the past decade, many tense Department of Fish and Game hearings have required a heightened police presence. On occasion, the added security has been for the benefit of Scripps researchers.

One camp in the long-running argument is dominated by commercial and sport fishermen trying to stay in business and the other by environmentalists insisting that time is running out to save many marine organisms. Scientific evidence has provided ammunition to both sides in a debate reminiscent of that raging over global warming. Fishing interests occasionally draw strength from lack of evidence when it comes to proof that reserves work. Researchers on the other hand believe that those interests are the ones upon whom the burden of proof falls heaviest.

SETTING BOUNDARIES

What neither side disputes is that things just aren't the way they used to be. San Diego natives of a certain age can remember that as recently as the early 1980s, a person could walk to the seashore and with minimal exertion collect enough abalone and lobster for dinner. Though it may seem unbelievable now, abalone once covered San Diego's rocky shorelines to such an extent that, in patches, they seemed to *be* the rocky shoreline. Photos from yesteryear show that fishermen could routinely catch linebacker-sized black sea bass and giant lobsters from local kelp forests.

Now white abalone is on the federal list of threatened species. Fishing of all abalone species is forbidden in southern California, but that doesn't mean it doesn't hap-

pen. You hear a note of personal loss in the voices of biologists when they report going on dives and finding poachers' knife marks left behind on rocky outcroppings where small aggregations of abalone had been fighting the good fight just months before. While it is difficult for scientists to establish a baseline estimate of the natural peak populations of locally harvested organisms (in the kelp forest as elsewhere, the fishermen arrived before the record keepers), they are in indisputable decline thanks to overfishing, disease, and other causes.

"They're not gone but their numbers are significantly depressed," said marine ecologist Paul Dayton, who has dived in the kelp forest since coming to Scripps in 1970.

The premise of marine reserves is that they become the



endowment that allows anglers to live off the interest that is accrued when fish are allowed to spawn and mature unmolested, then leave the boundaries of the reserve through spillover. But the case for such reserves over the years has been better advanced by anecdotal rather than empirical evidence. On Florida's east coast, fishing has long been noted to be best around the edges of a de facto reserve created by the security perimeter of the Kennedy Space Center. On the Pacific Ocean, abalone seem to be thriving along a stretch of coastline in British Columbia where the presence of a prison means there is no trespassing on the shoreline.

"Nobody believes in spillover, but everybody wants to fish close to where they can't," said Pete Halmay, who has fished local kelp forests for sea urchins for 30 years.

Deliberately drawn reserves may or may not be able to reproduce those kinds of results. Researchers have struggled over time to come up with sound ecological criteria to determine the best reserve locations and sizes. There are myriad factors to consider: How does an organism reproduce? What



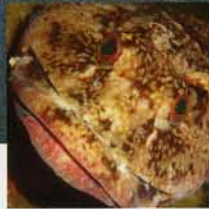
Opposite, Ed Parnell and dive partner Eric Hanauer position their boat over a kelp forest study site while flanked by small fishing vessels. **Top**, Parnell surveys habitat and species in the forest. **Middle**, California spiny lobsters trapped off La Jolla. **Bottom**, a forest-dwelling garibaldi.



kelp rockfish



California spiny lobster



cabezon



brown rockfish



wavy tops



barred sand bass



rock scallop



kelp bass



scorpionfish



red abalone



sheephead



gopher rockfish

kind of habitat does it need? How far do fish larvae travel before adulthood? How do you protect a tuna, which may swim thousands of miles in a lifetime and in the same act protect a sheephead, which spends its entire life in an area less than the size of a football field? If you have to pick one to protect, which one? If you protect one creature, do you put its predators or prey at risk?

Boundaries and sizes of marine reserves have often been set by vague rules of thumb. Over time, for example, the figure of 20 percent has been fixed as the target proportion of an ecosystem to set aside for a protected area, but few marine reserve advocates can explain where that figure came from. Even the most solid scientific conclusions must travel a road of political compromises on the way to becoming policy. The end result is often ineffective reserve design.

The dubiousness of that approach spurred Parnell to look for a more defensible scientific methodology. At 41, he is old enough to remember



Top, Rendered in stark outline through infrared photography, the kelp forest extends from La Jolla Cove south to Pacific Beach. **Right and opposite,** In his study, Parnell considered habitat needs for 20 exploited forest dwellers.

the days of easy fishing in San Diego and young enough to worry that his two children might only be able to see abalone in aquariums. A 1985 UCSD graduate who received his doctorate from the University of Hawaii, he has his own childhood stories of taking the bus from San Diego's North Park neighborhood to Sunset Cliffs on summer days to catch lobster and abalone.

These days he is more apt to call Fish and Game wardens to report people he finds poaching in the conservation area. He's had his share of confrontations since returning to UCSD as a postgraduate researcher in 2000. Despite such clashes, he is trying to do right by fishermen.

"There's a level of information we've achieved that needs to be achieved elsewhere in order to design reserves that are ecologically meaningful," Parnell said. "If you're going to threaten someone's livelihood, you'd better have some good science."

TOUGH CHOICES

Over a series of more than 500 dives, Parnell surveyed the entire La Jolla kelp forest, breaking it down into a grid of 250-square-meter (2,700-square-foot) units. He characterized each unit by its physical components. Was it a rocky and craggy place or sandy and flat? He noted the kinds of organisms that were to be found in these areas and whether those organisms tended to roam or spend their lives in a small area. He measured currents and temperature to see if the square on the grid was subjected to the buffeting forces of the great ocean or relatively protected.

With this information in hand,

Parnell compared the physical data to the known habits of 20 exploited fish and invertebrates, what the Department of Fish and Game would term "species of management concern." He created an algorithm to determine the best possible place to preserve the largest number of fish and invertebrates at the smallest possible size to benefit the greatest number of species as well as people. He plotted on a graph the maximum size beyond which a reserve stops being ecologically useful. It's something he hopes he can show fishermen to demonstrate that no more space would be put off-limits than necessary if his recommendations were followed.

Parnell believes this approach is portable. It can be set up in many areas of the world, modified to reflect local variables and conservation goals, and put into practice. The cost? The dive time of a few people willing to characterize what they see and the cost of running an analysis.

"I'm one person with an assistant and I did La Jolla in one summer," Parnell said.

Parnell's study concludes that the present boundaries of the marine reserve should possibly be expanded. In addition, an area at the southern end of the kelp forest should also be put off-limits.

That's the hard part. If state officials were to follow Parnell's suggestion, the amount of the kelp forest included in marine reserves would go from less than one percent—the small portion overlapping the current conservation area—to about 40 percent. It would extend into the places where generations of fishermen have made their livelihoods.



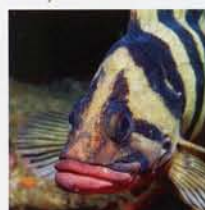
octopus



copper rockfish



warty sea cucumber



treefish



pink abalone



sea urchin



giant keyhole limpet



lingcod



GRASSROOTS PRESERVATION

Potential spillover from a reserve would provide little benefit to sea urchin fishermen like Halmay, whose rock-hugging quarry would not accumulate at its boundaries the way fin-fish would. So Parnell and

Dayton give high praise to organizations like the Sea Urchin Harvesters Association of California for acknowledging the general objectives of a reserve. They point out that the organization has made important moves to self-regulate.

Halmay, in turn, has respect for Dayton, a contemporary who can also count his time in the kelp forest in terms of decades. Such regard makes Dayton rare too.

"I honestly believe Paul's goals and my goals aren't that different," Halmay said. (A former president of the harvesters association, Halmay emphasized that he is only speaking for himself.)

What Halmay says he does not respect is what he considers the lack of scientific underpinning behind many existing reserve designs. He says he is not opposed to setting aside no-take areas as long as there is a sound rationale for doing so.

As for Parnell's analysis, it still leaves a few variables unaddressed, said Halmay. Understanding the drift patterns of sea urchin larvae, for example, is necessary for the long-term effectiveness of a protected area. Parnell and Dayton acknowledge that such complex phenomena do need more study, but believe that it should be policy to err on the side of preservation while such details are uncovered.



Above, Parnell performed more than 500 research dives over one summer for the project in waters south of the Scripps campus.

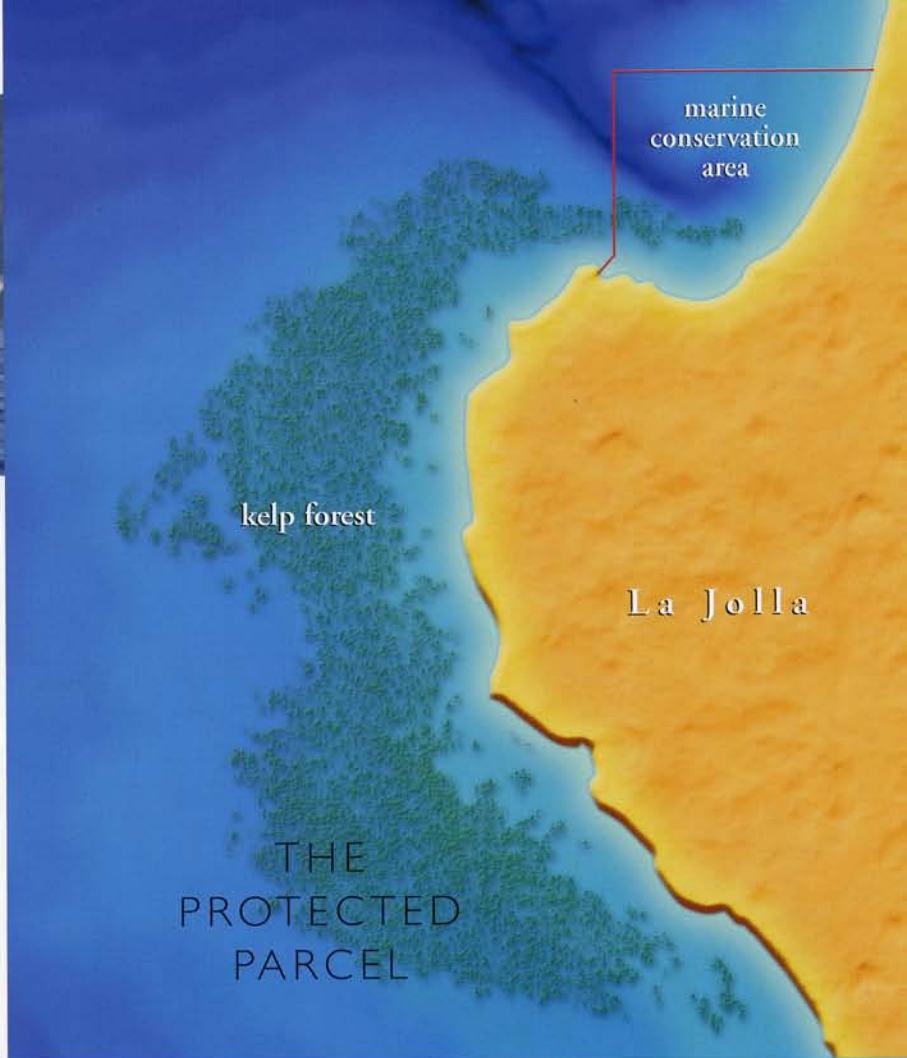
Despite gaps in opinion, Halmay does see a solution that, like Parnell's, could be applied in a number of places. He believes that if a dollar value were assigned to the lost catch and divers like him were compensated accordingly, they could do much of the fieldwork needed for study of fine-scale processes like larval transport. Being virtual field researchers as it is, they could make their livings fishing for data instead of urchins. Parnell and Dayton say they would welcome such an arrangement.

"I like that idea of working together," Halmay said. "All of a sudden, you've got a buy-in from the fishermen."

Some kind of grassroots agreement might be what's needed to manage the San Diego area coastline in the near future. The traveling roadshow of angst that is the Marine Life Protection Act public workshop series isn't expected to take up the question of protecting additional portions of the San Diego coastline for at least two years.

When the chance comes, Parnell's new research may be accepted as the foundation for a new reserve or it might be considered politically infeasible and scrapped.

"It's completely out of my hands, but this is the best input we can provide that process," he said. 🌐



THE PROTECTED PARCEL

THE AREA THAT IS NOW within the La Jolla State Marine Conservation Area has hosted everything from clam fisheries to military exercises in the past century. But when its popularity as a spot for catching large grouper and bass began to deplete fish stocks, the movement to set it aside was born.

As early as the 1950s, Scripps Institution of Oceanography's first dive officer, Conrad Limbaugh, and his successor, Jim Stewart, noticed with alarm a rapid dwindling of large fish, lobster, and abalone in the kelp forest and submarine canyon mouth just off La Jolla Cove.

In 1968, the state of California launched an underwater parks program meant to identify sites with unique marine features along the coast. While La Jolla was being considered as a candidate for park membership, the city of San Diego created the La Jolla Underwater Park in 1970 in a move to gain jurisdictional authority over the area.

The following year, thanks in part to data and lobbying from Scripps researchers, the California Department of Fish and Game created the San Diego-La Jolla Ecological Reserve. The agency designated the bay a no-take zone to protect abalone, lobster, and squid populations in the area.

In 2005, the reserve was renamed the La Jolla Marine Conservation Area. The redesignation of the two-square-kilometer (0.76-square-mile) parcel reflects the fact that commercial bait fishing for squid is allowed under certain conditions. During the reclassification, the agency renamed another marine protected area off Point Loma the Mia Tegner State Marine Conservation Area in honor of Scripps marine ecologist Mia Tegner, who died in 2000 in a diving accident. 🌐