Collecting Sea Palms: Planning for Sustainable Use in a Variable Environment

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BACKGROUND

Up until recently, few in mainstream America ate seaweed, or wanted to. Edible seaweed was a concept relegated to, for all practical purposes, Asian and Native American cultures and cuisines. Times have changed. Today, bulk bins at health food stores overflow with kombu, nori, wakame, dulse and all sorts of other kinds of "sea vegetables," while high-end vegetarian restaurants offer entrées as innovative (and unexpected) as seaweed strudel.

The allure for health-conscious Americans is obvious: seaweeds are high in iodine, iron, phosphorous, potassium, manganese, copper and zinc, as well as vitamins A, B, C, E and K. They are low in calories, and low on the food chain. Although not technically plants, in most people's minds, seaweed counts toward the "fruits and vegetables" part of the food pyramid.

S. Thompson/SSU

A solitary sea palm growing on top of a mussel.

PROJECT

In both the states of Washington and Oregon, all commercial harvesting of edible seaweeds is prohibited, in large part because of the ease with which they can be overexploited. In California, the current regulatory landscape is quite different: The edible seaweed "fishery" is open to anyone who purchases a $100 annual permit. There are no limits on the number of fishery participants, no limits on the method or season of collection, the species harvested or pounds landed.

S. Thompson/SSU

Dried sea palm fronds for sale.

The goal of this project was to evaluate the sustainability of current harvesting practices for the state's major edible seaweed, the sea palm, *Postelsia palmaeformis*. The center of the sea palm's range, and its commercial harvest, is in Mendocino County. For this reason, experiments mimicking different collecting methods and their effects on the plants were conducted in this county.

LANDINGS DATA

Based on California Department of Fish and Game logbook data analyzed by the scientists for this project, the sea palm comprised about 45 percent of all edible seaweed landed in California between 2002 and 2007. Reflecting rising consumer demand, edible seaweed landings increased from an annual average of 3.4 tons between 1997 and 2003 to one of 14.6 tons between 2004 and 2007. These trends provide further motivation for wanting to investigate more completely the sustainability of the sea palm fishery, as currently practiced.

GEOGRAPHIC VARIATIONS IN GROWTH AND REPRODUCTION

Because knowing the plant's basic biology is the first step in developing management recommendations, the scientists began their project by comparing sea palm phenology, growth and reproduction at four sites—Vancouver Island in British Columbia, Central Oregon, Mendocino County and San Luis Obispo County—representing the northern, central and southern portions of the species' range.

At the sea palm's northern range, biologists observed a shorter growing season, delayed reproductive maturity, lower total plant biomass and lower reproductive output than at southern sites, presumably due to the shorter growing season at higher latitudes.

In Mendocino County, growth and reproduction were, as predicted, maximal, as compared to the other sites. Notably, the sori (spore-producing portions of the blades) were larger, and the plants taller than at the northern and southern sites. The sea palm's distribution within the intertidal was also the broadest, meaning plants were found at both higher and lower elevations within the zone. As a result of all these factors, the species' biomass and its reproductive output were the greatest at the Mendocino site.

At the sea palm's southern range, scientists documented higher mortality rates in summer, a lower total biomass and lower reproductive output, despite the fact that there was also a longer growing season and earlier reproductive maturity.

COLLECTION IMPACTS

The second phase of the project involved mimicking three different harvesting practices on frond re-growth and reproduction to iden-

Sea palm groves in Mendocino County (left and right). A cut sea palm (center).

tify the greatest and least sustainable collection methods. For these experiments, blades were either trimmed in early June (before the onset of the plant's reproductive cycle), late July (after its onset), in both June and July or not at all. All blades were cut above the meristem to avoid lethal "clear cutting" of the kelp palms. The meristem refers to undifferentiated plant tissue. Meristematic cells are analogous to stem cells in animals.

The hypothesis, validated during the experiments, is that late season single harvesting and especially multiple harvesting stunt re-growth and reproductive output, ultimately causing reduced recruitment the following year.

More specifically, clipping fronds more than once or late in a season was shown to limit re-growth and both delay and reduce spore production. None of these effects occurred when fronds were cut only once in the season before the palm's development of reproductive tissue.

Biologists are currently looking at what happens if single or multiple trimmings are repeated year after year, the hypothesis being that it is multiple rather than single early cutting that will eventually lead to local population extinctions.

MANAGEMENT RECOMMENDATIONS

Based on their findings, biologists recommend a spatial management approach to the sea palm fishery, in which permit holders would only be allowed to collect from a particular grove of sea palms. They also recommend allowing only one early harvest per season and to prohibit "clear cutting" of sea palms, in which plants are cut below the meristem.

These recommendations were shared with the California Fish and Game Commission, as part of a scientific communication of the potential impacts of commercial take of marine algae within proposed marine protected areas along Northern California. The lead scientist of this Sea Grant-funded work is also a member of the science advisory team for the Marine Life Protection Act process along the North Coast study region.

APPLICATIONS

What has been learned in this project for the sea palm is generalizable to other annual macro algae with similar life histories, including bull kelp (*Nereocystis luetkeana*) – the major kelp forest species in Northern California and Oregon.

COLLABORATOR

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STUDENTS

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PUBLICATIONS

Balancing Conservation and Commercial Use of Wild Seaweed: Growth and Reproductive Output of the Sea Palm, *Postelsia Palmaeformis*. Submitted to Marine Ecology Progress Series. 2009. Thompson, S.; Nielsen, K.J. and Blanchette, C.A.

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