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Careful management of this useful but fragile resource is recommended to ensure benefits to humans and wildlife.

MANAGING BULL KELP FORESTS

A SUMMARY OF NEW SCIENTIFIC ANALYSIS:

Springer, Y., Hays, C., Carr, M. and Mackey, M. 2006. "Ecology and Management of the Bull Kelp, *Nereocystis luetkeana*: A Synthesis with Recommendations for Future Research."

KELP ARE LARGE BROWN ALGAE that grow like forests along shallow, rocky coastlines around the world. Large floating kelp beds provide a wealth of benefits and services both to humans and to the marine ecosystem. In the United States, commercial interest in kelp from the pharmaceutical and aquaculture industries has increased the extraction pressure on these ecosystems.

With support from the Lenfest Ocean Program, Yuri Springer and colleagues recently reviewed and synthesized the ecology of bull kelp (*Nereocystis luetkeana*). They conclude that bull kelp is much more risky to harvest than the more common giant kelp (*Macrocystis spp.*) and thus regulation of bull kelp extraction must closely control harvest methods and locations. This *Lenfest Ocean Program Research Series* report is a summary of Springer et al.'s findings.

OTTERS, SHORE BIRDS, FISH AND US: WHAT KELP PROVIDES FOR HUMANS AND THE ECOSYSTEM

Kelp forests are important habitat for a variety of marine species. Fish use kelp forests as refuge from predators and as nursery areas for their young. Sea otters and shore birds forage for prey within the beds. In addition to its value while alive, broken kelp that washes ashore on sandy beaches or falls into submarine canyons provides important nutrients and habitat for other plants and animals.

Kelp forests also benefit human interests. The physical barrier along the coastline created by kelp forests dampens ocean waves, thereby reducing coastal erosion. Many of the species that are important to commercial and recreational fishermen, scuba divers, bird watchers and kayakers depend on kelp forests. Kelp is also eaten as a health food, used in herbal supplements, and is now being added to lotions and skin treatments. It is also used as feed in commercial abalone farms.



Giant Kelp

MOWING GRASS VS. CUTTING FLOWERS: THE DIFFERENCES BETWEEN GIANT KELP AND BULL KELP

The impacts of kelp extraction depend very much on the species and means by which it is removed. Two species of kelp form forests along the West coast of the United States. Giant kelp (*Macrocystis spp.*), above, dominates the landscape, but in the more northern coastal regions of Oregon and Washington a second species, bull kelp (*Nereocystis luetkeana*), right, is vital to the health of the coastline. Historically, giant kelp has been the focus of commercial extraction, primarily by the pharmaceutical industry. Large harvesting vessels remove the top two meters of the plants across large swaths of forest. The direct impact on the giant kelp forests is considered minimal because giant kelp is a perennial plant with its reproductive organs at the base of the plant. Thus, the kelp canopy is replaced by fronds growing up from the bottom (similar to the regrowth of grass after a lawn is mowed). However, less is known about the indirect impacts of this extraction on the fish and invertebrates that use the forest canopy as nursery habitat.

The demand for kelp is increasing, thus there is emerging interest in collecting bull kelp along the Oregon and Washington coasts. Though relatively smaller in volume and geographic extent than giant kelp extraction, the removal of bull kelp is problematic. Extraction is primarily by hand from a boat and, like giant kelp, limited to the top two meters of the forest. However, the source of buoyancy that keeps the plant upright, and the reproductive organs of bull kelp, are located at the top of the plant and are thereby removed when the upper portion is cut off (similar to cutting off a flower). Although bull kelp is an annual, individual plants must reproduce before they are harvested for forests to persist from one generation to the next. Because most bull kelp spores are thought to move only very short distances, unsustainable extraction in one area likely cannot be mitigated by healthy kelp forests in nearby regions.

KEEPING KELP FORESTS HEALTHY: RECOMMENDATIONS FOR MANAGING BULL KELP EXTRACTION

Due to the ecological differences between giant kelp and bull kelp, if bull kelp extraction is regulated in the same manner as giant kelp, the result will be unsustainable. Fortunately to date, commercial extraction of bull kelp has been limited. As a result, however, few resources have been invested in the development and implementation of stock assessment programs, harvest record databases or management guidelines for bull kelp. Current management regulations for bull kelp vary widely, and appear to be consistent only in the fact that they are based on few, if any, scientific data.

Before increased commercial extraction of bull kelp is approved, managers should develop extraction regulations that account for the species' unique ecology. Regulations should address extraction methods to ensure that bull kelp can reproduce effectively, but should also account for the varied ecosystem functions of the species.

Regulations should:

- **Address extraction methods** to ensure that bull kelp can reproduce effectively;
- **Account for the varied ecosystem functions** of the species; and
- **Coordinate throughout the species' range** to ensure that a broad-scale ecosystem approach is used.

If bull kelp extraction is regulated in the same manner as giant kelp, the result will be unsustainable.



Bull Kelp



LOOKING TO THE FUTURE: RECOMMENDATIONS FOR ADDITIONAL RESEARCH

Additional resources should be invested in developing better scientific knowledge of bull kelp and its ecosystem functions. This research should include:

- Developing region-wide stock assessment programs and harvest record databases, potentially using aerial digital imagery as a tool;
- Determining the impacts of different harvesting methods, such as using hand vs. mechanical extraction, removing the whole plant vs. a portion of the blade, harvesting plants from different locations within the plant beds, and timing the harvest to occur after reproduction;
- Evaluating the relative vulnerability of forests based on their size and isolation, including how kelp spores disperse and how interconnected genetically are different populations;
- Assessing how fish, invertebrates and other algae use bull kelp beds as habitat during different stages of their lives;
- Accounting for the nutrients and habitat that bull kelp provides to plants and animals in nearby ecosystems when it is transported by storms or other events.

About the Report

Springer, Y., Hays, C., Carr, M. and Mackey, M. 2006. "Ecology and Management of the Bull Kelp, *Nereocystis luetkeana*: A Synthesis with Recommendations for Future Research" is a thorough review of existing knowledge regarding bull kelp. The report synthesizes: (1) the ecology of bull kelp and its role in coastal ecosystems; (2) the past and present human uses of and threats to this species; and (3) the past and present approaches to managing bull kelp. It identifies gaps in scientific knowledge and recommends priority research needs to inform management of the human activities that impact the species. The report has been peer reviewed and is available at www.lenfestocean.org/publications. A scientific summary of the report is being prepared for publication in a refereed journal.

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Lenfest Ocean Program: Protecting Ocean Life Through Marine Science

The Lenfest Ocean Program brings the best scientific research to bear on identifying the causes, consequences and solutions to problems facing the global marine environment.

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