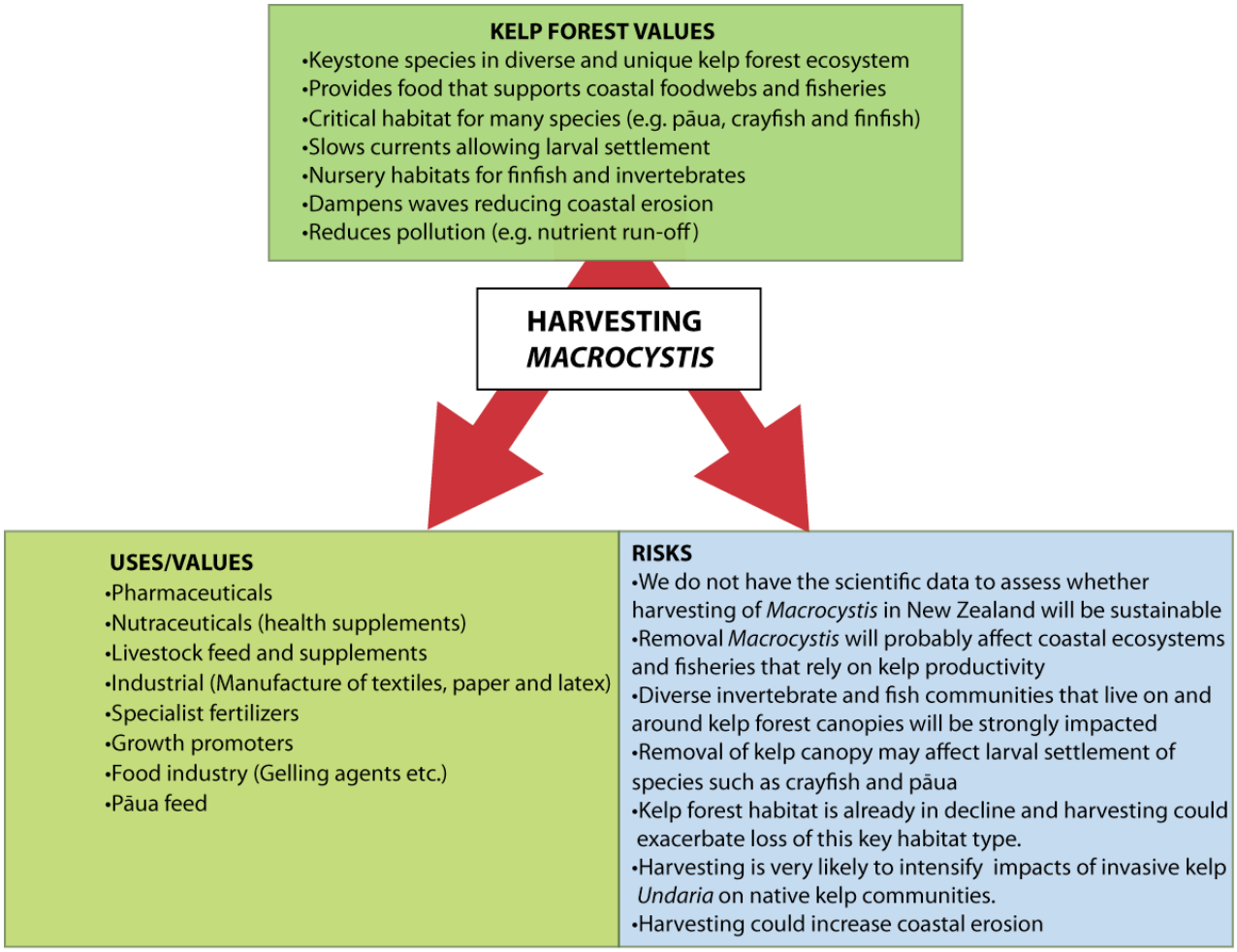
9th February 2009

Should giant kelp be managed under the QMS?

The Ministry of Fisheries is currently seeking submissions on a proposal to enter attached giant kelp (*Macrocystis pyrifera*) into the Quota Management System (QMS). If the Minister decides not to introduce giant kelp into the QMS, it will become an open-access fishery. There is a potential market for giant kelp in New Zealand and overseas, although economic gains from harvest need to be weighed against the potential ecological impacts. Much of the discussion around the potential for harvesting New Zealand giant kelp refers to harvesting of the species off the Californian coast. In this document we summarize key differences between kelp forests in California and New Zealand. We also discuss potential ecological implications of kelp harvesting and argue for future harvesting activities to be restricted in extent and take.

Weighing up ecological and economic values

A key difference between *Macrocystis pyrifera* and other species within the QMS is that this kelp provides critical habitat for other species (e.g. fish, invertebrates, birds), many of them being of enormous value (economically, culturally and ecologically). In addition to providing a habitat, giant kelp is also an important source of food for a large range of marine animals (Graham 2004). Any economic benefits gained from harvesting giant kelp must be carefully weighed against the risks of harvesting affecting the keystone role of this species in New Zealand's coastal seas.



Harvesting a habitat. A good idea?

Giant kelp forms forests that provide habitat for a diverse community of seaweeds, invertebrates, fishes and marine mammals. The resulting ecosystems are unique and very productive and provide for high value fisheries for crayfish, finfish and pãua. Taking a low value product (e.g. kelp tissue for stock feed or fertiliser) from these systems is analogous to a dairy farmer selling the grass in his paddocks for a low price when it is required for milk production. Removing food and habitat through harvesting giant kelp has the potential to reduce the productivity of high value fisheries.

Is Macrocystis a high value product?

Alginates are the primary product provided by the harvest of *Macrocystis* and are used as an ingredient in pharmaceuticals, as gelling agents in the food industry, and in the manufacture of textiles. An alginate industry may be feasible in areas where large amounts of *Macrocystis* can be harvested, such as in California. However, kelp beds in New Zealand are relatively small and are unlikely to be capable of sustaining the high levels of harvesting required to make such an industry economical. We could not find evidence of successful industries based on other products derived from *Macrocystis* listed in the Ministry of Fisheries Initial Position Paper (IPP). Evidence is required on the probable value of industries based on "high" value products listed in the IPP to New Zealand before stakeholders can make a meaningful evaluation of this fishery.

But if it works in California then why not here?

Commercial harvesting of giant kelp off the coast of California has been occurring for more than a century, and has at times reached a harvest of more than 170,000 tonnes wet weight (although the current take is ~ 4,000 tonnes; http://swr.nmfs.noaa.gov/fmd/bill/kelp.htm). The harvest is used mostly for alginates, and in the 1980's the fishery was worth an estimated $40 million. The recent dramatic decrease in the total take of giant kelp in California is apparently due to harvest not being economically viable. Although there has been scientific study of the potential implications of this harvest on kelp forest ecosystems, it has proven very difficult to tease apart changes in the ecosystem that are due to harvesting, from changes that have occurred due to climate, ocean currents, fishing of kelp grazers and their predators, sedimentation and pollution (Dayton et al. 1998, Airoldi et al. 2008). The extent of kelp forests off the Californian Coast are decreasing, probably due to the combined effects of these impacts. We think that it is misleading to draw direct comparisons between kelp forests in California and those off the east coast of the South Island. Key differences between these habitats are outlined below.

Californian kelp forests	**South Island kelp forests**
Very large in extent – individual patches up to 10 km^2 (Dayton et al. 1998)	Small and discrete – individual patches typically <100 m^2. Large beds are only found along the North Otago coast and are <1km^2 (Fyfe et al. 1999)
Latitude 33°N – high light, kelp growth not limited by light (Zimmerman and Kremer 1986, Kain 1989)	Latitude 41-47°S – relatively low light, kelp growth limited by light (Kain 1989, Hepburn et al. 2005 and 2007).
Relatively consistent growth year round and growth only slows in summer due to low seawater nitrogen (e.g. Zimmerman and Kremer 1986)	High variability in growth rates among sites due to light, nutrients and water motion. Respond to seasonal fluctuations in light with maximal growth during spring (Brown et al. 1997, Hepburn et al. 2005 and 2007)

What's happening closer to home?

It is interesting to note that in the 1960's and 1970's kelp harvesting resumed in coastal Tasmania – an environment with conditions more like those here in New Zealand. The operation failed, as there was not enough kelp available, and harvesting was limited to one time per year due to growth and environmental constraints. There has been a 70% decline in the extent of kelp forests in Southeast Australia and Tasmania over the last 90 years and this decline has been linked to the decline of abalone and finfish species. There are now plans to make *Macrocystis* kelp forests an endangered habitat type and kelps forests are listed alongside the Great Barrier Reef as a Special Marine Area by the Department of Environment, Water and Heritage of Australia (http://www.environment.gov.au).

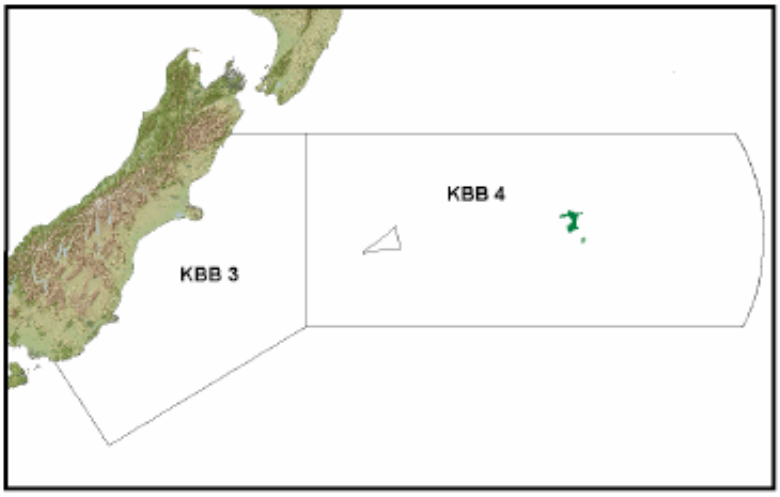
At what scale should the kelp be harvested in New Zealand?

The Ministry of Fisheries really has no choice but to introduce giant kelp to the QMS, as the alternative is to make it an open access fishery. However, we are concerned over the proposed management strategy for this species.

<u>The proposed management areas are very large in extent (see below).</u>

Giant kelp growth rates vary significantly over very short distances, due to differences in currents, light levels, nutrient levels, and other environmental factors (Hepburn et al. 2007). These differences are likely to make some kelp forests more vulnerable to negative effects of harvesting. The only study to date on harvesting *Macrocystis* in New Zealand was conducted in Akaroa Harbour (Pirker et al 2000). In our opinion it is unwise to extrapolate these findings to an area that stretches the length of the South Island, and out to the Chatham Islands. Nothing is known about how harvesting could impact on more southern kelp forests where most *Macrocystis* biomass is located and therefore is the logical location for a fishery. Strong differences in the growth of *Macrocystis* can occur over a scale of metres and it is expected that the response to harvesting of northern kelp forests in wave sheltered situations will be very different from offshore kelp forests on open wave exposed coastlines 250 km to the south.

Proposed QMAs for attached bladder kelp in FMAs 3 and 4



<u>The proposed harvesting season is from 1st October to 31st September (i.e. year-round).</u>

Pirker et al. 2000 suggest that sustainable harvesting of *Macrocystis* is only possible during two intervals per year in late spring and during autumn. It is unlikely that a biannual harvest rule-of-thumb will apply to other areas.

Suggested action

We suggest that, upon introduction to the QMS, the Total Allowable Catch (TAC) for *Macrocystis* be set at zero until:

1. Market research is completed by an independent expert to determine a clear economic value of a *Macrocystis* fishery in FMA's 3 and 4.
2. Risk assessment analyses are conducted by an independent expert to determine if risks inherent in a *Macrocystis* fishery outweigh the possible benefits.
3. Ethical and independent research is conducted to determine the likely impacts of harvest on *Macrocystis* and its' associated values in a range of areas in FMAs 3 and 4.
4. A management plan is developed that minimise adverse affects of kelp harvesting on *Macrocystis* and its' associated values (e.g. Vasques 1995).
5. Identification and protection of kelp forest areas of outstanding value (e.g. the offshore kelp forests north of Otago Peninsula).

If a fishery is deemed to be unsustainable or too risky we suggest that the *Macrocystis* fishery should be closed and that provision be made for the protection of attached *Macrocystis* from future fishing activities.

If a sustainable fishery is found to be possible we would suggest that limited harvesting should begin using an adaptive management approach (i.e. learning by doing). This should only occur where good evidence already exists that harvesting is likely to be sustainable for the kelp being harvested and for associated ecosystems and fisheries. Extreme care should be taken with the management of this species due to its' importance to many species that live in our coastal seas.

Submissions relating to this IPP close on 21st September 2009. A copy of the IPP can be found at www.fish.govt.nz by clicking on the 'consultations' link.

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