

Seaweeds: sustaining habitats & harvest

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NIWA- Greta Point



Lessonia forests – Chathams



Far north - fringing reef



*Rimurapa – Durvillaea -
Kaikoura*



Cook Strait tidepools

Macrocystis forests – Cape Campbell



Lottin Point

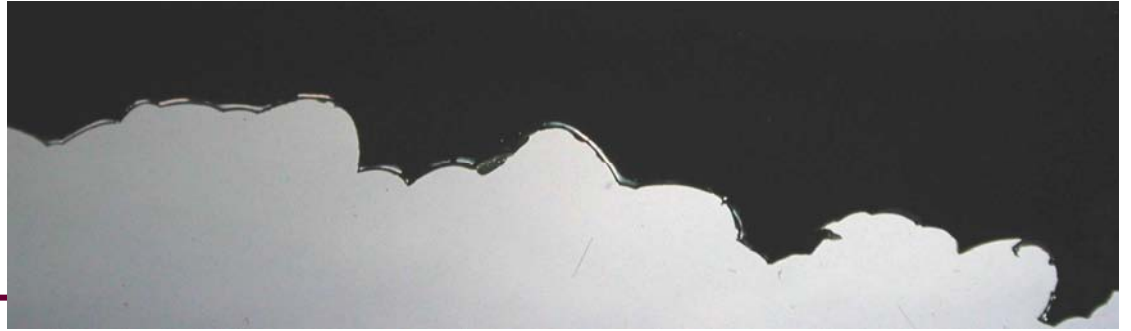
Seaweeds: sustaining habitats & harvest

- Ecological importance of seaweeds
 - Food chains
 - Habitat
 - Settlement cues
- Threats
- Case studies



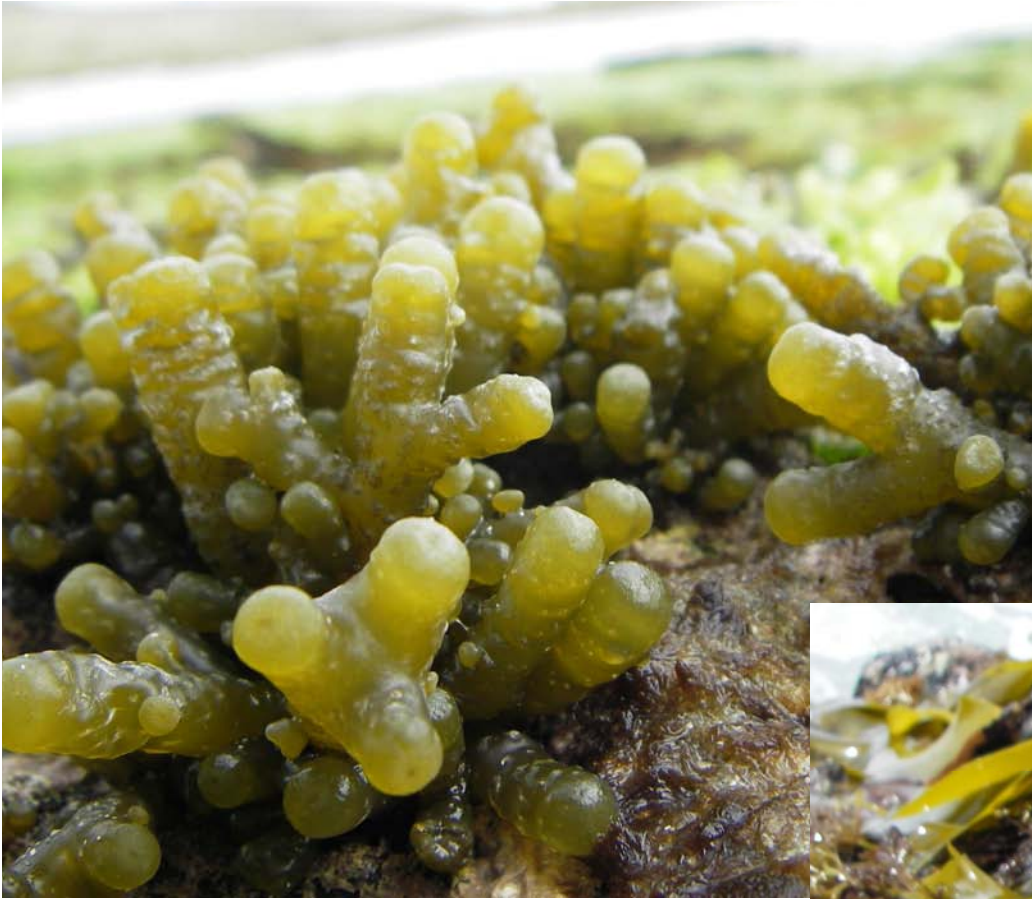
Food chains

- eaten – herbivores
- dissolved, particles – filter feeders
- surfaces - bacteria



drift & storm cast seaweed
→ coastal food chains





gums, slimes
→ coastal food chains

Habitat – structure, surfaces

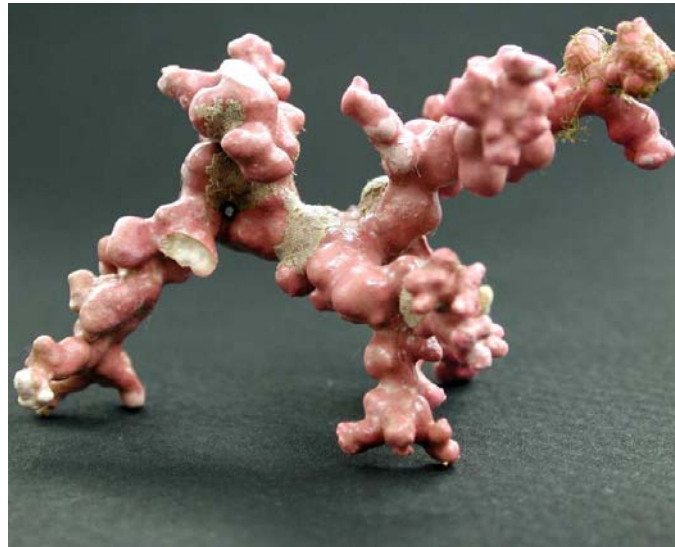




- habitat - 3D space
- forest structure modifies environment –
 - light, water motion, nutrients



coralline algae -



- many different growth forms
- jointed, crusts, free-living

Settlement cues

Coralline algae:

- provide habitat, refuge and grazing areas for numerous fish and invertebrates
- found from the Antarctic to the tropics
- intertidal to 270m
- Release chemicals that trigger settlement

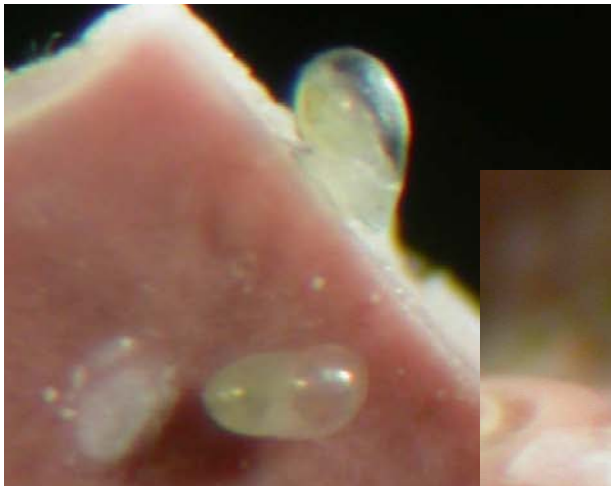


Act as settlement inducers for marine invertebrates

- paua



- paua larvae settle on coralline algae
- larvae propel themselves, 'tasting' the surface
- recognise a unique chemical on the surface of the corallines
- dependence has been observed in 13 species of abalone/paua



Seaweeds: sustaining habitats & harvest

- Ecological importance of seaweeds
- Threats
 - Water quality –
 - sediment/water clarity
 - pollution – freshwater, chemicals, enrichment/sewage/fertilisers
 - Invasive species
 - Overharvest
 - seaweeds, herbivores, predators....
 - Coastal zone developments (marinas, housing...) reclamation, shoreline erosion
- Case studies



Water quality

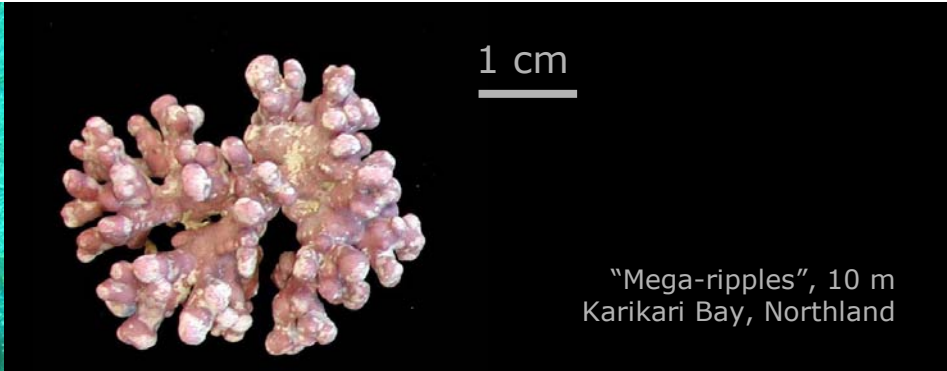
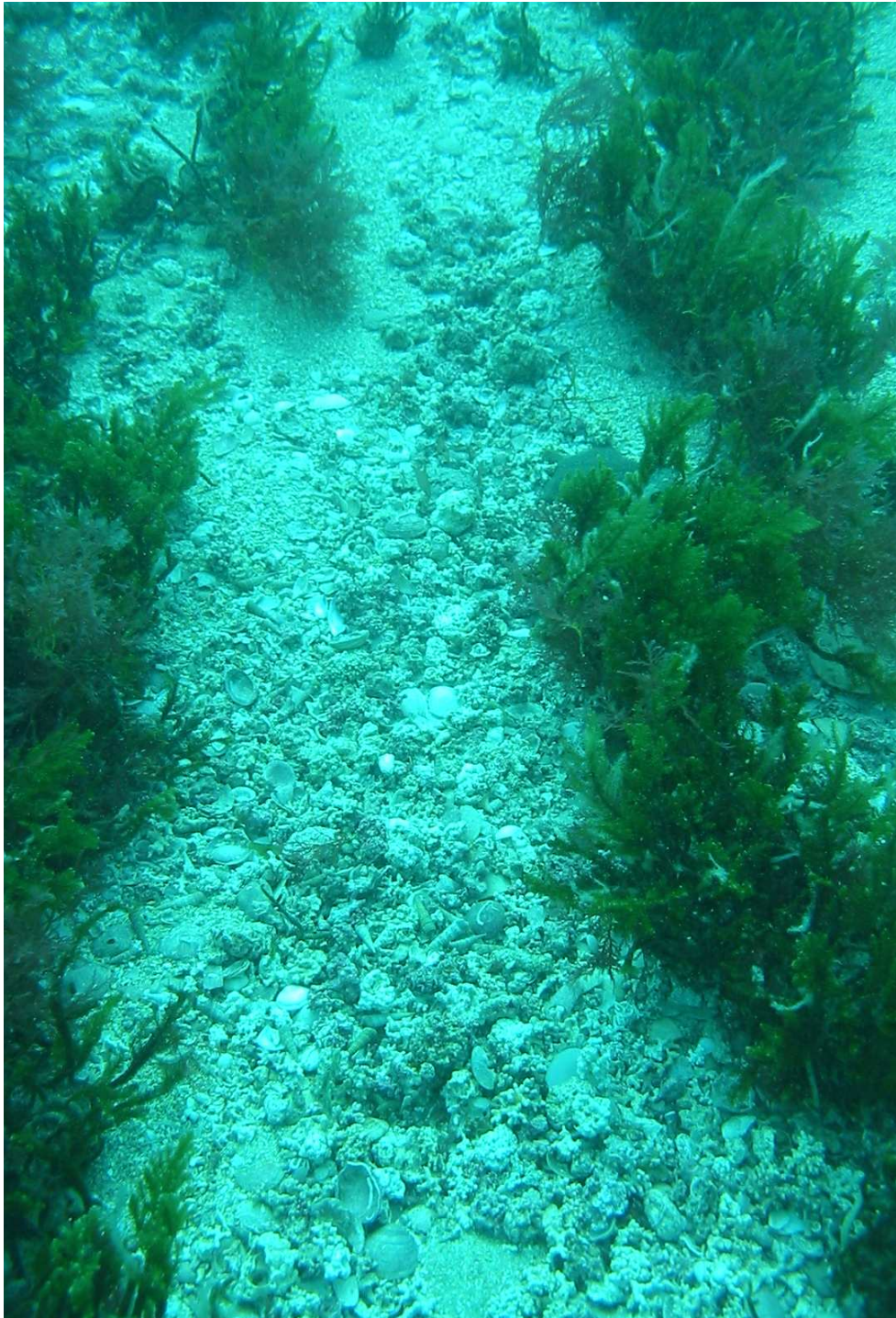
- Sediment
- Freshwater
- Pollutants - chemicals, enrichment - sewage/fertilisers
-



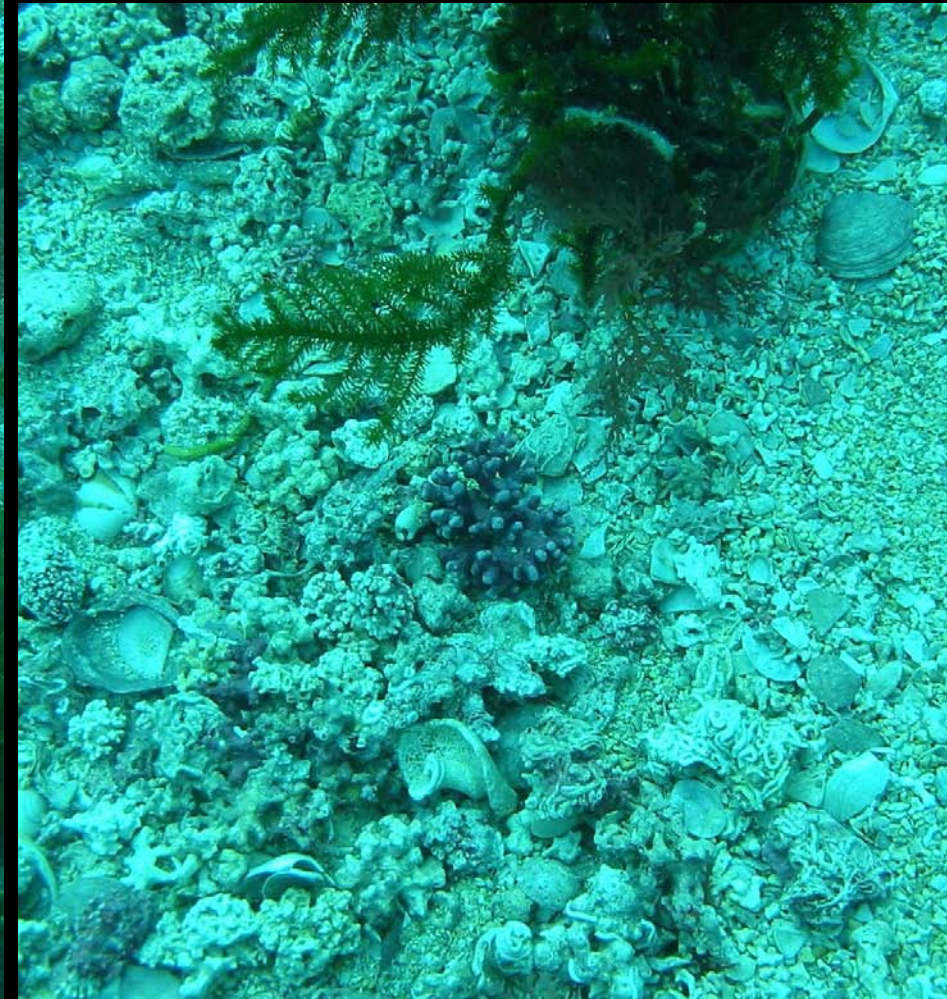


settlement → recruitment
→ growth → reproduction





"Mega-ripples", 10 m
Karikari Bay, Northland



Field photos: D. Freeman, DoC

Invasive species

- *Undaria*
- Other species of seaweeds
- Other invasives



Undaria pinnatifida - WAKAME



1-3m high
low intertidal subtidal
(20+m)





Napier



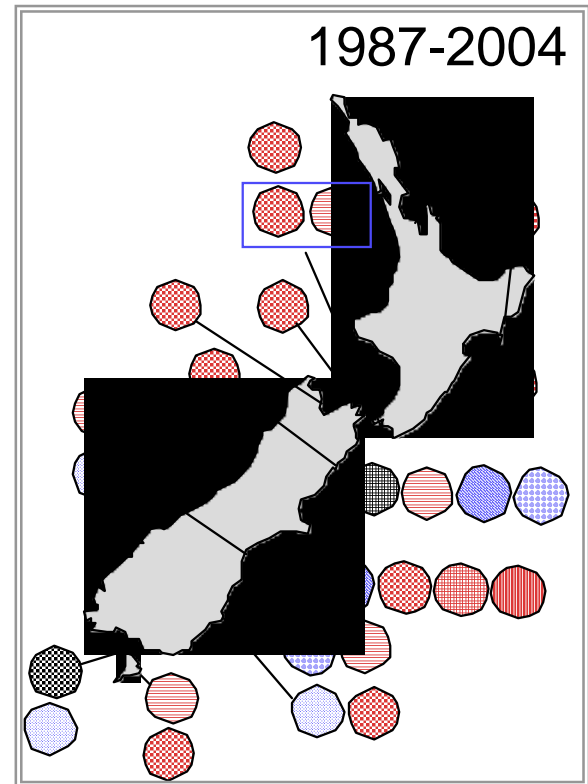


Timaru





Moeraki



Undaria pinnatifida

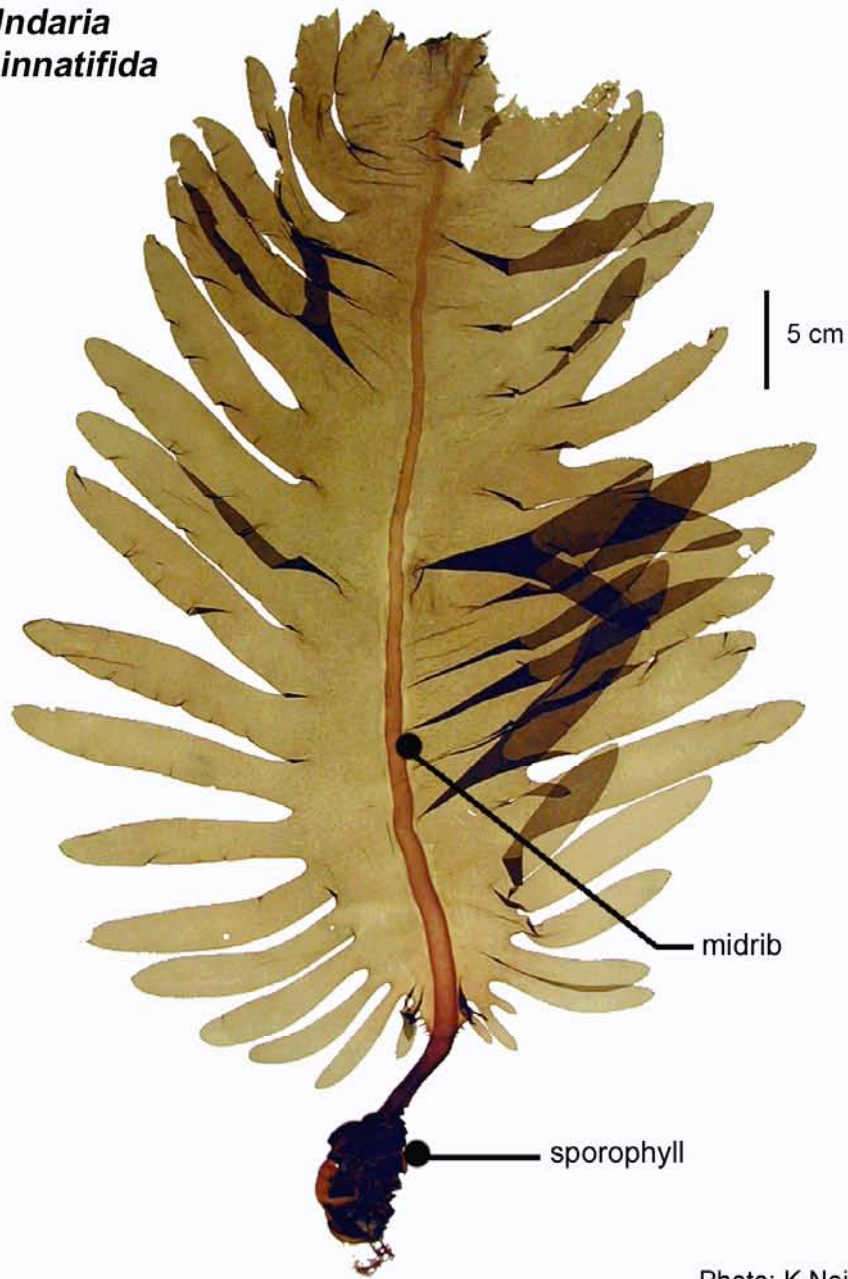


Photo: K Neill

Ecklonia radiata



Photo: K Neill

Colpomenia bullosa

- Leigh Marine Reserve (first record 1980); Auckland; north of Gisborne; Mahia; Napier; Wellington, northern South Island.
- strongly seasonal species with a macroscopic life-history phase that disappears over summer, autumn and early winter.



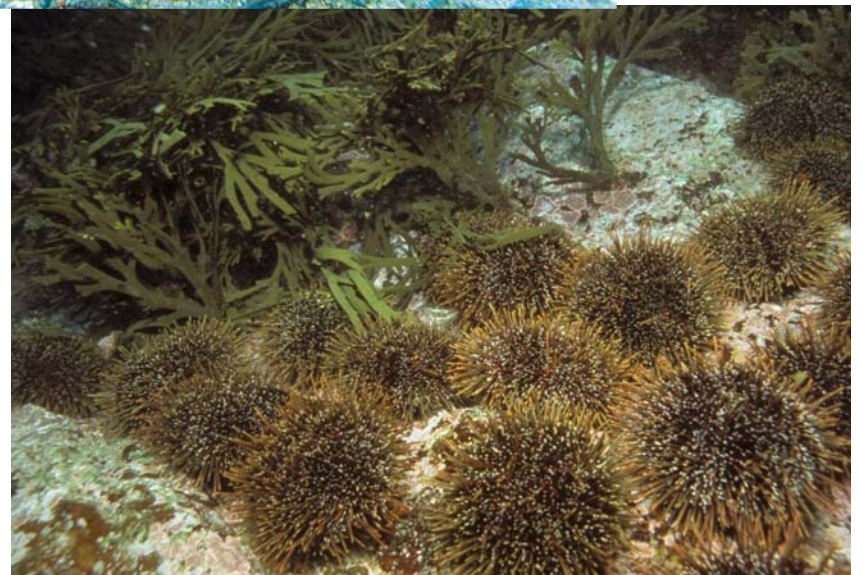
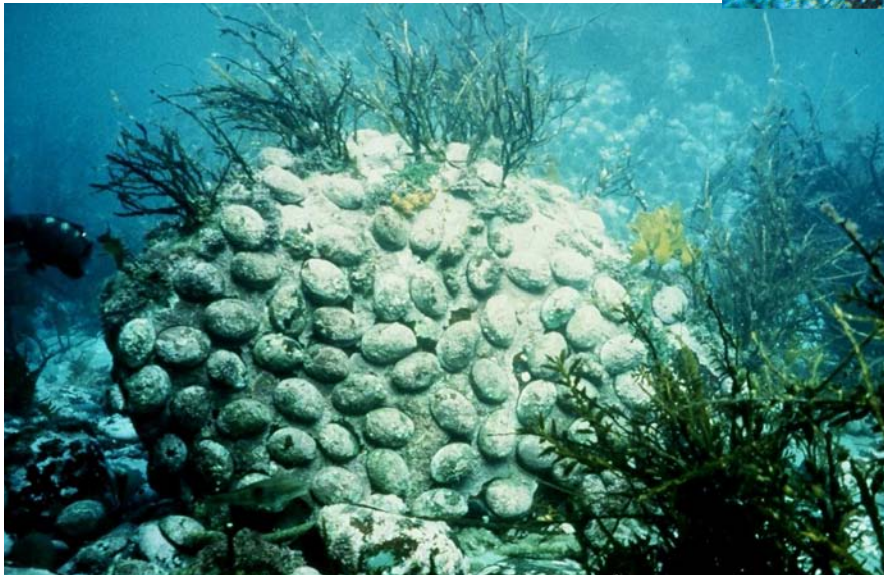
Grateloupia turuturu

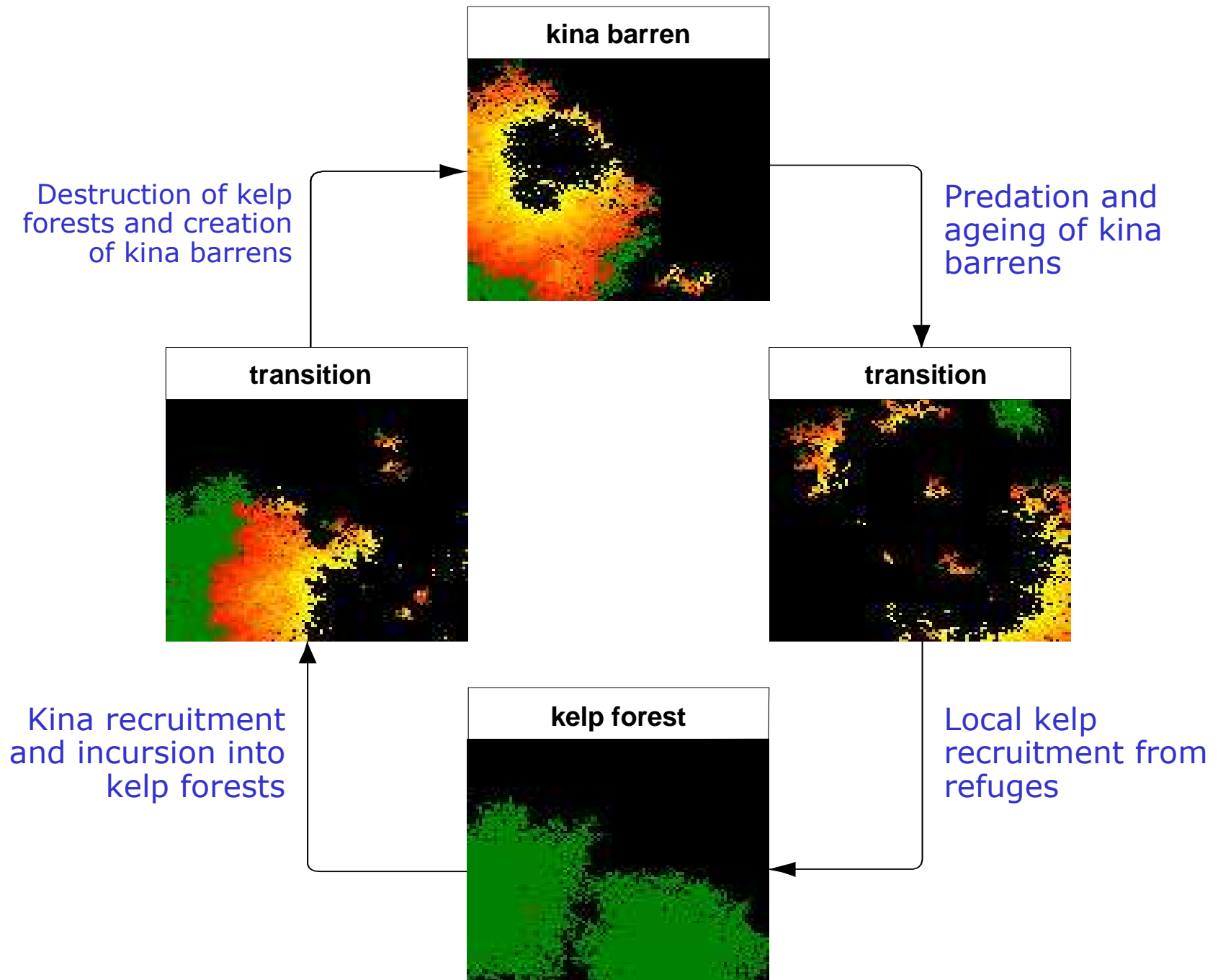
- recently found in Wellington – known serious problem in USA, France, Mediterranean....



Impacts of harvest

seaweeds
herbivores
predators





Seaweeds: sustaining habitats & harvest

- Ecological importance of seaweeds
- Threats
- Case studies
 - Life histories
 - Karengo
 - Rimurapa
 - *Gracilaria*
 - General comments





Rimurapa

Separate male & female plants

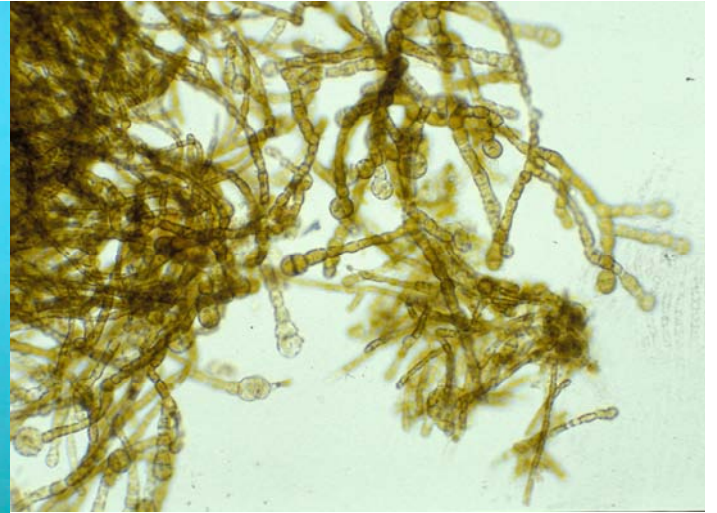
Eggs & sperm →→ zygote

→→ new recruit

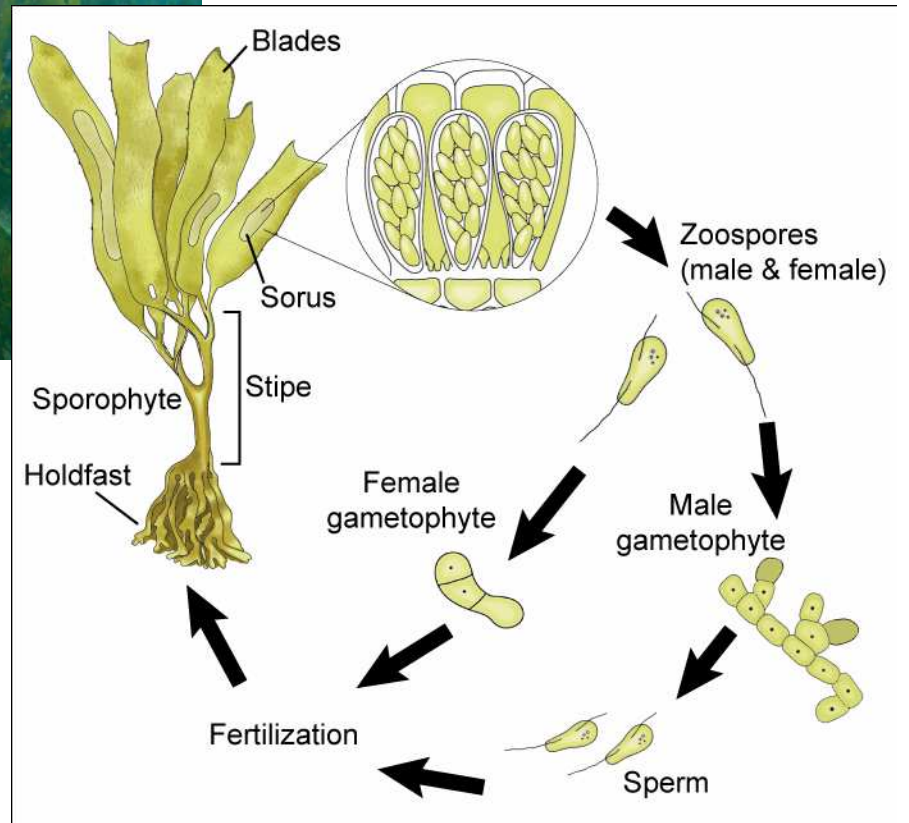
A close-up photograph of kelp blades, showing their characteristic yellowish-brown color and elongated, slightly curved shape. The blades are densely packed and overlap each other, creating a textured appearance. The lighting is bright, highlighting the natural color and texture of the seaweed.

Kelp

2-stage life history



Heteromorphic life history



Karengo

2-stage life history
lots of ways to reproduce....



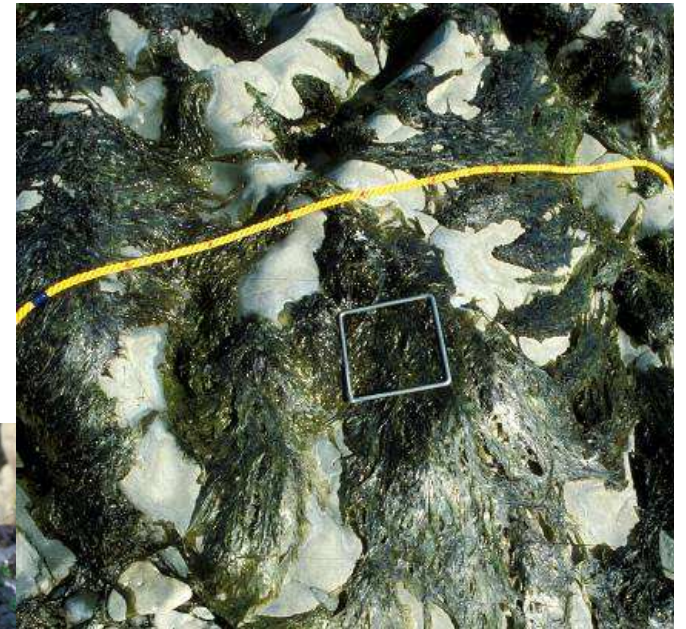
Case studies- Karengo

Karengo = *Porphyra*

- taonga species
- from mid 1980s commercial wild harvest around Kaikoura
- experimental work on harvest impact



- Seasonal growth data
- Impact of harvest on recovery and yield:
 - methods: complete removal or cutting
 - number of harvests: 1, 2 or 3
 - time of first/second harvest: (July-Sept)



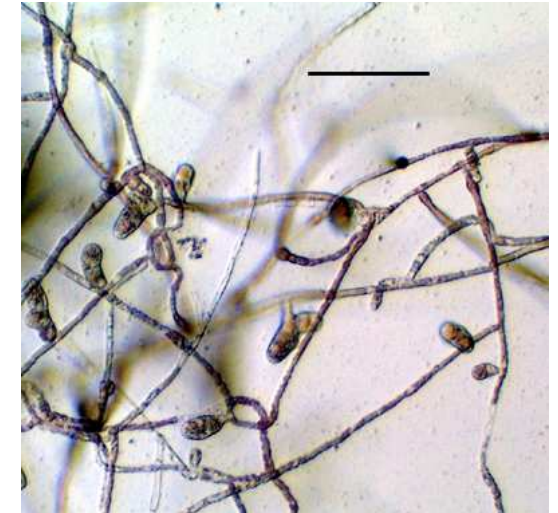




Complex life histories and reproduction - karengo

Blade phase

- spermatangia
- phyllospores
 - zygospores
 - neutral spores
 - agamospores
- archeospores
- endosporangia
 - endospores
 - propagules

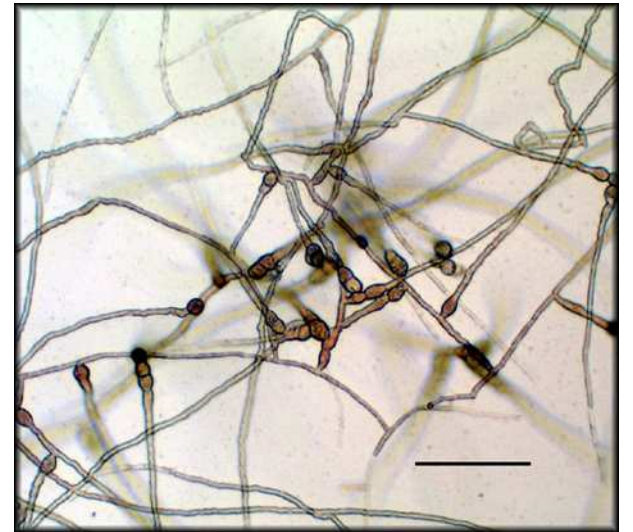
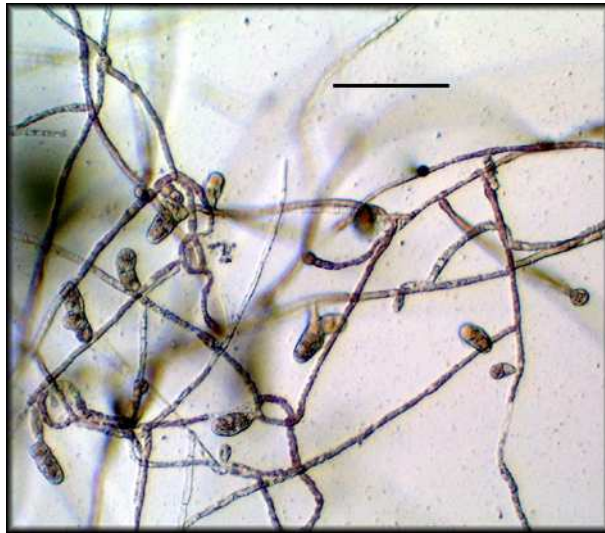
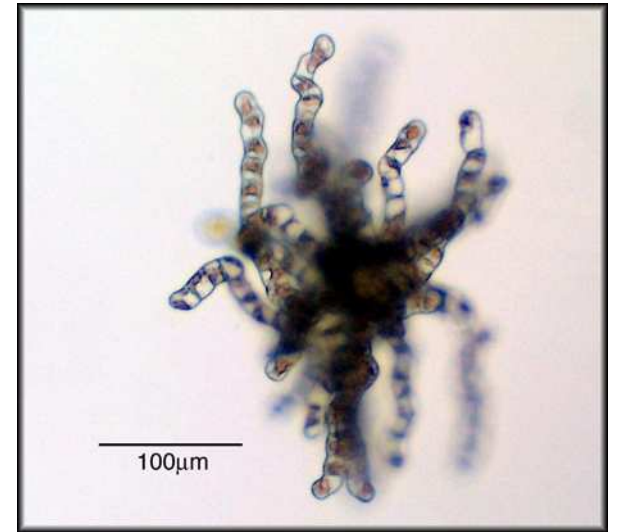
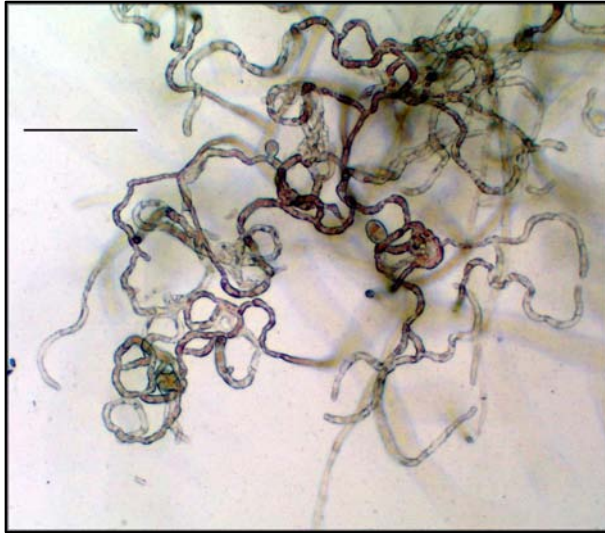


Conchocelis phase

- conchospore
- neutral conchospore
- archeospore
- protothallus

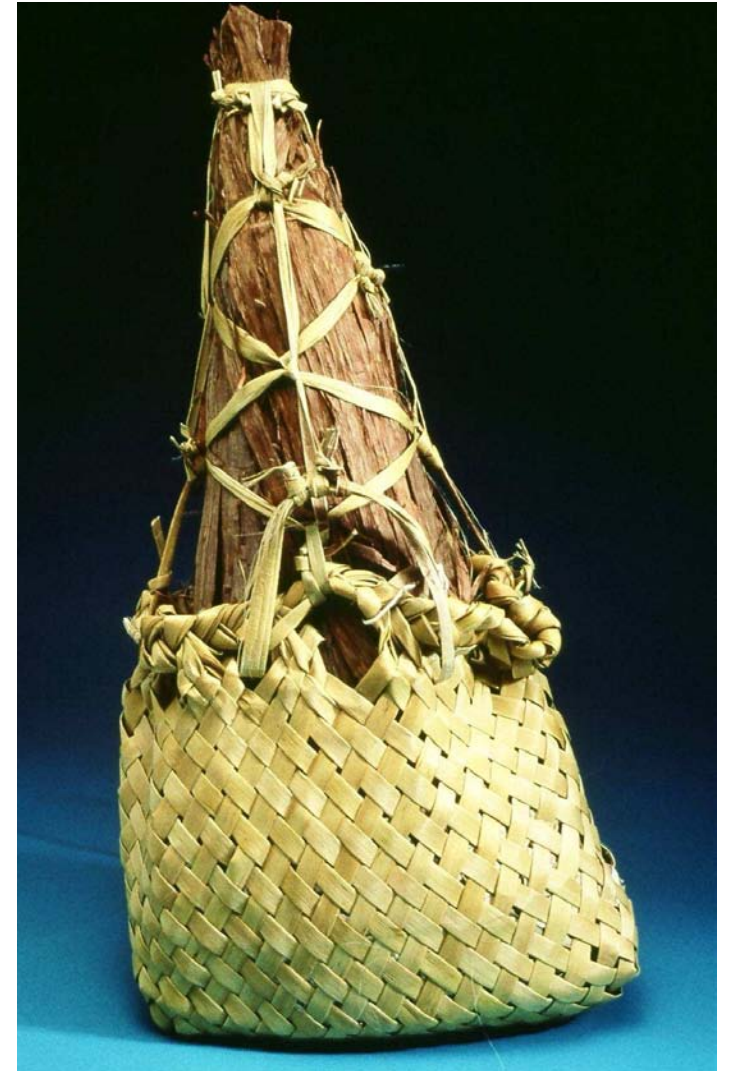


Nelson, Brodie & Guiry 1999
Jour. Appl. Phycol. 11: 407-
411.





Rimurapa - Poha titi



Harvest Trial – rimurapa (winter fertile – April-August)

Harvest completed	Density of recolonising kelp	Date recorded
May	1450	Oct
June	1332	Oct
Oct	9	Dec
Feb	5	June
April	7000	Sept
June	414	Dec
Sept	3	Dec
Sept	0	May

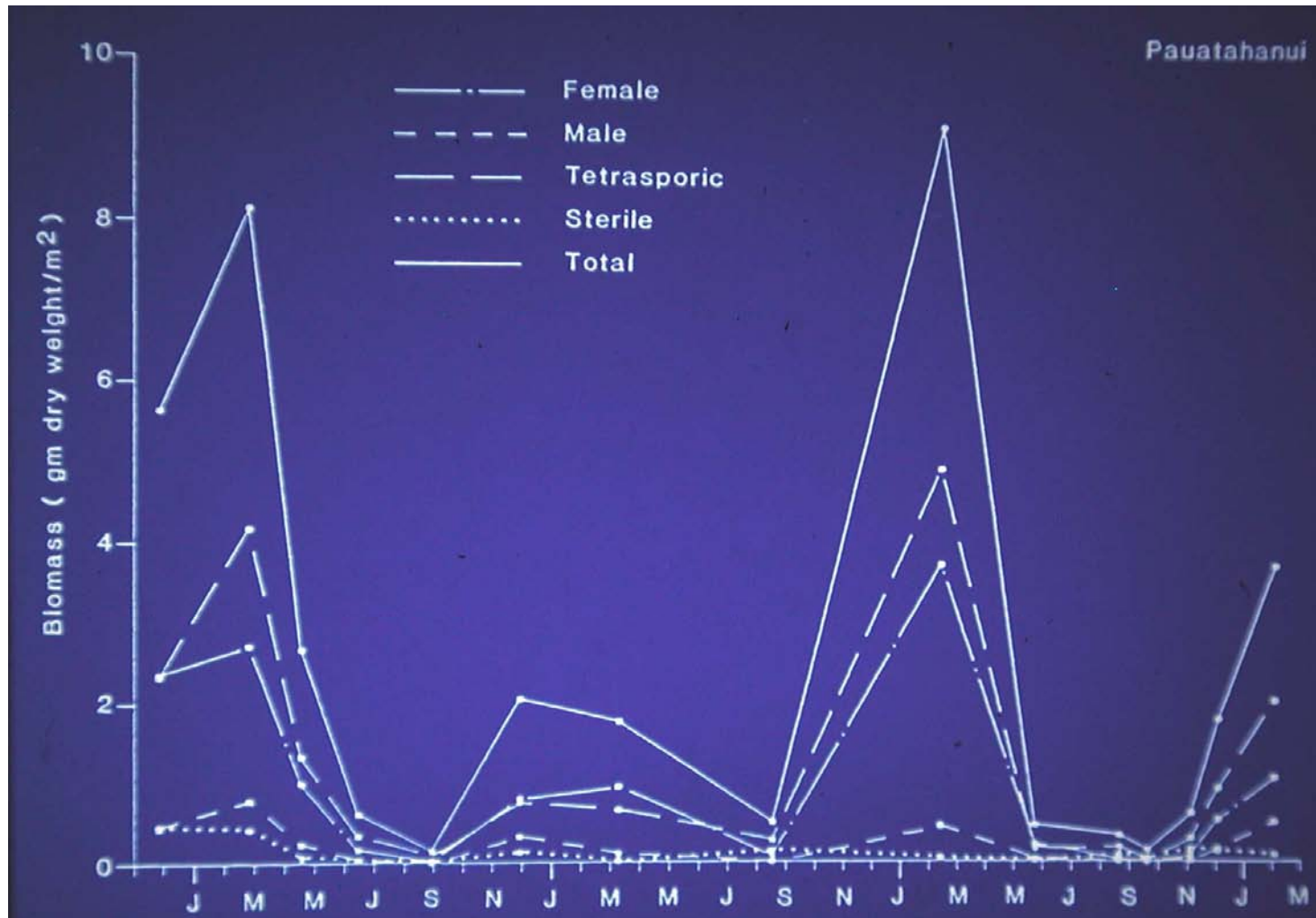


Fertile

Recruits appear

	m	j	j	a	s	o	n	d	j	f	m	a
<i>Ecklonia radiata</i>	Fertile				Recruits appear							
<i>Landsburgia quercifolia</i>		Fertile				Recruits appear						
<i>Carpophyllum maschalocarpum</i>				Fertile					Recruits appear			
<i>Carpophyllum angustifolium</i>				Fertile			Recruits appear					
<i>Sargassum sinclairii</i>						Fertile						Recruits appear

Gracilaria seasonal biomass & growth



Services provided by seaweeds:

- Productivity – sunlight energy fixing C → food source
- Settlement cues
- Habitat/refuge/3D space, surfaces for other species to grow on...
- Shape the environment – e.g. modify wave energy – dampening effect; create shaded and sheltered areas,.....

Information that assists management of resources:

Species focus:

- Type of life history
- Seasonal variation – reproduction, growth, recruitment
- Year-to-year variability – growth
- Harvest time, method, intensity

System focus:

- Competition – e.g. settlement space, light
- Interactions – seaweeds, herbivores, predators

Current and Future issues....

Maintaining healthy seaweed communities vital to maintaining coastal ecosystems – enables continued use and enjoyment of coasts, marine life and sustainable access to kaimoana.

