Resource management of the sea urchin *Strongylocentrotus intermedius* on the basis of its biotic relations with the brown alga *Laminaria japonica*

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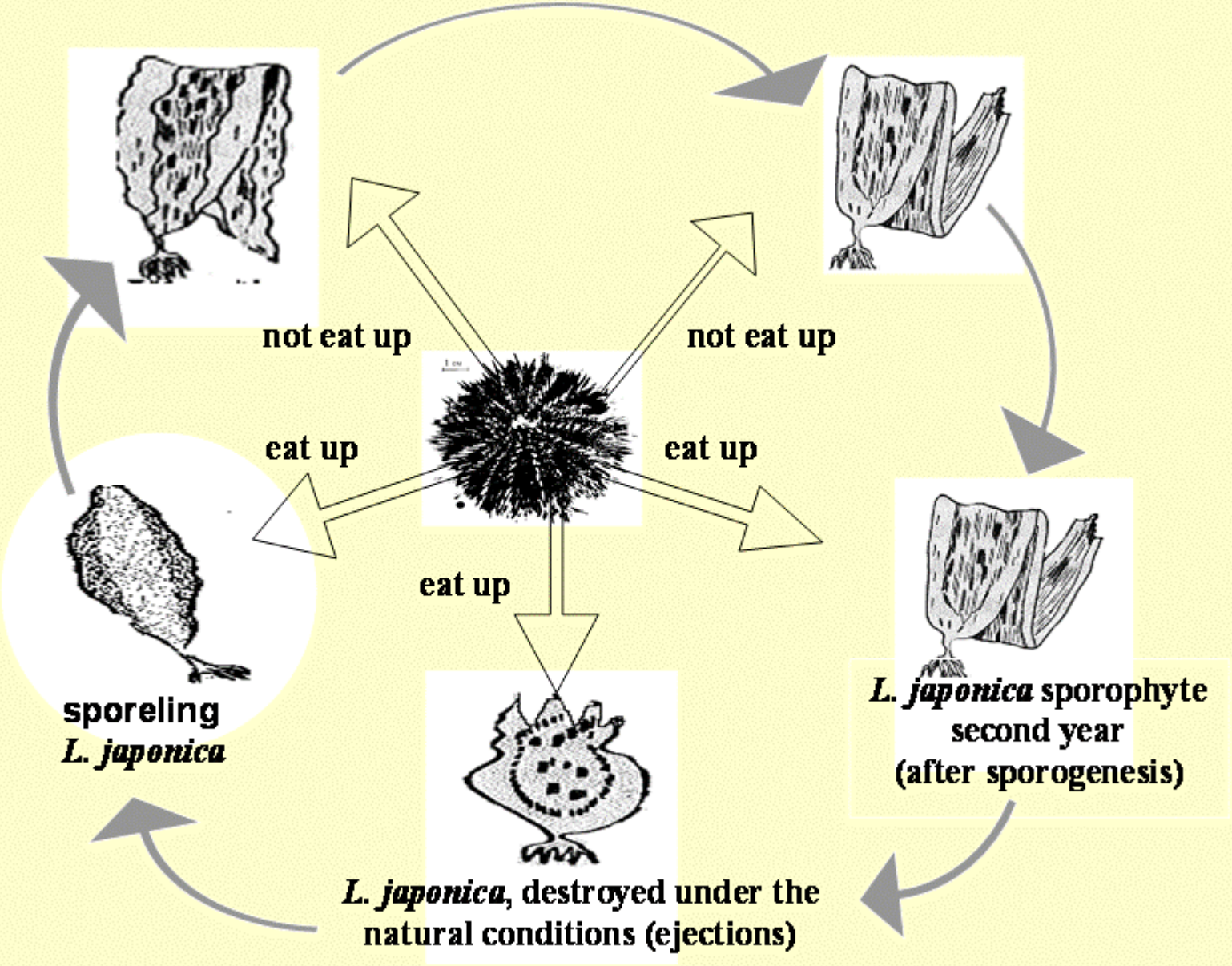
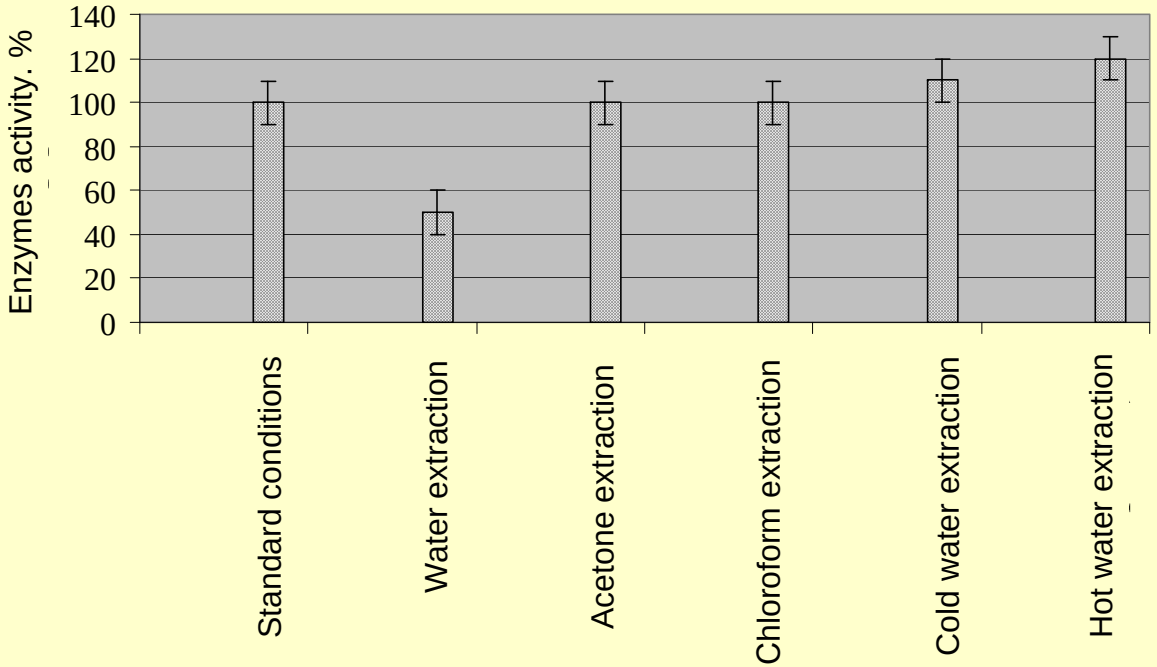
Thalli of 1-year and 2-year *Laminaria japonica*, in the area with absence of sea urchins

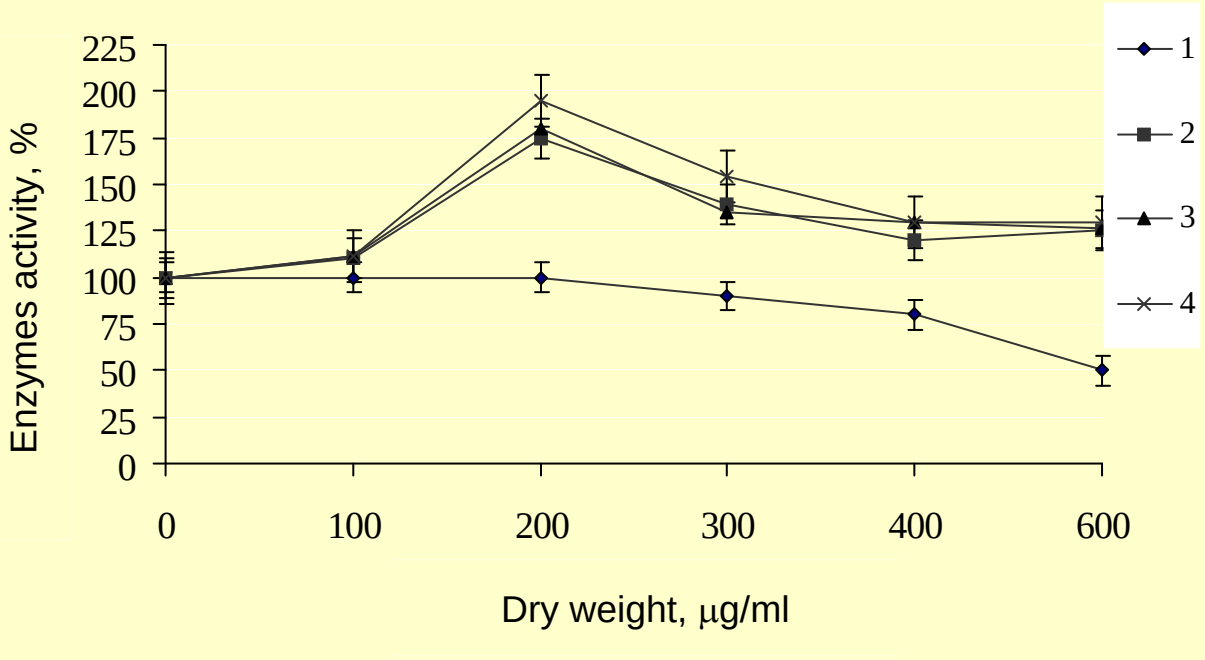
Thalli of 2-year *Laminaria japonica* (after sporogenesis)
In the area of sea urchins dwelling

Interrelationship between the sea urchin *S. intermedius* and seaweed *L. japonica*

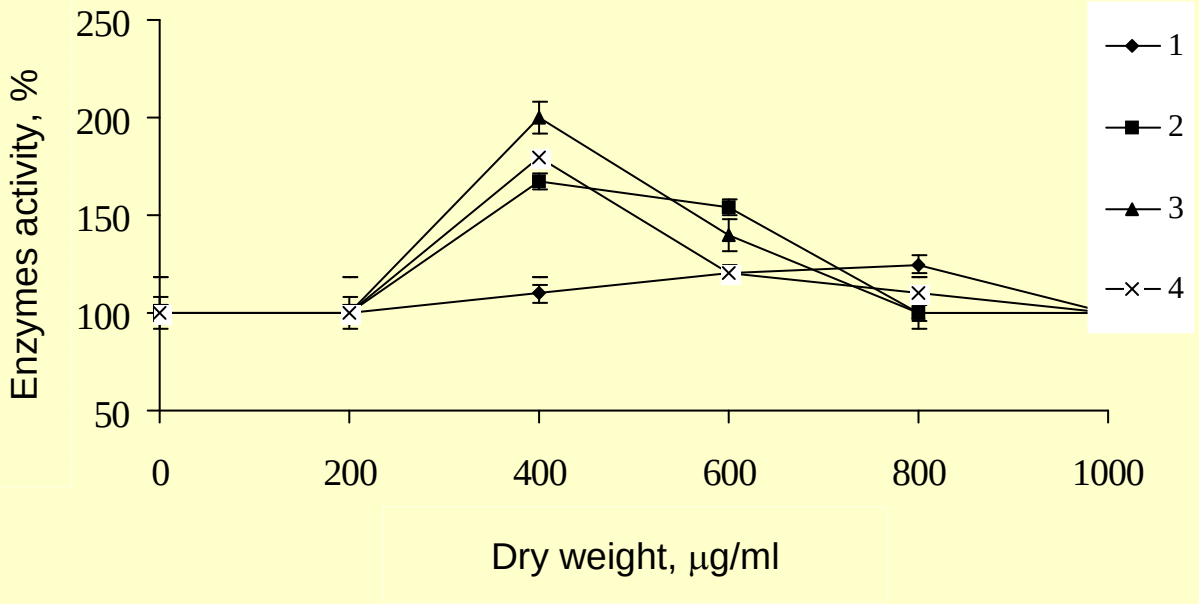


Influence of extractive substances from fresh 1-year *Laminaria japonica* on digestive enzymes of sea urchin (the enzymes activity in standard conditions is 100%)





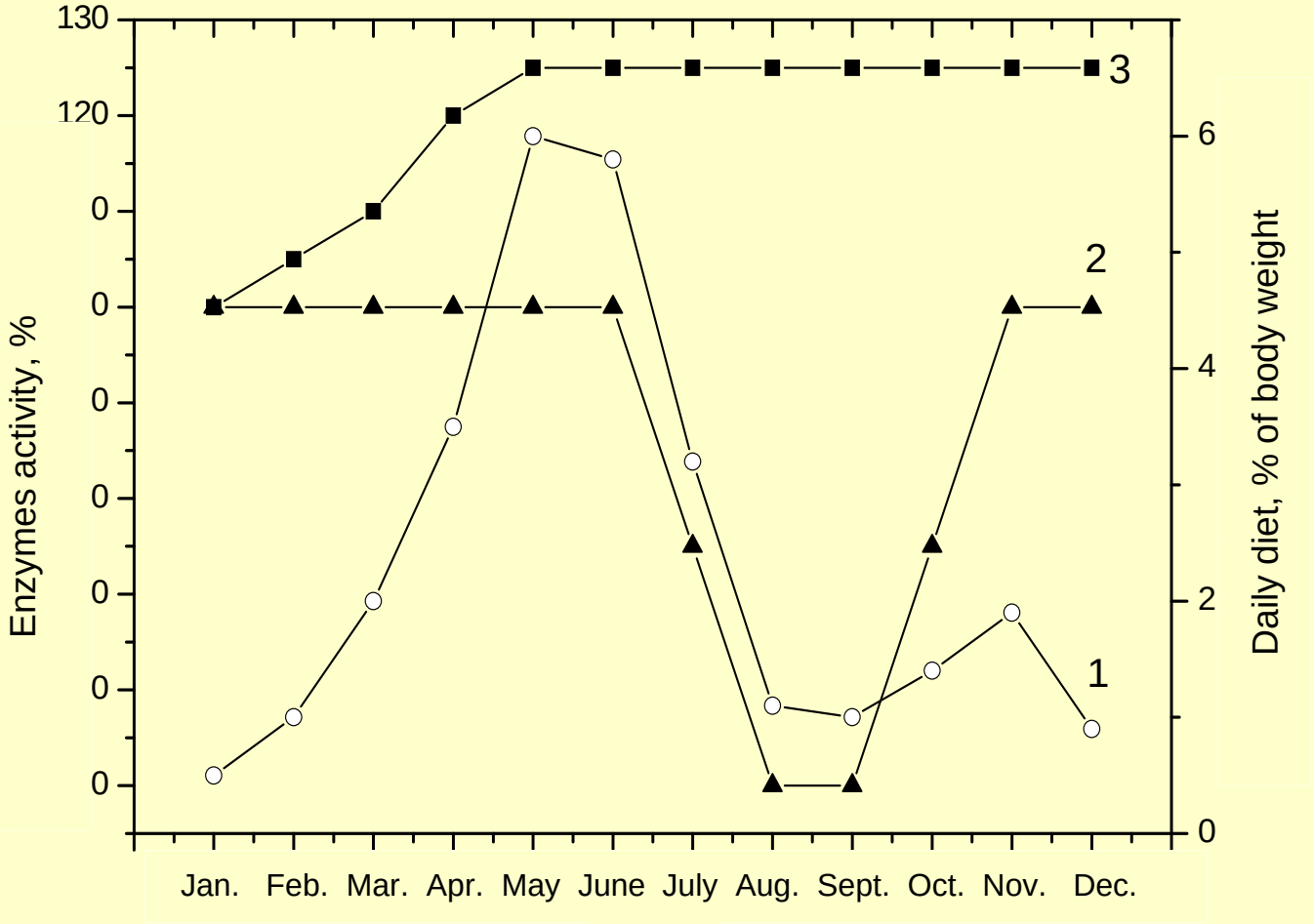
Activity of 1,3-β-D-glucanase from *S. intermedius* (% from reference template) under influence of water-ethanol extracts from thalli of **1-year** *Laminaria japonica:*
1 – fresh thalli
2 – after 1 day storage
3 – after 2 days storage
4 – after 3 days storage)



Activity of 1,3-β-D-glucanase from *S. intermedius* (% from reference template) under influence of water-ethanol extracts from thalli of **2-year** *Laminaria japonica:*
1 – fresh thalli
2 – after 1 day storage
3 – after 2 days storage
4 – after 3 days storage)

Influence of water-ethanol extracts from *L. japonica* on activity of 1,3-β-D-glucanase from *S. intermedius* in dependence on season of sampling (because of seasonal changes of the sea urchin feeding)

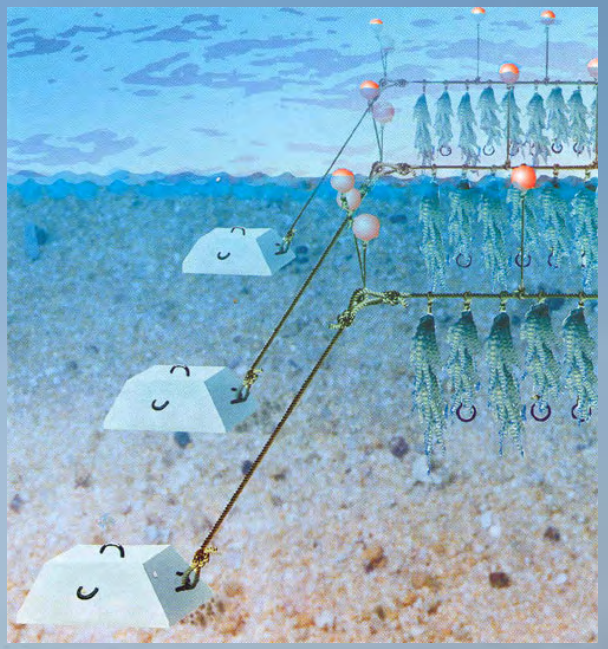
1 – daily diets of sea urchin (% of body weight)
2 – influence of enzymes extracted from fresh 1-year seaweeds on activity of 1,3-β-D-glucanase
3 - influence of enzymes extracted from fresh 2-year seaweeds on activity of 1,3-β-D-glucanase



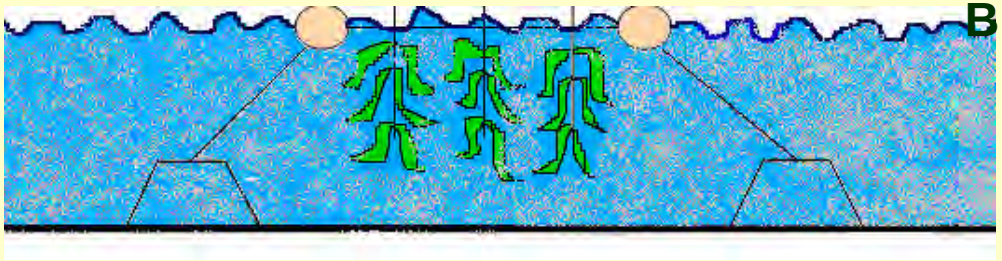
Content of water-soluble polysaccharides (fucoidans and laminarans) and their monosaccharide composition in the seaweed *Laminaria japonica* before and after its consumption by sea urchins

Sample	Polysaccharides	Content, % WW after fats removing	Sugar, %	Monosaccharide composition Glc / Fuc / Gal / Man / Xyl / Rha
Before consumption	Fucoidans	2,2	9,3	0 / 53,0 / 27,8 / 6,25 / 11,8 / 0
	Laminarans	0,7	12,9	16,9 / 38,5 / 30,6 / 2,5 / 9,3 / 0
After consumption	Fucoidans	11	8,3	0 / 28,9 / 43,5 / 5,65 / 14,7 / 5,6
	Laminarans	0,4	10,5	15,25 / 17,65 / 19,5 / 9,3 / 14,5 / 14,5

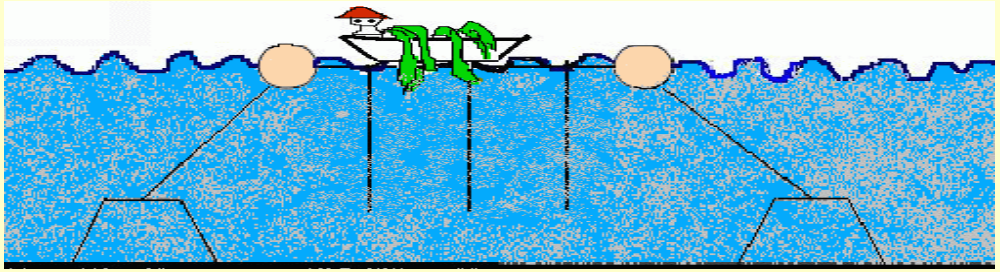
Suspended plantation for Laminaria



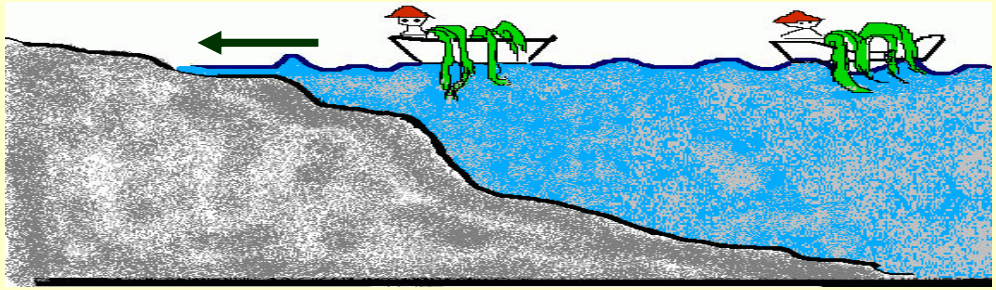
Biotechnology of feeding the sea urchins



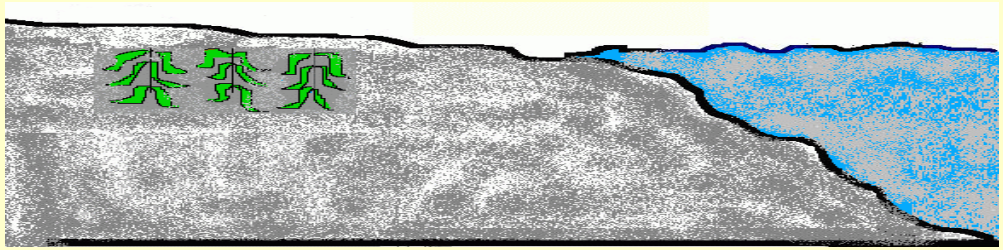
Cultivation of the seaweed *Laminaria japonica* with heightened content of mannitol



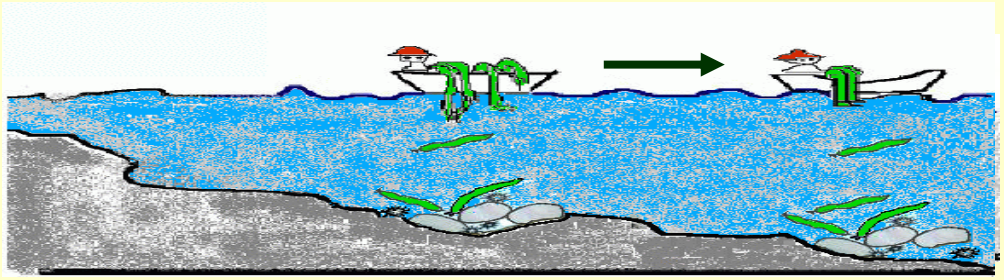
Harvesting the seaweeds



Transportation of the seaweeds to the land



Storage the seaweeds on shore during 3 days (imitation of storm output)



Distribution of Laminaria thalli destructed during the storage in the area of sea urchins dwelling

Thanks!