WE NEED TO SEA KELP!

Summary

- Coastal water is highly acidic due to the increased source of CO2 from terrestrial runoffs.
- Ocean acidification is an ongoing challenge for the aquaculture industry and also habitats like the coral reefs since they are mostly located in coastal waters.
- Calcifying organisms are losing their structural integrity due to acidification
- Prompt action is required to relieve negative impacts.
- Research supports that seaweed farming is an innovative, inexpensive, locally effective tool that can buffer the ocean for these areas.
- Additionally, reap economic benefits from improved crops yields.

Ocean Acidification

Severely Disturbed Areas

Seawater near river mouths and shallow coastal areas are severely impacted due to the increase in CO2 from nutrient runoff from large-scale agriculture, coastal upwelling and erosion.[1] **Moreover, most aquaculture and habitat protection programs occur in these areas thus, acidification is a pressing challenge.**

Most Vulnerable Species

Calcifying organisms such as reef calcifying organisms and shellfish are highly vulnerable to acidification because the calcium carbonate (CaCO3) minerals that they use for building structural integrity are in lower concentrations.

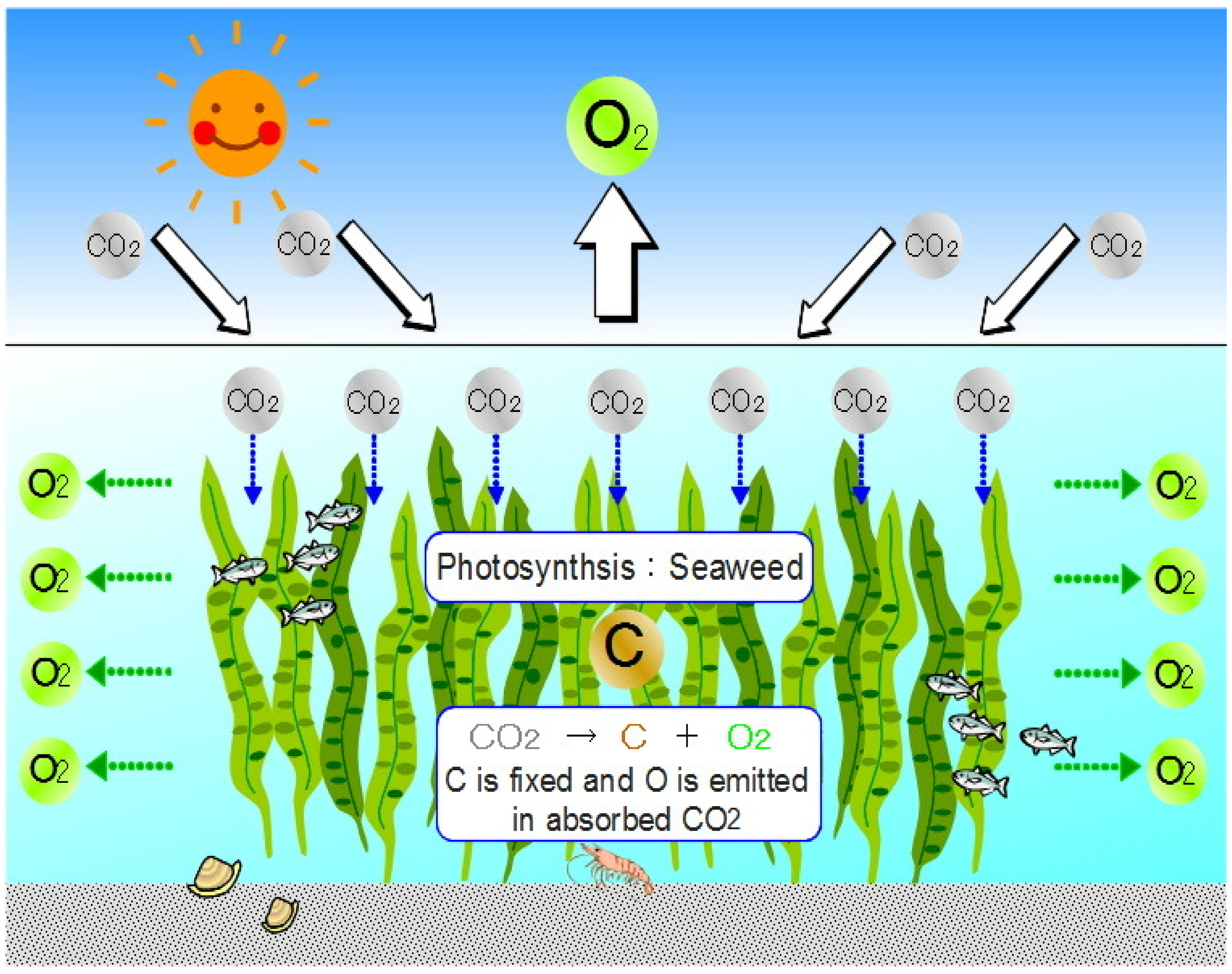

Figure 1. Seaweed and CO2 absorption through photosynthesis (adapted from Japan Water Guard).

How Can Seaweed Help?

Seaweed accumulates carbon through photosynthesis and produces biomass by the uptake of nitrogen, phosphorus and other essential minerals.[5] Thus, if the seaweed farm is located upstream of a reef or other aquaculture crops, there is potential that the water flowing into the area from the farm will contain less carbon and therefore, buffers the level of acidification to provide an area of refuge.

BENEFITS

ECOLOGICAL

- Act as carbon sinks and store atmospheric carbon as blue carbon.
- Remove up to 70% of excess carbon, nitrogen, and phosphorus and translate that into new biomass to also relieve effects of eutrophication.[4]
- Co-culture can enhance local biodiversity and thus the resilience of the entire ecosystem to environmental stressors.[5]

ECONOMIC

- Seaweed co-cultures is inexpensive ($20,000) compared to other measures.
- Increases yield of crops and thus higher economic reward.
- Provide an additional crop for farmers to sell.

COSTS

ECOLOGICAL

- Require addition of degradation resistant synthetic materials for securing seaweed growth and debris that is lost due to poor farming management or accidents, can be disruptive.
- Compete with area of interest for resources such as light. The presence of seaweed can heavily shade understory vegetation and decrease overall productivity.

ECONOMIC

- High seaweed biomass is required for significant effect so the cost of setting aside areas that could be used for other crops or proposes can be an economic consequence.

RECOMMENDATIONS

1. Areas heavily disturbed by acidification such as coastal waters would benefit the most from local seaweed farming to supplement crops or protected areas.

2. Increase awareness and educate farmers on this option to ensure seaweed co-cultures are put into place accordingly to enhance success rate.

3. Use a heterogeneous population of non-calcifying seaweed species that have a substantial market value to increase resilience against disease. E.g. Red Ogo Seaweed (*Gracilaria pacifica*)

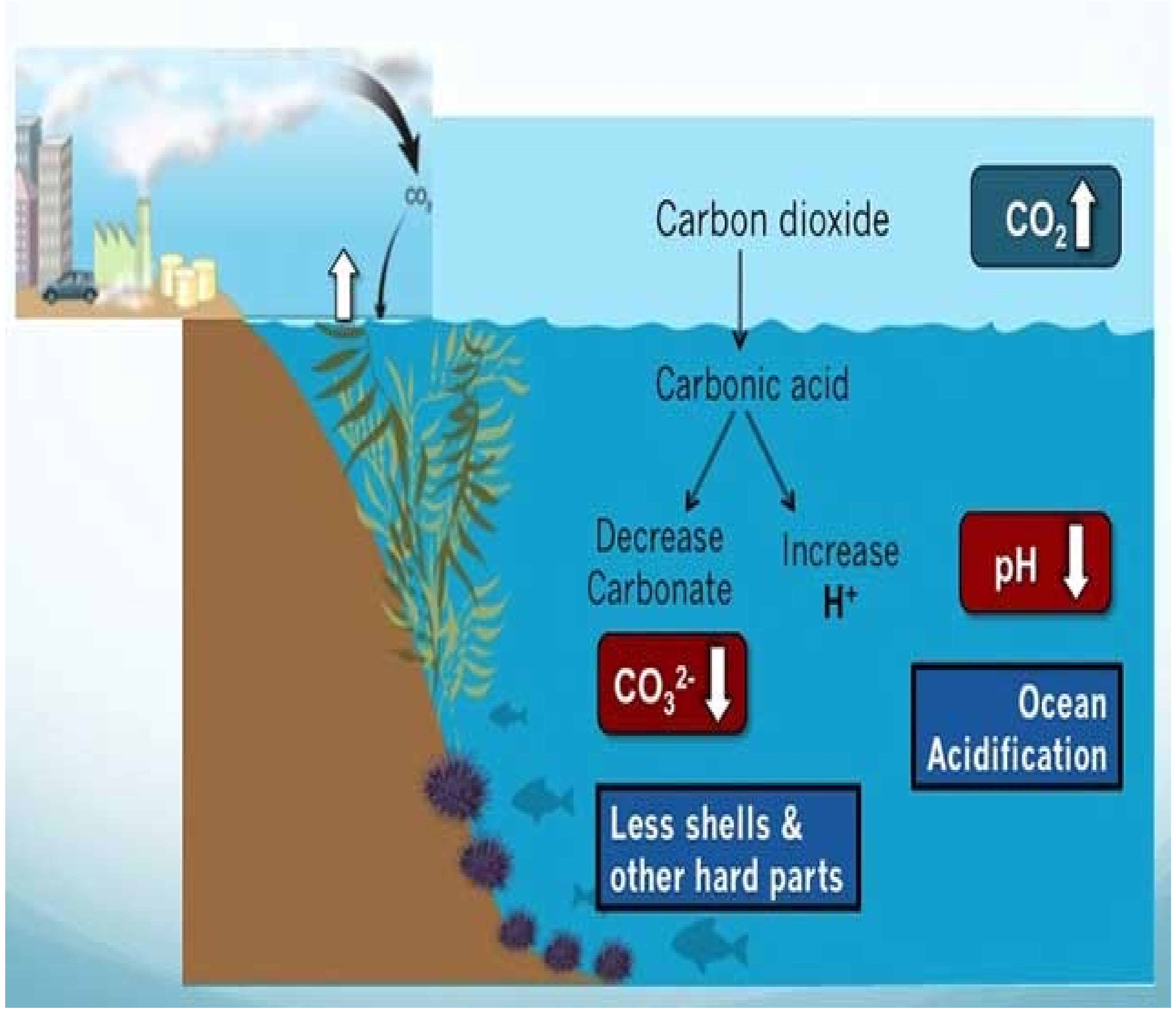

Figure 2. Carbon dioxide absorption into the ocean and the effects (adapted from Marine Science Today).

CONCLUSION

Upstream seaweed farming has strong potential to be effective in site-specific response to mitigate ocean acidification by acting as a carbon sink to provide an area of refuge for other habitats or aquaculture.

Figure 3. Co-culture of seaweed and shellfish (adapted from Thimble Island Ocean Farm).

References

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