Coast Bordeaux 2017

FRA

Valuation of ecosystem services and identification of conservation and fisheries management options protecting those services in Sekisei Lagoon, southwest Japan

Masaaki Sato[1, 2],

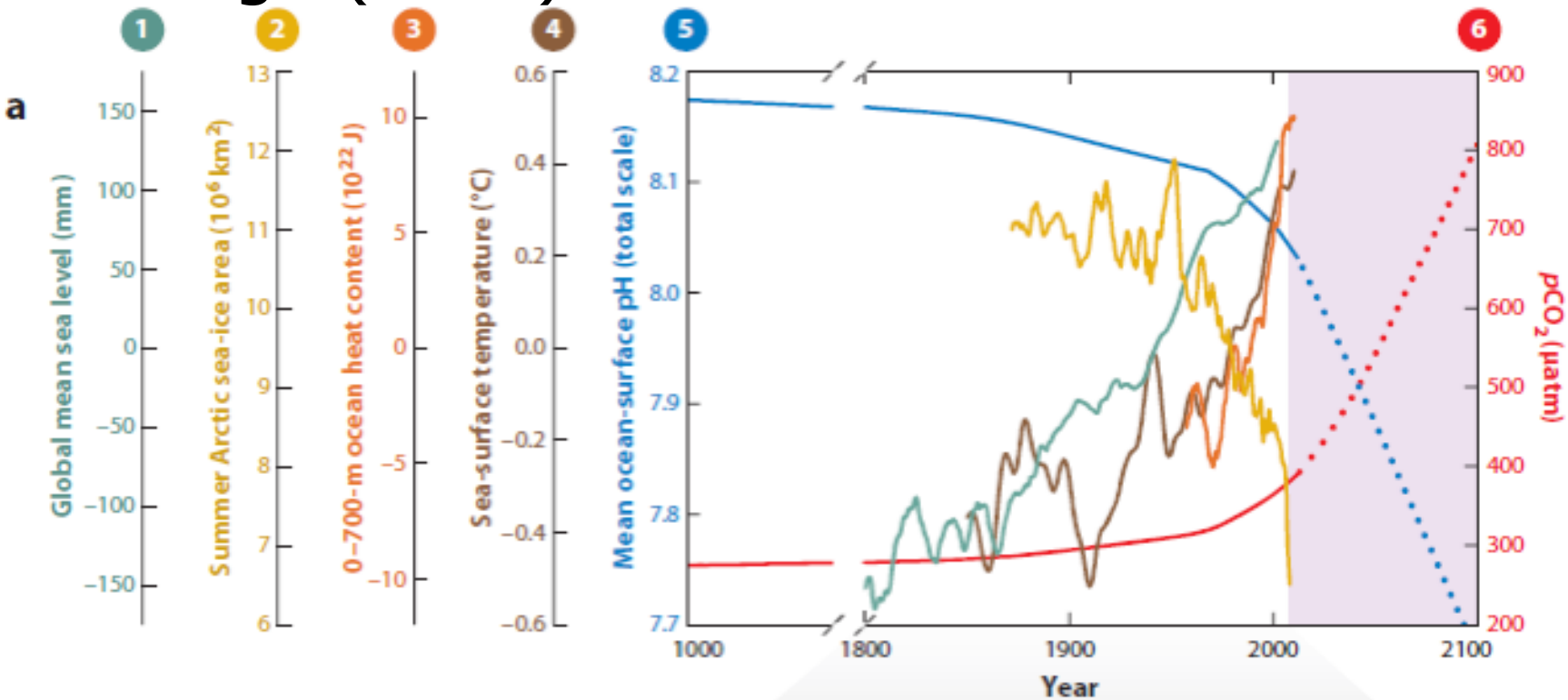
Nanami Atsushi[3], Masakazu Hori[1]

1National Research Institute of Fisheries and Environment of Inland Sea, FRA

2Present address: National Research Institute of Fisheries Engineering, FRA

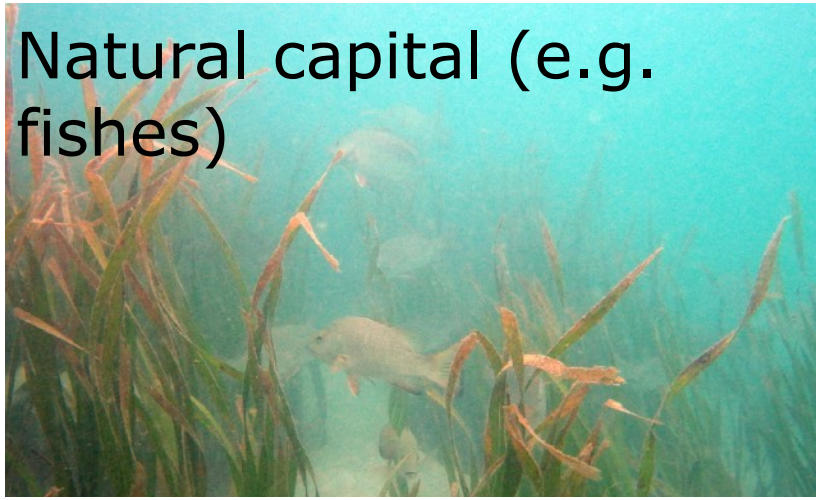
3Seikai National Fisheries Research Institute,

- Climate change and related stressors are projected to have large impacts on natural capital and ecosystem services on marine ecosystems under the scenarios of Intergovernmental Panel on Climate Change (IPCC)



(Doney et al. 2012, Annu Rev Mar Sci)

- Important to develop mapping and evaluating methods of natural capital and ecosystem services

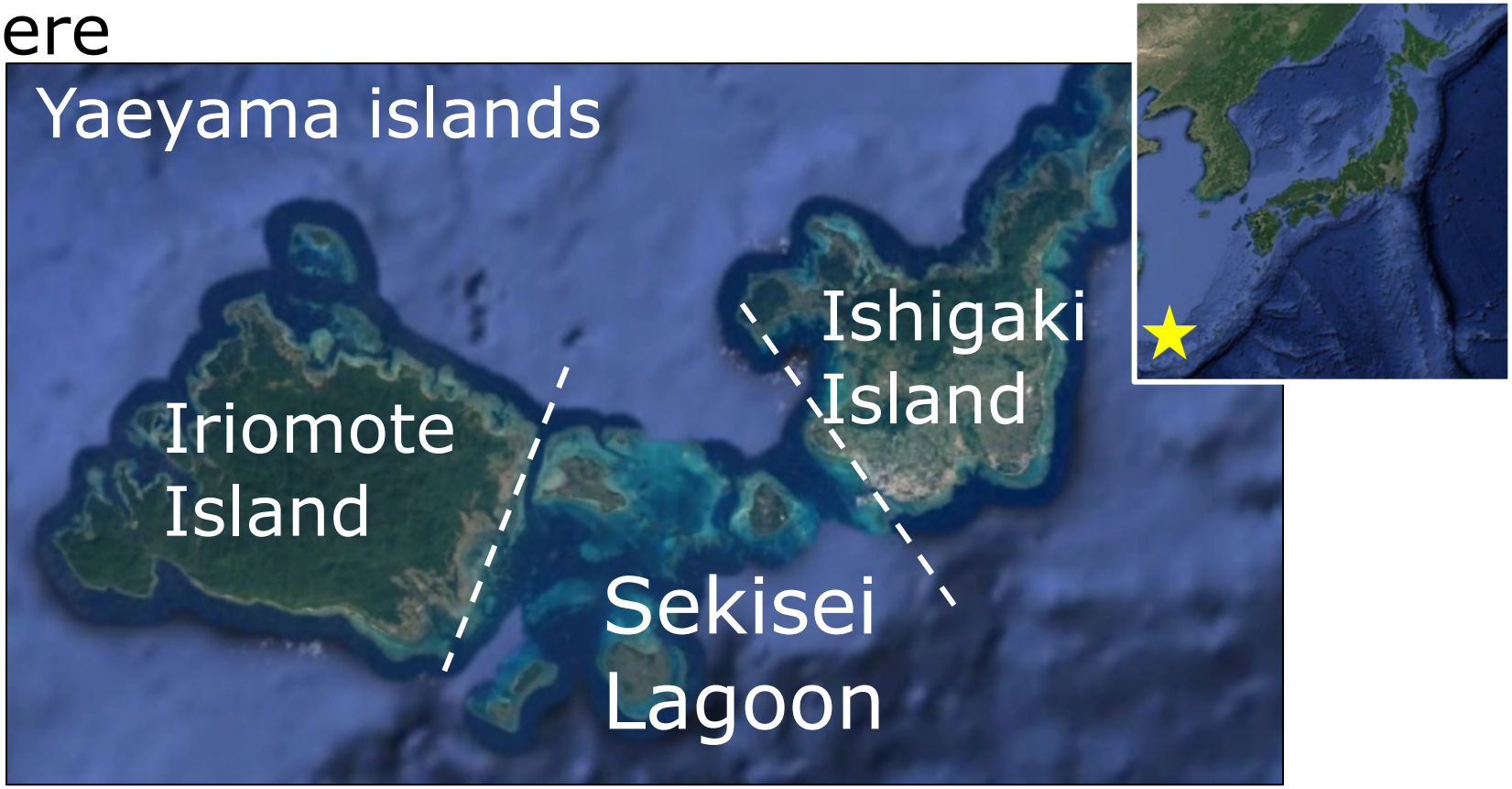


Useful for

- Future scenario analysis
- Setting appropriate management options

Sekisei Lagoon

- Largest coral reef in Japan
- Quantitative information regarding natural capital and ecosystem services is limited there



Objectives

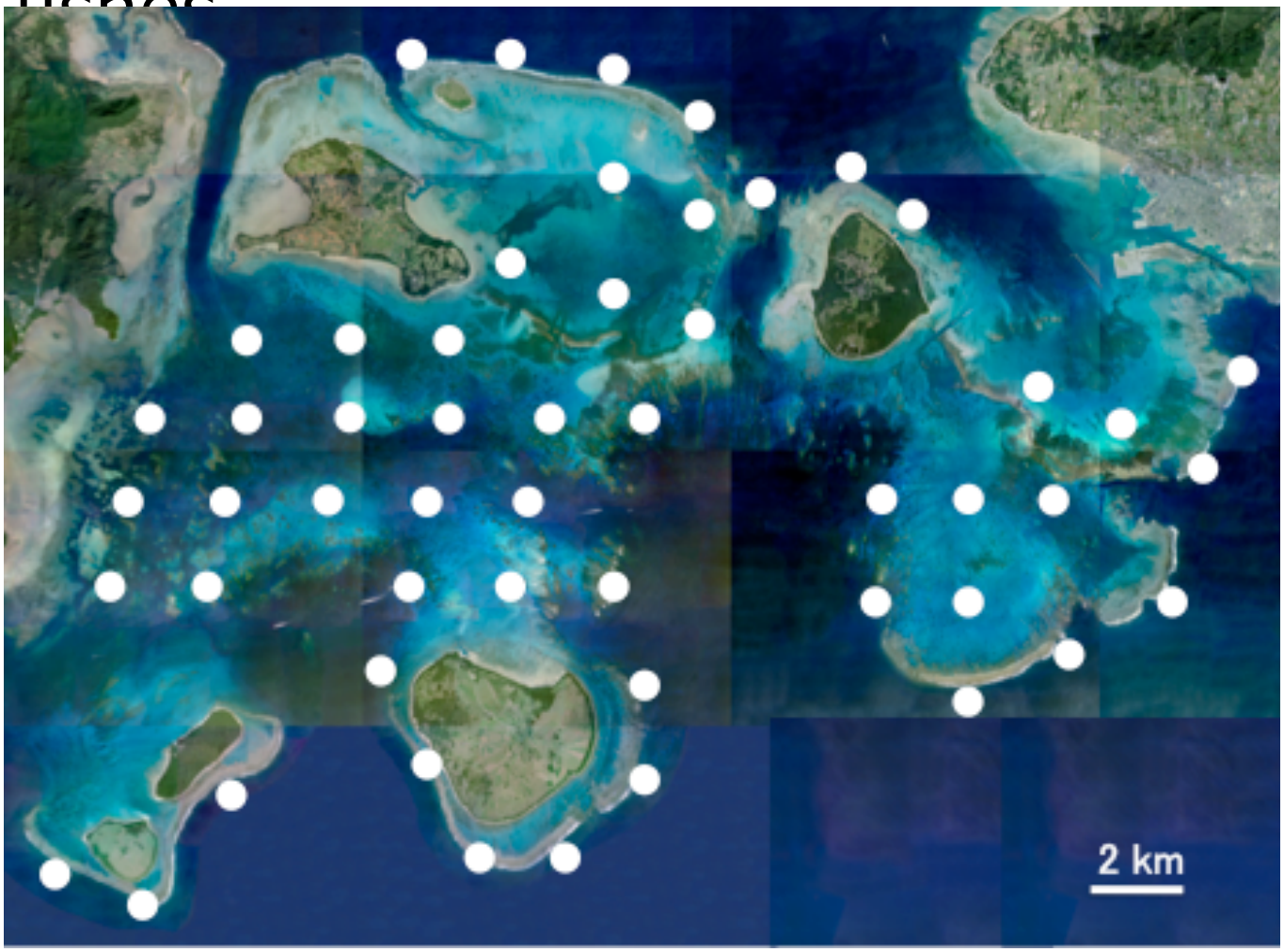
1. Mapping values or quantity of ecosystem services in Sekisei Lagoon using the distribution data of fishes (natural capital)
2. Evaluating how much current management options protect ecosystem services in Sekisei Lagoon

Pomacentridae in Sekisei Lagoon (http://tida-ishigaki.com)

Crown of thorns starfish (oni-hitode) removal (Yaeyama mainichi newspaper)

Mapping ecosystem services

Transect survey sites for coral reef fishes



This picture from Ministry of the Environment

Mapping ecosystem services

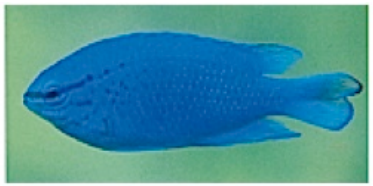
Materials and methods

Target species

Chaetodontidae

Pomacanthidae

Pomacentridae



Labridae

Scaridae

Siganidae

Pictures from “Grand Atlas of Fish Life Modes (Tokai University Press)” and http://fishesofaustralia.net.au/

Calculating the value of ecosystem services

- Value of provisioning service

Fishery production (Scaridae) : Market value per kg ×weight at each sit

Aquarium fish production (Chaetodontidae and Pomacanthidae): Store value per ind. ×density at each site

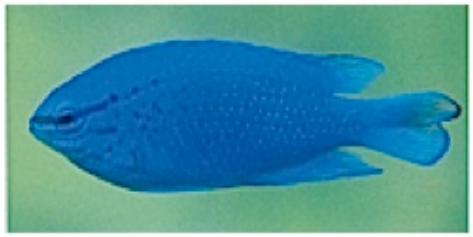
Photo from https://blogs.yahoo.co.jp/turibakaah

Calculating the value of ecosystem services

- Value of cultural service

Recreational diving opportunity (Chaetodontidae, Pomacanthidae, Pomacentridae and Labridae):

1. Calculating total sum of payment for diving tours in Sekisei Lagoon by tourists per year
2. Distributing 1 to each survey sites based on the species richness of diving target fish (a site with higher species richness has more value of this service)

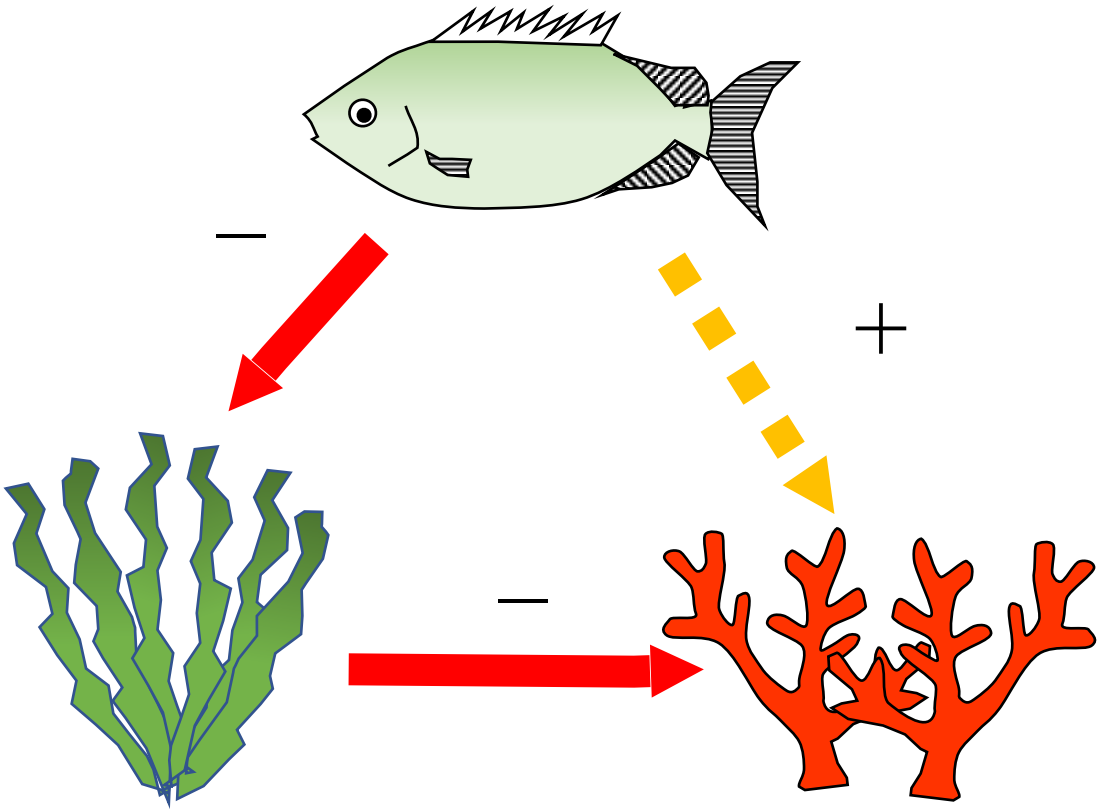


Calculating the quantity of ecosystem services

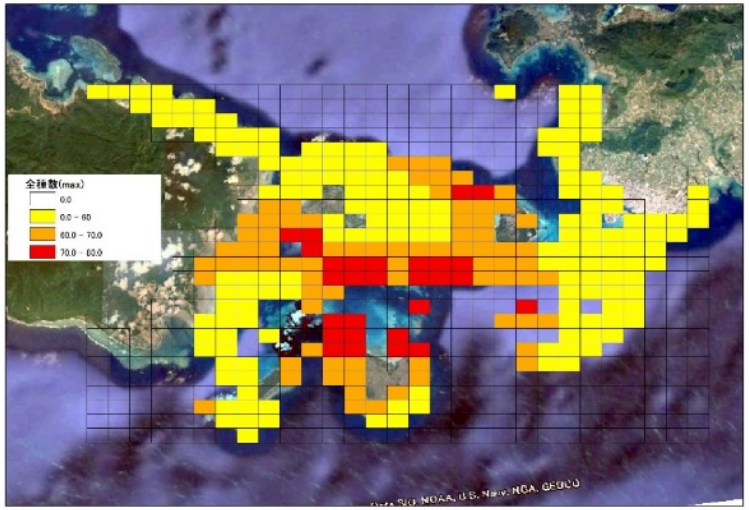
- Quantity of regulating service

Seaweed removal by herbivores (Siganidae):

Feeding rate per ind.×density at each site



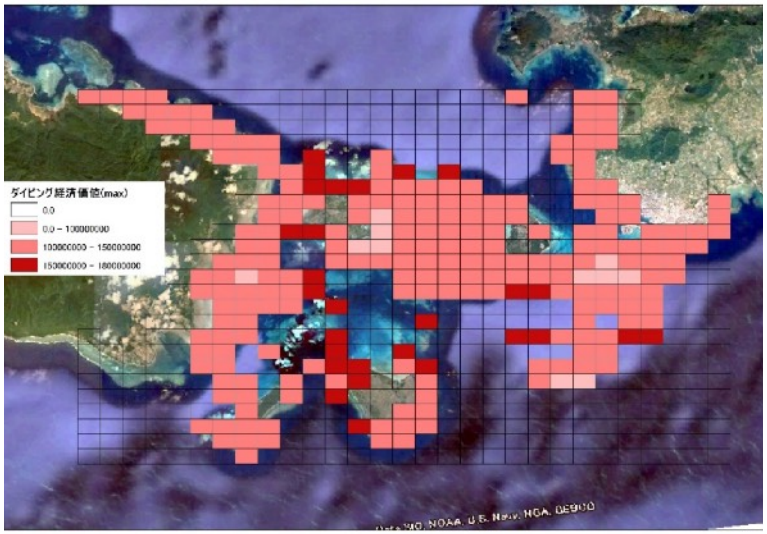
Mapping the potential value or quantity of ecosystem service in the whole lagoon



Data of fish density or species richness

+

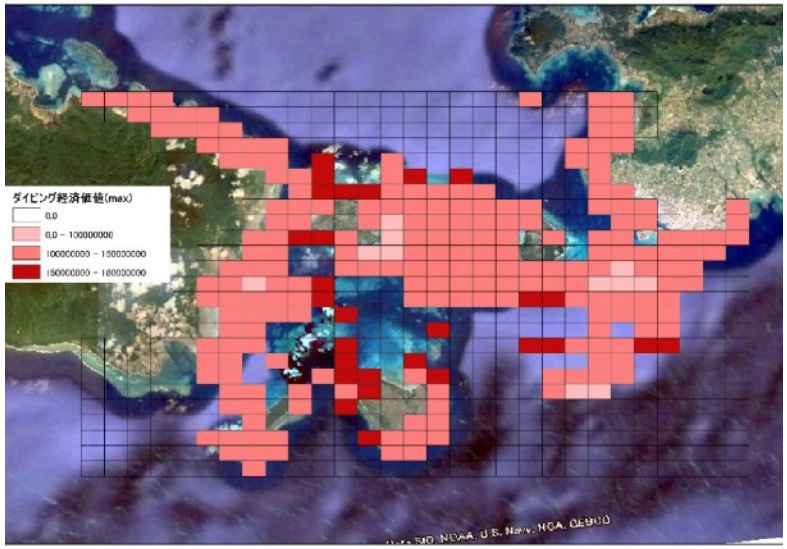
Calculation of ecosystem services



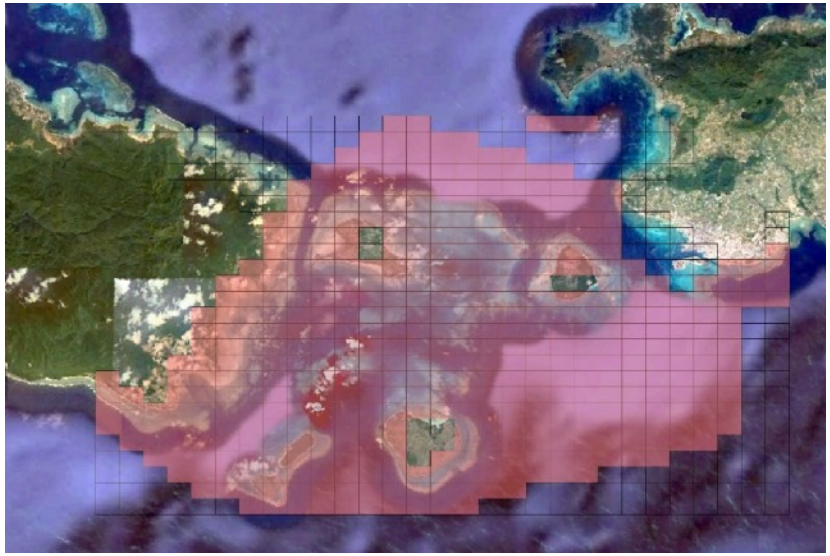
Potential map of ecosystem service

Evaluating management options

Overlay



+



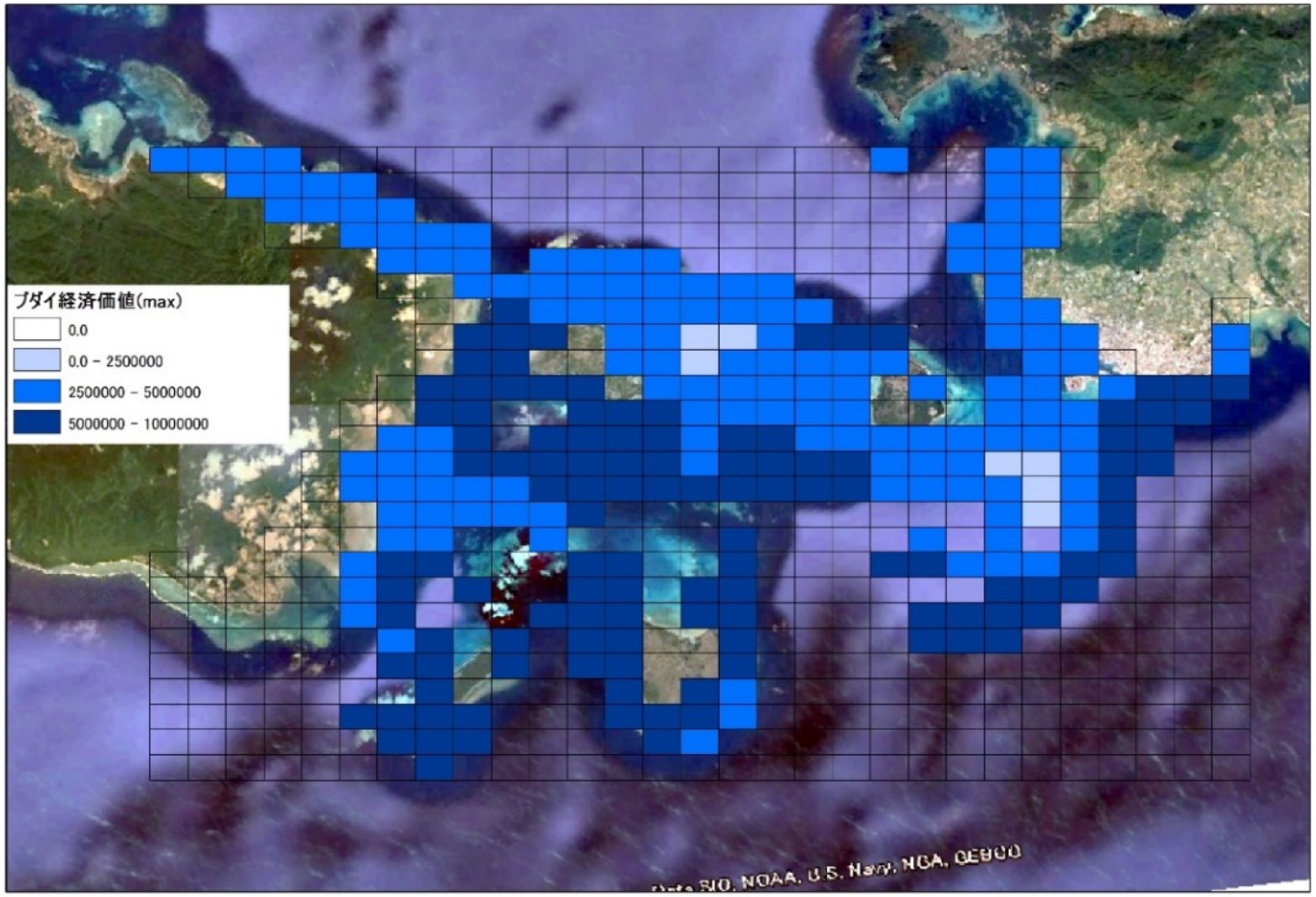
Potential ecosystem service

Management option
e.g. national marine park

How much a management option protects the value or quantity of each ecosystem service?

Mapping potential values of ecosystem services

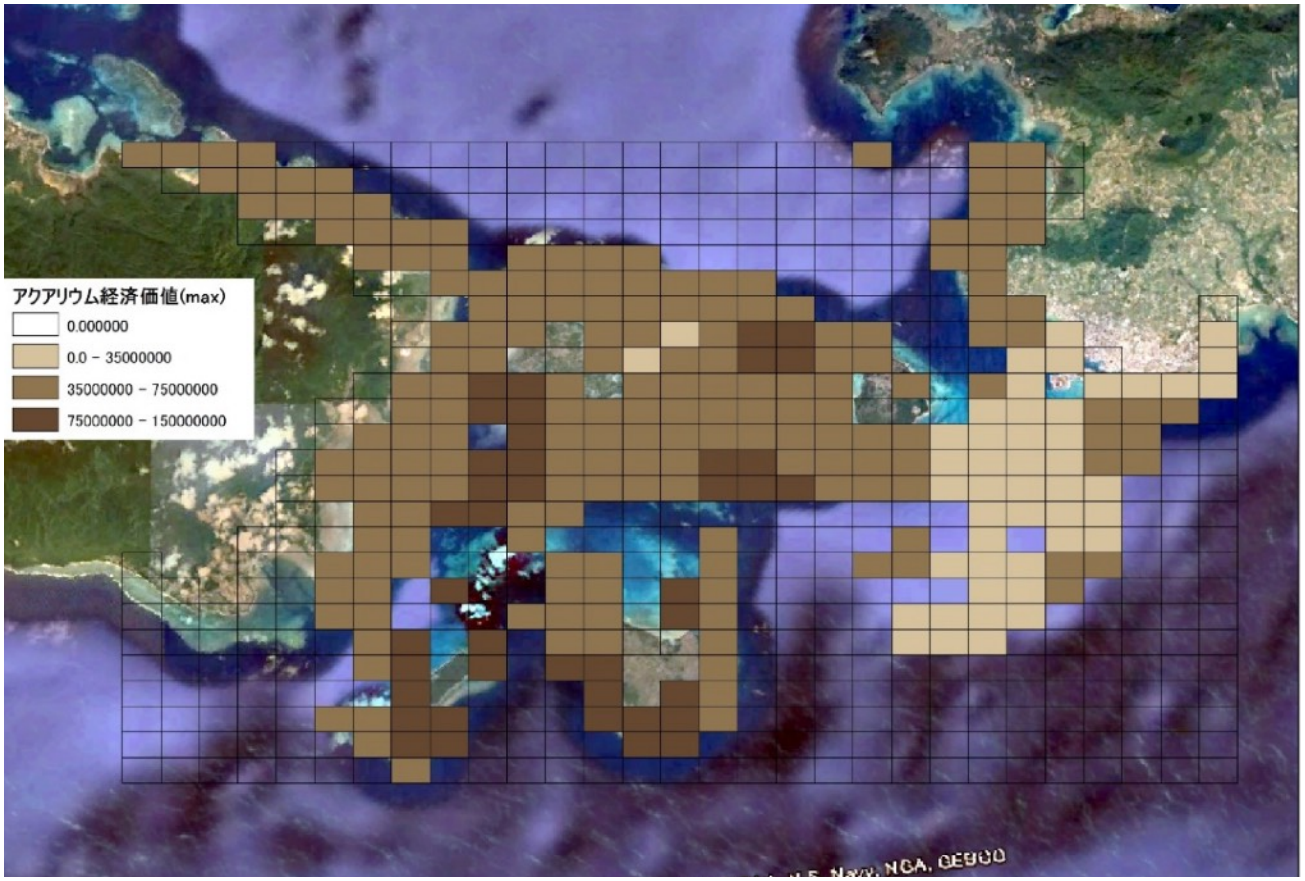
Value of provisioning



Fishery production: \1.35 billion (€10 million)

Mapping potential values of ecosystem services

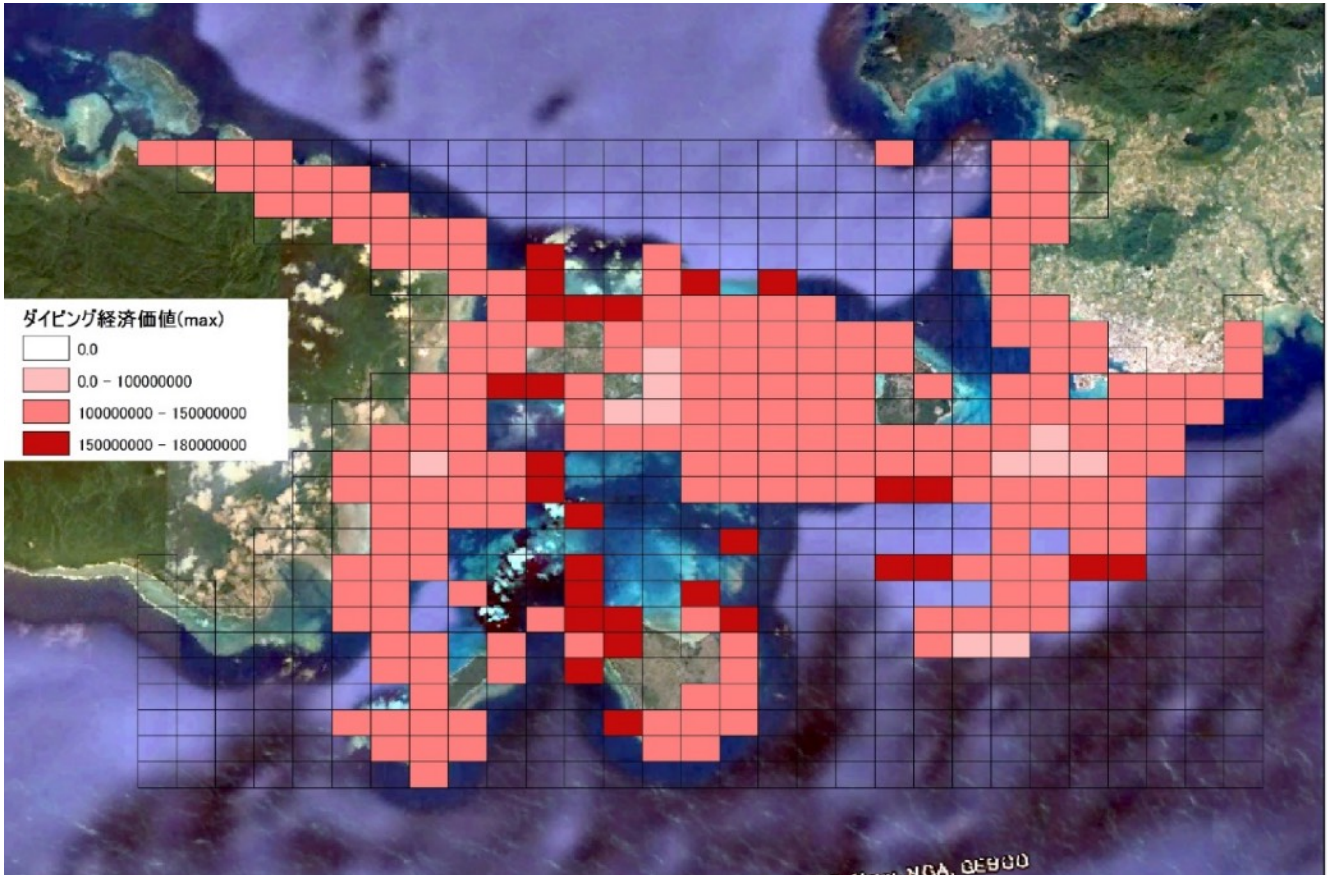
Value of provisioning service



Aquarium fish production: \14.5 billion (€ 110 million)

Mapping potential values of ecosystem services

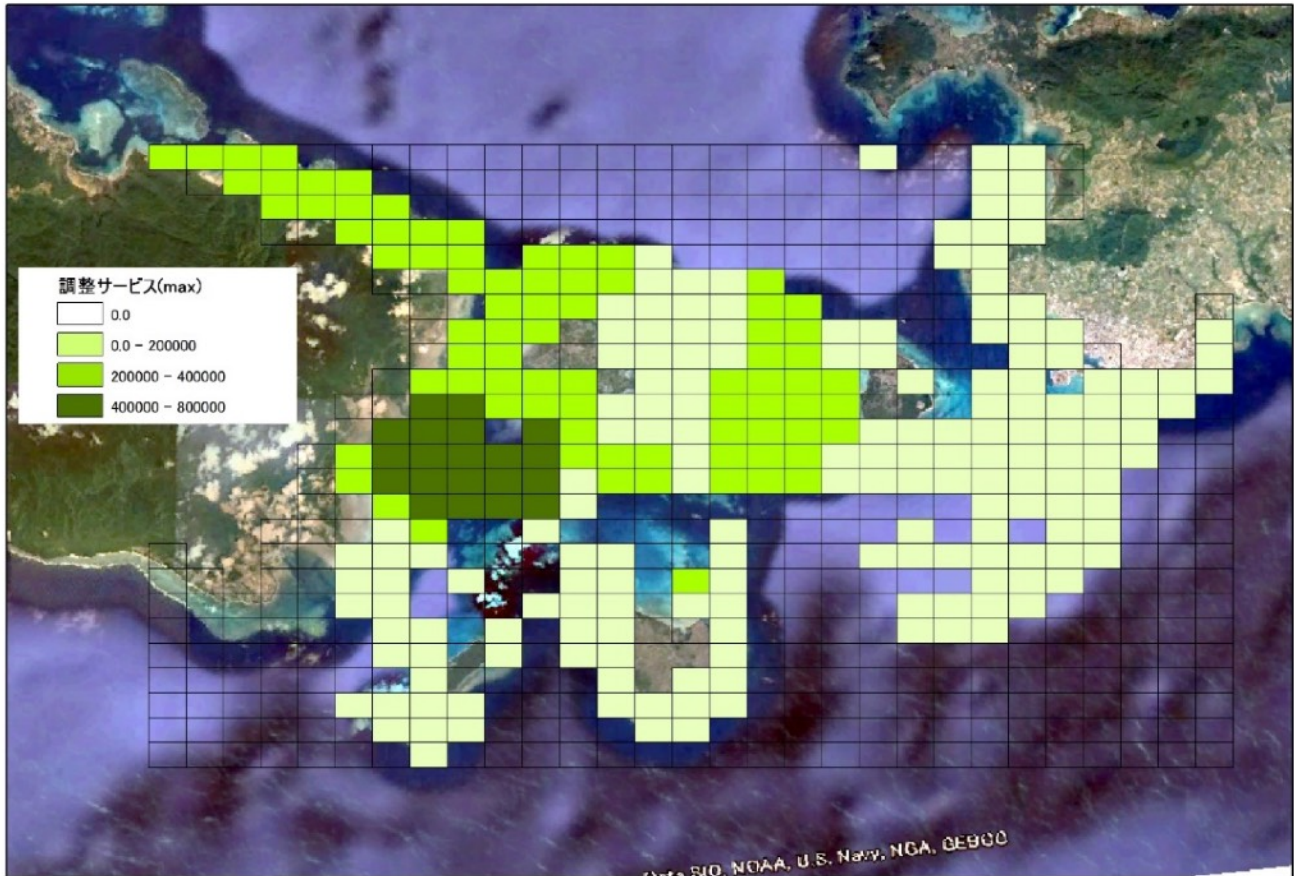
Value of cultural service



Recreational diving opportunity: \35.5 billion (€269 million)

Mapping potential values of ecosystem services

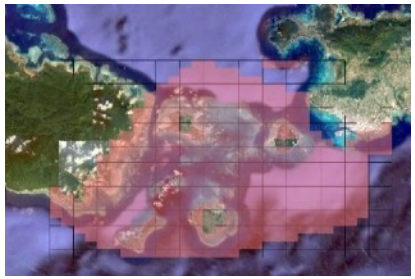
Quantity of regulating service



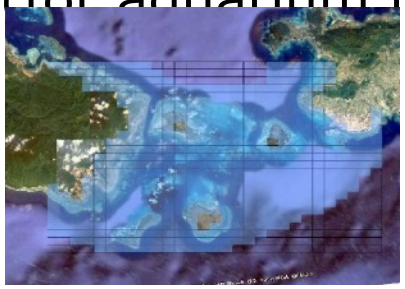
Seaweed removal by herbivores

Evaluating management options

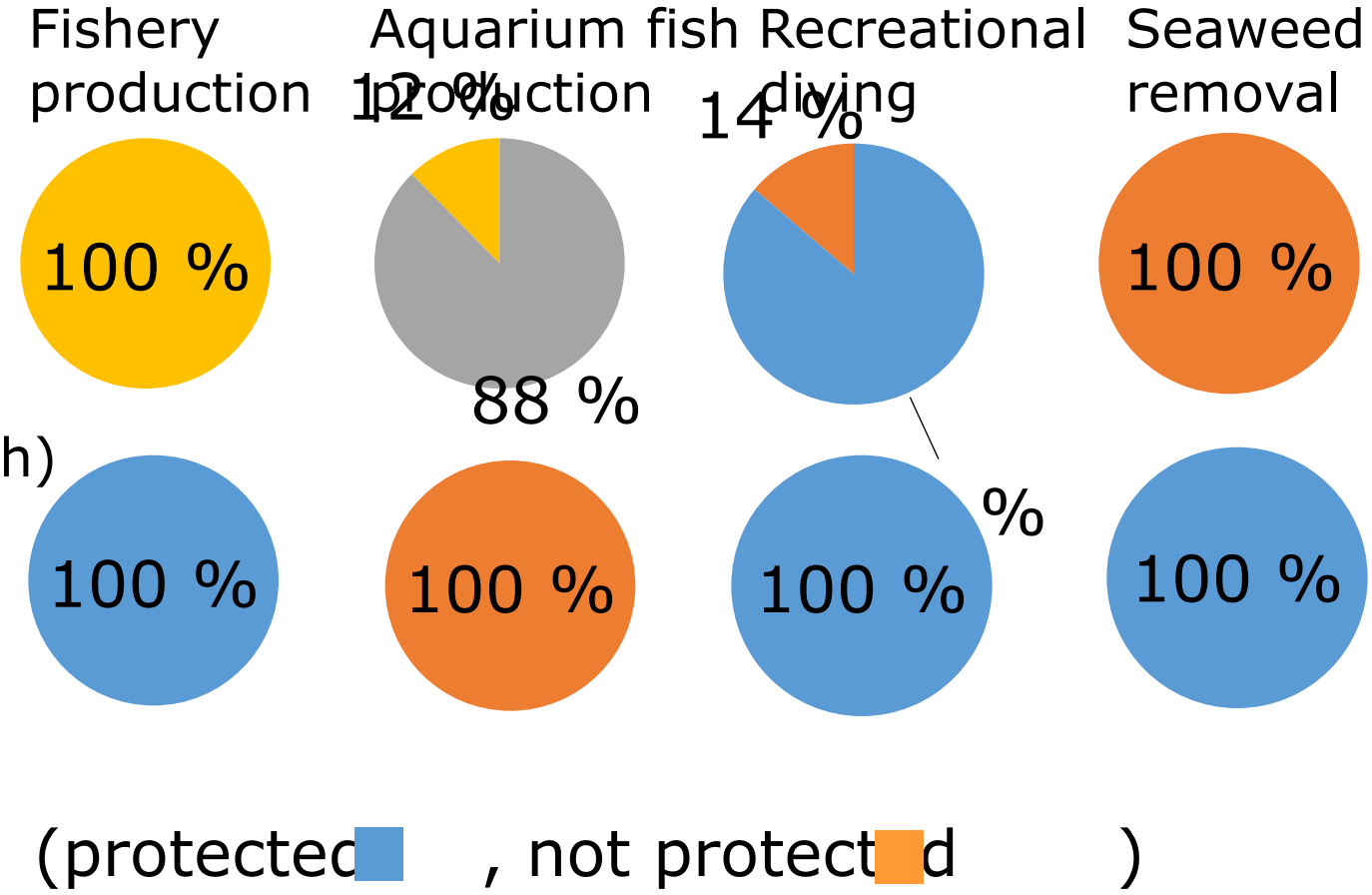
Protected proportions of each ecosystem service by each management option



National marine park (for aquarium fish)

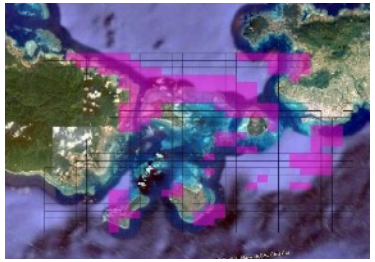


Regulation of fisheries gears by Okinawa pref. (for all fish)

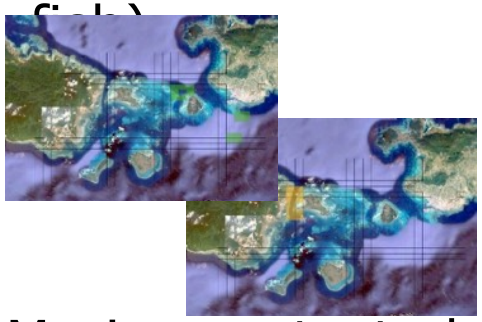


Evaluating management options

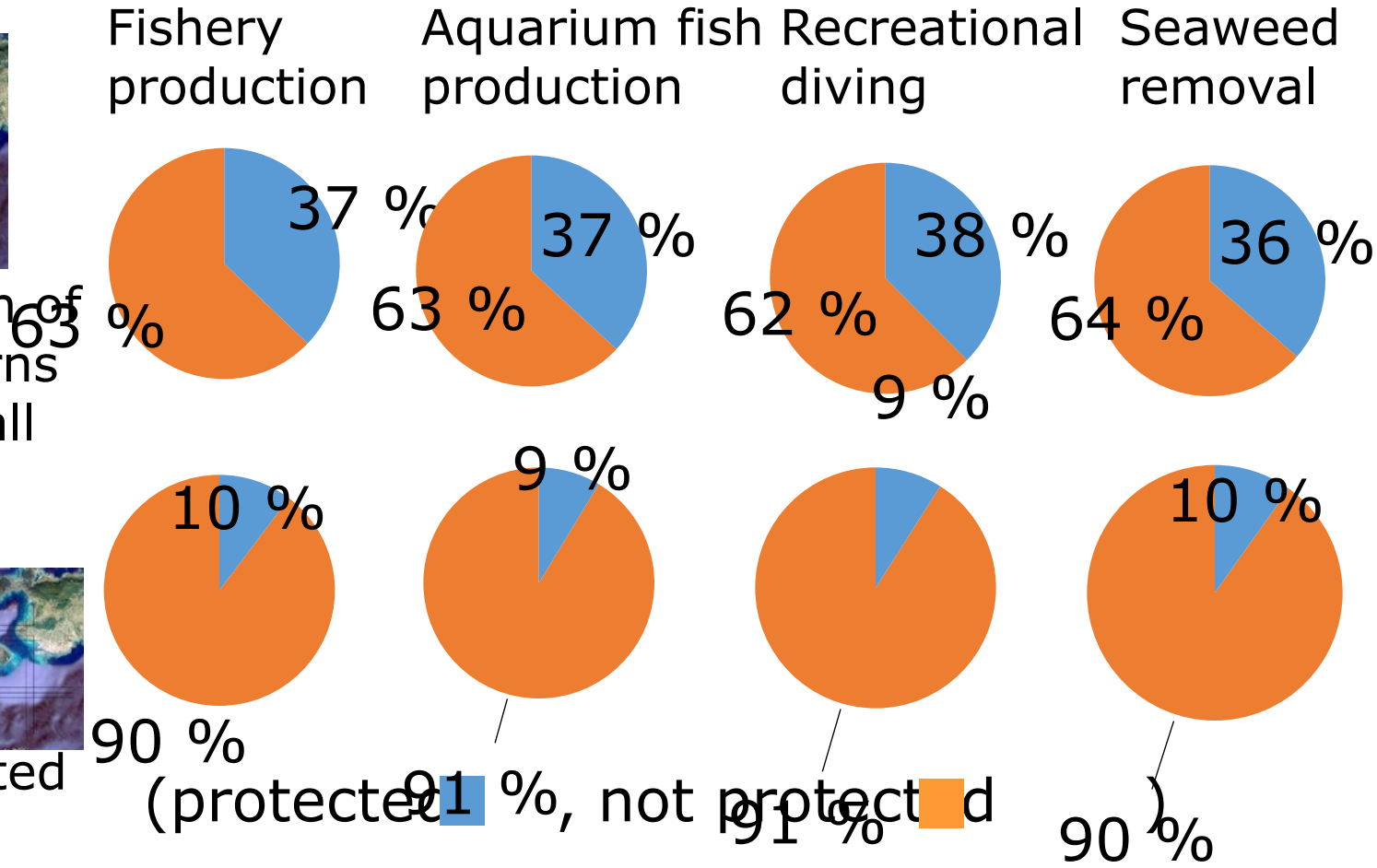
Protected proportions of each ecosystem service by each management option



Extermination of crown of thorns starfish (for all fish)



Marine protected areas by local fisherman unions (for all fish)



Potential values of ecosystem services

The values of aquarium fish provision and recreational diving opportunity (\14.5 and \35.5 billion) are higher than that of fishery production (\1.35 billion) in Sekisei Lagoon.

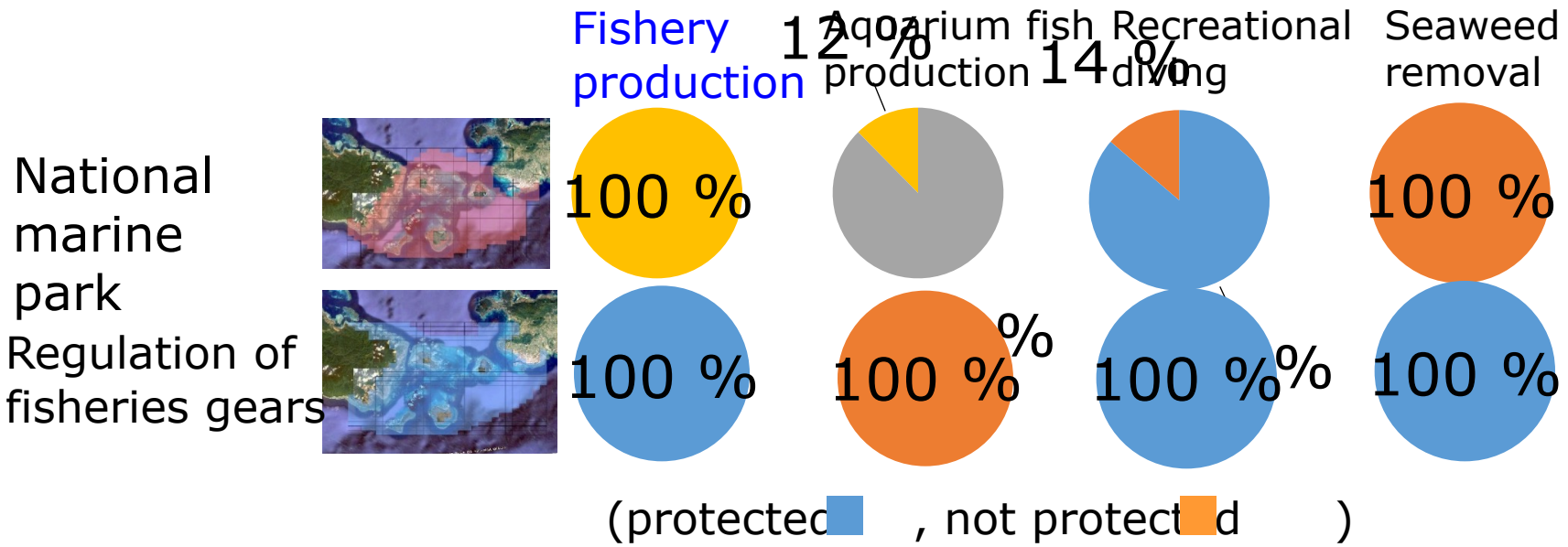
$>$

But our target species of fishery production is only Scaridae, and we cannot include next steps of a value chain of fisheries production such as a selling of fish from markets to restaurants or food processing

Evaluating management options

A protected proportion of fishery production (Scaridae) by national marine parks and regulation of fisheries gear is lower than that of other ecosystem service.

→ Additional management options or enlarging area of the current options are necessary for protecting fisheries production (Scaridae).



Conclusion

Our mapping and evaluating methods are useful to provide baseline data of natural capital and ecosystem services

Useful for

- Future scenario analysis (e.g. under IPCC scenario)
- Effective setting of management options and environmental policy

Acknowledgements

This study was supported by the Environment Research and Technology Development Fund (S-15) of the Ministry of

環境省 Ministry of the Environment
Government of Japan

We thank Hideki Hamaoka for making the mesh maps using GIS software.


Thank you for attention
Scenery of Ishigaki island, Okinwa Pref.