

Adaptation measures based on future projections of corals and macroalgae, use/conservation status on the southwest coast of Shikoku

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Range expansion of reef-building corals, a decline of macroalgal beds, and changes in constituent species for coral community and/or macroalgal beds have been reported in many temperate seas. Not only mitigation but also adaptation is important for the measures against climate change. Consideration of adaptation measures depending on local conditions such as the degree of environmental changes and industrial structure is necessary when the measures will be implemented. This study focused on the marine protected area (Ashizuri-Uwakai National Park) and its surrounding area on the southwest coast of Shikoku Island. This area is characterized by a very large north-south gradient in water temperature and the distribution of corals and macroalgae along with it. The main objective of this study was to consider what adaptation measures are desirable for each region and industry in response to the changes in coastal ecosystems (coral community and macroalgal bed). In order to achieve this objective, we assessed the underwater landscape with a focus on corals and macroalgae that dominates the study area and evaluated how these biological resources are used and conserved in the local tourism and fishery industries. The potential distribution of reef-building coral (*Acropora solitaryensis* complex, *A. hyacinthus* complex, *Pocillopora damicornis*), macroalgae (kelps: *Ecklonia cava kurome*, temperate *Sargassum S. hemiphylum*, tropical *Sargassum S. ilicifolium*), and their predators (coral-eating seastars *Acanthaster* cf. *solaris* and herbivorous fish *Siganus fuscescens*) in the 2090s under the RCP2.6 and RCP8.5 scenarios were projected using a simulated sea surface temperature dataset with high-spatial-resolution (FORP-JPN02 by SI-CAT). After projecting the coastal ecosystem changes and organizing the current use/conservation of coastal ecosystems, we gave examples of what specific adaptation measures should be taken in each area for three fields, i.e., biodiversity conservation, fisheries, and tourism. Assuming the 2090s, though drastic changes in the coastal ecosystem are not projected compared to the present state under the RCP2.6 scenario, as coral distribution moves north, feeding damage by coral-eating seastars is projected to become a problem. Therefore, the expansion of protected areas and the promotion of conservation activities are a major task for coral ecosystem conservation. In municipalities where coral monitoring and conservation activities are not currently being carried out, it is necessary to establish a system for such activities. Also, the challenge is to utilize them as a new tourism resource and to develop tourism facilities in areas where corals are increasing. On the other hand, under the RCP8.5 scenario in the 2090s, it is important to take appropriate conservation measures for macroalgae and grazing pressure on macroalgae will be increased due to extremely elevated water temperature. Moreover, since coral growth becomes difficult to achieve, the creation of alternate or new tourism resources must be needed. Any of the emission scenarios may cause changes in vegetation, and adaptation measures such as changing the target species of fish catches in coastal fisheries and enhancing aquaculture of fish species tolerant to high water temperature may be necessary. This research could represent coastal ecosystem changes in the future with high spatial resolution and adaptation measures based on the changes for each municipality. In the future, we plan to improve methods for projecting the future distribution of corals and macroalgae, clarify connectivity, and identify areas that are less susceptible to climate change. This study was conducted as a part of “Regional Adaptation Consortium Project” by the Ministry of the

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Keywords: coral community, macroalgal bed, climate change, adaptation, utilization, conservation