MexCal: Monitoring and Enhancing the Resilience of Temperate Social-Ecological Systems

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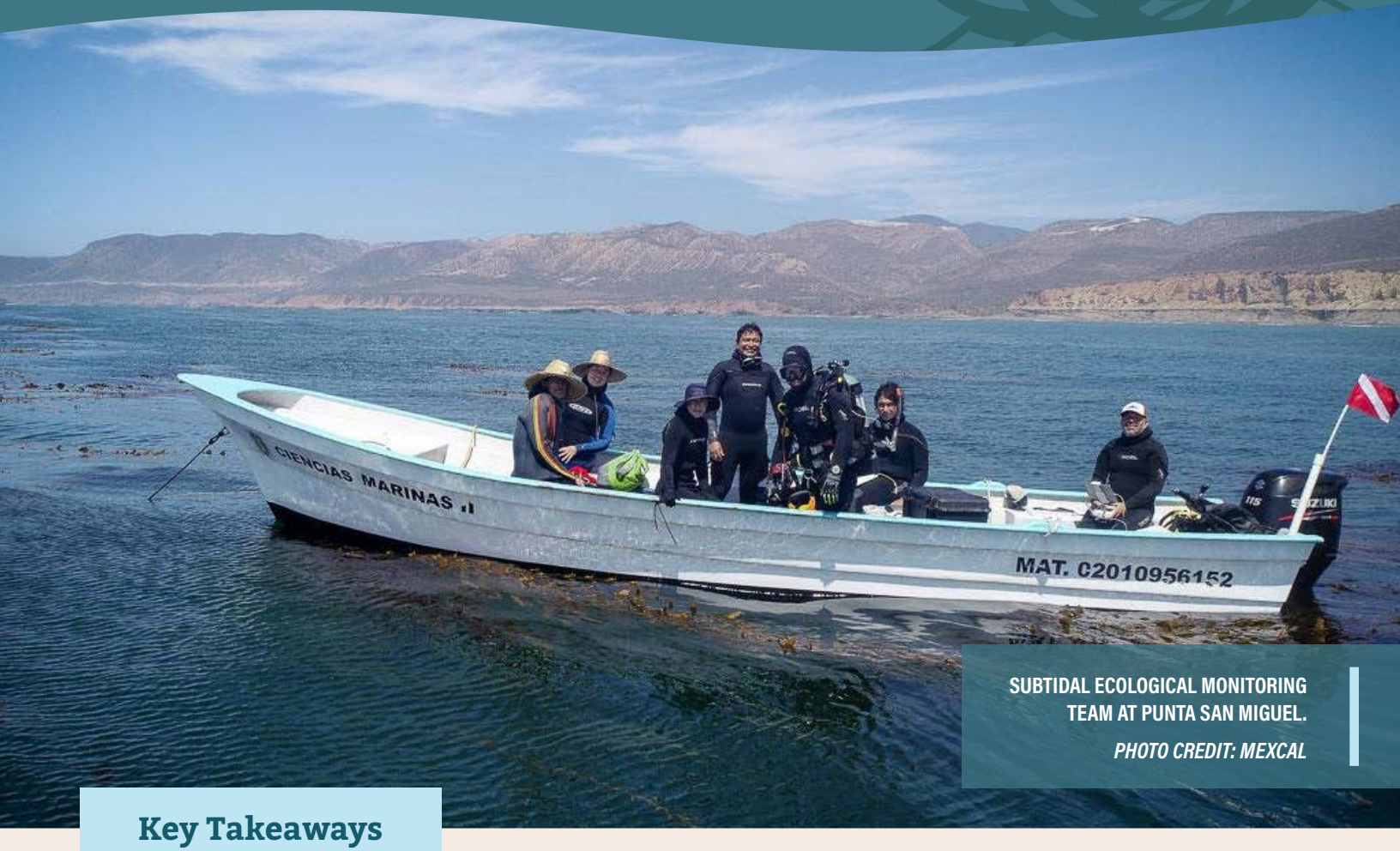

SUBTIDAL ECOLOGICAL MONITORING TEAM AT PUNTA SAN MIGUEL.

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Key Takeaways

- Large-scale, long-term documentation of biophysical and socioeconomic variables are needed to understand changes in social-ecological systems.
- Large-scale and long-term documentation of changes in biophysical conditions is only possible with innovative, integrative, interdisciplinary and international collaborations.

What is the focus and area of your research?

The goal of MexCal is to propose management actions that enhance the resilience of coastal temperate social-ecological systems, using the best information available. These social-ecological systems are the interaction between nature, such as resources and biodiversity, and society as a whole. We study these systems using ecological and social monitoring techniques and integrate information to document change. We focus on:

- Identifying variables and drivers of resistance and resilience
- Developing quantitative methods to integrate multiple sources of information
- Informing ecosystem-based adaptation strategies
- Proposing management actions that enhance the resilience of the social-ecological system

How do you see climate change impacting the focus of your work?

Climate change is increasing the frequency and intensity of some environmental stressors, and their effects on social-ecological systems are difficult to predict (*1*). Uncertainty can be good, as it can promote cooperation to better cope with changes (*2*). Climate change can also have negative effects, such as strong punctual stressors which tip the system to dramatic shifts and unwanted states, from which it is difficult to bounce back.

"MEXCALITO" DIVER ASCENDING AFTER DATA COLLECTION ACTION AT PUNTA EUGENIA, BAJA CALIFORNIA, MÉXICO.

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What climate impacts are you seeing in your region, and what are you most concerned about?

The last decade has been the hottest decade on record, and the Baja California Peninsula is right in the transition from tropical, subtropical, and temperate coastal systems (*3*). Declines in several temperate species that were once abundant (e.g. sea stars, kelp) and shifts in species ranges (e.g. urchins, crabs) (*4*) have been documented in the region. In particular, we have seen tropicalization—when tropical species move northward and can displace temperate species (*5*) —of several biological communities. We have also seen the spread and establishment of invasive species due to losses of native species. These ecological changes can impact economic activities by expanding/contracting fisheries grounds, causing financial hardship due to shortages in revenues.

What are the gaps in understanding that need more research?

Monitoring social-ecological change is expensive, logistically complicated, and underfunded, even though we know that long-term studies typically have a strong positive impact on management and policies (*6*). The main gap we need to fill is the lack of social-ecological models that allow us to identify the drivers (variables and interactions) who conduct the systems to desirable states (outcomes), more resilient and less vulnerable. If we want to predict and plan future scenarios that will help to enhance resilience, we need to monitor these productive but dynamic social-ecological systems.

SUBTIDAL MONITORING AT THE ISLA SAN JERÓNIMO MARINE REFUGEE. WORKING IN COORDINATION WITH THE CONSERVATION GROUP MOCOES (MONITORING AND CONSERVATION OF SPECIES) FROM THE COOPERATIVA ENSENADA.

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What is your plan moving forward to start to better understand or minimize the impacts from climate change?

One way to plan for an uncertain future is through scenario planning focusing on enhancing the resilience of the social-ecological system. In addition, the development of management plans will need to have an adaptive co-management approach to suit changes in the distribution and abundance of marine resources, and include collaboration and communication with local resource users.

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