

## APPENDIX 1

### Role played by research in fostering societal participation and solving marine social-ecological problems reported in the analyzed scientific documentation.

Marine transdisciplinary research in Costa Rica			Role played by research in fostering societal participation and solving marine social-ecological problems								
N°	Published articles	Year	Countries of affiliations of first authorship	Who?	Where?	Region	How?	Level of participation	Communication modes	Stages of transformation of the social-ecological system	Transformational research (phases)
1	MPAs and aspatial policies in artisanal fisheries (Albers et al., 2021)	2021	University of Wyoming, USA	Fisher stakeholders	Costa Rica (Tortuguero) Tanzania	Caribbean (Costa Rica)	Spatial bioeconomic model Interviews Stakeholder discussions	Collaboration	Bidirectional	Preparation for change	Descriptive research I. Past-Current State, II. Scenario-Construction
2	Using dialogue to contextualize culture, ecosystem services, and cultural ecosystem services (Allen et al., 2021)	2021	Department of Earth, Environmental, and Sustainability Sciences, Furman University	Rural communities	Costa de Pájaros	Pacific coast Gulf of Nicoya	Photovoice Maps Participant observation Dialogue workshops Semi-structured Interviews Post-workshop surveys	Coproduction	Bidirectional	Preparation for change	Descriptive research I. Past-Current State, II. Scenario-Construction  Anticipation research IV. Intervention research
3	Levels and drivers of fishers' compliance with marine protected areas. (Arias et al., 2015)	2015	Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University,	Coastguard Inopesca SINAC Tour companies Community leaders Fisher leaders Researchers	Cahuita Santa Rosa Manuel Antonio Cabo Blanco Ostional Gandoca Caletas-Arrio Camaronal Palito Isla Caballo	Caribbean and Pacific	Semistructured interviews Key informant Snowball and convenience sample	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
4	Indicator-based management recommendations for an	2017	Sistema Estudios de Posgrado (SEP),	Artisanal longline fishers	Bejuco (Nicoya Peninsula)	North Pacific	Traffic light method Perceptions	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State

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	artisanal bottom-longline fishery in Costa Rica, Central America (Bystrom et al., 2017)		Universidad Estatal a Distancia. Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica				Fishers' questionnaires				
5	Do responsible fishing areas work? Comparing collective action challenges in three small-scale fisheries in Costa Rica (Carrillo et al., 2019)	2019	Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Costa Rica	Researchers NGOs Governmental institutions SSF Coastal communities	Isla Caballo Isla Chira	Pacific Gulf of Nicoya	Semistructured interviews	Contribution	Unidirectional	Navigating change Institutionalization	Descriptive research I. Past-Current State
6	Segmentation by Motivations in Sustainable Coastal and Marine Destinations: A Study in Jacó, Costa Rica (Carvache-Franco et al., 2022).	2022	Facultad de Turismo y Hotelería, Universidad Espíritu Santo, Ecuador	Tourist sector	Jacó	Pacific coast	Questionnaires Factor analysis	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
7	Pesca artesanal y pobreza en comunidades aledañas al Golfo de Nicoya (Fernández-Carvajal, 2013)	2013	Instituto de Estudios de la Mujer de la Universidad Nacional de Costa Rica (UNA)	Fishing communities Women and their families	Punta Morales Costa de Pájaros Manzanillo	Gulf of Nicoya Pacific coast	Interviews	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
8	Identifying drivers of collective action for the co-management of coastal marine fisheries in the Gulf of Nicoya, Costa Rica	2016	Department of Earth and Environment, Florida International	Fishing communities Cooperative members	Tárcoles	Gulf of Nicoya Pacific coast	SES framework as a diagnostic key informant interviews	Contribution	Unidirectional	Navigating change	Descriptive research I. Past-Current State

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	(García Lozano & Heinen, 2016).		University, Miami, USA				informal interviews Literature review				
9	Property relations and the co-management of small-scale fisheries in Costa Rica: Lessons from Marine Areas for Responsible Fishing in the Gulf of Nicoya (García Lozano & Heinen, 2016)	2016	Department of Earth and Environment, Florida International University Miami, USA	Fishers NGOs Governmental institutions	Tárcoles Isla Chira Costa de Pájaros	Gulf of Nicoya Pacific coast	Literature review (articles, jurisdiction, gray literature) Semistructured interviews Informal interviews Etnographic observation Case studies Participatory modelling Causal loop diagrams Fuzzy cognitive mapping Semistructured interviews	Collaboration	Bidirectional	Navigating change Institutionalization	Descriptive research I. Past-Current State
10	Transformative research and capacity building in the education sector to protect livelihoods and biodiversity in Costa Rica (Gorris et al., 2023).	2023	University of Osnabrück, Germany	Researchers Costa Rica-Germany Students Non-academic actors		Gulf of Nicoya Pacific coast		Coproduction	Bidirectional	Navigating change Institutionalization	Descriptive research I. Past-Current State
11	Innovative Recycling Solutions to Waste Management Challenges in Costa Rican Tourism Communities (Little & Little, 2017)	2017	Environmental Ethics and Development School for Field Studies, Costa Rica, Center for Sustainable Development Studies	Tourist communities NGOs		Nicoya Pensinsula	GIS mapping of litter Surveys on needs and barriers to recycling participation	Collaboration	Bidirectional	Navigating change	Descriptive research I. Past-Current State

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12	Identifying nearshore nursery habitats for sharks and rays in the Eastern Tropical Pacific from fishers' knowledge and landings (López-Angarita et al., 2021)	2021	Fundación Oceans, Bogotá, Colombia	Talking Coastal community stakeholders		Eastern Tropical Pacific Costa Rica Panamá Colombia	Interviews Landings data	Coproduction of knowledge	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
13	Local community perceptions of sea turtle egg use in Tortuguero, Costa Rica. (Mejías-Balsalobre et al., 2021)	2021	Sea Turtle Conservancy FL, USA Rescue Center for Endangered Marine Species (CREMA), Costa Rica	Community stakeholders	Tortuguero	Caribbean	Perceptions and attitudes Semistructured interviews Questionnaires	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
14	The link between risk taking, fish catches, and social standing: Untangling a complex cultural landscape (Naranjo-Madrigal & van Putten, 2019)	2019	Consultant services department, ALNA S.A, San José, Costa Rica	Artisanal fishers	Playa Lagarto	North Pacific	Ethnographic aspects (fisher's lifestyle) Fisher's perceptions (local ecological knowledge) Subsistence catch Interviews Participant observations	Coproduction of knowledge	Bidirectional	Preparation for change	Descriptive research I. Past-Current State
15	Understanding socio-ecological drivers of spatial allocation choice in a multi-species artisanal fishery: A Bayesian network modeling	2015	Consultant services department, ALNA S.A, San José, Costa Rica	Dive artisanal fishery	Playa Lagarto	North Pacific	Bayesian network modeling Good governance scenarios	Coproduction	Bidirectional	Preparation for change	Descriptive research I. Past-Current State, II. Scenario-Construction

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16	approach (Naranjo-Madrigal et al., 2015) Evaluating support for shark conservation among artisanal fishing communities in Costa Rica (O'Bryhim et al., 2016)	2016	Department of Environmental Science & Policy, George Mason University, USA Savannah River Ecology Laboratory, University of Georgia, USA	Fishing communities	San Juanillo Coyote Bejuco Ojochal Puerto Cortés	North Pacific South Pacific	Structured interviews	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
17	Posibilidades de promoción social para los pescadores costeros de Playas del Coco, Guanacaste, Costa Rica, utilizando el Turismo Marino Sostenible (Palacios-Martínez & Núñez-Zamora, 2021)	2021	FUNDACIÓN Promar, OCEANews, CCT, Costa Rica	Coastal fishers	Playas del Coco	North Pacific	Participatory action Participant observation Semistructured interviews	Collaboration	Bidirectional	Preparation for change	Descriptive research I. Past-Current State
18	Applying the SES Framework to coral reef restoration projects on the Pacific coast of Costa Rica (Palou-Zúñiga et al., 2023)	2023	Centro Agronómico de Investigación y Enseñanza (CATIE), Costa Rica;	Volunteers Tour operators Fishers Government institutions Community	Bahía Culebra Sámara Golfo Dulce	North Pacific South Pacific	SES framework Semistructured interviews Perceptions of projects	Contribution	Unidirectional	Navigating change	Descriptive research I. Past-Current State
19	Transforming the social-ecological systems framework into a knowledge exchange and deliberation tool for comanagement (Partelow et al., 2019)	2019	Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany. Jacobs University, Bremen, Germany	Fishers	Gulf of Nicoya	Pacific Coast	SES framework as knowledge exchange Images Deliberation	Coproduction	Bidirectional	Navigating change	Descriptive research I. Past-Current State  Anticipation research IV. Intervention research

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20	Linking fisher perceptions to social-ecological context: mixed method application of the SES framework in Costa Rica (Partelow et al., 2021)	2021	Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany. Jacobs University, Bremen, Germany	Fishers	Isla Venado	Pacific Coast Gulf of Nicoya	Experimental setting (psychometrics) SES framework Perceptions Content analysis Network analysis Participant observations Semi-structured interviews	Collaboration	Bidirectional	Preparation for change	Descriptive research I. Past-Current State
21	Job satisfaction in small-scale fisheries: Comparing differences between Costa Rica, Puerto Rico and the Dominican Republic (Partelow, Pollnac, & Ruiz, 2020)	2020	Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany	Small-scale fishers	Isla Chira Paquera-Tambor Isla Venado	Pacific Coast Gulf of Nicoya	Semistructured interviews Key informant Attitudes	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State
22	Understanding and valuing human connections to deep-sea methane seeps off Costa Rica (Pereira et al., 2024)	2024	Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California, USA	Costa Rican taxpayers	Isla del Coco	Eastern Tropical Pacific	Choice modelling (experimental setting) Ecosystem services WTP	Coproduction	Bidirectional	Preparation for change	Descriptive research I. Past-Current State, II. Scenario-Construction
23	Local community characteristics and cooperation for shared green reputation (Rivera et al., 2017)	2017	George Washington University, USA	Beach communities		North Pacific Central Pacific South Pacific	Census SIG Based on interviews in previous work 2008	Contribution	Unidirectional	Navigating change	Anticipation research IV. Intervention research Descriptive research I. Past-Current State

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24	Institutions and collective action in a Costa Rican small-scale fisheries cooperative: the case of CoopeTárcoles RL (Rivera et al., 2017)	2017	CoopeSoliDar R.L, San Jose, Costa Rica	Small-scale fishing cooperative	Tárcoles	Central Pacific Gulf of Nicoya	Semistructured interviews Secondary information	Collaboration	Bidirectional	Navigating change Institutionalization	Descriptive research I. Past-Current State
25	The importance of values in predicting and encouraging environmental behavior: reflections from a Costa Rican small-scale fishery (Sánchez-Jiménez et al., 2021)	2021	Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany, University of Bremen, Germany, Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica	Small-scale fishers	Paquera-Tambor Costa de Pájaros Isla Chira	Pacific coast Gulf of Nicoya	Deliberation Behavior change interventions Experimental setting EwE trophic model Science communication	Coproduction	Bidirectional	Navigating change	Descriptive research I. Past-Current State, II. Scenario-Construction  Anticipation research IV. Intervention research
26	Connecting a trophic model and local ecological knowledge to improve fisheries management: The case of Gulf of Nicoya, Costa Rica (Sánchez-Jiménez et al., 2019)	2019	Leibniz Centre for Tropical Marine Research (ZMT), Bremen, Germany, University of Bremen, Germany, Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica	Small-scale fishers	Paquera-Tambor Costa de Pájaros Isla Chira	Pacific coast Gulf of Nicoya	EwE trophic model Deliberation Systems of knowledge integration and exchange	Coproduction of knowledge	Bidirectional	Navigating change	Descriptive research I. Past-Current State, II. Scenario-Construction
27	Community Perception and processes of Integrated Coastal Zone Management	2015	Programa de Posgrado en Gestión Integrada	Coastal communities	Cuajiniquil, Villarreal, Montezuma,	North Pacific	Workshops consultation Perceptions	Collaboration	Bidirectional	Preparation for change	Descriptive research I. Past-Current State

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	in the North Pacific of Costa Rica (Sánchez-Jiménez et al., 2015)		de Áreas Costeras Tropicales (GIACT), Universidad de Costa Rica. Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica		and surrounding areas		Content analysis				
28	Sea turtles support sustainable livelihoods at Ostional, Costa Rica (Sardeshpande & MacMillan, 2019)	2019	Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, UK	Coastal communities	Ostional	North Pacific	Semistructured interviews Key informants Questionnaires Likert scale Perceptions Hypothetical scenario WTA	Coproduction	Bidirectional	Preparation for change	Descriptive research I. Past-Current State, II. Scenario-Construction
29	A beacon of hope: distribution and current status of the largetooth sawfish in Costa Rica (Valerio-Vargas & Espinoza, 2019)	2019	Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica, Sistema de Estudios de Posgrado en Biología, Universidad de Costa Rica	Coastal and riverine communities		Caribbean Pacific Northern region	Semistructured interviews Anecdotal records	Contribution	Unidirectional	Preparation for change	Descriptive research I. Past-Current State



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30	Percepción comunitaria sobre arrecifes coralinos en Golfo Dulce: bases para integración social en programas de restauración (Villalobos-Cubero, et al., 2023)	2023	Raising Coral Costa Rica (RCCR), San José, Costa Rica	Artisanal fishers and tourist sector	Golfo dulce	South Pacific	Interviews Knowledge perceptions	Contribution	Unidirectional	Preparation for change Navigating change	Descriptive research I. Past-Current State