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Criteria

Scientific and societal value - relevance, approaches, scope and generality, originality and conclusiveness

Structure and content - structure, visual quality, logical storyline, easily understandable, effort involved

Verbal presentation - clarity of verbal communication, enthusiasm, eye-to-eye contact, posture

Visual aids - clarity, simplicity, relevance, easily understandable

Posters - Shortlist

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David Abreu dos Santos	Promoting Sustainable Marine Planning in the Arctic and Antarctic
Xènia Frigola-Tepe	Is the parasitation of the eggs an additional threat for the Mediterranean sardine?
Guilherme Pinto	Spatio-temporal trends of marine heatwaves in the western Baltic Sea between 1950-2020
Erik Sulanke	How will climate change affect the demersal fisheries of the North Sea? Using a bio-economic model to predict climate-induced changes in fisheries profitability and identify pathways to nature-inclusive harvesting strategies
Alaia Morell	Multispecies eco-evolutionary dynamics of North Sea exploited fish under climate change
Amy Mackintosh	Modeling climate analogs to determine the effects of climate change on aquaculture species
Kalina C. Grabb	Measuring Protons with Photons: A Hand-Held, Spectrophotometric pH Analyzer for Ocean Acidification Research, Community Science and Education
Jessica A. Bolin	Forecasting and projecting swordfish quality for industrial climate adaptation

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INTERNATIONAL SYMPOSIUM | Bergen, Norway | 17-21 April 2023

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Presented to:

Alaia Morell

Co-authors: Alaia Morell, Yunne J. Shin, Nicolas Barrier, Morgane Travers-Trolet, and Bruno Ernande

for Outstanding Poster Presentation on:

Multispecies eco-evolutionary dynamics of North Sea exploited fish under climate change

Symposium Convenors:

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Jörn Schmidt	Sonia Batten	Geir Huse	Kirsten Isensee	Tarub Bahri
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FORECASTING FISH COMMUNITIES UNDER CLIMATE CHANGE WITH EVOLUTION

@AlaiaMorell

Alaia Morell, Yunne-Jai Shin, Nicolas Barrier, Morgane Travers-Trolet, Bruno Ernande

INTRODUCTION

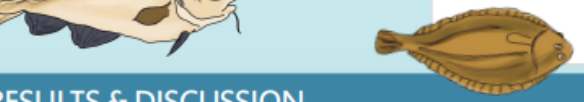
Context

- Fisheries and climate change induce evolutionary and plastic changes in fish life-history traits such as growth rate, size and age at maturation and fecundity
- Ecological consequences: decrease biomass and size-at-age
- Economic consequences: fisheries yields and fish values decrease

Current gaps:

- Evolutionary change is not included in marine ecosystem models. Forecasts ignore potential evolutionary traps or rescues and their ecosystem consequences

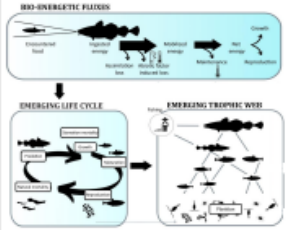
CAN EXPLOITED FISH IN THE NORTH SEA COPE WITH CLIMATE CHANGE THROUGH EVOLUTION?



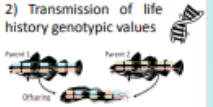
MATERIALS & METHODS

Evolutionary marine ecosystem model: the Ev-OSMOSE model

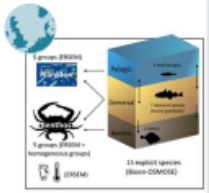
1) Explicit physiology, varying with T° and O_2, from which emerges life history



2) Transmission of life history genotypic values

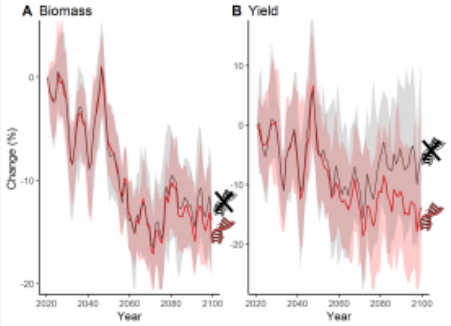


3) Applied to the North Sea ecosystem



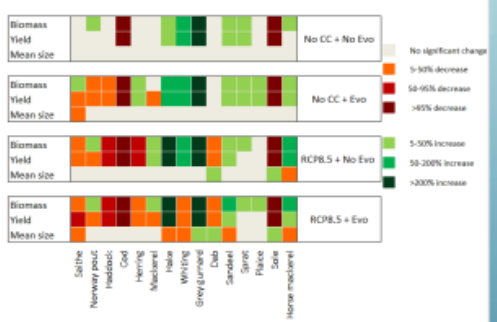
RESULTS & DISCUSSION

Total biomass and yield (RCP 8.5)



- Evolution does not impact the response of total biomass to climate change (A)
- The total fishing yield decreases more in scenarios with evolution (B)

Biomass, catch and mean size per species



- Evolution accentuates patterns of change mainly changes in size. A decrease in size could impact the economic value of fish
- The biomass and yield of valuable species (cod, sole, saithe, haddock, herring) decrease

With evolution, the volume and value of catch worsen

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Presented to:

Kalina C. Grabb

Co-authors: Kalina C. Grabb, William Pardis, Michael DeGrandpre, Reggie Spaulding, James Beck, Jonathan Pfeifer, and David Long

for Outstanding Poster Presentation on:

Measuring Protons with Photons: A Hand-Held, Spectrophotometric pH Analyzer for Ocean Acidification Research, Community Science and Education

Symposium Convenors:
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Measuring Protons with Photons: A hand-held, spectrophotometric pH Analyzer for Ocean Acidification Research, Community Science and Education

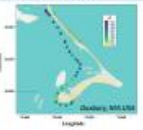
Kalina C. Grabb*[1,2], William Pardis[3,4], Michael D. DeGrandpre[5,6], Reggie Spaulding[5], James Beck[5], Jonathan A. Pfeifer[2,4], and David M. Long[4,7]

[1]National Oceanic and Atmospheric Administration, [2]Woods Hole Oceanographic Institution-MIT Joint Program, [3]Woods Hole Oceanographic Institution, [4]Flathead Valley Community College, [5]Sunburst Sensors, LLC, [6]University of Montana, [7]California Polytechnic State University

The Power of the pHyter

Measures pH reliably with a known accuracy and requires minimal training

Enables STEM and OA education programs to encourage and stimulate students to learn about local and global environmental issues



Provides people around the world with a **tool to measure pH** in their local environments to observe spatial and temporal pH trends

Empowers global communities to use their own **science to inform** local government, policy, and societal decisions

What is the pHyter?

- **Hand-held**, **affordable**, **field-durable**, **easy-to-use** pH instrument (Fig. 1)
- Controlled through **smartphone app** with data in under 1 minute (Fig. 2)
- pH measurements are **spec-based** with indicator dye (Fig. 3)
- **Accuracy comparable** to uncertainties in benchtop spectrophotometric pH measurements (Table 1, Fig. 4, Fig. 5)
- Designed for **community-based science** and used with minimal training
- Ideal for **spatial and temporal sampling**, while highlighting small-scale variations across large regions

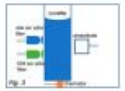


Fig. 1 (Left): pHyter diagram
Fig. 2 (Center): pHyter smartphone app
Fig. 3 (Right): pHyter optical design

Testing, Verification, and Accuracy

The pHyter was **tested and verified** against known methods (Pardis et al., 2022, above)

Table 1: pHyter **accuracy and precision** on Tris Certified Reference Material (CRM) was **±0.026 ± 0.045**

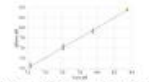


Fig. 4: Seawater pH measurements collected on benchtop **Cary UV-Vis** and **pHyter** (linear fit 0.997, R^2 = 0.998, n=69)

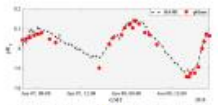
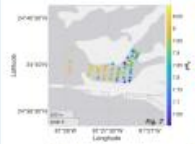


Fig. 5: Compared to **ISAMI**, pHyter measured pH **-0.033 ± 0.066**

The pHyter in Action

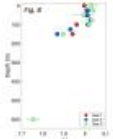
NOAA West Coast Region National Marine Sanctuaries developed a **plankton curriculum** that utilized the **pHyter to educate about OA**. Teacher Alice Ryan (right) taught this curriculum at the **Quileute Tribal School** (top), who proceeded to win the Nickelodeon Get Dirty! Ambassadors award for their work in science

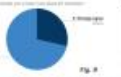


Sea Education Association (SEA) students measured **pH within mangroves** using the pHyter while on kayaks, highlighting the small-scale variation (Fig. 7)

SEA Semester

SEA students collected **pH data from water carousels** in the Gulf of Mexico, showing pH depth trends across three stations (Fig. 8)





In a user-feedback survey, SEA students say (Fig. 9):

- The pHyter **inspired** them to **learn more**
- The pHyter was **easier to use** than the benchtop spec
- They **felt competent** using the pHyter after a few times
- They were **comfortable teaching peers** how to use the pHyter
- They **enjoyed** using the pHyter

Additional Interested Partners

Education & Outreach
Cabrillo College
Chesapeake Bay Governor's School for Marine and Environmental Science
Flathead Valley Community College
Quileute Tribal School
Ocean Guardian School
Montana American Indians Math & Science
University of North Carolina, Wilmington
Woods Hole Oceanographic Institution (WHOI)

International Networks
Global Ocean Acidification Observing Network (GOA-ON)
Ocean Acidification Alliance

Local Industries
Aquaculture
Fishermen

Scientists
University (Cal Poly, UH, VIMS)
Research Institution (WHOI)

Community Science
Buzzards Bay Coalition
National Phytoplankton Monitoring Network
Surfrider Foundation

Governmental Agencies
US Environmental Protection Agency (EPA)
US National Oceanic and Atmospheric Administration (NOAA)

Non-government Orgs
The Ocean Foundation

The Future of the pHyter

The pHyter can provide communities, such as **Indigenous nations**, with opportunities in **science and education** (Quileute Tribal School, left; teacher training on Makah Indian Reservation, right)

Global OA networks can distribute pHyters and support users to increase **OA monitoring capacity** and **build international collaborations** (Pacific Islanders training in Fiji, left; Chile, right)

pHyter measurements will enable countries to meet **UN mandate to submit data to global pH databases** such as Sustainable Development Goal 14.3.1 Data Portal and GOA-ON Data Explorer

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Co-authors: Jessica A. Bolin, David S. Schoeman, Karen J. Evans, Claire M. Spillman, Thomas Moore, Jason R. Hartog, and Kylie L. Scales

for Outstanding Oral Presentation on:

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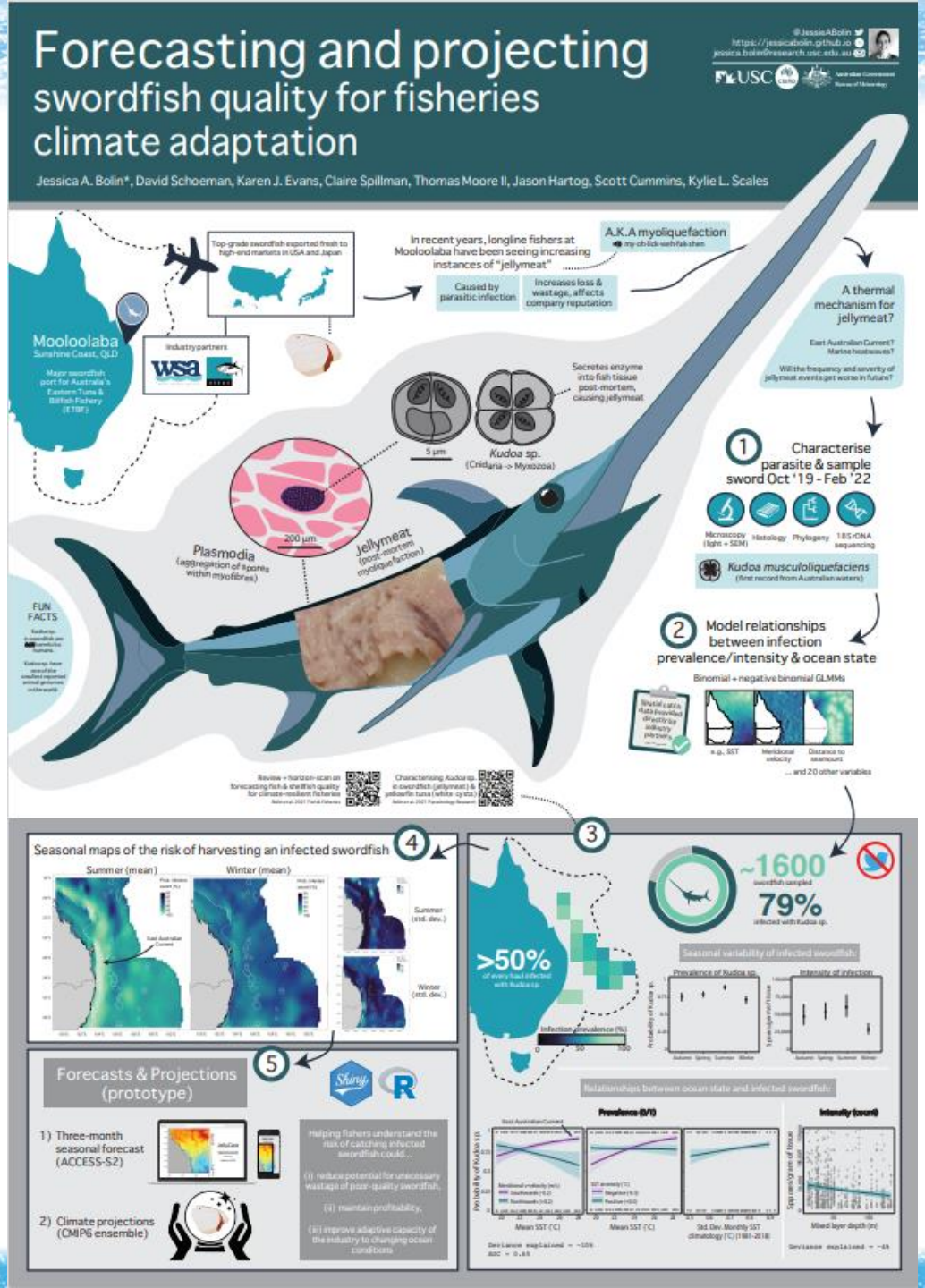

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Oral talks - Shortlist

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Tom J. Langbehn	Model evidence for photic barriers to poleward range shifts
Martine Røysted-Solås	Association between coastal water darkening and hypoxia
Corentin Clerc	Gelatinous macrozooplankton response to climate change and implications for the deep sea
Olivia Harrod	Climate change risk and adaptation for fisher communities in Ghana
Matthew D. Robertson	Testing models of increasing complexity to provide ecosystem-informed fisheries management advice
Alexa Fredston	Marine heatwaves are not a dominant driver of change in North Atlantic and Pacific fish communities
Jack Smith	Offshore carbon as a nature-based solution: Expert interviews on the potential governance of the offshore carbon system for climate change mitigation
Maren Kruse	Assessing possible futures of a complex fisheries social-ecological system in the southern North Sea with a spatially explicit Bayesian Belief Network
Clea Abello	Designing a large-scale Marine Protected Area network in a warming Mediterranean Sea
Dylan G.E. Gomes	Integrating information into end-to-end ecosystem models: data accessibility challenges and solutions

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