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AI and Satellite Technology in Feed Management for Sustainable Aquaculture

Abstract

The challenges of aquaculture are not simple, and a variety of issues from production to consumption are complex and interrelated. UMITRON is promoting the digitalization of the aquaculture sector by utilizing AI technology that can analyse the condition of fish and shrimp in real time and satellite remote sensing technology that outputs environmental information. The data obtained here can be used to improve FCR, growth rates, and production in fish and shrimp aquaculture, providing direct benefits to farmers. The company is also working with partners along the value chain such as helping feed manufacturers optimize feeding when utilizing fishmeal-free feed, working with financial partners to improve producers' access to financial services, and working with retailers to promote sales of seafood products by providing traceability data from the production site to consumers.

Our objective of this speech is to discuss with many participants through this seminar the possibilities to collaborate with various players by utilizing data.

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install Sustainable Aquaculture on Earth

WHY AQUACULTURE?

Presently unsustainable production landscape

- Natural fish stocks have declined by 50% in the past 40 years.
- Increased demand, unsustainable supply: Economic growth is fuelling an increased demand for better diets (including protein). Traditional sources such as beef and poultry will soon be unable to meet this protein gap.

Aquaculture's rapid expansion and potential

- It is currently the fastest growing food production sector.
- It provides real opportunity to plug the protein gap for the world's growing middle class.
- Sustainable aquaculture is expected to expand dramatically in the next 5 years.
- 85% of the world's aquaculture operators are in Asia.
- Employment growth in the aquaculture industry has been remarkable in recent years, with 11 million people engaged in the aquaculture industry in the Asian region.
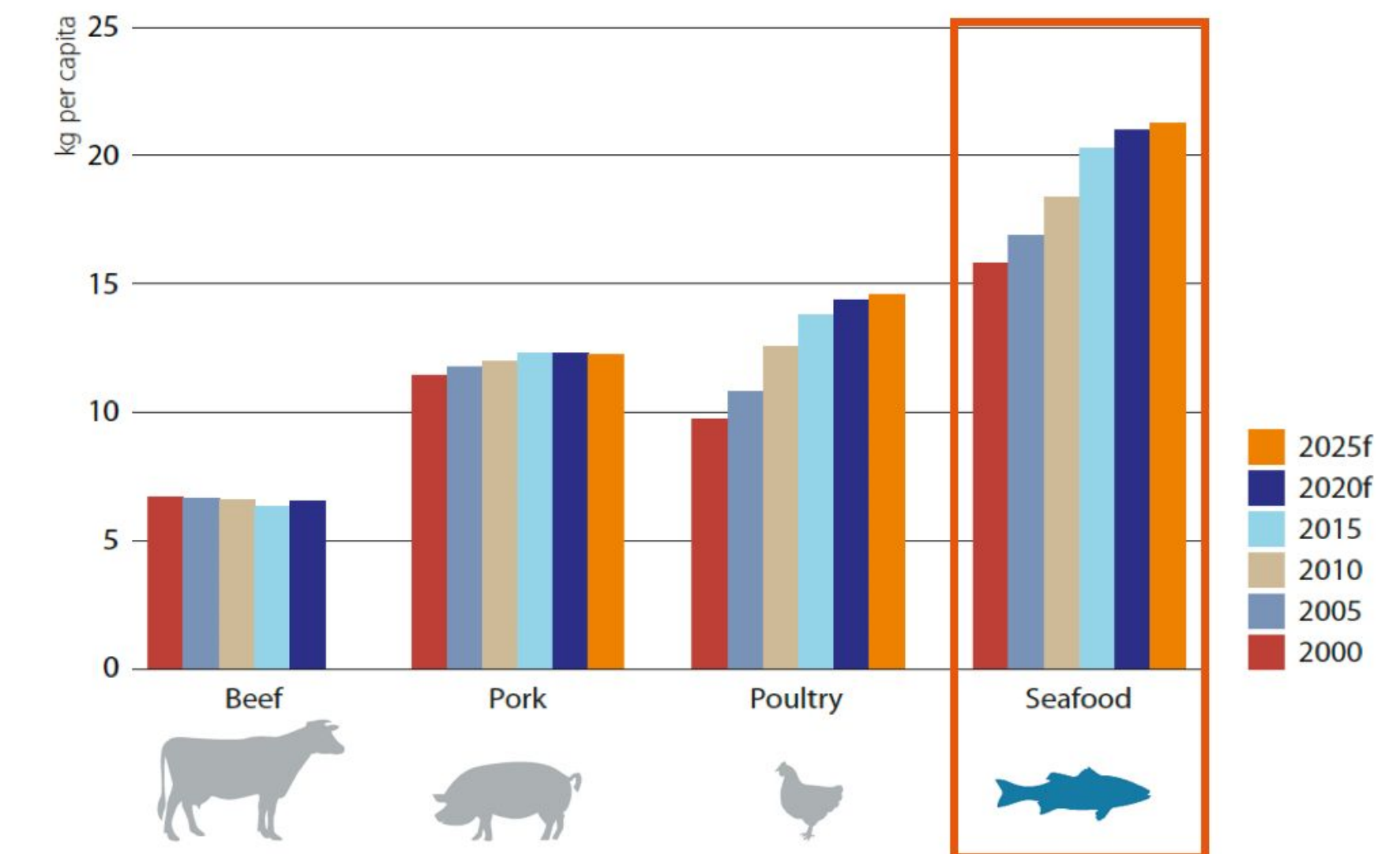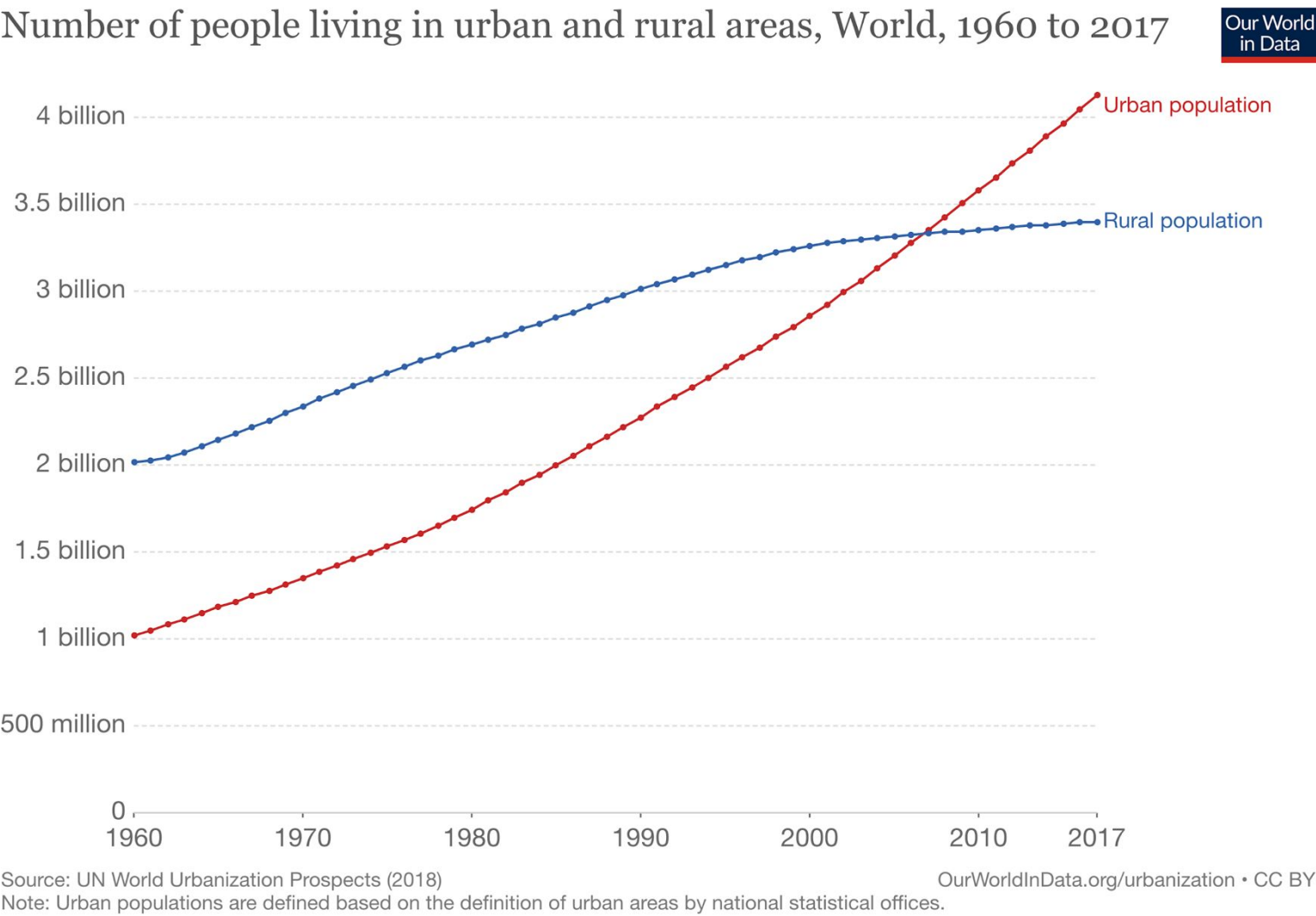
Seafood production: wild fish catch vs aquaculture, World
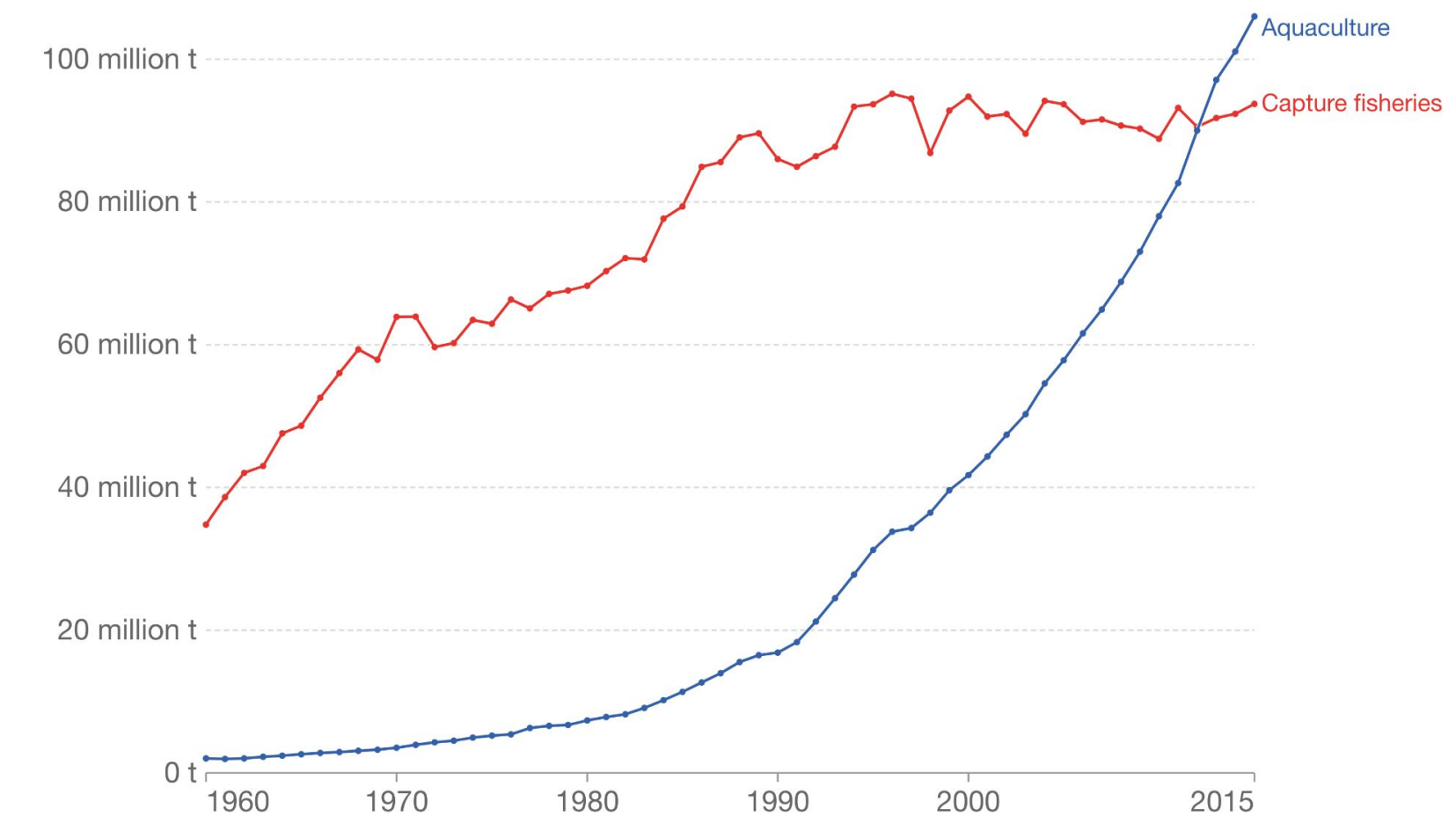
Source: Food and Agriculture Organization of the United Nations (via World Bank)   OurWorldInData.org/seafood-production • CC BY

**Per capita consumption of animal protein**

Urbanisation and global warming are changing the way we produce food and driving food system transformations.

Number of people living in urban and rural areas, World, 1960 to 2017

Source: UN World Urbanization Prospects (2018)
Note: Urban populations are defined based on the definition of urban areas by national statistical offices.

Global warming: monthly temperature anomaly
The combined land-surface air and sea-surface water temperature anomaly is given as the deviation from the 1951–1980 mean.

Source: National Aeronautics and Space Administration (NASA), Goddard Institute for Space Studies (GISS)   CC BY

The global population has been undergoing a shift, with more than half of the world's population now residing in urban areas. With almost 7 billion people projected to live in urban areas in the next 30 years, there will be increased stress on our food production systems to produce more with a reduced labour force in rural production settings.

Technology can help to bridge this workforce gap while increasing production efficiencies to meet our ever-growing global population.
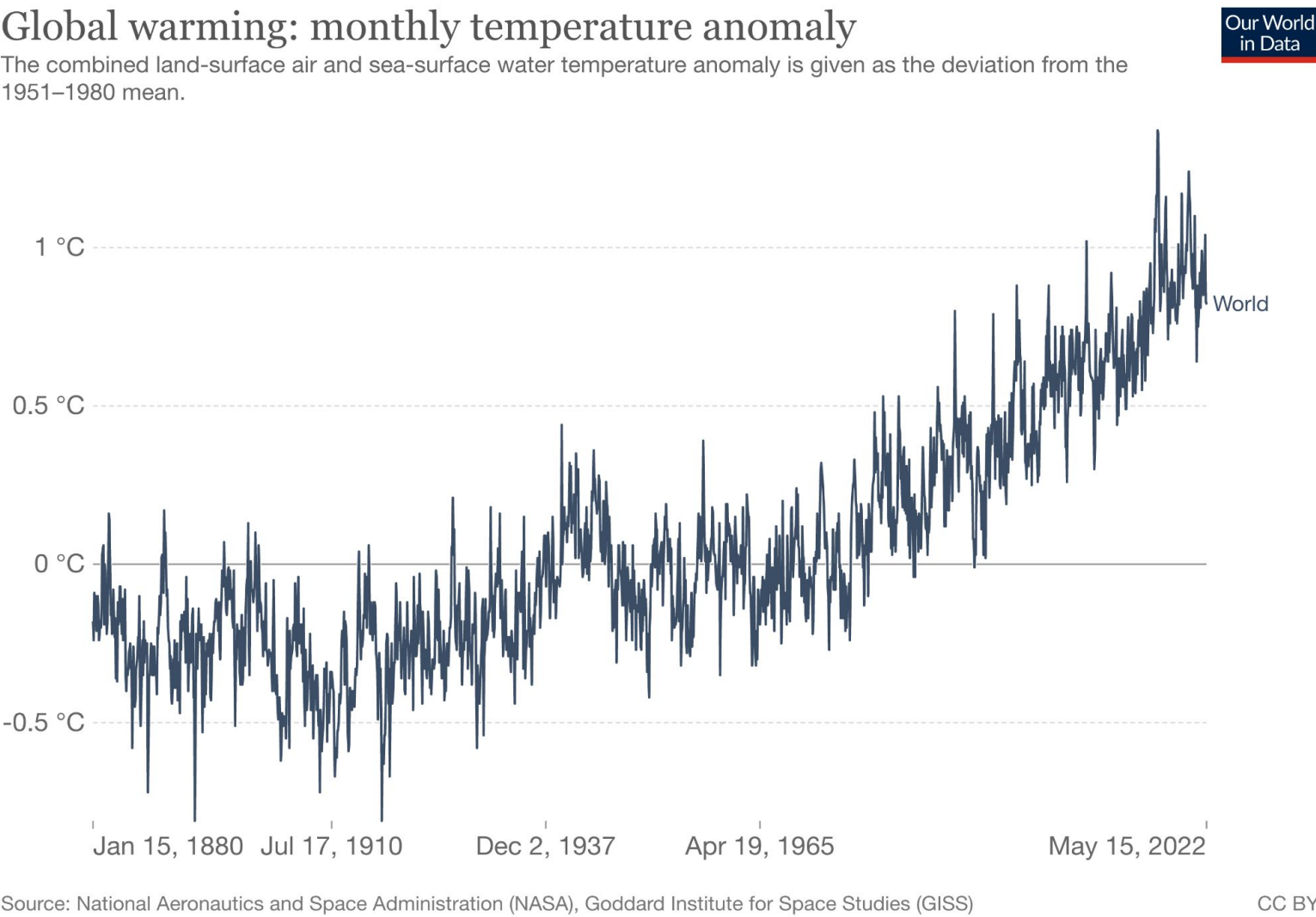
Sea level rise due to climate change and global warming are also placing coastal communities and agricultural farmlands at risk, which further emphasizes the need for highly adaptable, robust and resilient food systems.

WHO IS UMITRON?

WHY?

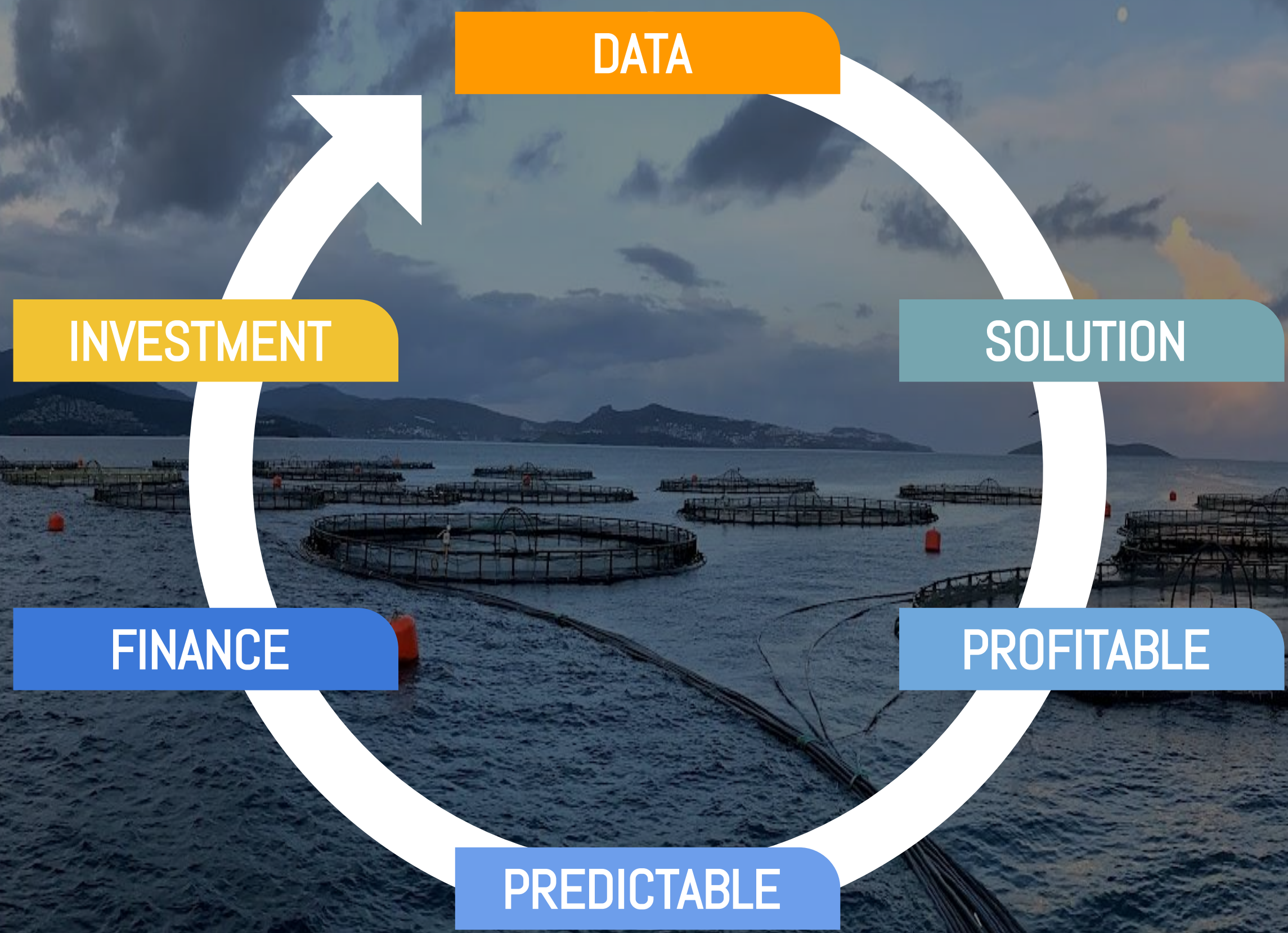Install sustainable aquaculture on Earth

HOW?

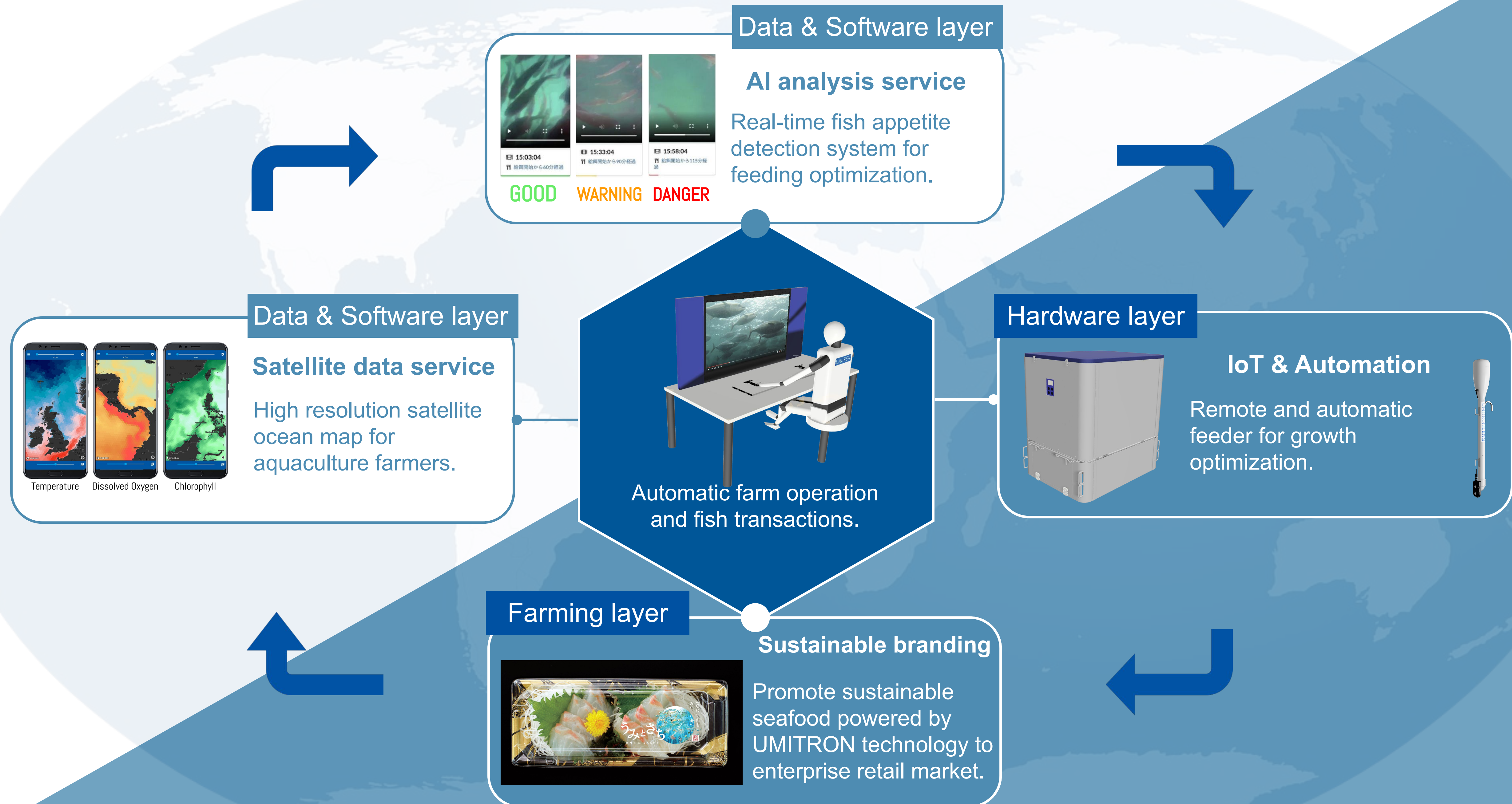Through Satellite Technology, AI, Machine Learning and a lot of passion

WHAT?

We are a leading aquaculture technology provider and advisor with unique offerings

Unlocking the future of sustainable aquaculture production using data

DATA

SOLUTION

INVESTMENT

FINANCE

PROFITABLE

PREDICTABLE

Data without context is meaningless. Without a good understanding of what is measured and why, it will be a challenge to make sense of the data in a useful way, even with the most robust of datasets.
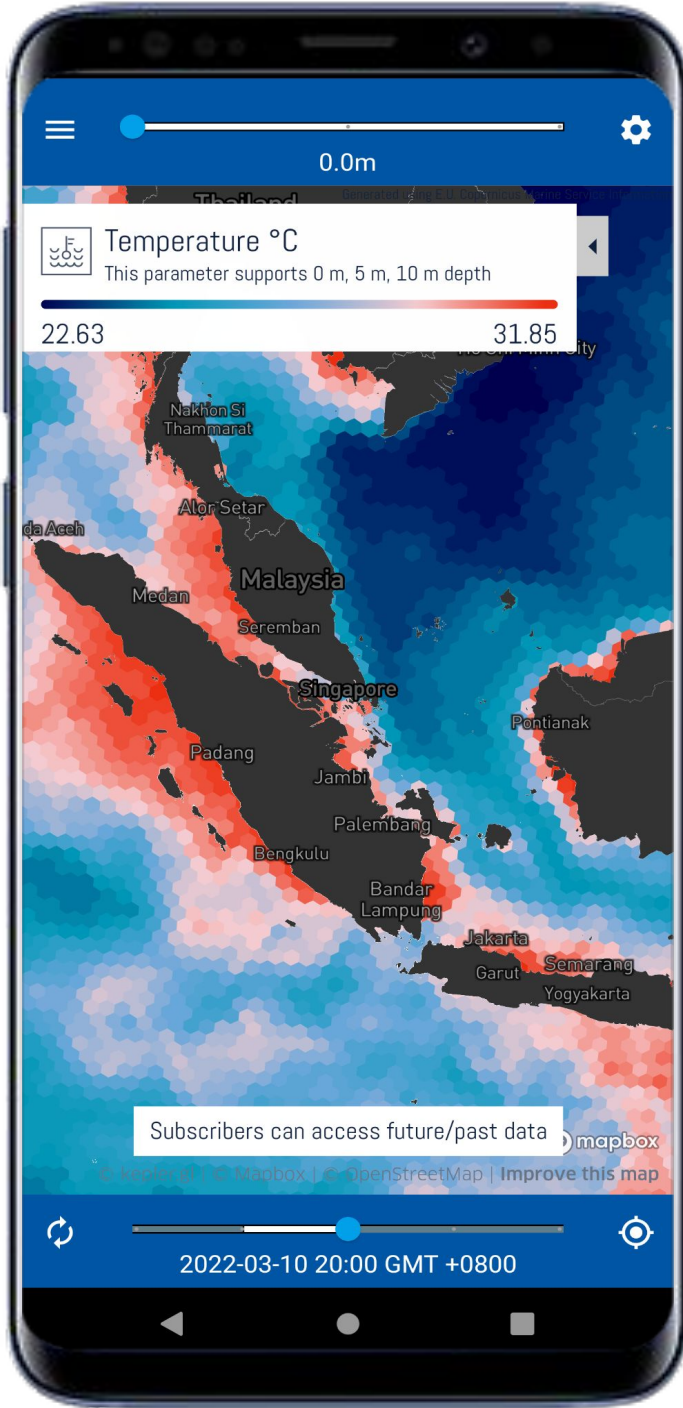
Our aim is to create solutions to help producers interpret and understand their farm data that will benefit their daily and long-term biological and economic growth, and create a farming system that is repeatable, predictable, scalable and sustainable.
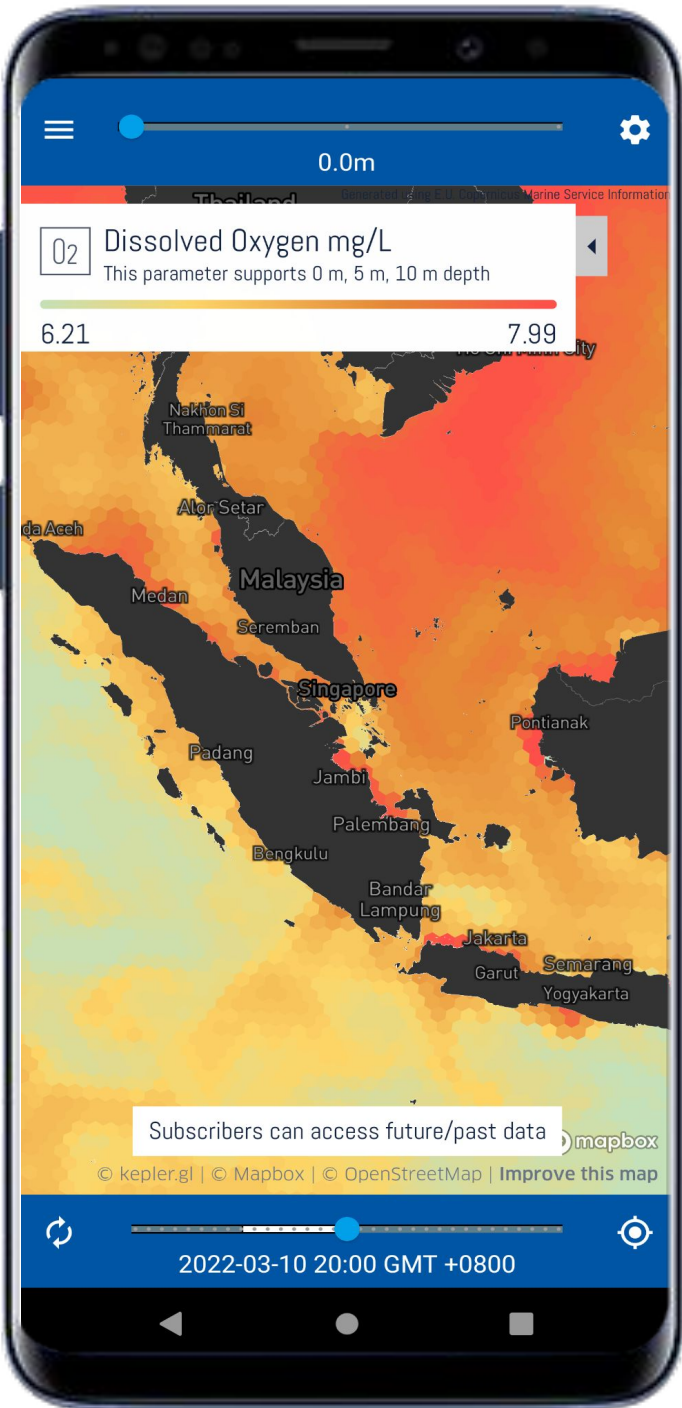
UMITRON **| Virtual farming - repeatable, scalable, data-driven aquaculture**

CONFIDENTIAL

Data & Software layer

AI analysis service

Real-time fish appetite detection system for feeding optimization.

GOOD WARNING DANGER

Data & Software layer

Satellite data service

High resolution satellite ocean map for aquaculture farmers.

Temperature   Dissolved Oxygen   Chlorophyll

Hardware layer

IoT & Automation

Remote and automatic feeder for growth optimization.

Automatic farm operation and fish transactions.

Farming layer

Sustainable branding

Promote sustainable seafood powered by UMITRON technology to enterprise retail market.

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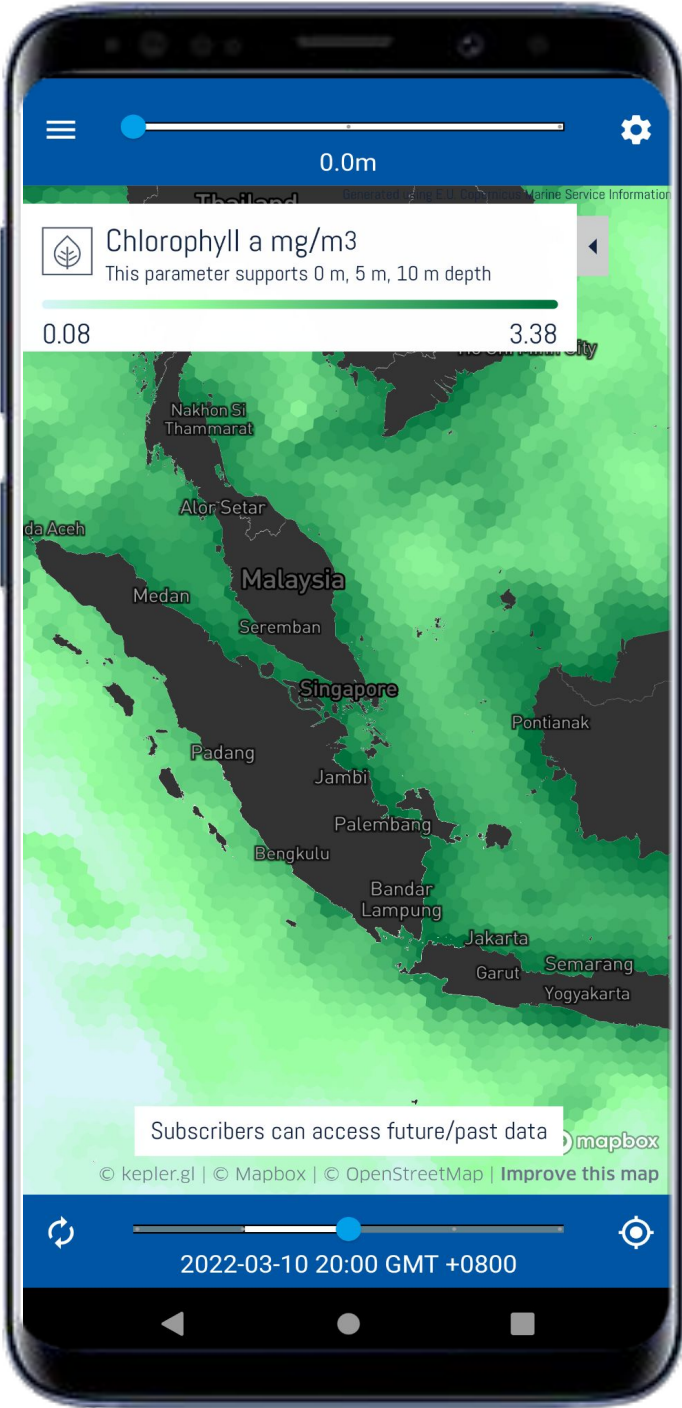
UMITRON**PULSE**

Data & Software layer

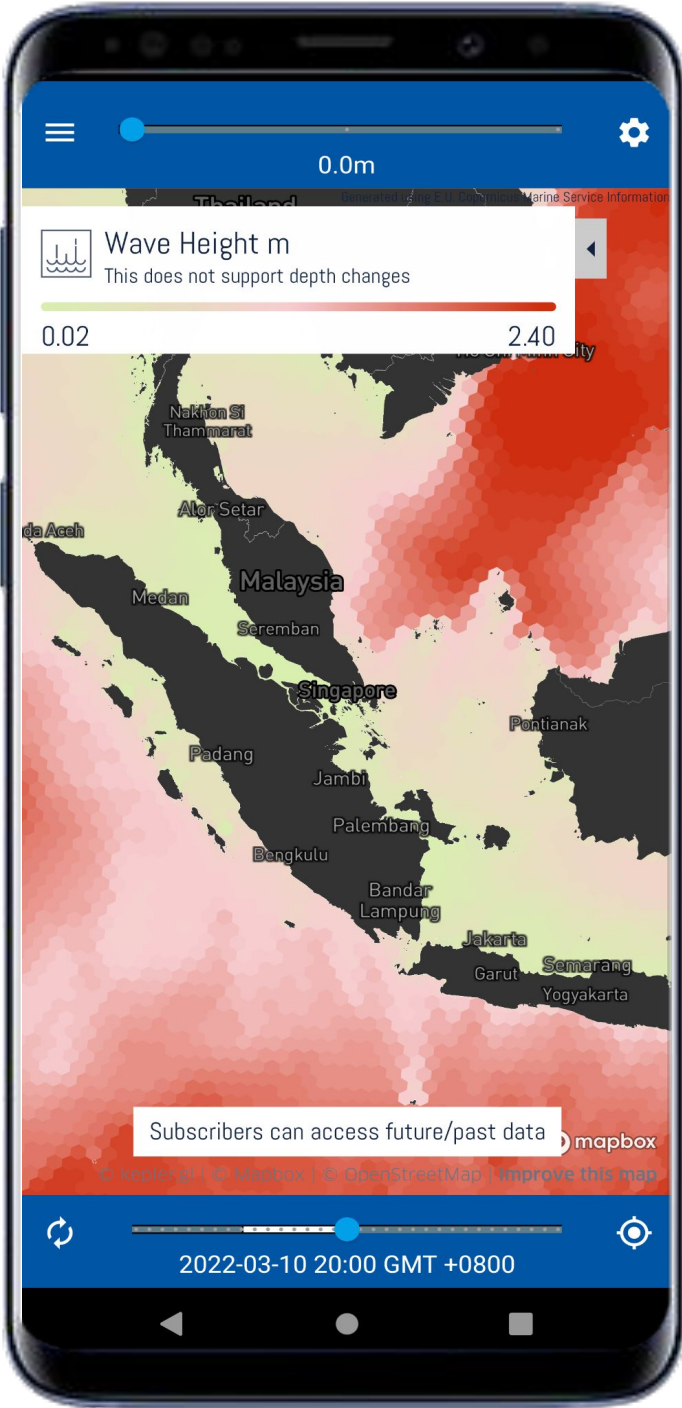*High resolution satellite data platform for aquaculture culture*
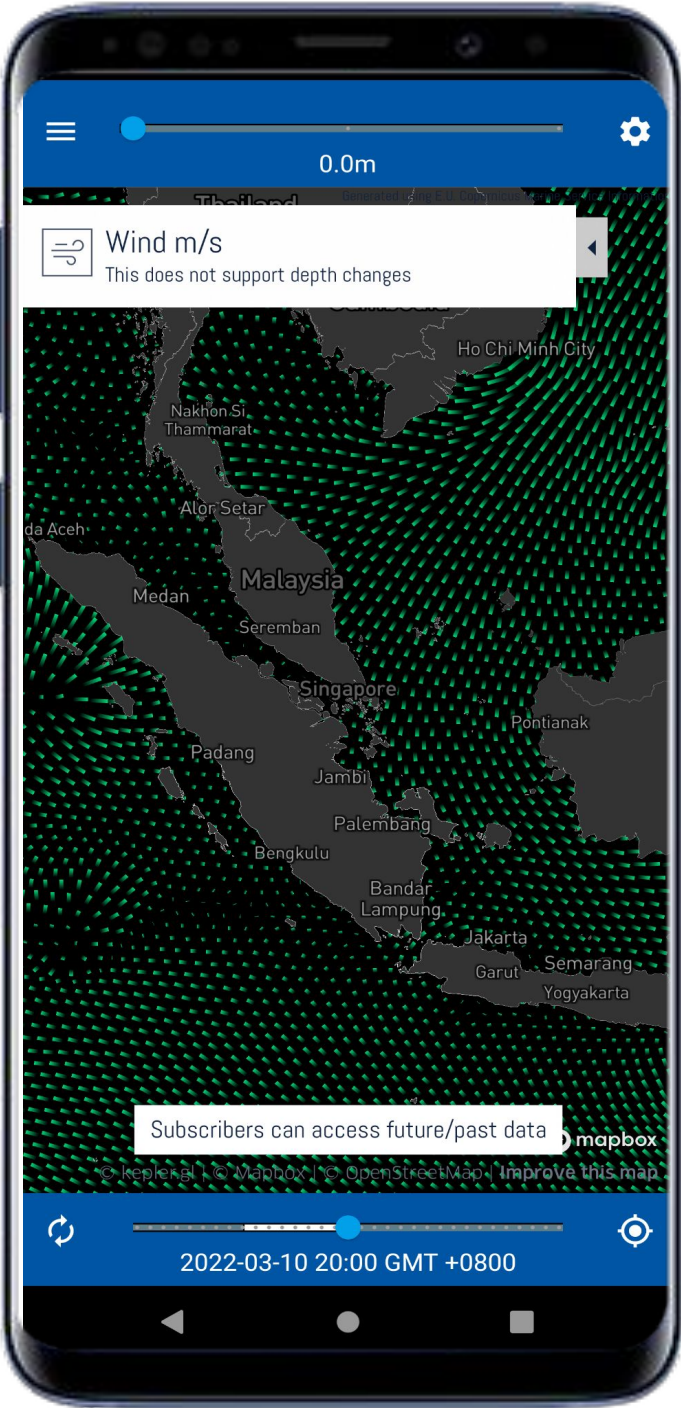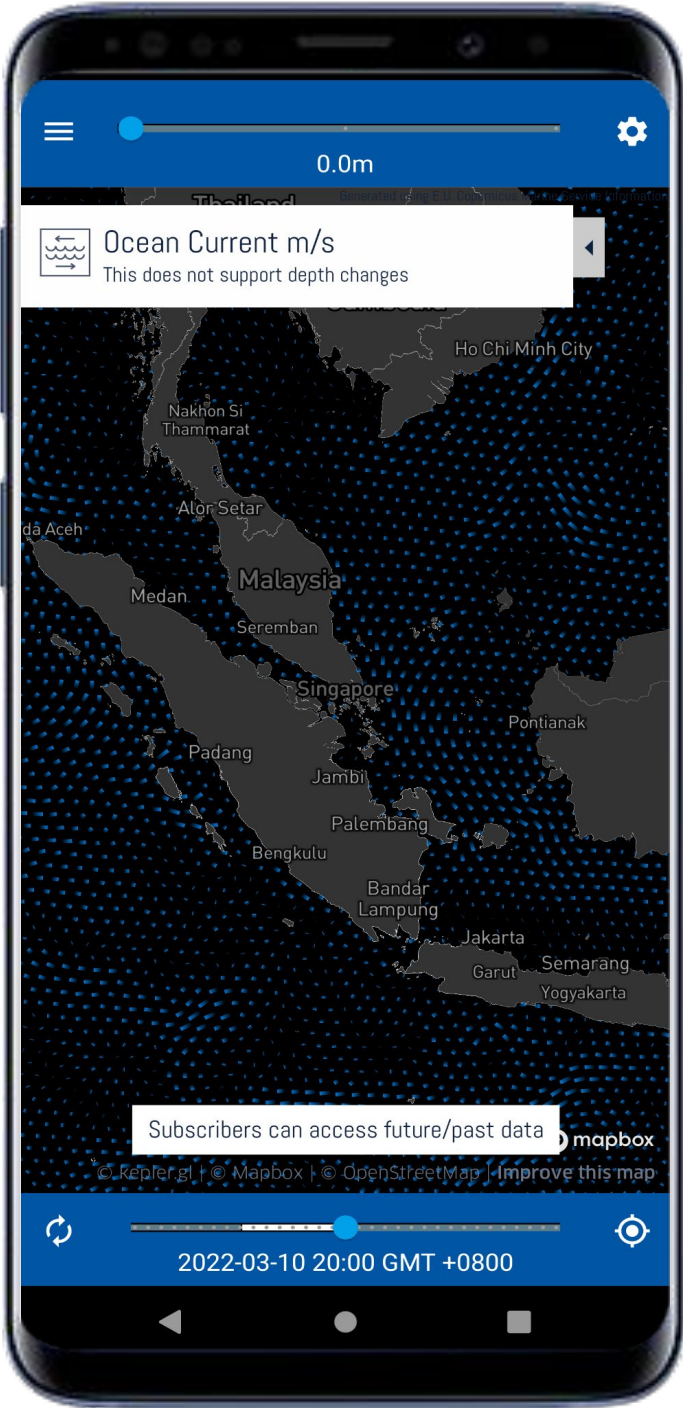
Temperature   **Dissolved Oxygen**   **Chlorophyll a**   **Salinity**   **Wave Height**   **Wind**   **Ocean Current**
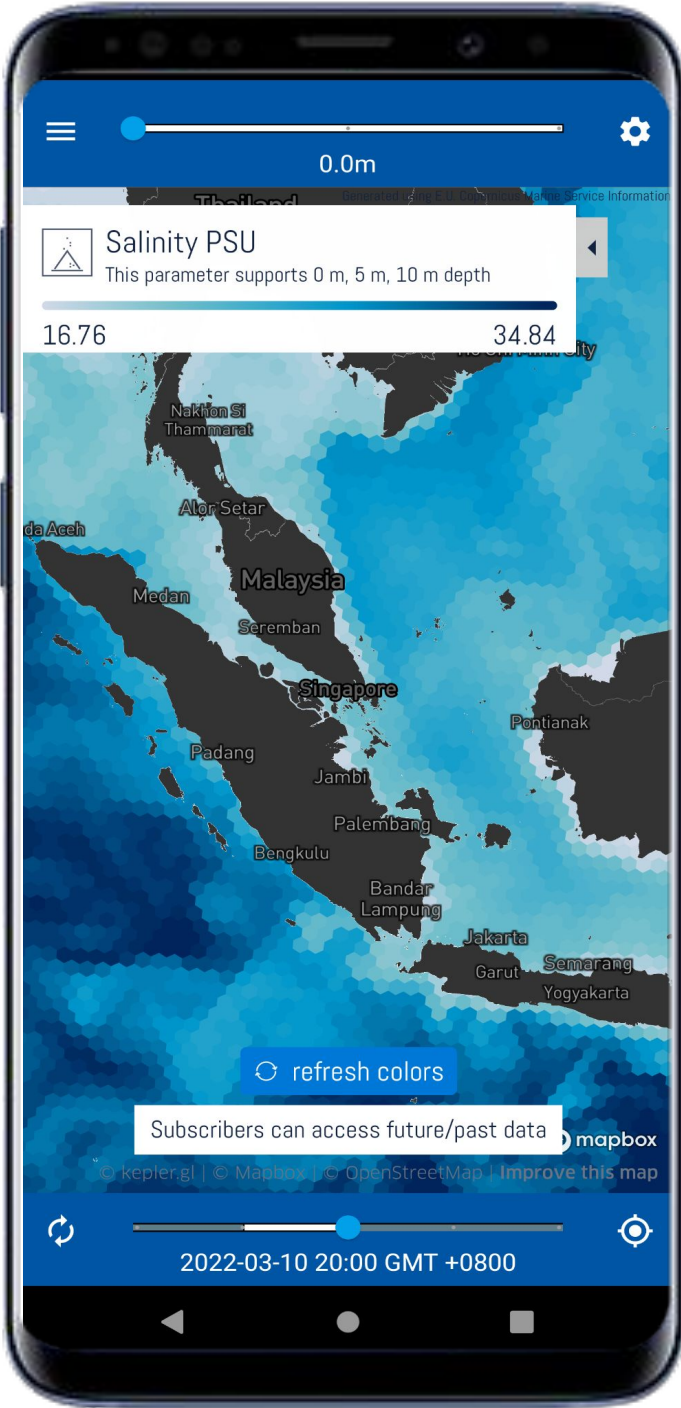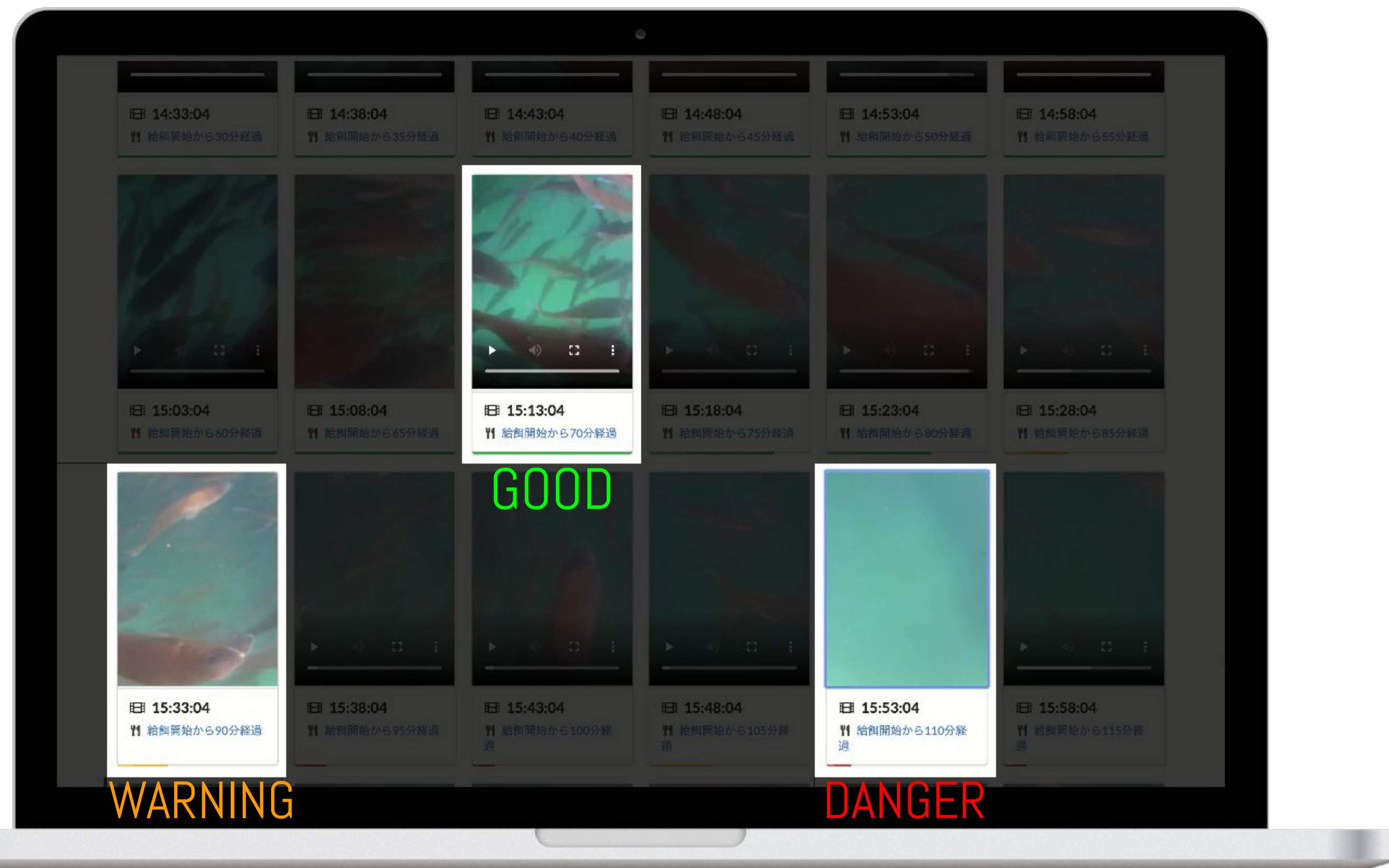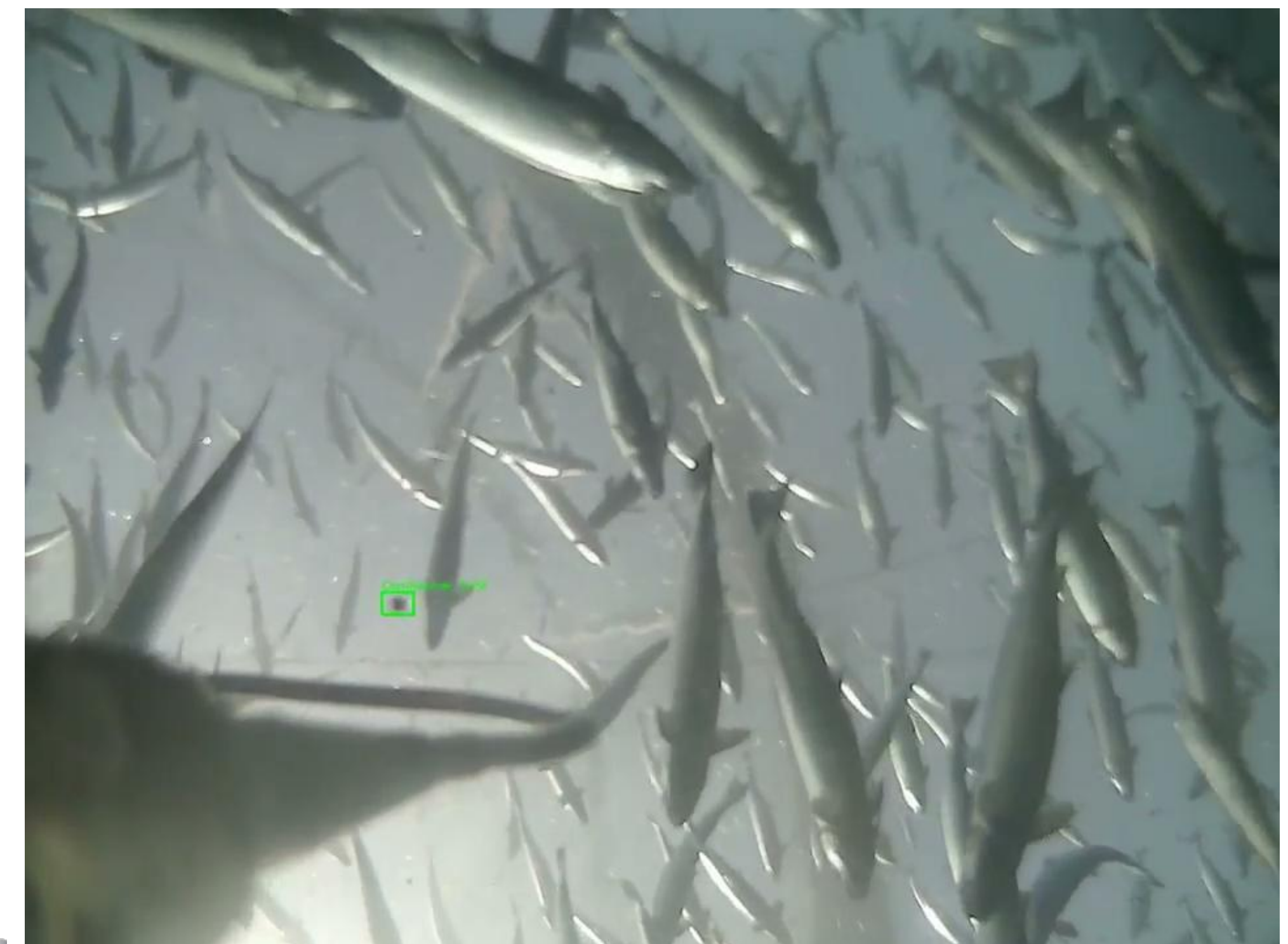
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UMITRON**REMORA**

Data & Software layer

Minimize feed waste and maximize growth rate by appetite AND PELLET DETECTION USING AI
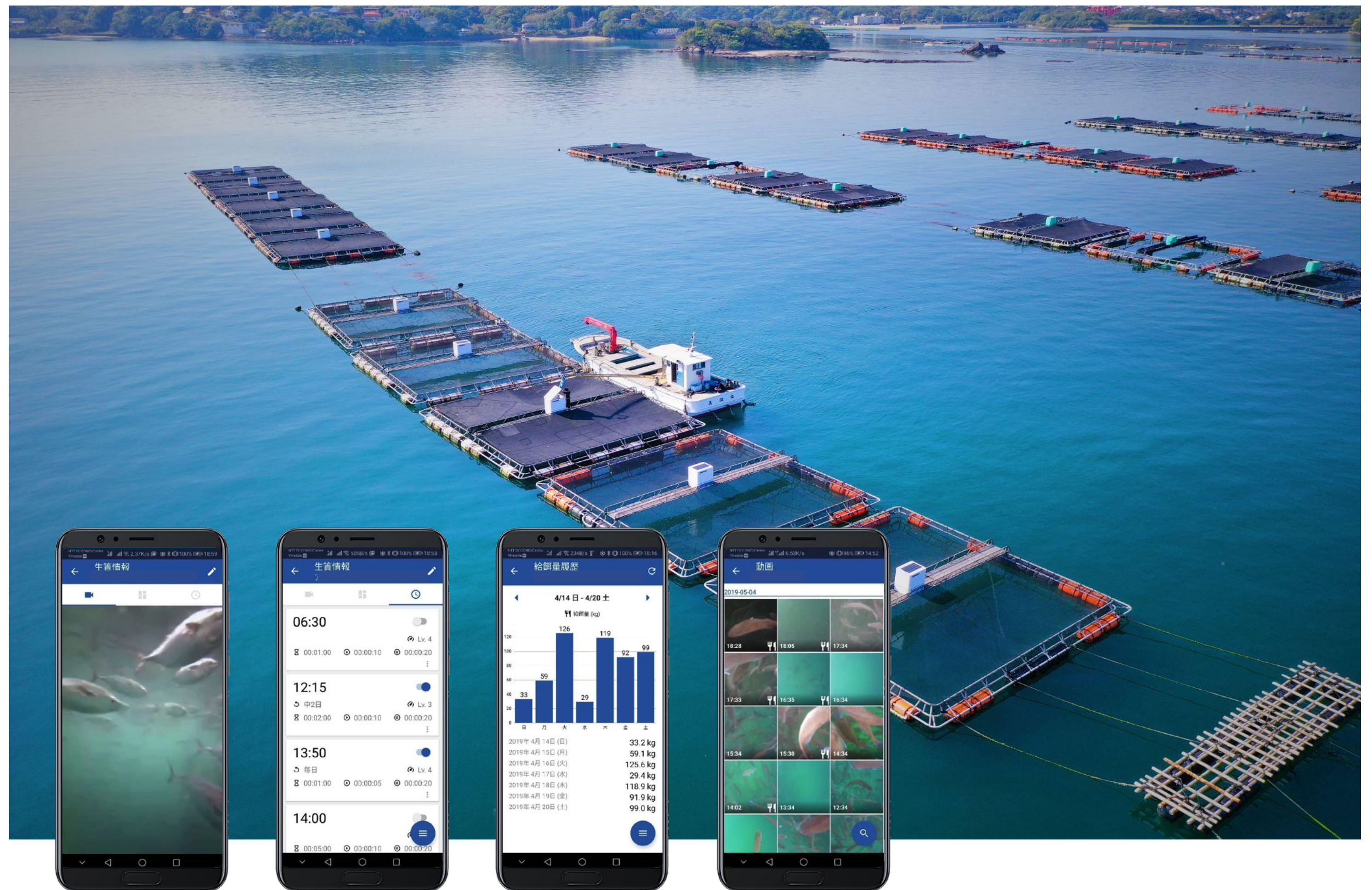
Fish appetite detection

Pellet detection

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UMITRON**CELL**

Hardware layer

Solar-powered IoT feeder liking to our software technology

UMITRON **LENS**

BIOMASS MEASUREMENT USING IMAGE ANALYTICS AND AI

How it works
- LENS uses an underwater camera to generate real-time biomass measurements of fish using AI and image analytics.
- The tool is easy to use and portable allowing farmers to move it from cage to cage.
- All data is collected and can be accessed via a mobile application.
- LENS reduces time and labour in measuring fish by hand.
- It improves the quality of biomass estimation.
- Reduces stress on fish since they no longer need to be handled for measurement.

UMITRON**EAGLE**

Data & Software layer   Hardware layer

Status of technology implementation in the day-to-day operations of shrimp farming

Semi-auto feeder

There are many semi-auto feeders on the market that can be set to start and stop by mobiles

Water sensor

There are many underwater sensors on the market that measure water temperature and dissolved oxygen.

Real-time shrimp analysis

No AI solution existed to analyze the condition of shrimp in ponds in real time until today

Patented AI solution for real-time shrimp analysis

In shrimp farming, there has been no technology on the market to analyze shrimp conditions, optimize appetite, or quantify growth. By combining IoT and AI technologies, <u>**Umitron promotes the introduction of digital transformation in shrimp farming in real time**</u>.

UMITRON**EAGLE**

WORLD'S FIRST AI-BASED ANALYTICS SOLUTION FOR SHRIMP FARMING

Benefits for industry

- EAGLE is a mix of hardware and software that plugs into the existing shrimp farming operation indoor or outdoor.
- Using unique AI, EAGLE can learn shrimp activity and inform the farmer on the following insights:
  - Appetite
  - Feeding levels
  - Length and weight
  - Biomass
  - Health
- The end result is a shrimp farm operating at maximum efficiency with minimal inputs.

うみとさち

一〇〇年先も
おいしい海へ。
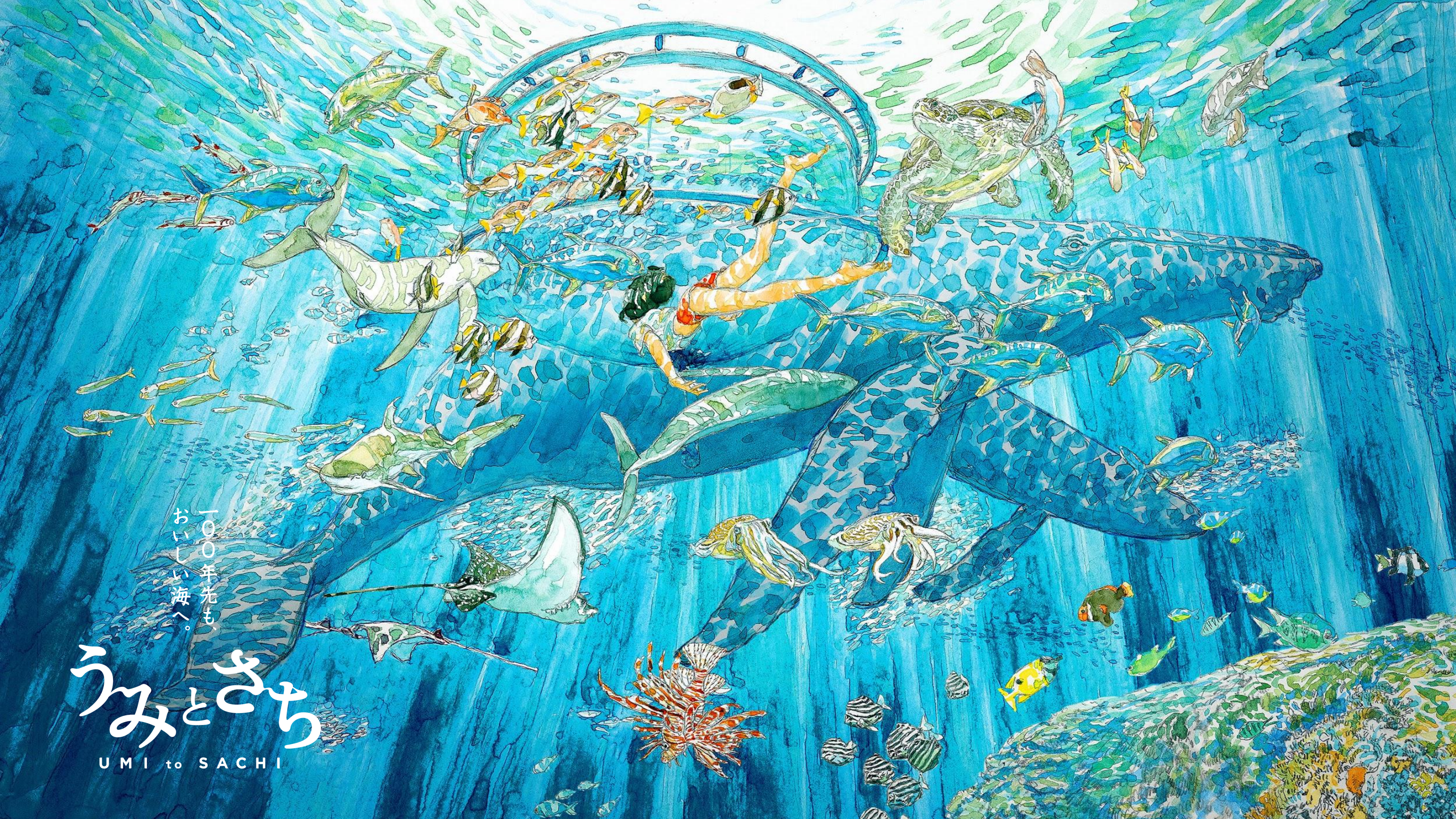
UMI to SACHI

Farming layer

UMI to SACHI

BRINGING FARM TO TABLE *Sustainable seafood brands powered by technology*

By leveraging technology and collaborating with supermarket, a total of more than **3 million plus meals** have been served in a year after its release.

AEON · KURA · maruetsu · Tokyu Store · YAOKO MARKETPLACE · sakana bacca · スーパーマーケット KASUMI FOOD SQUARE · MaxValu

Supporting the marketing of seafood that are more traceable and sustainable through the use of technology.
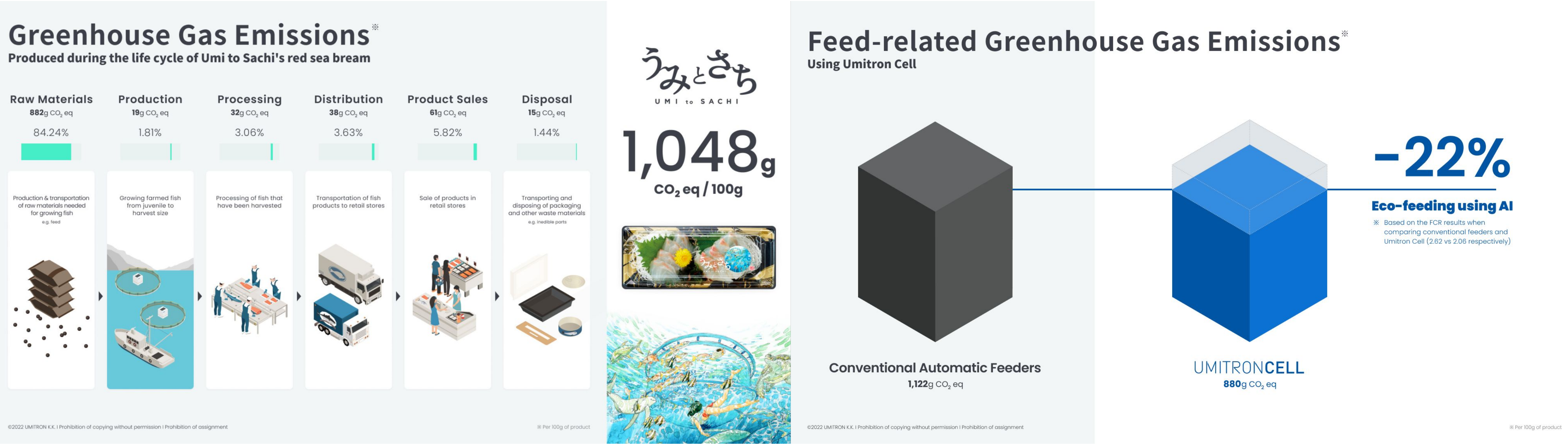
Farming layer

うみとさち
UMI to SACHI

BRINGING FARM TO TABLE *Sustainable seafood brands powered by technology*

ASSESSING THE CARBON FOOTPRINT OF OUR PRODUCTS - RED SEA BREAM CASE STUDY

Greenhouse Gas Emissions※
Produced during the life cycle of Umi to Sachi's red sea bream

Raw Materials	Production	Processing	Distribution	Product Sales	Disposal
882g CO₂ eq	19g CO₂ eq	32g CO₂ eq	38g CO₂ eq	61g CO₂ eq	15g CO₂ eq
84.24%	1.81%	3.06%	3.63%	5.82%	1.44%
Production & transportation of raw materials needed for growing fish e.g. feed	Growing farmed fish from juvenile to harvest size	Processing of fish that have been harvested	Transportation of fish products to retail stores	Sale of products in retail stores	Transporting and disposing of packaging and other waste materials e.g. inedible ports

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うみとさち
UMI to SACHI

1,048g
CO₂ eq / 100g

Feed-related Greenhouse Gas Emissions※
Using Umitron Cell

Conventional Automatic Feeders
1,122g CO₂ eq

UMITRONCELL
880g CO₂ eq

−22%
Eco-feeding using AI
※ Based on the FCR results when comparing conventional feeders and Umitron Cell (2.62 vs 2.06 respectively)

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Conduct a life cycle assessment of farmed fish and research how Asian consumers react to sustainable seafood by collaborating with retailers.