

#FishBiotech:

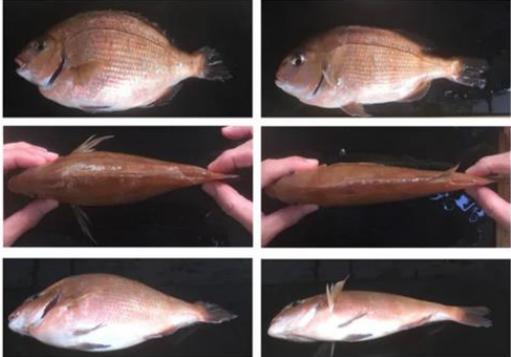
Insights on potential contributions to PH industry and economy

**BIOTECH UPDATES**
A weekly summary of world developments in biotechnology, produced by the ISAAA Global Knowledge Center on Biotechnology direct to your inbox.
ISAAA Inc.

Japan Begins Sale of Genome-Edited "Madai" Red Sea Bream

October 20, 2021

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The gene-edited red sea bream (left) compared to unedited versions (right) Photo Source: Dr. Masato Kinoshita, Kyoto University and Dr. Keitaro Kato, Kindai University

In Japan, the startup Regional Fish Co., Ltd., together with the Kyoto University and Kinki University, the Ministry of Health, Labor and Welfare and the Ministry of Agriculture, Forestry and Fisheries, has created a gene-edited red sea bream "Madai" and will begin selling in October.

The gene-edited fish was developed using CRISPR gene editing technology to knock out a protein that suppresses muscle growth. The red sea bream lacking the myostatin gene has an edible part of about 1.2 times (up to 1.6 times), and the feed utilization efficiency is improved by about 14%.

BIOTECH AND ME 😊

Scientist IV, *National Fisheries Research and Development Institute (NFRDI)*

Academician, *National Academy of Science and Technology (NAST)*

Former Chief, *DA-Fisheries Biotechnology Center*

Faculty for Advanced Genetics and Population Genetics, *Graduate School, University of Santo Tomas*

President, *Philippine Society of Biochemistry and Molecular Biology (PSBMB)*

PhD Applied Marine Biosciences, *Tokyo University of Marine Science and Technology*

 **Doc Mudjie**



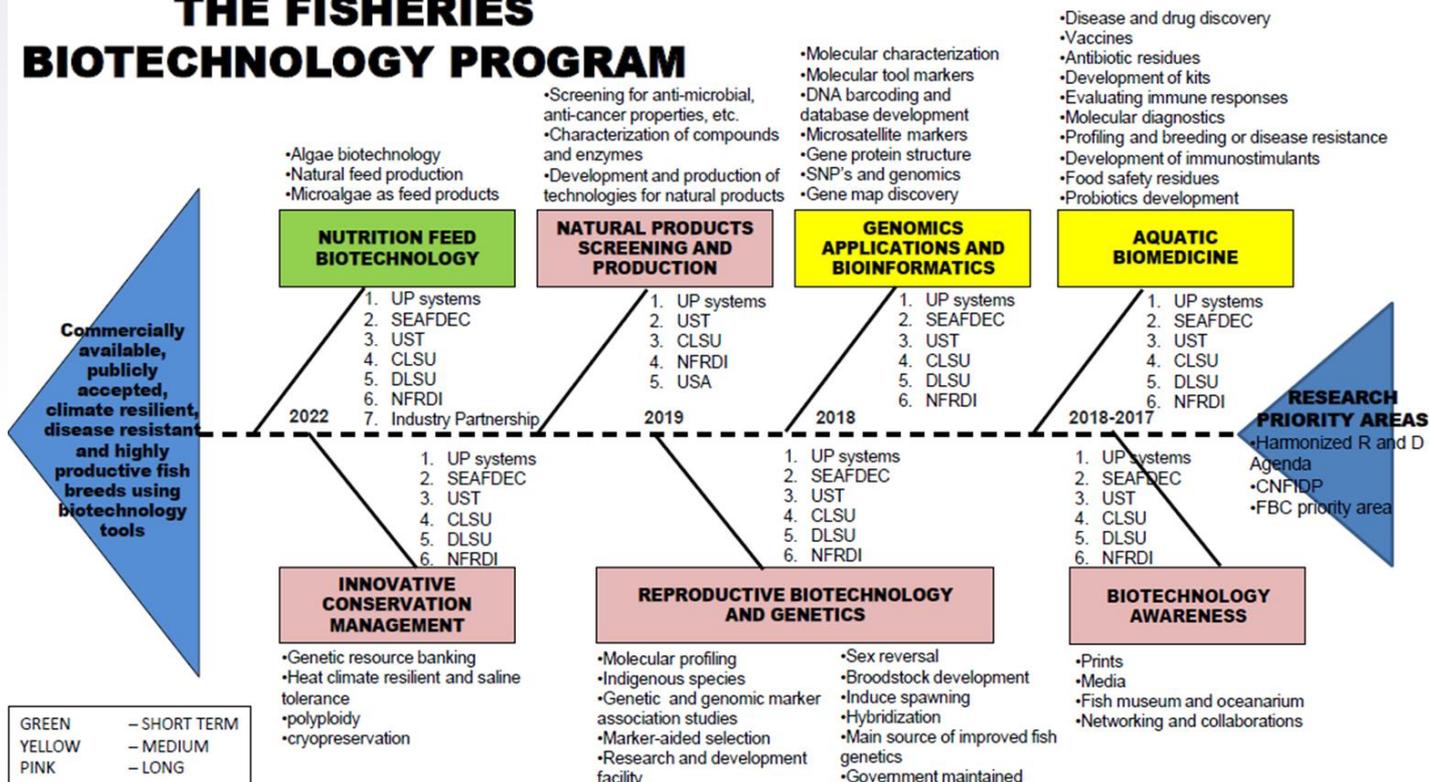
The four main areas where biotechnologies have been used in aquaculture and fisheries include:

- 1) **genetic improvements and control of reproduction;**
- 2) **biosecurity and disease control;**
- 3) **environmental management and bioremediation;**
- 4) **biodiversity conservation and fisheries management.**

www.fao.org

2017 (start)

THE FISHERIES BIOTECHNOLOGY PROGRAM

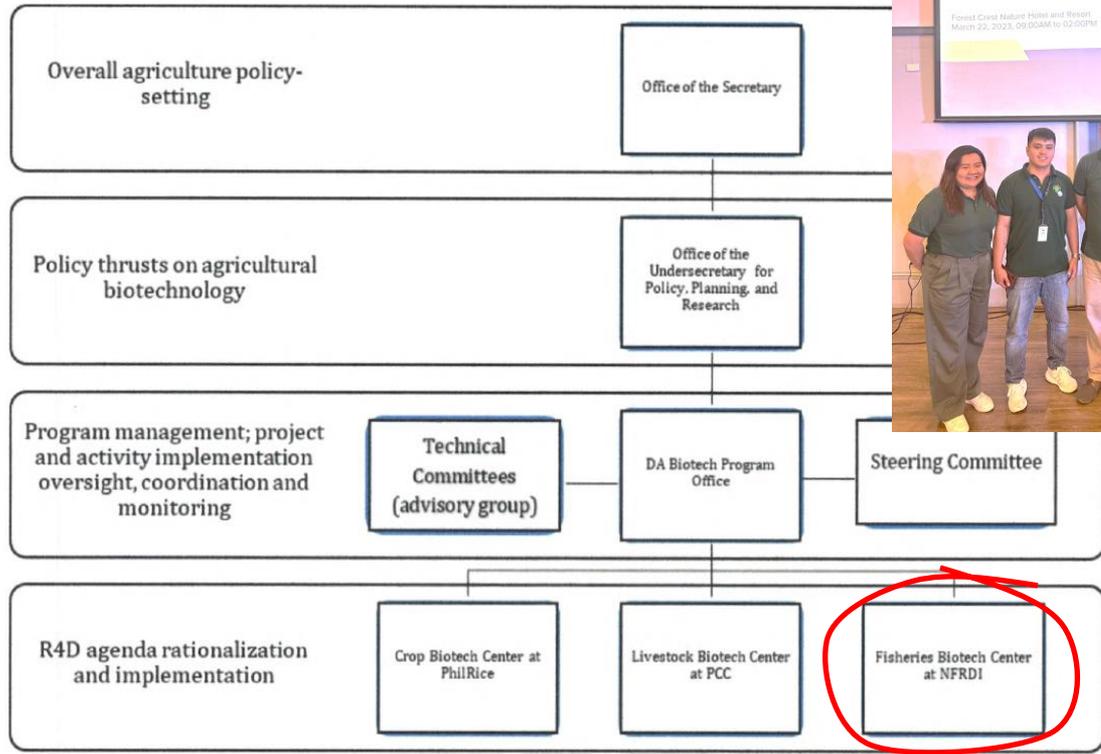


2021 GUIDELINE AS OUTLINE



ADMINISTRATIVE ORDER
NO. 26
Series of 2021

SUBJECT : REORIENTATIC
AGRICULTURE
BIOTECHNOL
AMENDING I



CONTEXT AND DEFINITIONS

WHEREAS, the Agriculture and Fisheries Modernization Act (AFMA) of 1997 recognizes biotechnology as a tool in modernizing agriculture by helping enhance productivity, profitability, and climate change resiliency, eventually helping improve the well-being of Filipinos;

2.3. **Biotechnology** refers to "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products for specific use" (Convention on Biological Diversity). It encompasses traditional applications, such as fermentation and brewing, conventional techniques, such as tissue culture, plant regeneration, and modern technologies, such as artificial insemination, genetic engineering, genomics, and bioinformatics.

2.5. **Fisheries** refers to all activities relating to the act or business of fishing, culturing, preserving, processing, marketing, developing, conserving, and managing aquatic resources and the fishery areas, including the privilege to fish or take aquatic resources (Republic Act No. 8550: "The Philippine Fisheries Code, 1998)

2.6. **Aquaculture** includes fishery operations involving all different forms of raising and culturing fish and other aquatic species in fresh, brackish, and marine waters (The Philippine Fisheries Code, 1998).

4 THEMES UNDER DA ADMIN. ORDER 26, SERIES OF 2022

1. *Technology development and innovation*
2. *R4D biotechnology capacity-building*
3. *Partnerships and fund generation*
4. *Technology commercialization and management*

1. TECHNOLOGY DEVELOPMENT AND INNOVATION

Now

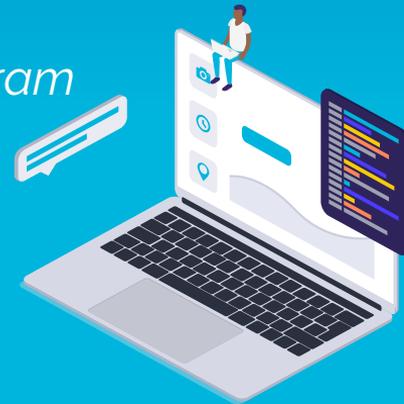
- *Biotech products developed and commercialized (e.g. Algal paste, WSSV-LAMP Kit, DNA forensics)*
- *Indigenous species breeding program (e.g. mudfish and jungle perch)*
- *Tilapia R4D program implementation (e.g. ongoing CRISPR Project)*



1. TECHNOLOGY DEVELOPMENT AND INNOVATION

Future

- *Bangus and Shrimp Biotech R4D Program*
- *Enhance DNA database for aquatic species e.g. FishTRace*
- *Aquatic species breeds registration*

A poster for FishTrace, a DNA-based technology for identifying fishery products. The poster includes the following information:

- NEW TECHNOLOGY!**
- FishTrace:** a DNA-based technology for identifying fishery products
- Interested? Inquire now! Just visit bit.ly/FishTrace2021 or scan the QR code below.**
- CONTACT US:**
 - nfrdigi@gmail.com
 - nfrdigi.wesdy.com
 - (8) 376-1178
- PROCESSED FISHERY PRODUCT SAMPLE COLLECTION**
- CHELEX AND CTAB DNA EXTRACTION**
- COI DNA AMPLIFICATION AND GEL ELECTROPHORESIS**
- SANGER SEQUENCING**
- SEQUENCE EDITING USING GENEIOUS**
- DNA MATCHING AND CLUSTERING USING MEGA**

2. R4D BIOTECHNOLOGY CAPACITY-BUILDING

Now

- *Progressive Manpower Enhancement Program (with ISAAA Inc.)*
- *On-the-Job-Trainees (OJTs) and interns*
- *FBC building and facility*



2. R4D BIOTECHNOLOGY CAPACITY-BUILDING

Future

- Regulatory framework (under draft JDC on GM Animal)
- Thesis matching

DOST-DA-DENR-DOH-DILG
JOINT DEPARTMENT CIRCULAR (JDC)
NO. __ Series of 2021

Subject: Rules and Regulations for the Research and Development, Handling and Use, Transboundary Movement, Release into the Environment, and Management of Genetically-Modified Animal and Animal Products Derived from the Use of Modern Biotechnology

WHEREAS, Section 15, Article II of the 1987 Philippine Constitution declares that the State shall protect and promote the right to health of the people and instill health consciousness among them. Furthermore, Section 9, Article XVI provides that the State shall protect consumers from trade malpractices and from substandard or hazardous products. Toward these ends, the State shall maintain a farm to fork food safety regulatory system that ensures a high level of food safety, promotes fair trade and advances the global competitiveness of Philippine foods and food products:



3. PARTNERSHIPS AND FUND GENERATION

Now

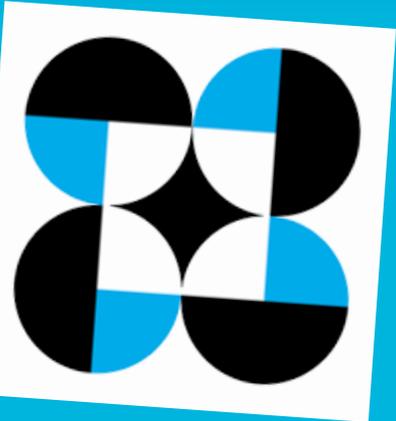
- *Networking (50 institutions and counting)*
- *Collaborative projects (e.g. NFRDI, BFAR, PSBMB, UP Visayas)*



3. PARTNERSHIPS AND FUND GENERATION

Future

- Fund sourcing (BPO-BAR, PL480, BFAR, DOST)



4. TECHNOLOGY COMMERCIALIZATION AND MANAGEMENT

Now

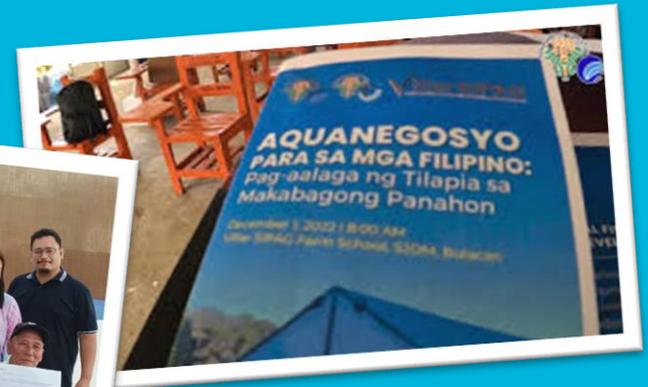
- *National Fisheries Biotechnology Symposium (NFBS) and National Biotechnology Week (NBW)*
- *Knowledge products and social media (website and FB)*



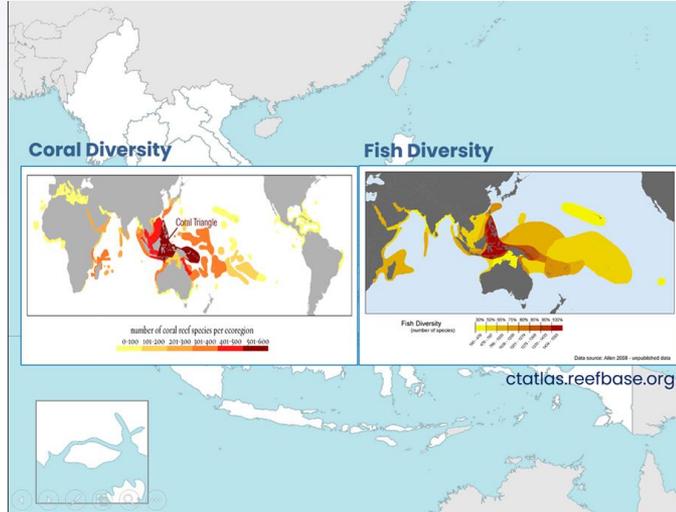
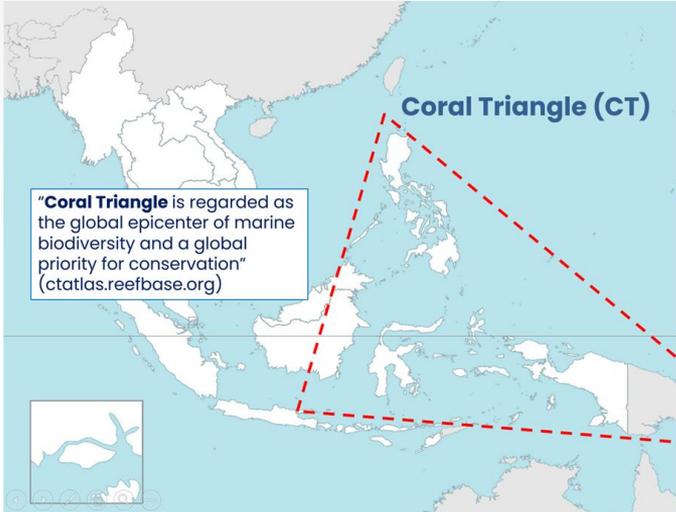
4. TECHNOLOGY COMMERCIALIZATION AND MANAGEMENT

Future

- Database (fisheries biotech products and experts in PH)
- Aquanegosyo: Technology Biz Incubation (TBI)
- Aqua biz schools



PHILIPPINES A TOP FISHERIES NATION AND CENTER OF MARINE BIODIVERSITY IN THE WORLD



SPECIES	NUMBER
Marine mammals:	: 28
Marine turtles	: 5
Fishes (all)*	: >3,200
Marine	: 2,645
Brackishwater	: 251
Freshwater	: 348
Sharks and Rays	: 168
Corals	: 550
Stony corals	: 500
Soft corals	: 50
Molluscs	: 648
Mangroves	: 22
Seaweeds	: 1,062
Seagrass	: 19

Maano, 2018, NAST Forum, *Froese and Pauly, 2009

- 5th longest coastline in the world
- 80% water (including EEZ)

- Top 10 fish-producing country in world
- Top 3 seaweed-producing country in world

PHILIPPINES' BLUE ECONOMY POTENTIAL

Valuing and Managing the Philippines' Marine Resources toward a Prosperous Ocean-Based Blue Economy

RHODORA V. AZANZA*, PORFIRIO M. ALIÑO,
RENIEL B. CABRAL, MARIE ANTONETTE JUINIO-MEÑEZ,
ERNESTO M. PERNIA, RONALD U. MENDOZA,
and CHARLES S. SIRIBAN

Abstract

The ocean-based "blue economy" is a significant part of the Philippine economy that has largely been taken for granted despite its enormous potential. It is of critical importance to a substantial segment of our population dependent on the seas and coastal resources for their livelihood and sustenance, appreciably enlarge the country's wealth, and significantly contribute to its gross domestic product. This paper attempts to review the major issues concerning marine ecosystems in relation to the country's pursuit of the blue economy. It discusses the economic and social activities in relation to the seas and coastal areas, and provides updated estimates of the real value of the country's marine ecosystems' goods and services. Based on primary and available secondary data, the marine ecosystems (excluding the continental shelf) can contribute a conservative monetary value of US\$ 966.6 billion to the economy. In light of the risks and threats to the blue economy, the paper further discusses the country's current national initiatives and involvement in regional collaborations toward ensuring its health and sustainable development. Given the Philippines' vast largely untapped potential, a recommendation for the creation of a Department of Marine Resources, separate from the Department of Agriculture, seems in order.

Keywords: blue economy, marine economy, marine resources, marine ecosystems, valuation, sustainable development, Philippines

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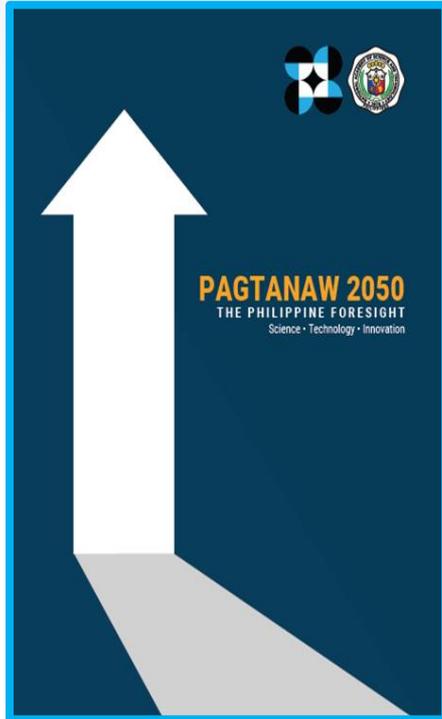
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Azanza, R. V., Alino, P. M., Cabral, R. B., Juinio-Menez, M. A., Pernia, E. M., Mendoza, R. U., & Siriban, C. S. (2017). Valuing and managing the Philippines' marine resources toward a prosperous ocean-based blue economy. *Public Policy*, 18, 1-26.

BILLIONS FROM PHL CONE SNAIL



PHILIPPINES' PAGTANAW 2050: A PROSPEROUS, ARCHIPELAGIC, MARITIME NATION



www.nast.dost.gov.ph

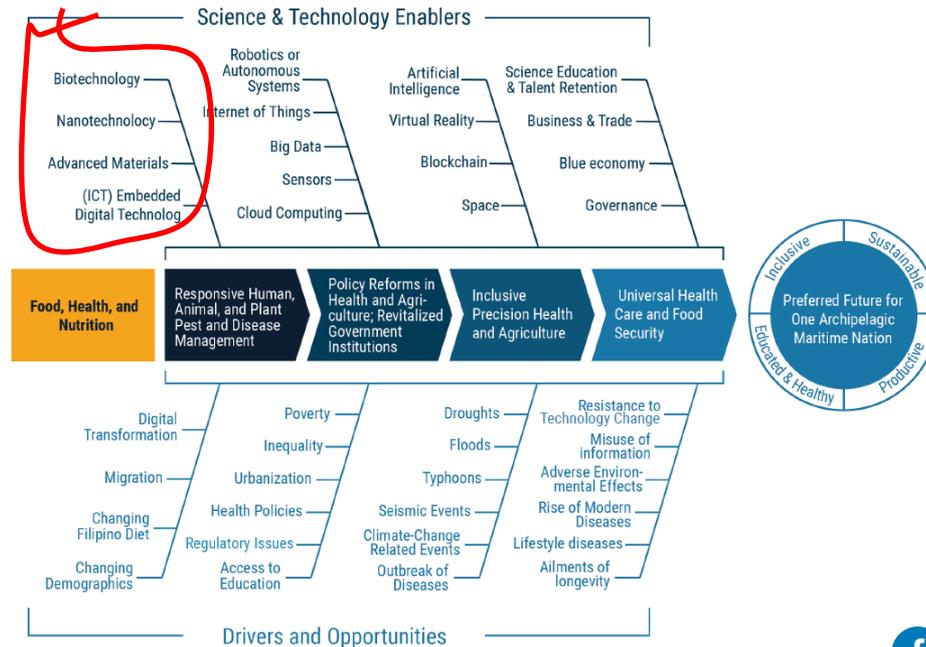


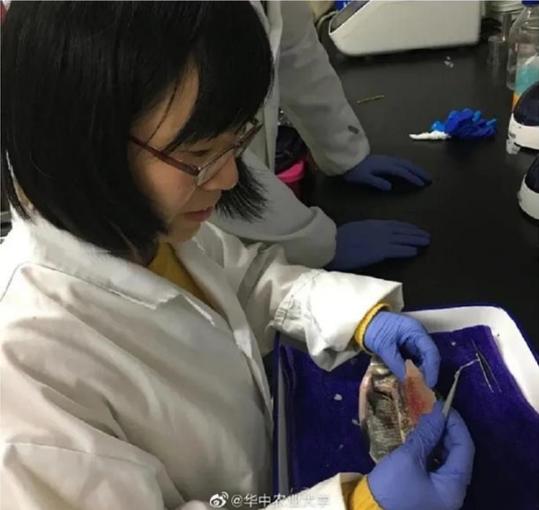
Figure 6.2_3. Food, Nutrition, and Health Cluster Map

PHILIPPINE FISH AND GENE-EDITING



GENOME EDITING SUPPLEMENT
ISAAA Inc. A biweekly update on genome editing research, regulations, and impact produced by ISAAA Inc.

Spineless Fish Developed Through Genome Editing in China
March 23, 2022



@华中农业大学

Dr. Gao Zexia studying the fish bones. Photo from Huazhong Agricultural University.

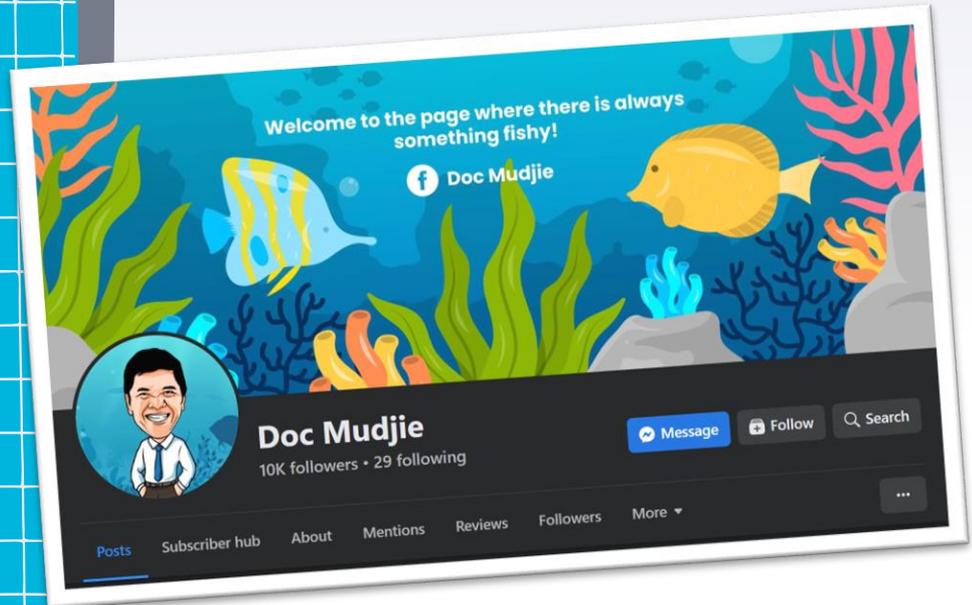
Scientists from the Huazhong Agricultural University (HZAU) and the Chinese Academy of Sciences were able to produce the first generation of spineless fish by knocking out the main genes that control the bone growth in bream, grass carp, and pond crucian carp.

BREAKING NEWS:

Top Phl Fish Bangus (Milkfish) Now Bred and Sold Boneless
March 17, 2028



Salamat po!
Thank you!



 **Doc Mudjie**