



World Aquaculture Singapore 2022

NEXT GENERATION AQUACULTURE

INNOVATION AND SUSTAINABILITY WILL FEED THE WORLD

Nov. 29 - Dec. 2, 2022

Singapore EXPO Convention & Exhibition Centre
and MAX Atria

The Annual International Conference & Exposition of
World Aquaculture Society

Asian Pacific Aquaculture 2022

- Annual Meeting of Asian Pacific Chapter, WAS

Hosted by Singapore Food Agency

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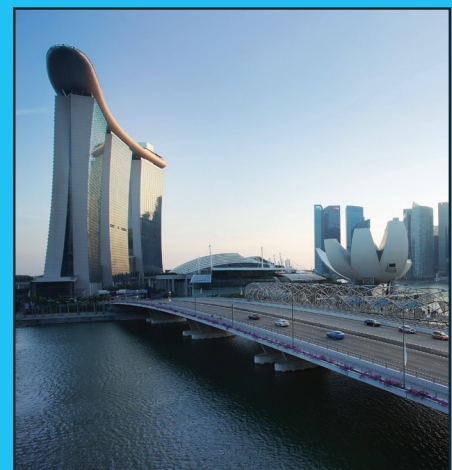
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Welcome Message for World Aquaculture 2022

Warmest greetings to everyone

On behalf of the Singapore Food Agency (SFA) I like to welcome everyone to Singapore for World Aquaculture 2022. This conference was originally intended to be held in Singapore in 2020. But the Covid-19 pandemic resulted in the conference being postponed until 2022. Therefore, we are really pleased to be able to welcome you to Singapore.

Despite your busy schedule during WA 2022, I hope that you will get the chance to do some sightseeing and try our local cuisine. We have a diverse range of food in Singapore. However, as Singapore is a small country, most of our food has to be imported. Therefore, food security is an ongoing concern for us. To ensure a stable supply of safe food, the Singapore Food Agency has embarked on a 30 by 30 goal to locally produce 30% of our nutritional needs by the year 2030. While this appears to be an ambitious goal, we believe that it can be achieved.

One of the cornerstones of our 30 by 30 goal is aquaculture. We aim to increase the volume of aquaculture products produced in Singapore by 2030. To achieve this, we want to transform our traditional net cage way of farming into high tech and highly productive fish farms where we can make use of the latest technology and farming methods to increase output.

Therefore, it is with this background that we are happy to host World Aquaculture 2022 in Singapore. We want to take this opportunity to learn from you and to also share with you the opportunities for fish farming and research & development in aquaculture in Singapore. Despite our small size, Singapore has a lot to offer.

Finally, I like to thank the conference organizers, participants from the industry, the various government agencies and all who have contributed to the planning and organization of this Conference. Thank you for your efforts and hard work.

Let us all make World Aquaculture 2022 a resounding success.

Thank you very much.

A handwritten signature in black ink, appearing to read 'Hon Keong', written over a horizontal line.

Dr Leong Hon Keong
Co-Chair of WA 2022

WELCOME MESSAGE

Dear All,

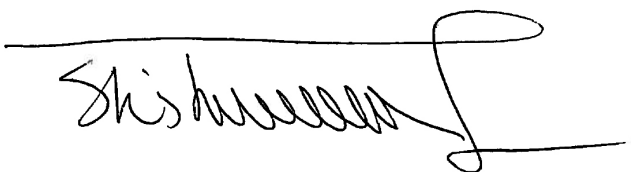
Welcome to the World Aquaculture 2022 Conference. It is an honour for us to host you in the beautiful Singapore. We are confident that during the following days, all of you will have plenty of opportunities to share knowledge and experiences, meet old friends, make new ones; and eventually start new businesses. Such moments in our academic and business careers are contributing to the exciting growth and the development of sustainable aquaculture globally. As you will see, the conference will offer some of the greatest opportunities to access key players of aquaculture in Asia and to network with experts travelling from all over the world to Singapore.

Being the world leading aquaculture association, it has been important for the World Aquaculture Society (WAS) to organize this global event in Singapore, a global hub for business and knowledge exchange. Our combined trade show and scientific conference reflect our commitment to consolidate the linkage between academia and industry as a basis for innovation.

We would like to thank the Government of Singapore and its agencies for all the supports received, especially the Singapore Tourist Board and the Singapore Food Agency. We extend our acknowledgements to the steering committee and program committee members for their hard work in preparing the event. Finally, we would like to thank all our sponsors and exhibitors for being part of the WAS family and making this event a success.

The Garden City is one of the most conducive business environments globally, providing us with incredible amenities, cultural diversity and outdoor activities. With so many varieties of food and culture, Singapore is a home to some of the best gastronomy in the world. This necessarily includes some of the locally produced aquaculture products. We are confident that this will be an unforgettable event for everyone!

Enjoy World Aquaculture 2022!



Dr. Farshad Shishehchian



Dr. Guillaume Drillet

Co-Chairs of the World Aquaculture 2022

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ABSTRACTS

HATCHERY-BASED MASS PRODUCTION OF MOLA (*Amblypharyngodon mola*) SEED TO SCALE NUTRITION-SENSITIVE AQUACULTURE

Sourabh K. Dubey, Francois Rajts, Kalpajit Gogoi, Rashmi R. Das, Saurava K. Biswal, Bibhuti B. Das, Arun Padiyar, Suresh Rajendran, Shakuntala H. Thilsted, Chadag V. Mohan, Ben Belton

WorldFish, Cuttack, Odisha 753001, India

*s.dubey@cgiar.org

Nutrition-sensitive approaches to aquaculture promote the production of micronutrient-rich small indigenous species (SIS) such as mola *Amblypharyngodon mola*, which is particularly rich in essential micronutrients, including vitamins A and B12, calcium and zinc, to address malnutrition in the developing world. However, to date, a lack of standardized hatchery-based mass production techniques for SIS seed has proven a key technical barrier to realizing the full potential of nutrition-sensitive aquaculture. To address this crucial bottleneck, WorldFish is implementing a project titled “Taking nutrition-sensitive carp-SIS polyculture technology to scale” in the Indian states of Assam and Odisha with funding from GIZ. A key goal of the project is to develop scalable mass production techniques for *A. mola* seed, based on a standardized protocol for hatchery-based breeding.

During breeding trials in Odisha, India, mola broodstock were collected from multiple sources to ensure genetic diversity and conditioned in broodstock ponds for two months at a partner hatchery (Lat 20°12'45.84"N/Long 86°20'3.32"E). Brooders were fed to satiation with 42% CP floating extruded feed twice daily. Six breeding experiments were conducted during peak breeding season (June–August 2022), with a natural photoperiod (12:12). Selected breeders were identified based on secondary sexual characteristics and transferred to a concrete conditioning tank (capacity: 10 m³) with constant water flow for stimulating spawning readiness. A combination of hormone administration and environmental manipulation was used to increase seed production. Synthetic GnRH-based inducing hormone was administered through the peritoneal cavity of mola brood (mean body weight 8.0 ± 0.55 for females and 3.75 ± 0.81 g for males, with a 1: 2 sex ratio) between 16–20.5 h, at the rate of 0.5 ml kg⁻¹ body weight for females and 0.25 ml kg⁻¹ for males. The fish were returned to double hapas inside breeding tanks and exposed to a constant shower of oxygen-rich water from an overhead tank equipped with an aeration tower. At water temperatures of 28–29.5°C, the latency periods were observed as between 6–8 h, when male brooders began chasing the females within 6–8 hours of hormone administration. Each male was found to be actively and aggressively paired with a single female, while eggs were released and fertilized by the male. The released eggs were collected in 250 micron mesh outer hapa and became slightly adhesive following fertilization. The breeding activity was repeated several times. Hatching of larvae was observed after 12 h of fertilization at 28–29.5°C water temperature. Average performance values from the six breeding cycles are depicted in Table 1. The fertilization, hatching, and survival rates were 89%, 91% and 92% respectively (Table 1). Hatchling production was significantly correlated with female body weight (r= 0.82; P≤0.05). Average production over 6 breeding cycles was 0.28 million hatchlings kg⁻¹ of female mola brood. Average physico-chemical parameters during the trials were: air temperature 32 °C, water temperature 28.75°C, pH 7.6, dissolved oxygen 7.2 ppm, and alkalinity 116.25 ppm. The six breeding trials produced a total 5.48 million mola hatchlings. Mola hatchlings were ready for sale after 3–4 days and 2.13 million hatchlings and 37000 fry (21 days old) were purchased by 15 local farmers. This ground-breaking commercial mass seed production trial with mola will facilitate large-scale adoption of carp-SIS polyculture to increase farm incomes and consumption of micronutrient-dense fish in regions of India where undernutrition is prevalent.

TABLE 1. Breeding performance of *Amblypharyngodon mola* during six induced breeding trials.

Particulars	Average value*
Body weight per female (g)	8.0 ± 0.55 (7.0-8.5)
Body weight per male (g)	3.75 ± 0.81 (2.7-4.5)
Injected females (kg)	3.28 ± 0.51 (2.5-4.0)
Fertilization rate (%)	89.28 ± 5.45 (81.8-96.86)
Hatching rate (%)	90.86 ± 7.53 (75.99-95.76)
Survival rate (%)	92.12 ± 4.47 (88.07-98.01)
Hatchlings harvested (million)	0.91 ± 0.30 (0.4-1.20)
Total hatchlings produced (million)	5.48

*Data were presented as Mean ± SD of six production cycles. Figures within parentheses indicated the ranges.