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REPORT OF THE 31ST NETWORK OF AQUACULTURE CENTRES IN ASIA-PACIFIC GOVERNING COUNCIL MEETING



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Network of Aquaculture Centres in Asia-Pacific

31st Governing Council Meeting

29-30 November 2021 via Zoom meeting

Report of the 31st NACA Governing Council Meeting



**REPORT OF THE 31ST NACA
GOVERNING COUNCIL MEETING**

(January 2019 – December 2020)

Network of Aquaculture Centres in Asia-Pacific (NACA)

November 2021

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Report of the 31st NACA Governing Council Meeting

29-30 November 2021, via video conference

Opening ceremony

1. The 31st Governing Council Meeting opened at 10 am on 29 March, via video conference. The meeting was attended by 44 participants from 16 member governments, the Regional Lead Centres for China, India, Iran and Thailand, the Food and Agriculture Organization of the United Nations (FAO), the Asia-Pacific Association of Agricultural Research Institutions (APAARI), the Network of Aquaculture Centres in Central and Eastern Europe (NACEE), the Pacific Community (SPC), the Bangladesh Shrimp and Fish Foundation (BSFF) and the Centre for Integrated Rural Development for Asia and the Pacific (CIRDAP). The list of participants is attached in **Annex A**.
2. The Chair of the 30th Governing Council welcomed participants, expressing his pleasure at meeting delegates again, virtually due to the pandemic, to discuss progress over the last two years and the focus for next year's work programme.

Procedural matters

3. As per the traditions of the organisation, the incoming host government, Hong Kong SAR, was selected as Chair of the 31st Governing Council. Thailand was selected as Vice Chair, nominated by Cambodia and seconded by China.
4. The Governing Council welcomed the new Chair and Vice-chair. The incoming Chair and the Secretariat thanked the outgoing Chair, China, for strongly supporting the organisation over the past two difficult years during the pandemic.
5. The provisional agenda was adopted (**Annex B**).

Report of the Director General

6. The Director General presented a summary of his report on NACA's activities and achievements over the past two years (**Annex C**) and the Strategic Plan 2021-2024 (**Annex D**), including a proposed revision to the structure of the work programmes, within a briefing presentation (**Annex E**)

Discussion of the DG's Report and Work Programme and statements by member governments

7. Members thanked the Secretariat for facilitating the first-ever virtual meeting of the Governing Council, convened via video conference due to the pandemic. They thanked the Director General for his detailed presentation on NACA's achievements over the past two years and the new strategic plan. Comments on the presentations were as follows:
8. Bangladesh noted that fish are its second most valuable agricultural crop, representing 3.5% of GDP, and play an important role in the livelihoods of millions of people, with 12% of the population depending on fisheries and aquaculture for their livelihood on a part- or full-time basis. Fish is also vital for food and nutritional security, with per capita consumption at 65 g per day, which the government plans to increase to 70 g by 2030 and 85 g by 2041, with priority on increasing production in open waters. Government priorities for aquaculture development include strengthening institutional capacity, broodstock management, disease surveillance, value chain development, the introduction of SPF shrimp, food safety and quality, electronic traceability systems, promotion of cluster-based approaches to smallholder farming, crab farming. Bangladesh requested support on improving investment, reducing production cost,

facilitating germplasm exchange, addressing climate change vulnerability, and reduction of post-harvest losses. Bangladesh expressed willingness to collaborate with NACA members on the sharing of knowledge and scientific cooperation, enhancing exports, inland fisheries resources management and development, development of capacity in aquaculture management systems, development of genetic resources for candidate aquaculture species, development of farming technology for finfish and, shrimp, business-friendly value chain fish farming, demonstration programmes, aquaculture certification and compliance with GAP.

9. Cambodia supported the DG's Report and Strategic Plan for 2021-2024, observing that NACA was an important platform for the sustainable development of aquaculture in the region and wished to strengthen the relationship between NACA members and other organisations. Cambodia expressed interest in improving broodstock management and seed production to support aquaculture development and requested hands-on training of its personnel. Cambodia wished to work closely with NACA members and regional lead centres to build the capacity of its personnel. Cambodia thanked the Government of China, the Freshwater Fisheries Research Centre (RLC China), and Shanghai Ocean University for providing virtual training to build the capacity of Cambodian personnel. Cambodia also expressed gratitude to the Australian Centre for International Agricultural Research (ACIAR) and the Government of Indonesia for supporting the south-south research project on marine finfish aquaculture.
10. China thanks DG NACA for his detailed report on NACA's activities, of which China had been an active supporter and implanter. China recognises the important role that NACA has been playing in the sustainable development of aquaculture and the achievements that members have collectively made over the past years. The overall productivity of aquaculture has been increasing, and China ranks first in aquaculture output. The industry in China is well established. Totally 141 species have been approved for aquaculture production over the last few years, bringing to total approved and under culture to over 300. However, China is transforming the modality of aquaculture to make it more environmentally friendly and sustainable. For example, the use of fertilisers and chemicals has been reduced by about 30%. China would like to strengthen international cooperation with all partners including, NACA members. China exports aquatic products to over 190 countries and territories and is now both the largest processor and market. China is actively involved in bilateral and trilateral cooperation in the field of aquaculture and looks forward to closer collaboration with all partners on transboundary issues. With regards to the proposal to increase the financial contribution to NACA, China agrees in principle, but MARA needs to consult with other relevant ministries. China will continue to support NACA and endeavour to make aquaculture more secure in the region.
11. Hong Kong SAR recognised the global and regional trend of rising aquaculture production over the past three decades. In response to risks such as biosecurity, environmental impact, food safety and climate change, further increases must be met through sustainable aquaculture practices. Hong Kong SAR has implemented several measures to support the sustainable development of the industry. These include allowing capture fishermen to switch to sustainable farming, helping concerned sectors to adopt advanced technology and seize new opportunities such as modern deep-sea mariculture. Impact assessments are underway for new deep-sea mariculture zones, anticipated to be completed in 2022. With the assistance of the South China Sea Fisheries Research Institute, CAFS, a modern demonstration farm was established in 2021 using a semi-submersible steel cage design that can withstand strong winds, waves and current, and features modern technology, such as real-time surveillance, water quality monitoring and feeding systems, and solar and wind power generation systems. To assist fishers in getting involved, a sustainable fisheries development fund was established in 2014 to enhance research supporting the competitiveness of the industry. About 30 projects have been approved,

including 15 on aquaculture. Hong Kong SAR looks forward to closer interactions and collaboration with NACA members under the new strategic plan. The Hong Kong Polytechnic University has been funded by the sustainable fisheries development fund to provide hands-on training and lectures to local industry and fishers on modernised and sustainable mariculture at the demonstration farm.

12. India noted that the widespread impact of COVID-19 on the entire aquaculture industry over the course of the pandemic, which has not just affected production but also exports and all primary stakeholders. India appreciated the Secretariat's efforts to move NACA activities online to virtual platforms, although the previous year's Governing Council could not be held. India was committed to exchanging all support and cooperation for NACA activities in the coming years. The sNACA concept was well appreciated, but given the limited resources available, it may be best to start with two or three priority areas and develop a funding blueprint. In India, network programmes have been successful in disease surveillance. Two more platforms were planned for the next five years, a "one health" cross-sectoral network anti-microbial resistance and one on ornamental fish. With regards, it was important to increase connections and activities between members to assure ongoing government support for funding of NACA. As authority to increase member contributions may not lie with Governing Council delegates, India reiterated the proposal to convene a ministerial-level meeting to discuss the issue. Exchanges of personnel and knowledge and collaboration were important to help members achieve their production targets.
13. Indonesia delivered a statement via video recording. Indonesia considered it important to support the NACA work programme as the only regional organisation focussed on aquaculture development. Aquaculture faced ongoing challenges from the COVID-19 pandemic, but collaboration could help members to adapt to the situation and bridge opportunities for aquaculture development. Indonesia considered aquaculture to have a strategic role in food security and poverty reduction. Indonesia was developing a "blue" concept of marine and fisheries economy, considering the balance between economic and ecological interests, with a view to developing future fisheries businesses through sustainable aquaculture for the empowerment of rural communities and fisher's welfare. This concept was in line with FAO's "Blue Transformation" initiative. The Ministry of Marine Affairs and Fisheries had established three breakthrough programmes: Increasing non-tax state revenue from capture fisheries resources; aquaculture development for export supported by marine and fisheries research; and development of freshwater, brackish water and marine aquaculture villages based on local wisdom. Indonesia wished to collaborate with all NACA members to advance the development of sustainable aquaculture activities on the following issues: Aquatic animal health; risk mitigation of global issues including climate change; food safety, quality, and certification; education and training; gender equality; genetics and biodiversity; information and communication; sustainable aquaculture systems and technology; and digitalisation and innovation. Indonesia encouraged members to join hands to develop an action plan to realise the blue transformation of aquaculture for food security, nutrition, and livelihoods in the region.
14. Iran advised that its aquaculture sector was currently producing around 550,000 tons based principally on carp, trout and shrimp. Iran wished to collaborate with members on issues, including climate change and the future of aquaculture, cage culture, feed technology and nutrition, breeding and genetic programmes, smart aquaculture technologies, sustainable development and responsible aquaculture approaches, better management practices, aquaculture financing and health and disease.
15. Lao PDR advised that 75% of its population was rural and principally dependent on aquatic resources to meet their daily animal protein needs. In 2020, aquaculture production was estimated at 200,120 tonnes, of which 130,000 tonnes (63%) came from aquaculture. The

average per capita fish consumption was 28kg per year. The agriculture development strategy to 2025 and vision to 2030 aimed to ensure food security, competitive, clean, safe, and sustainable aquaculture. The policy priority was to promote poverty-focused integrated agri-aquaculture. The Aquaculture Strategies from 2021-2025 is aiming to contribute to the Ministry of Agriculture and Forestry programme on food and nutritional security, poverty reduction, and regenerative farming techniques. Small-scale aquaculture faced many challenges in terms of technology and innovation, increasing feed costs, climate change, and the impact of the pandemic. Lao PDR assured members of its ongoing collaboration, particularly with regards to issues of human resource development, global policy development, aquatic animal health and better management practices. Lao PDR supported the NACA Strategic Plan 2021-2024 and was ready to implement it, especially in the areas of productivity and sustainability, health and biosecurity, safety, and quality.

16. Malaysia noted that the DG's report and Strategic Plan 2021-2024 were thorough. The virtual modality of meetings allowed more frequent interactions with good potential for capacity building through online platforms. Malaysia encouraged NACA to continue to promote networking and regional self-reliance through cooperation through programmes addressing member priorities. The aquaculture industry was growing rapidly in Malaysia and accounted for 22.4% of production and around US\$733.8 million in value. The government saw aquaculture as a key priority area, including resource management, aquaculture biosecurity, R&D and international collaboration. Malaysia has implemented an act for inland fisheries and aquaculture, with state governments in the process of implementing regulations. Malaysia is looking forward to implementing smart farming as per national agro-food policies to transform the sector through new technologies and the "internet of things" (IoT) to improve the management of farms, which is part of the strategic plan for aquaculture to 2030 and to improve food security. Biosecurity is one of the major concerns, especially to shrimp aquaculture. Malaysia requests regional cooperation and initiatives in aquatic animal health management and biosecurity. Malaysia will continue to actively participate and support NACA activities in future.
17. Thailand thanked NACA members for their cooperation in the development of aquaculture and for the establishment of the Regional Lead Centre at the Phranakhon Sri Ayuthaya Inland Aquaculture Research and Development Center, which is responsible for conducting research, exchanging information, and organising training courses for NACA member countries. Thailand's cooperation with members during the pandemic has been adapted to allow cooperative activities to continue. Thailand assured members of its ongoing collaboration and support.
18. The Secretariat expressed gratitude and appreciation for Thailand's excellent and ongoing support to the organisation as host government, which included the provision of office facilities and support for administrative staff, in addition to generous assistance on technical matters, training and exchange.
19. Pakistan noted the substantial progression of aquaculture in the region, which was a substantial source of employment. Pakistan's aquaculture industry was also developing rapidly, although still at an initial stage. Developments included the emergence of the domestic feed industry, carp, and trout farming, with total production at 150,000 tons. Much of Pakistan's inland waters had high salinity with potential for the culture of shrimp and tilapia. A very large irrigation canal infrastructure also had the potential for aquaculture production. The government was providing interventions and incentives to facilitate industry development, including the establishment of hatcheries, cage culture demonstration farms, R&D centres, and fish health laboratories, strengthening of public sector extension services, and training and technical backstopping. Pakistan supports the concept of sNACA and is ready to partner in activities including health and biosecurity, marine fish culture and shrimp farming. Pakistan suggested NACA to prepare a list of

experts in various fields that could be accessed by members that required specific technical expertise. Pakistan requested capacity building for extension workers and hatchery technicians in marine fish culture and shrimp farming capacity building. On-site expertise on marine cage installation was needed on an urgent basis. The Secretariat undertook to try and assist, noting that heavy COVID-related travel restrictions were again being raised, and physical attendance would be difficult to arrange.

20. The Secretariat advised that an “Experts Database” was available on the NACA website, although it was a work in progress and not yet comprehensive. The Secretariat undertook to request further nominations of key technical experts from members, who would be invited to submit a profile for the database and to address some of the technical gaps in the current coverage.
21. Maldives noted that the DG’s report was comprehensive. Maldives’ aquaculture was still in its infancy, focusing on mariculture. Two species were currently being cultured, tiger grouper and sea cucumber. The government was developing mariculture through the implementation of a World Bank project, which includes components on human resource development, infrastructure development, aquaculture production and aquatic animal health management. Maldives wished to collaborate with members on issues including transfer of sea cucumber and grouper culture technologies, human resource development in grouper and sea cucumber hatchery, grow-out production, and aquatic animal health. Maldives supports sNACA and agrees with India on the need to focus on certain priority areas.
22. Nepal advised that its aquaculture production was 97,221 tons, of which 76,000 tons came from aquaculture. Inland capture fisheries were limited. The growth of aquaculture at 6.2% per year compared favourably to other agricultural sectors. Of 252 potential aquaculture species, only 11 were being bred for aquaculture use. Funding was a major constraint. Local feed technology was needed to support intensification. Seed production, quality control and health were issues, as were diversification of species, breeding of pangasius and other species. The aquarium fish industry was in high demand. Trout production had expanded from 22 to 36 districts.
23. The Philippines thanked the DG for his leadership and initiatives to strengthen the network and seek to improve the livelihoods of rural people and reduce poverty. The Philippines was working to increase food sufficiency through fisheries development programmes that include roadmaps for five priority commodities in Philippine aquaculture to improve the value chain. Plans to complement these initiatives are being updated, including the comprehensive National Fisheries Industry Development Plan and the Post-Harvest Marketing and Ancillary Industries Plan. The Philippines has aligned its progress with the Blue Transformation in aquaculture, covering the Sustainable Development Goals, Code of Conduct for Responsible Fisheries, and Ecosystems Approach to Aquaculture. The Philippines looks forward to collaboration with members on recent aquaculture developments, including spatial planning, assessment of carrying capacity for mariculture zones, aquatic biosecurity, digitalisation, training and others.
24. Sri Lanka advised that its aquaculture industry was at an early stage of development, although growing rapidly by 13% to 200,220 metric tonnes, with 320,000 expected by 2025 with earnings of US\$415 million by 2025. The government’s national development priorities were human nutrition, food security, foreign exchange earnings, employment and livelihoods, poverty alleviation and a large contribution to the rural and national economy. The government has recognised the development of inland fisheries and aquaculture as an effective way of increasing fish supplies in rural areas at affordable prices while also providing employment and additional income for rural farmers. Sri Lanka plans to increase fingerling stocking, improve fisheries management practices, promote value-added products, use advanced technology, increase fingerling production, promote private sector participation in seed production, intensification of shrimp farming, increased seed production and productivity of sea cucumber, seaweed, crab and

milkfish farming, and introduction of high-value marine fish. Over the last 20 years, average fish consumption has grown, largely due to growth in supply from inland areas, contributing to nutritious and healthy diets. There is a large opportunity to invest in aquaculture in Sri Lanka. To achieve development targets Sri Lanka requests support and collaboration on capacity building, technology transfer, aquaculture investment, supply of broodstock and R&D.

25. Vietnam requested that trade in aquaculture products and value chain development be included in the Strategic Plan 2021-2024. Vietnam had developed its second ten-year national aquaculture programme, with a focus on measures to improve quality, safety, and the trade value of products. Vietnam is concerned about the impact of emerging issues, including climate change, COVID-19 and alternatives to the use of fishmeal in aquaculture feed. Vietnam is aware of the importance of regional collaboration and communication on issues, such as international trade, supply chains, policy communication, technology transfer and prevention of transboundary diseases. Vietnam hoped NACA could be more active to promote regional collaboration and communication for sustainable aquaculture development and aquatic resource management.

Briefing of GCA+20 achievements

26. A briefing on the key outcomes of the Global Conference on Aquaculture Millennium +20 was given by FAO on behalf of the Co-Chairs of the International Organizing Committee (**Annex F**). The conference was the fourth major aquaculture-related event since 1976.
27. FAO thanked the Government of China for hosting the Global Conference, which was very much appreciated by the global aquaculture community. The proposal to hold the conference had originated at the 29th NACA Governing Council Meeting in the Maldives, after which a proposal was tabled at COFI 33.
28. More than 2,900 people registered their interest to attend via the conference website. Of these, 1,728 from 113 countries attended the conference (500 in-person, 1,228 online), representing stakeholders from every sector.
29. Preparations for the conference included the development of a series of regional reviews on the status of aquaculture development and a series of thematic review papers, which were prepared by teams of expert authors commissioned by FAO and opened for public comment.
30. The main output of the conference, the Shanghai Declaration, was unanimously adopted by the participants and over 40 organisations had provided written statements of support, which are available on the conference website (<https://aquaculture2020.org>). It was important to note that the Shanghai Declaration was a participant's declaration, outlined by an invited group of experts, informed by regional and thematic reviews and with input from many stakeholders of diverse interests.
31. The declaration consisted of a vision for sustainable aquaculture, five overarching commitments and ten strategic priorities, which are elaborated in a Call to Action, which contains indicative actions to help achieve the vision for sustainable aquaculture. The declaration provided a guide to NACA, FAO, and other organisations to help set their direction in support of sustainable aquaculture development.
32. Members expressed their appreciation to NACA, FAO, and MARA for convening the Global Conference on Aquaculture Millennium + 20. Members requested FAO and NACA to consider holding these milestone aquaculture events more frequently.
33. Members also expressed their support for the Shanghai Declaration, requesting that it be tabled for consideration at the FAO COFI Sub-Committee on Aquaculture and requesting technical support to follow up on the implementation of the declaration's priorities. Supports of south-

south and triangular cooperation were also requested to facilitate members to collaborate with others on priorities in which they enjoyed relative strength. BSSF, CIRDAP and the NACA Secretariat also made statements fully supporting the Shanghai Declaration.

34. FAO thanked members for expressing their support and undertook to present a report on the outcomes of the conference to FAO members at the next session of the COFI Sub-Committee on Aquaculture in 2022.

Statements by partner organisations and observers

FAO

35. FAO congratulated NACA and the Ministry of Agriculture and Rural Affairs of China for their excellent contribution to the promotion of aquaculture in Asia and the Pacific region and the successful conclusion of the GCA +20 and its major output, the Shanghai Declaration. The declaration provided a vision of what was needed in the region and how this could be turned into action. Asia was a powerhouse of global aquaculture producing around 89% by volume and creating many jobs, with clear evidence of the impacts on poverty reduction and food supply. Aquaculture was expected to provide around 59% of fish for human consumption by 2030. The Asian region featured highly diversified practices, systems, and species with many examples of how systems could be improved or adapted to different contexts. FAO had revised its strategic frameworks under four “betters”: better production, better nutrition, better environment, and better life. FAO’s work on aquaculture is under the priority area called Blue Transformation, which is fully aligned with the Shanghai Declaration. FAO RAP is partnering with NACA to develop a new FAO Technical Cooperation Programme (TCP) proposal to support upscaling of innovation and good aquaculture practice and enhance national capacity to transform aquaculture towards sustainable intensification and expansion and leverage future investment. A high-level meeting on investment and cooperation in Blue Transformation in support of the Shanghai Declaration would be convened. FAO thanked NACA members for their collaboration.

NACEE

36. NACEE was established in 2004 with the assistance of FAO and has been an Associate Member of NACA since 2012, but HAKI has been working in partnership with NACA for over 20 years. NACEE has 30 members from 10 countries. The main activities of NACEE include facilitating the exchange of information and enhancing collaboration between EU and non-EU countries, organising regular workshops, and encouraging young scientists. NACEE publishes books and papers and represents the region in different international events. NACEE had been involved in some development projects with FAO and the EU and believed that there is potential for great collaboration between central and eastern Europe and Asia. NACEE confirmed it was ready to collaborate with NACA on inter-regional freshwater aquaculture development and to help establish sNACA, especially regarding freshwater aquaculture, which was its strong point. Hungary has been working with Lao PDR since 2009 on food safety and food security. This collaboration had upgraded Lao PDR research centres and strengthened their partnership with farmers.
37. Lao PDR responded with thanks to NACEE for the proposal to include its institutions in sNACA and for the offer of support.

APAARI

38. APAARI is an inter-governmental organisation and intermediary that brings about a collective change in agri-food systems in the Asia-Pacific region, covering agriculture as a whole. APAARI works on natural resource management, policy advocacy and risk mitigation with a view to

improving food security and achieving the SDGs. There is a common mandate between NACA and APAARI on aquaculture development and an opportunity to join hands to work on issues of common interest in the Asia-Pacific region. APAARI occasionally draws on NACA expertise in capacity building programmes for aquaculture and has considerable overlap in membership. In 2019 APAARI convened an expert consultation in Sri Lanka on aquatic genetic resources, which produced a strategic plan that is complementary to NACA's 2021-2024 Strategic Plan. APAARI is in the process of revising its own strategic plan, and where there is a commonality between the two organisations, it would be beneficial to collaborate, for example, in regional information systems. Other potential areas for collaboration include harmonisation of policy on the exchange of germplasm within and between regions, transboundary movement of aquatic organisms, quarantine and disease management and access and benefit-sharing.

CIRDAP

39. CIRDAP expressed appreciation to FAO, NACA and the Government of China for the organisation of the Global Conference on Aquaculture Millennium +20. CIRDAP is an intergovernmental organisation that promotes integrated rural development through regional cooperation in Asia and the Pacific. CIRDAP has been cooperating with NACA since 2020 when the organisations collaborated on two project proposals for submission to the EU Horizon 2020. CIRDAP organised seabass and hilsa culture cooperation between Thailand and Bangladesh in January 2021 and submitted a joint pledge of support for the Shanghai Declaration with NACA. A meeting with NACA is scheduled for 11 January 2022 to discuss technology transfer and capacity building in seabass culture for Bangladesh in collaboration with BSFF and the Thai Union. CIRDAP looks forward to collaborating with NACA, FAO and partners to follow up on the proposed building of climate resilience in aquaculture and agriculture systems and other activities in the years to come. CIRDAP's full statement is attached as **Annex G**.

Bangladesh Shrimp and Fish Foundation

40. BSFF was a business support organisation with an emphasis on regional cooperation. BSFF had established cooperation with NACA within the framework of an MOU. Even during the pandemic, NACA had risen to the challenges of providing useful work and cooperation in the development of sustainable aquaculture. All participants remained deeply worried about the impact of COVID 19. Research has shown the negative impacts of the pandemic to be widespread, necessitating collaboration to overcome the difficulties. BSFF supported the GCA +20 and Shanghai Declaration and offered full support for the Strategic Plan 2021-2024. Climate change and saline intrusions are already an issue in Bangladesh. In this context, brackishwater aquaculture offered the potential for the culture of seabass, mullet and shrimp. BSFF sought support from NACA members to promote the culture of these species to mitigate the fallout and provide opportunities. BSFF's full statement is attached as **Annex H**.

Reports of the Regional Lead Centres

41. The Regional Lead Centres for China, India, Iran, and Thailand presented progress reports (**Annexes I-L**). Highlights are summarised below.

Freshwater Fisheries Research Center, Regional Lead Centre for China

42. Highlights of the RLC China's report included:

- a. A rural revitalisation strategy to improve the living standards of rural people. Priorities for future development were that aquaculture was green and efficient, safe and standardised, integrated and open, resource-saving and environmentally friendly by

addressing a range of chained issues from policy, financial, products, ecological, culture, technological and branding.

- b. Publication of 619 papers, six books, and award of 94 patents, 45 of which are inventions.
- c. Development of new strains of river crab, common carp, river prawn and fugu has been developed.
- d. Award of 27 prizes, including two national-level prizes and fifteen ministerial and provincial level prizes.
- e. Major breakthroughs in the artificial breeding of freshwater drumfish for the first time and artificial breeding of *Solenia oleivora*.
- f. Development of breakthrough technologies such as live marking, paternity testing, high-throughput character determination and non-invasive genetic evaluation of river prawns.
- g. Provision of technical support for the development of the local fisheries industry.
- h. Technological support to enterprises, including the joint establishment of research institutes on crabs, crayfish, and other commodities.
- i. Provision of higher education from BSc to MSc and PhD level.
- j. International cooperation included technical training programmes involving 45 projects with over 2,320 fisheries officials from twenty countries.
- k. Twenty-three delegations were dispatched to sixteen countries for technical consultation and exchange, including Indonesia, Thailand, and Cambodia.
- l. Academic exchange and knowledge sharing with 112 scientists participating in 33 international academic symposiums from 2019-2021.
- m. The 2022 work plan includes a focus on capacity building for young scientists, R&D of aquaculture technology, technical extension and demonstration, training and education, international cooperation, and exchange programmes in partnership with FAO, NACA and other organisations.

ICAR-Central Institute of Freshwater Aquaculture, Regional Lead Centre, India

43. Highlights of the RLCI report included:

- a. Technology packages available for 20+ food fishes and 15+ ornamental fishes.
- b. Genetically improved varieties including Jayanti rohu, CIFIA GI Scampi, Improved Catla and Shining Barb.
- c. Therapeutic and preventative aids including CIFFAX, Immunoboost-C and CIFACURE.
- d. FRP portable hatcheries for carp and magur.
- e. Fish semen preservation.
- f. Specialist feeds for carps at different life stages.
- g. Diagnostic kits including spot agglutination, dot ELISA for on-farm diagnosis of bacterial diseases.
- h. Nanotech-based products such as Nanoplus@CIFA for growth stimulation and disease resistance in carps.
- i. The utilisation of waste such as fish hydrolysate.
- j. System diversification through development of technologies for RAS, integrated farming systems and biofloc technology, and aquaponics.
- k. Notable developments in the breeding of many species, including golden snakehead, *Channa striata*, *Hypseleobarbus pulchellus*, *Puntius caraticus*, and *Mystus cavasius*.
- l. PCR-based *Clarias magur* and *C. gariepinus* hybrid detection system
- m. Replacement of fishmeal with guar meal in rohu diets

- n. Whole-genome sequencing and development of allied resources of *Labeo rohita*.
- o. Award of patents for various technologies developed at CIFA.
- p. Digital Outreach Approaches, including virtual training and stakeholder consultations, and development of an Android app that is an e-learning platform with video modules and self-assessment quiz and e-certificate.
- q. World fisheries day lecture series 2020.
- r. Proposals have been submitted to NACA for conducting training programs with funding support from NACA on advances in quality seed production, development of entrepreneurship and start-ups in the freshwater aquaculture value chain, quality fish seed production through brood fish management.

Coldwater Fisheries Research Center and International Sturgeon Research Institute, Regional Lead Centre, Iran

44. Highlights included:

In the Coldwater Fisheries Research Centre

- a. The main research activities of the Coldwater Fisheries Research Centre concerned rainbow trout and Caspian Sea salmon aquaculture with regards to reproduction, health, nutrition, genetics, and culture technology.
- b. Objectives were to increase production per unit area, establish gene banks, promote sustainable development of coldwater fish production, and promote knowledge of rainbow trout aquaculture and rural development.
- c. Achievements include the production of all-female rainbow trout population, triploid rainbow trout population using induction method, and development of broodstock.
- d. Preservation and reconstruction of Caspian Sea salmon stocks through the determination of genetic diversity of populations in important rivers.
- e. Production of rainbow trout by the silo method, useful for mountainous areas.
- f. Studies of the uses of medicinal plants.
- g. Production of specific pathogen-free rainbow trout.
- h. Establishment of the first semi-industrial pilot method for SPF trout production.
- i. Education and extension programmes for farmers, including mechanisation, monosexual production techniques, health management, breeding trout and salmon, and promoting salmon farming in cages in the Caspian Sea.

In the International Sturgeon Research Institute

- j. Main research activities concern the conservation and sustainable exploitation of sturgeon stocks in the Caspian Sea and the development of sturgeon aquaculture.
- k. Sturgeon aquaculture had reached 3,500 tons of meat and 12,000 kg caviar in 2020, with 132 active farms in 21 provinces. The dominant farmed species are great sturgeon *Huso huso* and Siberian sturgeon *Acipenser baerii*.
- l. Convening key events, such as the International Sturgeon Symposium.
- m. Collaboration with international partners from Hungary, Netherlands, Armenia and others.

RLC Thailand Phranakhon Sri Ayuthaya Inland Aquaculture Research and Development Center

45. Highlights of the RLC Thailand report included:

- a. Main activity seed production for stock enhancement programmes in public waters, including for silver barb, Siamese mud carp, climbing perch, giant gourami and giant freshwater prawn.

- b. Seed production of snakeheads.
- c. Breeding of the critically endangered Mekong giant catfish in concrete tanks from captive broodstock.
- d. Cooperation with China on conservation programmes for threatened species via supportive restocking programmes.
- e. Training programmes to support around 500 farmers per year, as well as training of personnel from Myanmar and 10-20 personnel from other countries. Recently, training has been virtual.

Endorsement of NACA Strategic Plan 2021-2024

46. Members endorsed the draft Strategic Plan 2021-2024 with amendments as proposed in the open session.

Adoption of the report of the meeting

50. The Governing Council adopted the report of the meeting.

Vote of thanks

51. Members thanked the Government of Hong Kong SAR, China, Thailand and the NACA Secretariat for their efficient arrangements and facilitation of the first-ever virtual Governing Council Meeting.

Close

52. The meeting closed at 12:15 on 30 November 2021.

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GC31-01

Network of Aquaculture Centres in Asia-Pacific
31st Governing Council Meeting
 29-30 November 2021 via Zoom meeting
Adopted Agenda

[Day 1, 29 November 2021]

10:00 – 10:05	Logistic Announcement	
10:05 – 10:20	Opening Ceremony	
	<ul style="list-style-type: none"> • Welcome: Outgoing GC Chair • Opening Remarks: DG of NACA 	
10:20 – 10:25	Procedural Matters	
	<ul style="list-style-type: none"> • Election of Chair and Vice Chair • Adoption of Provisional Agenda 	
10:25 – 10:50	Report of the NACA Director General and NACA Strategic Plan	GC31-02, GC31-03
10:50 – 12:30	Discussion of DG Report and Strategic Plan, and Statements by Member Governments and Partner Organisations	
	<i>Break: 12:30 – 13:30</i>	
13:30 – 13:45	Briefing of GCA+20 Achievements	GC31-04
13:45 – 14:30	Interventions from Members and Organizations	
	<i>Break: 14:30 – 14:45</i>	
14:45 – 15:15	Reports of Regional Lead Centres	GC31-05~09
15:15 – 16:00	Discussion of Regional Lead Centre Reports	

[Day 2, 30 November 2021]

	CLOSED SESSION	
10:00 – 10:10	Presentations of Board Papers and discussions	
10:10 – 12:00	Financial matters	
	<ul style="list-style-type: none"> • Audited Financial Reports – NACA HQ, Accounts in India and Nepal • Proposed Budget for 2021 and Indicative Budget for 2022 • Contributions of Member Governments • Other Financial Matters 	GC31-10
	Discussion of Financial matters	
12:00 – 12:20	Adoption of Strategic Plan 2020-2024	
12:20 – 12:30	Closing remarks by GC Chair	



Network of Aquaculture Centres in Asia-Pacific
31st Governing Council Meeting
29-30 November 2021 via Zoom meeting
Report of the Director General



REPORT OF THE DIRECTOR GENERAL

(January 2019 – December 2020)

31st Governing Council Meeting

Network of Aquaculture Centres in Asia-Pacific (NACA)

November 2021

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Executive Summary

NACA Secretariat implemented its works, including general administration and staff matters, public relations, fundraising, managing Associate Members and partnerships, and Regional Lead Centres. Income in 2019 and 2020 has been derived from membership fees contributed by NACA Member governments and projects. NACA implements its works through nine work programmes, restructured in NACA Strategic Plan (2020-2024), namely; Productivity & Sustainability (P&S), Health & Biosecurity (H&B); Genetics & Biodiversity (G&B); Safety & Quality (S&Q); Emerging Regional & Global Issues (ER&GI), including COVID-19 impacts, Climate Change; Education & Training (E&T); Information & Networking (I&N); Strategy & Governance (S&G); and One Community (OC). NACA organizes conferences, forums, workshops, and webinars and produces publications.

Report of the Director General

1 Greeting and Formal Welcome

Chairperson, Vice-Chairperson and Honorable Members of the NACA Governing Council, Representatives of Associate Members, Representatives of Regional Lead Centres, Representative of observing organisations, Friends and Partners of NACA, Colleagues:

The presentation to the GC will provide a major holistic report of all NACA activities in 2019 and 2020 under the new structure of NACA Strategic Plan 2020 to 2024 with five thematic programmes, including Productivity & Sustainability, Health & Biosecurity, Genetics & Biodiversity, Safety & Quality, and Emerging Regional & Global Issues and four cross-cutting programmes on Education & Training, Information & Networking, Strategy & Governance, and One Community. Due to the limitation in the video conference, the presentation of the DG Report will only brief the activities. For more details, please refer to the full text of the NACA DG Report. The NACA Programme Managers may also provide additional information. The document is not a final version and may be changed upon comments received from Governing Council.

2 Major Activities and Accomplishments in 2019 and 2020

2.1 Productivity & Sustainability

2.1.1 Introduction of successful sustainable aquaculture modes in Asia-Pacific

DG NACA was invited as an intergovernmental organization observer in the 10th Session of the FAO COFI Sub-Committee on Aquaculture held on 23 to 27 August 2019 in Trondheim, Norway. He was invited to deliver a presentation on “Profile and Cases of Aquaculture for Sustainable Development in Asia-Pacific” during the Special Event on Better Management Practices and Guidelines for Sustainable Aquaculture Development. The presentation was started with the regional background, followed by features, challenges, opportunities, and priorities of aquaculture in Asia-Pacific. The attracting part introduced excellent regional sustainable aquaculture development cases with different IMTA types, including coastal ocean longline raft IMTA, ecological polyculture IMTA, ecological recirculating IMTA, and marine Ranching IMTA, and also integrated plant-aquatic farming in China. In the end, he briefed other successful cases in the region. The cases introduced in the presentation were highly concerned for the other regions of the world.

2.1.2 Technology Innovation and Social Impact of Integrated Agro-Aquaculture

DG NACA was invited to attend the International Symposium on Technology Innovation and Social Impact of Integrated Agro-Aquaculture: Rice-Fish System in Shanghai organized by Shanghai Ocean University, in cooperation with FAO and NACA on 13-15 October 2019. He introduced NACA’s vision and the initiation of subject-oriented networks for regional resources mobilization. Further discussions were among the participants and raised the potential interest in establishing a network focusing rice-fish

system.

2.1.3 Using Innovative Seaweed Production Technology for Large-scale Restoration of biodiversity and Ecosystem services

NACA collaborated with CIRDAP to initiate the proposal, identified the partners in our Members and the coordinator SAMS for the proposal, and invited them to join the proposal. With the collaborative efforts of the proposal team, the proposal was finally developed and submitted. After the evaluation, the "Excellence and Quality" and "Efficiency of the implementation" got good to very good results. Still, the impact got a fair to a good result, which made the proposal rejected. However, during the several months' collaboration of partners under SAMS's leadership, the proposal team has done very hard and excellent works and developed new cooperative partnerships on seaweeds. These efforts and outputs will definitely benefit future cooperation.

The objectives of the project, including

- Develop a scalability plan, together with concerned communities, national and international bodies and other stakeholders, based on the innovative solutions validated in SEATEC-Restore.
- Showcase the restorative capability of SIX large-scale (total area ~ 2,300 ha), sustainable seaweed production systems on degraded marine environments, including enhancement in biodiversity, connectivity, ecosystem function, including maintaining and enhancing natural carbon and nitrogen sinks in Europe, Asia, South America and Africa by 2024.
- Validate existing and innovative methods and tools for monitoring biodiversity and ecosystem function at large-scale restoration sites, in order to set baselines and goals and to develop a framework for long-term monitoring.
- Develop a selective breeding, biocontrol and biostimulant program, suitable for large-scale indigenous seaweed production, aimed at optimizing industrial specification by significantly increasing crop resilience to climatic stressors, such as temperature and disease, in addition to maintaining high biomass yields and increasing specific compounds for bio-based product production.
- Develop supportive and robust management plans at local, national and international levels to reduce pressures and impact of habitat damage at the local scale, which can be integrated with governance frameworks for both restoration and large-scale aquaculture activities.
- Validate social solutions, including acceptance, resilience and shifts in social and behavioral patterns towards increased benefits for biodiversity, particularly for communities in transition.
- Validate existing governance structures for seaweed cultivation within biodiversity and ecosystem services restoration, and test new approaches to embedding seaweed cultivation within marine nature-based solutions for ecosystem restoration towards climate change and disaster risk reduction benefits.
- The above scientific and technical objectives will be linked to a series of commercial,

social, governance and financial objectives to place our results in the context of immediate industrial exploitation, including to: Test and validate final products; Test a range of sustainable and economically viable value chains; Create a platform for knowledge exchange; Identify and adapt or design new innovative revenue models and financial structures.

2.1.4 Asia Regional Consultation on Development of the Guideline for Sustainable Aquaculture (GSA)

DG NACA was invited to participate in the virtual workshop: Asia Regional Consultation on Development of the Guideline for Sustainable Aquaculture (GSA) organized by FAO from 30 November to 2 December. The workshop was joined by more than 40 participants from Member countries. It provided systemic information related to sustainability and approaches to developing the GSA for the region. The consultation consisted of abundant instruction, plenary and group discussion, and excises. DG NACA actively joined the discussion and provided feedback on the requested survey. In addition, he provided some information with the regional situation and proposed to encourage the establishment of distinctive eco-friendly communities or villages by promoting cross-sectoral comprehensive and integrated industries, including aquaculture, agriculture, and other relevant value chains, by utilizing the feature of the diversity of aquaculture in the region to increase the compatibility of aquaculture with other industries and to improve resilience for the impact of COVID-19.

2.2 Health & Biosecurity

2.2.1 Quarterly Aquatic Animal Disease Reporting

This is a continuing programme of NACA in collaboration with OIE and FAO. This reporting system has been a useful mechanism for recognizing emerging and important aquatic animal diseases in the region, as well as excellent regional networking in support of aquatic animal disease surveillance. From the first quarter of 2016 (July publication), QAAD Asia-Pacific is now a merged report of OIE-RRAP (Tokyo, Japan) and NACA, covering all OIE member countries in the Asia-Pacific region. With the initial launching of the OIE-WAHIS in 2020, a new format of aquatic animal disease reporting in the Asia-Pacific region is to be implemented from 2021. This will eventually facilitate purely online reporting in the future. <https://enaca.org/?id=8>

2.2.2 Asia Regional Advisory Group on Aquatic Animal Health

A continuing programme of NACA. The Advisory Group (AG) is composed of selected aquatic animal health experts from the region, regional and international partner organisations, and the private sector.

- The 18th meeting (AGM 18) was held in Bangkok, Thailand, on 18-19 November 2019. Dr. Eduardo Leñaño organized the meeting.
- The 19th meeting (AGM 19) was held virtually on 26-27 November 2020 due to the current pandemic. During the annual meetings, updates on aquatic animal health management as well as other related issues are discussed, and recommendations

formulated.

2.2.3 Regional Proficiency Testing Program for Aquatic Animal Disease Diagnostic Laboratories in the Asia-Pacific

NACA hosted the workshop on Regional Proficiency Testing Program for Aquatic Animal Disease Diagnostic Laboratories in the Asia-Pacific for 33 laboratories from 12 Asia-Pacific countries on 13-14 March 2019 in Bangkok, Thailand. The workshop, a part of the ongoing Proficiency Testing Project of the Australian Department of Agriculture and Water Resources, offered direct communication with laboratory representatives from the program to assist in the understanding of diagnostic standards, proficiency testing procedures and laboratory quality assurance management systems. It also allowed participants to discuss any issues they had come across during the first two rounds of completed testing. <https://enaca.org/?id=1040>

- Dr. Eduardo Leaño organized, on behalf of NACA, the Asia-Pacific Laboratory Proficiency Testing Workshop held on 13-14 March 2019 in Bangkok, Thailand. Mr. Simon Wilkinson participated in the Asia-Pacific Laboratory Proficiency Testing Workshop.

2.2.4 Response to DIV1 and Preparedness for Emerging Shrimp Diseases

In order to provide updated knowledge, recommendations, and emergency preparedness for a new emerging shrimp disease, Decapod iridescent virus 1 (DIV1), and other emerging shrimp diseases, the NACA Secretariat actively respond to the DIV1 issue with concerns raised in the region and the world. Response actions were carried out as the following:

- DG NACA and Dr. Eduardo Leaño welcomed the visit of Prof. Timothy Flegel and Prof. Kallaya Dangtip at the Secretariat on 3 October 2019 and discussed future collaboration on shrimp health. Dr. Flegel expressed his concern about the possibility of disease transmission through aquatic food for human consumption and findings of infection with DIV1 in lymphoid organs and positive detection of DIV1 in the wild population.
- With Prof. Flegel's team's support, the Secretariat published an authored preprint paper: "Urgent announcement on the usefulness of the lymphoid organ (LO) as an additional prime target for diagnosis of decapod iridescent virus 1 (DIV1) in diseased *P. vannamei*" on 20 February 2020. <https://enaca.org/?id=1092>
- With Prof. Flegel's team's support, the Secretariat published an authored preprint paper: "Urgent warning: Positive PCR detection results for infectious myonecrosis virus (IMNV) and decapod iridescent virus 1 (DIV1) in captured *Penaeus monodon* from the Indian Ocean" on 25 February 2020. <https://enaca.org/enclosure.php?id=1093>
- The Secretariat published a technical issue: "Disease advisory: Decapod Iridescent Virus 1 (DIV1): An emerging threat to the shrimp industry" on 21 April 2020. <https://enaca.org/enclosure.php?id=1098>
- With the support from Yellow Sea Fisheries Research Institute, the Publication of a

technical issue: "Infection with decapod iridescent virus 1 (DIV1): Disease card" on 7 May 2020. <https://enaca.org/enclosure.php?id=1104>

- The Secretariat organized a virtual public consultation on 10-11 September 2020. The consultation primarily aims in discussing and plan actions for the prevention and management of the disease. Specifically, it provided updated technological information on DIV1, advocated the strengthening of diagnostic capacities as well as active surveillance of DIV1 (to detect presence or absence of the virus), formulated recommendations on sanitary measures (including biosecurity) for disease prevention, and promoted emergency preparedness for DIV1 and other emerging shrimp diseases. The webinar had more the 350 participants worldwide. Participants had active interaction with the speakers for questions. <https://enaca.org/?id=1117>
- Publication of QAAD Reports covering DIV1 in the list.
- Dr. Eduardo Leaña represented NACA during the 9th Meeting of the ASEAN Shrimp Alliance (ASA) and 11th ASEAN Fisheries Consultative Forum (AFCF) held on 24-26 June 2019 in Danang, Vietnam.
- DG NACA was invited to the virtual 10th Meeting of the ASEAN Shrimp Alliance (ASA) held on 20-22 June 2020 in DoF, Thailand, and reported "New challenges to shrimp aquaculture in Asia-Pacific" with the research progresses on infection with DIV1
- DG NACA and Dr. Eduardo Leaña attended as invited experts during the OIE Regional Virtual Meeting on Decapod Iridescent Virus 1 (DIV1) on 20 August 2020 (Tokyo, Japan). DG NACA made a presentation on Diagnostic and surveillance technologies for DIV1
- DG NACA was invited to attend the GOAL 2020 organized by Global Aquaculture Alliance on 2 October 2020 and spoke on Risks of decapod iridescent virus 1 and management strategies via recorded video.
- DG NACA was invited to an FAO expert group for DIV1 Expert Knowledge Elicitation (EKE) Risk Analysis on 17 September 2020. He helped in the nomination of some experts related to this issue and provided comments for the background document and DIV1 risk profile. Feedback to the questionnaire of DIV1 EKE RA was provided on 8 November 2021.

2.2.5 Response to Emerging Shrimp Disease Glass Postlarvae Syndrome

Queries were received from Members and other regions on Glass postlarvae syndrome (GPL) reported from China in early 2020. The Secretariat responded to the queries via emails, interviews, and social media.

- DG NACA, in a special interview to Pravash Pradhan, Chief Editor, aquapost.in and SMRT AGRIPPOST, the well-known India media, on 20 May 2020, talks about the need for developing a strong domestic market and the stringent biosecurity measures to prevent the spread of GPL in shrimp hatcheries. The interview report "Stringent biosecurity measures to be taken to prevent Glass PL in shrimp

hatcheries: Jie Huang, DG, NACA” can be found at the SMRT AGRIPPOST site: <http://www.aquapost.in/stringent-biosecurity-measures-to-be-taken-to-prevent-glass-post-larvae-in-shrimp-hatcheries-dg-naca/>

- DG NACA represented NACA during the virtual 10th Meeting of the ASEAN Shrimp Alliance (ASA) held on 20-22 June 2020 in DoF, Thailand. DG NACA reported "New challenges to shrimp aquaculture in Asia-Pacific" with the research progresses on "Glass postlarva" syndrome (GPL)

2.2.6 OIE Regional Collaboration Framework on Aquatic Animal Health in Asia and the Pacific

NACA actively collaborates on this regional initiative of OIE through their Regional Representation in Asia and the Pacific (OIE-RRAP), wherein Dr. Eduardo Leaña is a member of the *Ad Hoc* Steering Committee. The first meeting was held in Bangkok, Thailand on 20-21 November 2019, and the second meeting was held via teleconference on 26 March 2020. The Regional Collaboration Framework focuses on building a framework of actors with the aim to strengthen laboratory capacity for aquatic animal disease activities in Asia and the Pacific, such as emergency response. The main objectives are to strengthen collaboration among and between OIE Reference Centres (i.e., Reference Laboratories and Collaborating Centres) and Member Countries and share and exchange information on test validation and reference material. As one of the priority activities of the Collaboration Framework, NACA will be implementing a project on the Collection and Evaluation of Existing Guidelines and Awareness Materials on Aquaculture Biosecurity for Small-scale Farms in the Asia-Pacific Region in 2021.

- Dr. Eduardo Leaña represented NACA during the OIE 87th General Session of World Assembly of Delegates held on 26-31 May 2019 in Paris, France.
- Dr. Eduardo Leaña represented NACA during the 31st Conference of the OIE Regional Commission for Asia, Far East and Oceania, held on 2-6 September 2019 in Sendai, Japan.
- Dr. Eduardo Leaña attended as an invited expert during the OIE Think Tank on the Development of Codification System for Animal Health Data and its Integration to OIE-WAHIS, held on 5-7 November 2019 in Paris, France.
- Dr. Eduardo Leaña and DG NACA attended the 1st Meeting of the ad hoc Steering Committee of the Regional Collaboration Framework on Aquatic Animal Health in Asia-Pacific on 20-21 November 2019 in Bangkok, Thailand.
- Dr. Eduardo Leaña attended the OIE PVS Pathway Orientation Training Workshop for South-East Asia on 10-13 December 2019 in Bangkok, Thailand.
- DG NACA was invited to participate in the OIE Evaluation Committee as an external evaluator on 8 July 2020 and was involved in several rounds of virtual evaluation meetings.
- Dr. Eduardo Leaña and DG NACA attended the virtual OIE Steering Commission Meeting on 3 December 2020. Dr. Leaña spoke on the recent activities related to aquatic animal health in NACA.
- NACA and OIE signed an LoA on the “Collection and Evaluation of Existing Guideline

and Awareness Materials on Aquaculture Biosecurity for Small-scale Farms in the Asia-Pacific Region” on 8 December 2020 for the collaboration between 1 January 2021 and 31 December 2021.

2.2.7 Development and collaboration on Aquaculture Biosecurity

As various diseases are an urgent and systemic risk to the sustainable development of aquaculture in the Asia-Pacific region, aquaculture biosecurity has attracted more and more attention. The NACA Secretariat regards aquaculture biosecurity as an important core approach to ensure aquaculture health, believing that this concept will provide a holistic solution strategically and technically for aquaculture in the region. Therefore, since 2019, biosecurity has been adopted as a part of the programme theme to complement the original Aquatic Animal Health. Furthermore, the Secretariat decided to develop and promote the biosecurity concept through collaboration with Member’s capacity resources and international organizations, particularly FAO and OIE.

2.2.7.1 Collaborate and contribute to FAO initiative of Progressive Management Pathway (PMP) to improve Aquaculture Biosecurity (PMP/AB)

- Dr. Eduardo Leña attended the 2nd Multi-stakeholder Consultation on Progressive Management Pathway (PMP) to Improve Aquaculture Biosecurity (AB) on 28-31 January 2019 in Paris, France.
- Dr. Eduardo Leña, authorized by Dr. Melba G. Bondad-Reantaso, the Senior Officer of FAO on biosecurity, introduced the concept and its key steps and pillars of PMP/AB to the NACA Governing Council members during the 30th GCM on 26-28 March 2019 held in Guangzhou, China. As a result, the Governing Council supported a proposal to develop a multi-donor supported long-term programme on aquaculture biosecurity and for NACA to attend the COFI/SCA10 to make an intervention on behalf of members to develop and implement PMP/AB in partnership with FAO.
- DG NACA was invited to attend Round-table Discussions on Aquaculture Biosecurity organized by FAO and Mississippi University on 22-26 July 2019 in Washington, DC, USA. He delivered a presentation introducing the five-grade farm-level biosecurity plan with the combination of the concept of PMP/AB and presented the challenges in the development of farm-level biosecurity plan, and also actively participated in the discussions.
- DG NACA expressed strong supporting intervention to the proposal to prevent and manage aquatic animal disease risks in aquaculture through a PMP during the 10th Session of the FAO COFI Sub-Committee on Aquaculture from 23 to 27 August 2019. He appreciated FAO’s efforts on the initiative of the concept and the inclusiveness in collaborating with partners, including NACA, in the initiative of PMP/AB. He is looking forward to a global solution to improve aquatic animal health and aquaculture sustainability through a risk-mitigating based systemic better aquaculture management. He informed that the initiative of PMP/AB was introduced to NACA Members during the 30th NACA GCM in March 2019. The proposal to develop a multi-donor supported long-term programme on PMP/AB was

supported by the GC. He spoke on behalf of NACA to forward the strong support on the proposal and interest in the development of the implementation of PMP/AB in the region in collaboration with FAO and other partners.

- DG NACA was invited as a Technical Working Group (TWG) member to participate in the Round-table Discussion: Moving Forward through Lessons Learned on Response Actions to Aquatic Animal Disease Emergencies, which was an important component for PMP/AB, on 16-18 December 2019 in Rome and delivered the presentation Response Actions to AAD Emergencies in Asian-Pacific. He introduced roles of NACA dealing with aquatic mass mortality events (MME) with examples of response actions to WSD, AHPND, infection with DIV1, lessons learnt and improvements, and five minimum emergency preparedness response requirements. He was also actively involved in discussions.
- Dr. Eduardo Leña attended the FAO COFI34 Virtual Dialogue on Biosecurity in Aquaculture: Innovative biosecurity approaches for a healthier aquaculture industry on 15 July 2020 (Rome, Italy).
- DG NACA and Dr. Eduardo Leña participated in preparing a review manuscript “Interdisciplinary approach for active surveillance of diseases in aquaculture: a 12-point checklist” led by Dr. Melba G. Bondad-Reantaso and provided comments and revisions. The content of the manuscript provides valuable information in developing the active surveillance plan to support PMP/AB. The manuscript was submitted to Reviews in Aquaculture on 30 August 2020. According to reviewer’s comments, the title of the manuscript was changed to “A 12-point checklist for surveillance of diseases of aquatic organisms: a novel approach to assist multidisciplinary teams in developing countries”. The final manuscript was accepted for publication in the journal on 17 December 2020.
- DG NACA was invited by Dr. Melba G. Bondad-Reantaso to a Technical Working Group (TWG) for the Development and Implementation of PMP/AB (PMP/AB TWG) on 7 December 2020.

2.2.7.2 Propose the development and dissemination for aquaculture biosecurity

- In cooperation with Yellow Sea Fisheries Research Institute, FAO, and OIE Asia-Pacific Office, NACA participated in the organization of the International Workshop on Biosecurity in Aquaculture on 24-25 September 2019 in Qingdao, China. DG NACA attended the workshop and addressed NACA’s intention in developing aquaculture biosecurity for the region. DG NACA also delivered a presentation on the framework of aquaculture biosecurity system and farm-based biosecurity plan. The Secretariat assisted in the agenda development and invitation of international experts. Total 14 presentations on the research progress of aquaculture biosecurity, health management practices in aquaculture, PMP/AB concept and application examples, regional implementation of international aquatic animal health

standards were delivered and discussed. During the discussion, representatives from FAO, OIE, and NACA proposed to establish a long-term research mechanism for aquaculture biosecurity and to co-host the annual international biosecurity seminar with Yellow Sea Fisheries Research Institute to jointly promote the green development of aquaculture.

- DG NACA was invited to attend the World Marine Science and Technology Conference organized by Qingdao Association for Science and Technology, National Laboratory for Marine Science and Technology (Qingdao), Marine Economic Technology Society of Shandong Province, Qingdao Oceanic Valley Administration Bureau on 24 September 2019 in Qingdao, China, and delivered a presentation on “Biosecurity System Rule and Steps in Shrimp Disease Prevention and Control”.
- DG NACA was invited as a speaker to attend the Aquaculture Vietnam 2019 Exhibition organized by Informa Markets on 16-19 October 2019 in Can Tho City, Viet Nam. He presented on Biosecurity System: Rule and Steps in Shrimp Disease Prevention and Control and answered questions. During the exhibition, he visited most stalls and discussed on the needs and willingness in the enterprise cooperation under a network mechanism and obtained positive feedback.
- DG NACA was invited to attend the 2019 *Penaeus vannamei* Broodstock and Postlarvae China Forum organized by the National Fisheries Technology Extension Center, the Department of Agriculture and Rural Affairs of Guangdong Province, and Southern Agriculture Newspaper on 5-7 December 2019 in Guangzhou and delivered the presentation "The latest research progress of shrimp diseases and biosecurity prevention and control technology in seedling stage".
- DG NACA was invited to attend the Summary Conference of China Agriculture Research System organized by the Chinese Academy of Fishery Sciences on 24-28 December 2019 in Ningbo, China, and delivered the presentation on shrimp culture biosecurity system.
- Responding to the kind invitation, DG NACA delivered a 3-hour webinar speech on the topic Biosecurity – The Concept to Guarantee the Sustainable Development of Aquaculture for the World Fisheries Day - 2020 Lecture Series held on 23 December 2020 organized by ICAR-Central Institute of Freshwater Aquaculture, Odisha, India.

2.3 Genetics & Biodiversity

2.3.1 Joining current actions on genetic & biodiversity

Currently, the Secretariat has no specific professional staff working on Genetics & Biodiversity Programme. Therefore, the most activities on this programme were participation in the actions taken in the other organizations.

- Mr. Simon Wilkinson was invited to represent NACA to speak at the APAARI

Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration, 10-12 July 2019, Colombo, Sri Lanka.

- DG NACA was invited to attend the Regional Consultative Meeting on Biodiversity Mainstreaming across Agriculture Sectors in Asia and Pacific organized by FAO RAP on 17-19 July 2019 in Bangkok, Thailand. He actively participated in the discussion and provided opinions about the biodiversity mainstreaming in the aquaculture sector in the region.
- DG NACA was invited to participate in the 10th Session of the FAO COFI Sub-Committee on Aquaculture as an organizational observer on 23 to 27 August 2019 in Trondheim, Norway, and expressed NACA's supporting intervention on the State of the World's Aquatic Genetic Resources for Food and Agriculture and possible follow-up, COFI:AQ/X/2019/2.1 during the session. He acknowledged the FAO's efforts which significantly contribute to the genetic breeding and biodiversity supporting the global aquaculture development. He expressed a concern to the diversity of farming species and complexity of farming system which are important characteristic aspects for aquaculture sustainability, especially for developing regions and the tendency of using bred strains in aquaculture. He hoped FAO and regional organizations initiate and coordinate long-term regional and global evaluation to estimate the impact of bred strains to aquaculture sustainability, which is characterized with high diversities, comparing to terrestrial agriculture. He also expressed the concern to the current status of separation of genetic breeding and biosecurity in research and even in some standards, certification, even industries. With the example of the great success of the development of *Penaeus vannamei* industry which started from the establishment of SPF broodstock to support subsequent genetic breeding program, he hoped FAO and relevant organizations encourage governments, institutions, scientists, and industries to set up standards for this combination between genetic breeding and biosecurity.
- Mr Simon Wilkinson participated in the consultation on Development of a Registry of Farmed Types of Aquatic Genetic Resources, 8-12 June 2020 (video conference).
- Mr Simon Wilkinson represented NACA as a speaker at the ICAR-NBFGR Regional Capacity Building Programme on Biotechnological Tools in Aquatic Genetic Resource Management and Ex-situ Conservation, 7-18 December 2020, Lucknow, India (via video conference).

2.3.2 Finding potential needs and partners interested in genetics & biodiversity

The Secretariat took the initiative in finding potential needs and partners interested in genetics & biodiversity.

- The Secretariat discussed the possible cooperation areas in genetic resources and biodiversity with some members institutions and TAC members. According to feedback, the strategy & governance on genetic & biodiversity has the highest priority level overall major works in aquaculture. There is a basic need for information sharing of genetic resources. Based on the need, the Secretariat proposes building a web-based database for government recognized genetic resources, especially commercialized genetic strains and varieties.

- The Secretariat joined a proposal made by the Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences on "Collaboration on Protection and Utilization of Genetic Resources of Marine Fishery Organisms for Sustainable Development of Entire Value Chain of Aquaculture" for application of project under China-ASEAN Maritime Cooperation Fund Program. In the NACA support letter sent on 15 August 2019, DG NACA expressed strong support for the application on the main tasks, including 1) collaborative research on the technologies for protection and utilization of the marine fishery biological genetic resources among China and ASEAN countries; 2) construction of sharing platform and demonstration centre of aquaculture technologies; 3) training and education of aquaculture technologies; 3) to promote sustainable development of the entire value chain of aquaculture in different countries.
- DG NACA was invited to meet with Dr. Graham Mair, Senior Aquaculture Officer on Genetic Resources, FAO, on 26 August 2019 during the 10th Session of the FAO COFI Sub-Committee, to discuss an initiative of a genetic network in collaboration with NACA. Dr. Mair explained the background and his prospectation of how the genetic network could contribute to aquaculture development in Asia-Pacific and other regions. DG NACA expressed NACA is high interest in developing the network and the abundant capacity resources in NACA Members. They also discussed the possible funding resources to support this network. Both sides considered the genetic network a very significant initiation and were willing to cooperate in this area. Dr. Mair presented DG NACA with an FAO recent publication, The State of the World's Aquatic Genetic Resources for Food and Agriculture
- DG NACA was invited to visit CP Broodstock Multiplication Center and Disease Challenge Center on 9 November 2019 in Thailand. The DG was impressed with the presentation introducing the enterprise's background, development progress, and innovations and the facilities displayed. Both sides had in-depth technical discussions on the enterprise genetic breeding program and biosecurity plan. The discussion was also extended to the possibility of regional cooperation on genetic breeding programmes. Valuable advice from the enterprise helped the understanding of the needs and willingness.
- The Secretariat welcomed the Delegation of Pearl River Fisheries Research Institute (PRFRI), Chinese Academy of Fishery Sciences on 14 November 2019. Both sides introduced their respective progress, contributions, and development interest in aquaculture. PRFRI appreciated the NACA's initiative on subject-oriented networks and expressed its interest in building a network for alien aquatic species. The Secretariat recognized the importance of this work and welcomed future activities can be organized to identify competent partners.

2.4 Safety & Quality

2.4.1 Antimicrobial use (AMU) and antimicrobial resistance (AMR) in aquaculture

NACA is actively collaborating with FAO-RAP and ASEAN on the development of Regional AMR Monitoring and Surveillance Guidelines Volume 3 (Monitoring and surveillance of

AMR in aquaculture).

- DG NACA was invited to attend FAO RAP: Regional Forum on Antimicrobial Stewardship in Agriculture on 11-12 July 2019 in Bangkok, Thailand. The DG presented on “Initiatives that Improved Practices which Fostered Antimicrobial Stewardship in Asia-Pacific Aquaculture”, providing information on good practices and innovations in aquaculture. He highlighted that the biosecurity system is of paramount importance in reducing AMU in aquaculture. He actively joined the discussions on identifying drivers of AMU and challenges of responsible use of antimicrobials, identifying recommendations and solutions, defining the roles of key stakeholders in promoting antimicrobial stewardship in agriculture in Asia,
- Dr. Eduardo Leaña attended the second consultation meeting for the finalization of the Guidelines was held virtually on 22-25 June 2020. Singapore, as the lead country for AMU and AMR in the ASEAN, is the one preparing the final draft of the Guidelines.
- Dr. Eduardo Leaña attended as invited expert the 1st Meeting of the AMR Technical Working Group (TAG) of South Asia held on 19-21 August 2019 in Bangkok, Thailand.
- Dr. Eduardo Leaña attended the Fleming Fund CORDS AMR Experts Convening Meeting on 16-18 December 2019 in Bangkok, Thailand.
- Dr. Eduardo Leaña attended the virtual 2nd Consultation Meeting on Regional AMR Monitoring and Surveillance Guidelines Volume 3 (Monitoring and surveillance of AMR in aquaculture) on 22-25 June 2020 (Bangkok, Thailand).
- Dr. Eduardo Leaña attended the OIE-Responsible, and prudent antimicrobial use (AMU) in aquatic animals in Asia and the Pacific held virtually on 16 November 2020 (Tokyo, Japan).

2.4.2 Other activities related to Safety & Quality in aquaculture

- DG NACA was invited to attend the Launch of Regional Overview of Food Security and Nutrition in Asia and the Pacific 2019: “Placing Nutrition at the Centre of Social Protection” organized by Food and FAO RAP, in conjunction with the regional offices of United Nations Children’s Fund (UNICEF), World Food Programme (WFP) and World Health Organization (WHO) on 11 December 2019. In addition, for future cooperation, DG NACA took a chance for a short communication with Ms. Kundhavi Kadiresan, ADG of FAO RAP.
- DG NACA was invited by the Ministry of Agriculture and Cooperatives to attend the Agricultural Policy Briefing under the theme “Agriculture: Safety, Security & Sustainability” held on 30 September 2020 in Bangkok, Thailand. It’s noted the exhibition displayed the advanced and perfect tracing chain of market agricultural products showing each step through the whole value chain.

2.5 Emerging Regional & Global Issues

2.5.1 COVID-19 impacts and mitigating strategies related to the aquaculture sector

DG NACA takes the initiative at the very early stage of the COVID-19 pandemic to identify possible solutions for the public using biosecurity principles and to search in literature. He also collaborated with FAO, YSFRI, ASA, ASEAN FEN, and other NACA Members institutions. To engage in the impacts and mitigation strategies related to the aquaculture sector. The objectives include identifying the COVID-19 impacts on the aquaculture sector, finding out possible mitigation strategies, clarifying the misunderstanding if SARS-CoV-2 infect or contaminate aquatic products, exchanging ideas and data and promoting actions for the sector to deal with the challenges, helping the public with available products and aquatic products in the prevention of COVID-19 to encourage the consumption of aquatic products. The actions include:

- On 27-29 January 2020, DG NACA submitted COVID-19 prevention and control suggestions to the State Council of China and relevant departments through the WeChat APP client of the State Council on the issue "Clues on Epidemic Prevention and Control (Solicits)" and related meetings.
- DG NACA proposed a draft approach for assessment of 2019-nCoV risk exposure events and submitted to the relevant departments through the Human Resources Center of the Ministry of Agriculture and Rural Affairs of China, Hubei Province of China, and the Ministry of Health of Thailand from 31 January to 11 February 2020.
- Based on the literature, DG NACA suggested to experts on citrus research that hesperetin may be considered a potential component for preventing the disease as it can inhibit the activity of 3CLpro and its combining activity with the receptor of the virus needs to be investigated. A manuscript was then drafted based on bioinformatic analysis and opened on Preprints "Citrus fruits are rich in flavonoids for immunoregulation and potential targeting ACE2". During that time, there was almost no scientific-based medicine available for the public.
- Based on the literature, DG NACA drafted "Importance and Feasibility of Early Self-intervention after Infection with 2019 Novel Coronavirus", pointing out that self-intervention after early exposure is very important. Proposed natural antiviral ingredients from normal food and herbs for self-intervention. The proposal was opened to the public by WeChat Moments, Twitter, and other IM Apps and submitted to the Ministry of Health of Thailand on 11 February 2020.
- DG NACA participated in the discussions on the argument that SARS-CoV-2 may infect aquatic animals and cooperate with FAO and other relevant organizations to publish a paper "Viewpoint: SARS-CoV-2 (the cause of COVID-19 in humans) is not known to infect aquatic food animals nor contaminate their products" on Asian Fisheries Science on 22 April 2020.
- DG NACA, in a special interview to Pravash Pradhan, Chief Editor, aquapost.in and SMRT AGRIPPOST, the well-known India media, on 20 May 2020, talks about the current COVID-19 pandemic and its impact on the aquaculture value chain. He provided answers to the questions about "What is the impact of COVID 19 on aquaculture? How long will the crisis continue?", "What are the advisories you have sent to the member countries to tackle the crisis?" "Has NACA made any study about the losses accrued by the member countries and sent any recommendation?",

"During this crisis period, farmers suffered due to price volatility. Does NACA work in ensuring remunerative prices to aquaculture farmers?". The answers to the questions are available via the SMART AGRIPPOST website: <http://www.aquapost.in/stringent-biosecurity-measures-to-be-taken-to-prevent-glass-post-larvae-in-shrimp-hatcheries-dg-naca/>

- DG NACA was invited to attend the 10th Meeting of ASEAN Shrimp Alliance to present on "New challenges to shrimp aquaculture in Asia-Pacific" on 22 June 2020, which indicated the impacts of COVID-19 on aquaculture and trade. Mitigation strategies were also proposed.
- Based on the literature, DG NACA published a paper "Current findings regarding natural components with potential anti-2019-nCoV activity" on *Frontiers in Cell and Developmental Biology* on 3 July 2020, which promote a lot of natural products with anti-2019-nCoV activities available for the public.
- NACA published news "China announces import measures to respond to nucleic acid positives of COVID-19 detected from the outer packaging of frozen white leg shrimp from Ecuador" on 16 July 2020 indicated that 2019-nCoV cannot infect aquatic animals. Still, the virus or its nucleic acid may contaminate products during farming, harvesting, processing, packaging, and shipment. With the published news, NACA reminded Members to strengthen safety management systems in the manufacture of aquatic products during the COVID-19 pandemic. It is reasonable to quarantine products from regions with an outbreak of COVID-19, but the public does not need to fear or be cynical about aquatic products. In contrast, with high contents of quality protein, high unsaturated fatty acids, and micronutrients, eating more aquatic products will improve human immunity and prevent the disease. <https://enaca.org/?id=1115>
- DG NACA was invited to attend the ASEAN FEN Webinar to present "Approaches to mitigate the impacts of COVID-19 on aquaculture – a concept" on 28 August 2020.
- DG NACA was invited to attend One-day International Webinar on "Challenges and Opportunities for Fisheries under the COVID Pandemic- Country perspectives" organized by the College of Fisheries, Central Agricultural University (Imphal), Lembucherra, Tripura, India on 29 September 2020. He delivered a lecture, "Challenges and Opportunities for Fisheries under the COVID Global perspectives", and answered all 16 questions by writing. The Webinar was attended by 543 participants and got very encouraging feedback. The organizer looks forward to such collaborations with NACA in the future to empower the academic and research fraternity involved in the country's fisheries sector.
- DG NACA was invited to attend the International Conference on Post Pandemic Ecological Sustainability: Challenges and Role of IT organized by the Department of Biology and Department of Bioinformatics & Computational Biology, the Virtual University of Pakistan on 6-7 October 2020 and delivered the presentation "Approaches to mitigate the impact of COVID-19 in aquaculture - a concept". About 180 participants from Pakistan and other countries join the conference online.

- NACA Secretariat co-organized the International Forum on Aquaculture for Silk Road Countries with YSFRI on 24-25 November 2020. Eight speakers from FAO, NACA, WorldFish, Malaysia, Myanmar, Bangladesh, and Sri Lanka were invited by NACA to present the COVID-19 impacts and the mitigation strategies for aquaculture in the region. DG NACA analysed the statistical data and found a significant negative correlation between COVID-19 deaths and per capita fish consumption worldwide. The analysis results were reported at the above forum.

2.5.2 Activities on climate change issues

- International Conference on 'Impact of Climate Change on Hydrological Cycle, Ecosystem, Fisheries and Food Security (ClimFishCon2020), Cochin, India

DG NACA accepted the invitation as a keynote speaker in ClimFishCon 2020 held at Cochin during 11-14 February 2020 to address the topic "Strategic preparedness for aquaculture to potential impacts related to climate change". The conference invited 67 experts, including 25 representing from 15 overseas countries, for keynote presentations on various focal themes of the conference.

According to the earlier discussion, he was also invited to co-host a stakeholders Conclave as a side event of the conference. The Conclave was expected to bring together a representative cross-section of the stakeholders, mostly aquafarmers, besides representatives' fishers, preprocessors, processors, and exporters. The Conclave was expected to provide a forum for sharing their experiences about the threats to their livelihoods, socioeconomics and food insecurity due to the impact of climate changes, discuss adaptation actions being taken in different types and scales of aquaculture, fishing, pre-processing and processing sectors to contain the impacts, providing opportunities for selected stakeholders from aqua farmers, fishers, preprocessors, processors and exporters for sharing their experiences regarding adaptive strategies followed and containment of the threats to livelihoods, economy and employment securities, and also serve as a forum for sharing experiences on the above aspects and interactions among the participants, administrators and experts and policymakers and also help in spreading the message that instead of trying to control nature and its climate, society needs to learn to live with the impacts and uncertainties through learning, experimentation and change.

Unfortunately, due to the suddenly raised COVID-19 situation in Southeast Asia, DG NACA could not successfully continue his journey to Cochin when he transited at the Kuala Lumpur International Airport on 11 February 2020 and returned to Bangkok.

- Making Information and Communication Infrastructure Resilient to Climate Change for Community-based Climate Smart Farming Practices

NACA collaborates with CIRDAP and other partners initiated the EU Horizon 2020 proposal and organized the preparation. The proposal was submitted. However, after the evaluation, the proposal was not granted. Nevertheless, the organization of preparation created partnership on the relevant topic identified the issues and needs in the relevant countries and may help the future cooperation. The objectives

of the project including:

- The frequency of natural disasters in Asia-Pacific has risen markedly in recent years, particularly the devastating storms and floods associated with climate change. Floods have devastating effects on infrastructure, agricultural/aquaculture sites, and the loss of human life. Floods cannot be avoided, but their effects can be mitigated by Information and Communication Technology (ICT). Climate-smart agriculture/aquaculture can be implemented to improve agriculture productivities, reduce carbon emissions, and reduce climate risks.
- The project will develop an ICT platform and decision-support systems for improving stakeholders' awareness and resilience in selected vulnerable sites in Bangladesh and Thailand. These are data & information management, communication and planning for smart climate farms for selected areas in each country, the planning and development of adaptive management plans for mitigating the impacts of climate change in terms of preparedness, response, and recovery by integrating scientific information.

2.6 Education & Training

2.6.1 Aquaculture education and training network

Aquaculture education and training are the basic functions of NACA. Most of the work focuses on professional aquaculture technology training for governmental officials, researchers, and technical personnel in governments, institutions, and enterprises. In addition, the Secretariat is considering the possibility to be involved in the coordination of the cooperation of college education in the region. For this purpose, the following actions were carried out:

- DG NACA visited Shanghai Ocean University in Shanghai (17 October), the Ocean University of China in Qingdao (28 May), Sun Yat-sen University in Guangzhou (20 June), South China Agricultural University in Guangzhou (20 June), Zhongkai University of Agriculture and Engineering in Guangzhou (20 June), Dalian Ocean University in Dalian (24 May), and Guangdong Ocean University in Zhanjiang (20 June) in 2019 to introduce NACA and discuss the possible cooperation and networking in aquaculture education in Asia-Pacific. All of the universities expressed a strong interest.
- The Secretariat welcomed the Delegation of Ocean University of China, visiting the Secretariat and discussing future cooperation opportunities on aquaculture education on 29 October 2019.
- Shanghai Ocean University and Zhongkai University of Agriculture and Engineering expressed their plans to visit NACA and discuss further aquaculture education and training cooperation. Unfortunately, due to COVID-19, the plans were postponed.
- DG NACA was informed for the EURASTiP education workshop on 18 November in Kuala Lumpur as a back-to-back event with ASEAN FEN (ASEAN Fisheries Education Network) annual symposium. Unfortunately, due to the time conflict with NACA

AGM18, the Secretariat could not send a delegate to attend the meeting.

- Internship collaboration program with Shanghai Ocean University was discussed in 2019. SHOU-selected 6 candidates of intern students were interviewed online on 31 August 2020, and 2 of them were decided to be recruited as interns. SHOU planned to send them to NACA in late 2020. However, the COVID-19 situation caused the plan to be aborted. Nevertheless, abridged online activities of the internship were continued to the end of 2020 to discuss on education network.
- The Secretariat has maintained a Facebook page and a LinkedIn group for information dissemination on training and education in aquaculture for many years.

2.6.2 Training cooperation on aquaculture

The NACA Secretariat actively collaborated with Member resources to co-organize training programs on aquaculture. In the collaboration, NACA consulted with the resource institution to improve the training program, assisted the partners to help find more expert resources worldwide for specific topics, built up and maintained the online training platform to ensure the preferable condition of training, and co-signed the certificates to grant more competent qualification. With NACA's cooperation, the influence and trainee's sources have been greatly raised.

The following collaborative training programs have been completed.

- Online Training on Mariculture Technologies

In cooperation with YSFRI, The Secretariat co-organized online Training on Mariculture Technologies under the "Setting Sail" Talent Training Project of the Ministry of Agriculture and Rural Affairs of China from 21 to 25 September 2020. The training courses aimed to help developing countries strengthen the capacity building of fishery human resources, upgrade the management and technology level of aquaculture in marine fisheries, and cultivate highly skilled professionals and management personnel, thereby contributing to the healthy and sustainable development of aquaculture in the world. Experts from YSFRI, FAO, and NACA provided 19 lectures on mariculture biological strains breeding, scale breeding, disease control and prevention, nutrition feed research and development, breeding model construction and farming technology development, breeding facilities and equipment research, development and engineering construction theory and technology, and quality and safety inspection technology for aquatic products. Total 146 trainees from 15 NACA Members and 17 trainees from Brazil, Egypt, France, Peru, Singapore, Solomon Islands, South Africa, Tunisia, and the USA working as governmental officials, scientific researchers, enterprise technicians and personnel of other organizations participated in the training courses for free. They were granted certificates of completion of the training after their complete attendance. As a result, the trainees have improved their understanding of interdisciplinary knowledge and technologies related to mariculture in China and established connections with YSFRI and NACA.

- DG NACA and Dr. Eduardo Leña attended as invited lecturers. Mr. Simon Wilkinson hosted and provided technical administrator in facilitating the

training during the First Online Training on Mariculture Technologies held on 21-25 September 2020 (Qingdao, China).

- Online Training on Aquaculture Biosecurity

NACA cooperated with YSFRI to co-organize online the Second Training Course of Mariculture Technology for the Asia-Pacific Region (2020), focusing on aquaculture biosecurity and relevant technologies on 15-20 November 2020. Experts from FAO, OIE, NACA, China, Saudi Arabia, Thailand, and Myanmar provided 14 excellent lectures on the biosecurity concept, PMP/AB, national-level biosecurity, farm-level biosecurity measures, and laboratory operation technologies. Total 279 trainees from 13 NACA Members and 41 from other 17 countries registered and participated in the 4-day training courses. The training courses were rich in content, using “webinar lectures + trainees exchange experience + online Q&A discussion + chat + email reply” and other ways. The training has played a demonstration effect in promoting and implementing the PMP/AB advocated by FAO and the biosecurity recommendations of OIE Aquatic Animal Health Code in promoting and applying the norms around the world and promoting the healthy and sustainable development of regional aquaculture and international trade of aquatic products.

- DG NACA and Dr. Eduardo Leña attended invited lecturers during the online training course. Mr. Simon Wilkinson acted as the virtual host and a technical administrator for the training e.

- ICAR-NACA School on Aquatic Epidemiology and Disease Surveillance

This collaboration was hosted by the ICAR-National Bureau of Fish Genetic Resources (NBFGR) on 1-6 March 2019 in Lucknow, India. The school aimed to develop capacity in the field of aquatic animal epidemiology and disease surveillance of the aquatic animal health experts working in India and NACA member countries. The major topics covered during the school included: Concept and principles of epidemiology; Use of epidemiological principles in design and implementation of surveillance; Sampling considerations for surveillance; Population survey; Estimation of sensitivity and specificity of diagnostic test and Questionnaire design; Health Management in Aquaculture; and Emerging Disease Risks in Global Aquaculture <https://enaca.org/?id=1041>

- Dr. Eduardo Leña (lecturer) and Mr. Simon Wilkinson (NACA representative) attended the ICAR-NACA School on Aquatic Epidemiology and Disease Surveillance, 1-6 March 2019 in Lucknow, India.

- Training Programme on Regional Ocean Governance, Trade and Sustainable Development in the Southeast Asian Seas and the Indian Ocean

Dr. Derun Yuan was invited as a lecturer in the Training Programme on Regional Ocean Governance, Trade and Sustainable Development in the Southeast Asian Seas and the Indian Ocean organized by the International Ocean Institute and International Institute for Trade and Department on 19 June -23 July 2019 in Hua Hin, Thailand, to speak on Network of Aquaculture Centres in Asia-Pacific (NACA) and Aquaculture for food security and food safety.

- Education & training cooperation interest with organizations

DG NACA signed a 5-year MOU with Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) on 7 October 2020. The MOU shall be extended for another 5 years unless either Party gives written notice to terminate the agreement.

The Parties have complementary objectives and a mutual desire to collaborate in a number of areas to pursue common education, training, and research objectives, including:

- Collaborate in undertaking programs, projects, and other related activities whenever and wherever feasible opportunities present themselves.
- Join networks in the collaboration on education, training and research objectives for a specific subject organized by a Party upon the relevant network rules.
- Exchange scientific materials, publications, and information.
- Invite the competent experts to be mentors or advisory consultants from a Party, upon the approval of the relevant Party
- Execute separate agreements in writing for any particular undertaking jointly implemented, wherein a sharing of responsibilities shall be specified.
- Centers or subordinate bodies under a Party shall be able to implement these complementary objectives on behalf of the relevant Party.
- Official documents published in the name of the Parties shall be approved by both Parties.

2.7 Information and Networking

2.7.1 IT Services development

- Video conferencing supports thematic work programmes for conducting online webinars, consultations, and meetings (“new normal” way of working).

This has proved to be highly popular, especially for training, and very cost-effective. Far more people (5-10 times as many) can attend a virtual meeting than a physical one, and the meeting cost is extraordinarily low.

Virtual host / technical administrator for five video conferences organized by NACA and partner institutes.

- NACA website development
 - Technical production and management of the NACA website and its content.
 - Essential software upgrade to support PHP V 7.3 (PHP 5 end of life).
 - Publish V2 of software with many optimizations: 5x faster (page load < 1 second); increased efficiency conveys resilience to high loads; easier to maintain and extend. Published under the GNU General Public License V2 and

available for use by all members: <https://github.com/crushdepth/tuskfish2>

- Add native multi-language capability to software (piloting on Global Conference on Aquaculture 2020 website).
- Technical advice/support to partners on information and communication issues.

Built the website for the FAO/NACA Global Conference on Aquaculture 2020 website (in six UN languages), including online registration/poster management/automated correspondence and reporting/analytics systems. To date, over 1,600 people have registered using this system (around three times more than the 2010 conference). Correspondence is automated, and registration reports with breakdown by gender, youth, organization type etc. can be generated on demand: <https://aquaculture2020.org>

- Advise on information system design and sustainability issues (FAO/APAARI).
- Maintenance of NACA IT infrastructure.
 - Maintain essential IT services (LAN, file server, email) and publishing platforms (website, Facebook, Twitter, LinkedIn, Zoom) for NACA Secretariat and work programmes.

2.7.2 Information publication services

- Publication production (all aspects, including layout, file generation and electronic distribution).
 - NACA Newsletter.
 - Aquaculture Asia Magazine.
 - Ad hoc technical publications in support of programme activities.
- Audio/video production
 - Established NACA YouTube channel for publication of materials from online training courses, webinars, and consultations.
 - Developed capability in technical production and editing of audio/video recordings in line with accepted broadcasting standards.

2.7.3 Networking regional capacity resources

The Secretariat has maintained an open interest in cooperation with Member capacity resources, both the public and private sectors, through physical visits and virtual communications. The communications provided approaches for the Secretariat to understand the Members' capacity resources and needs and identify mutual cooperation opportunities. Based on those communications, DG NACA proposed the mechanism of building subject-oriented networks (sNACA) by mobilizing Member's capacity resources to establish all-member-involved, Regional Lead Centres-operated, self-funded, decentralized sNACAs focusing on specific subjects in aquaculture. The Secretariat has discussed the mechanism and provided more improving recommendations. The Secretariat discussed the possibility of the involvement of the private sector by networking regional enterprises, including resource centres,

networking associations with small-scale farmers, and proposing culture-based consensus for aquaculture enterprises.

- Mr. Simon Wilkinson represented NACA as the rapporteur/participant for the ICAR-NBFGR Expert Consultation on Genetically Responsible Aquaculture, 26-27 February 2019, Lucknow, India as rapporteur/presenter.
- The Secretariat welcomed a delegation from the Freshwater Fisheries Research Centre (FFRC), Chinese Academy of Fishery Sciences on 16-19 July 2019 and discussed on the NACA's plan in strengthening the network in cooperation with the Regional Lead Centres and the proposal of the sNACA mechanism. FFRC expressed the strong interest in the future cooperation and provided advice and comments on NACA's plan.
- The Secretariat welcomed a delegation from the FFRC on 7-10 August 2019 for a survey on the cooperation history and roles of NACA contributing to the China aquaculture development in an international cooperation project, "Research on the Current Situation and Strategies of China Involving in Fishery International Organizations".
- The Secretariat welcomed delegations from India jointed by Dr. Jitendra Kumar Sundaray, Dr. Munil Kumar Sukham from ICAR-CIFA, Dr. Dr Dilip Kumar, and other two experts visiting at the Secretariat on 21 August 2019. Both sides reviewed the previous cooperation and discussed on future opportunities for cooperation. DG NACA introduced the primary idea of subject-oriented networks and the future involvement of enterprises in NACA activities. Dr. Dilip Kumar expressed his interest in this initiative.
- Dr. Eduardo Leaña attended as invited speaker during the 20th Ecuadorian Aquaculture Congress held on 9-12 September 2019 in Guayaquil, Ecuador.
- DG NACA welcomed the visiting request from Ms. Connie Chiang, the Executive Director of 3C Environmental Solutions visit on 17 September 2019 at the Secretariat and discussed the willingness to cooperate in-network with enterprises for sustainable aquaculture operations in the Yellow Sea area.
- DG NACA was invited to participate in the activity of the 93rd Celebration of Department of Fisheries, Thailand, on 20 September 2019.
- DG NACA was invited to attend the Silk Road International Forum on Aquaculture on 25-27 September 2019 in Qingdao. The Forum was hosted by The Chinese Academy of Fishery Sciences (CAFS) and undertaken by the "Belt and Road" Mariculture Technology Training Base of The Ministry of Agriculture and Rural Affairs of the Yellow Sea Fisheries Research Institute. Representatives from the FAO, OIE, NACA and other major international organizations related to aquaculture and fisheries participated in the Forum. More than 400 guests from more than 10 countries, including Australia, the Netherlands, Brunei, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, Bangladesh, Egypt, Tunisia and Saudi Arabia, attended the Forum. DG NACA introduced NACA and its vision in supporting the sustainable development of aquaculture in the region. CAFS initiated the initiative of establishing the International Aquaculture Technology and Industry

Development Consortium. NACA was invited to join the initiation of the consortium. The consortium includes FAO, NACA, and organizations, institutions, and enterprises from different countries to build a synergy innovation mechanism for unified and efficient international aquaculture and fishery cooperation in promoting the innovation, international collaboration, development of sustainable green farming technology and mode, and a maritime community with a shared future.

- DG NACA was invited to attend the Second Asia-Pacific Day for the Ocean on 8 November 2019 at the United Nations Conference Center (UNCC), which is located in the UN Compound on Rajadamnern Nok Avenue in Bangkok, Thailand, and presented on "Strengthening networking to promote sustainable aquaculture" in Session A to introduce the NACA's initiative on the subject-oriented networks in aquaculture. (<https://www.unescap.org/events/asia-pacific-day-ocean>)
- Dr. Eduardo Leaña and Dr. Derun Yuan were invited to attend as invited speakers during the INFOFISH World Shrimp Conference and Exposition held on 12-14 November 2019 in Bangkok, Thailand. DG NACA and Mr. Simon Wilkinson also participated in the conference and joined the discussion.
- DG NACA was invited to attend the 4th PAF Congress on Increasing Aquaculture Production in India through Synergistic Approach between Multinational Industries, Domestic Entrepreneurs and Aquaculturists hosted by ICAR-CIFA (Central Institute of Freshwater Aquaculture) and Indian Association of Aquaculturists on 15-17 November 2019 in Bhubaneswar, India. He was also invited to visit the institute facilities and participate in the parallel exhibition with more than 50 exhibitors and organizations. DG NACA presented the NACA vision and initiative on the subject-oriented networks in aquaculture. CIFA staff expressed their interests in future cooperation, the initiative of sNACA, and an interest in the network for ornamental fish.
- DG NACA was invited to visit ICAR-Central Inland Fisheries Research Institute (CIFRI), Barrackpore, on 12 December 2019. The Director of ICAR-CIFRI elaborated the activities being performed by CIFRI across India in enhancing fisheries of inland open waters and stressed that the collaborations between NACA and CIFRI activities would be the future course of action for a greater perspective towards societal development in this part of Asia. DG NACA emphasized the objectives and activities of NACA, having its presence being felt at Members and epoched towards all-round development of the fraternity of aquaculture communities in the region, symbolizing 'ONE'ness as Ownership of members, Network of resources & Expertise of aquaculture development.
- DG NACA was invited as a speaker to attend the International Conference, 'Efficient Value in Fisheries & Aquaculture' organized by SMART AGRIPPOST, in collaboration with ICAR-Central Institute of Fisheries Education (CIFE) and other government and private sector organizations on 13-14 December 2019 in Kolkata, India. He presented the NACA's vision with the emphasis of the subject-oriented networks (sNACA) and how to involve enterprise in the sNACA mechanism.

- Dr. Eduardo Leaña attended as invited plenary speaker during the Trends in Aquatic Animal Health Management Strategies (DA-BFAR 57th FishCon) held virtually on 12 October 2020 (Manila, Philippines).
- Dr. Eduardo Leaña organized (in collaboration with NACA and on behalf of the Fish Health Section of the Asian Fisheries Society) the FHS-AFS Webinar: Beauty and the Beast – Important parasites of fish, held on 9 December 2020 (Bangkok, Thailand)
- Dr. Eduardo Leaña attended as invited plenary speaker the Philippine Society for Microbiology Visayas Regional Chapter, Webinar on Microbiology and Biotechnology, held on 11 December 2020 (Iloilo, Philippines)

2.7.4 Facilitating regional collaboration among Members

The Secretariat welcomed and responded positively to Members' requests to facilitate cooperation among Members.

- Facilitating regional collaboration requested from Bangladesh
 - NACA signed the MoU with BSFF on 31 May 2018 for five-year cooperation from 2018-2023. Both parties agree to exchange their respective experiences and collaborate in various areas such as promoting farming systems, management with focus on best practices including concrete works on promoting cluster approach; introducing credible e-traceability system as an important part of ensuring food safety and quality in the sector; facilitating work on genetic improvement of shrimp breeding programs; examining early rapid appraisal of inbreeding and loss of genetic diversity in marine shrimp broodstock and farms; helping address issues relating to aquatic animal health and prevention as well as control of most important diseases of farmed aquatic species; promoting mass reproduction of marine fish species as well as production of live food for aquaculture; generating ideas and initiatives on addressing emerging issues such as impacts of climate change on shrimp farming and development of adaptation measures; helping collaborative research projects which will simultaneously contribute to both NACA and BSFF capacity building; undertaking feasibility studies on private sector capacity building, such as through establishment of a network of Business Support Organization such as BSFF in other NACA member countries eventually leading to formation of a federation; working together to participate in and facilitate implementation of private – public sector project in the above areas as part of a consortium formed among NACA, BSFF and others constituted for the purpose.
 - Visiting, communication, and study tour in Thailand

NACA collaborated with BSFF to organize a study tour programme focused on shrimp operations in Thailand for fourteen Bangladesh officers, included representatives from the Ministry of Fisheries and Livestock and Department of Fisheries of Bangladesh, during 29 April to 2 May 2019. The study tour was supported by the Winrock Foundation and coordinated by the former DG NACA. The group had a meeting with CP Executives at CP Headquarters on 29

April, to discuss CP SPF shrimp management systems, as well as freshwater fish production. On 30 April, they visited a CP SPF shrimp hatchery in Ranode, Songkhla Province. The Bangladesh delegation had a meeting with DOF-Thailand on 1 May, chaired by DDG and staff from related divisions to discuss policy and regulations, as well as shrimp farming practices and information. The new DG NACA attended the meeting and gave a presentation on the role of NACA as a mechanism for sharing experience and bridging needs with resources in sustainable aquaculture development. DG NACA appreciated the efforts of the Thai Government, scientists, and private sector in the development of shrimp aquaculture in the region. The delegation went on to visit the Banjong Farm in Chachoengsao Province. The farm operates SPF hatcheries for *P. monodon*, *P. vannamei* and giant freshwater prawns. The delegates returned to Bangladesh on 2 May 2019.

- The Secretariat welcomed the visit of Mr. Imtiaz Uddin Ahmad from BSFF at the Secretariat on 2 October 2019 and further communicated with emails. NACA expressed its support for technology transfer and training to private sector enterprises and public sector institutions in Bangladesh. It facilitated technical training of the private sector engaged in *P. monodon* aquaculture. Mr. Ahmad expressed his endorsement NACA's idea in promoting the involvement of the private sector in future activities and welcomed NACA's offer with relevant training and research institutes and academic institutions in NACA Members. He reiterated that BSFF attaches great importance to its partnership with NACA and hopes that the collaboration will contribute to improving the livelihoods of small-scale fish farmers.
- The Secretariat welcomed the visit of BSFF Chairman, Mr. Syed Mahmudul Huq, at the Secretariat on 14 November 2019. During the meeting and following email communication, Mr. Huq introduced the needs and priorities of Bangladesh in aquatic species and relevant technologies. He expressed Bangladesh had a high priority for expansion of the aquaculture, which including the hatchery, farming, and processing technologies for training in freshwater species of Golda (*Macrobrachium rosenbergii*), eel (*Monopterus albus*), and snakeheads, brackish-water species of bagda (*Penaeus monodon*), mud-crab, and seabass. DG NACA provided some potential partners in Members on different technologies.
- DG NACA keeps communication with BSFF Chairman on the following cooperation. However, due to the COVID-19 pandemic, the action of the collaboration was not fully implemented.
- Response to request from India for regional collaboration

In mid-December 2019, the Secretariat was requested from WorldFish in Malaysia to facilitate an Indian high-level delegation from Odisha for a study visit in Indonesia and China and some other Members for 8 days, including travel time. The purpose of the study visit is to learn from the policies and experiences of these countries in the promotion of freshwater cage culture in reservoirs or big lakes (both good and bad aspects of cage farming). The topics would cover government policies on cage

culture, including leasing aspects, biosecurity measures and zonal management. Also, it will cover the technical aspects of cage culture. DG NACA sent requests to China and Indonesia to consult their availability and proposed advice in the provisional visiting schedules. However, due to the COVID-19 pandemic in China, the plan was then changed to Thailand and Vietnam. The communication continued until the end of February 2020 and was suspended due to the pandemic in most related countries.

2.8 Strategy and Governance

2.8.1 The 13th Technical Advisory Committee meeting

The Secretariat organized the 13th Technical Advisory Committee (TAC) meeting (TAC13) held virtually on 26-28 August 2020. Total 14 TAC members newly nominated by the Member governments or appointed by the Secretariat, 2 Consultants for the Sub-regional reviews, 2 representatives of Regional Lead Centres (RLC), 4 observers from organizations, and the Secretariat staff and interns presented the TAC13. The meeting had the following outputs:

- Reexamination and identification of regional priorities and perspectives

Before the meeting, a survey with Excel sheets on Member's priorities in a matrix of 8 thematic issues (Longitude)(including genetics and biodiversity, biosecurity and health, farming technology and facilities, climate change and environment, feed and nutrition, safety products and processing, IT in aquaculture, and economics and finance) x 9 cross-cutting issues (Latitude) (including strategy and governance, S&T innovation, college education, training and extension, standardization and certification, primary industry, 2nd Industry and trade, 3rd Industry and culture, and social issues) in aquaculture development was requested for TAC member's inputs with ranked scores and brief explanations. TAC members were also asked to input information on advantages, weaknesses, and cooperation needs on aquaculture development. Feedback from 7 Members was received and analyzed. TAC members also provided Member perspectives in aquaculture.

- Priorities in 7 Members: Bangladesh, China, Myanmar, Nepal, Philippines, Sri Lanka, and Vietnam

The overall priorities in longitudes had an order: Farm. tech. & facilities > Feed & nutrition > Genetics & biodiversity > Biosecurity & health > Safety prod. & proc. > Clim. change & envir. > Economics and finance > IT in aquaculture

The overall priorities in latitudes had an order: Strategy & governance > 1st industry / production > Standard. & certification > College education > Sci. & Tech. Innovation = 2nd industry & trade > Training & extension > Social issues > 3rd industry & culture

The most prioritized fields at the cross of longitudes and latitudes are shown in the figure. This survey revealed some new themes that need to be concerned in future cooperation, such as feed and nutrition. Detailed analysis based on more broad and representative surveys may need to be engaged.

Regional	Genetics & biodiversity	Biosecurity & health	Farm. tech. & facilities	Clim. change & envir.	Feed & nutrition	Safety prod. & proc.	IT in aquaculture	Economics and finance	Average
Strategy & governance	7.6	7.0	7.3	5.9	6.4	6.5	3.9	5.3	6.2
Sci. & Tech. Innovation	7.2	6.7	6.1	5.4	6.1	4.5	2.8	3.1	5.2
College education	6.5	5.0	6.9	4.7	6.6	5.7	3.6	3.2	5.3
Training & extension	5.1	5.1	7.5	3.7	6.7	5.9	4.3	2.8	5.1
Standard. & certification	5.8	5.9	6.2	4.1	6.9	6.3	4.6	3.5	5.4
1st industry / production	6.5	5.8	6.4	5.3	6.1	5.7	4.3	4.7	5.6
2nd industry & trade	4.5	5.8	6.4	3.9	6.6	4.6	4.2	5.4	5.2
3rd industry & culture	3.3	3.3	4.4	4.1	4.7	4.3	3.9	3.2	3.9
Social issues	4.3	4.8	6.4	5.2	5.2	4.7	2.8	5.0	4.8
Average	5.6	5.5	6.4	4.7	6.1	5.4	3.8	4.0	5.2

- Common issues raised by the 13th Technical Advisory Committee Meeting (TAC 13)
 - COVID-19 disruption of aquaculture production, logistics and market chains, including displacement of labourers, the need to improve occupational safety measures and increase the resilience of the industry
 - Seed quality and supply
 - Increasing the skilled human resource base to support the development of the aquaculture industry
 - Ageing farmer population and need to attract youth to the aquaculture industry
 - Climate change mitigation, impacts and adaptation
 - Environmental monitoring/protection/carrying capacity and zoning of aquaculture production areas (including by real-time/automated means)
 - Biosecurity and aquatic animal health
 - Efficient (low waste and loss) and socially inclusive value chains
 - Development and manufacture of local/cost-effective feeds, including fishmeal substitutes
 - Aquaculture for poverty alleviation and livelihood issues
 - Improving aquaculture governance (legislation, planning and management)
 - Genetic improvement and broodstock management, exchange of genetic materials
 - Management of water resources
 - Promoting farmer-friendly credit and finance arrangements
 - More efficient, “green” farming systems (more efficient farming technology and practices)
- Mechanism for the establishment of subnetworks on specific subjects and designation of centres for potential sectors related to aquaculture

DG NACA introduced the proposal of a mechanism for establishing subnetworks focusing on specific technical subjects and the designation of centres for potential sectors related to aquaculture. The purpose of the mechanism is to strengthen the entire network by mobilizing Member's resources to promote regional cooperation and communication. The mechanism is basically an idea of diversified and distributed networks on decentralized subjects, operations, locations, and partners. Under this mechanism, NACA designates a Regional Lead Centre which has the capability on a specific subject and the interest in regional cooperation. Then the RLC and NACA may identify more Regional Participating Centres in institutions and enterprises in NACA Members or other countries to establish a network focusing on the specific technical subjects. The RLC is authorized to operate the sub-network on behalf of NACA and also report activities to the NACA Secretariat.

The TAG members expressed their supports without demur to the subject-focused network mechanism. The Secretariat requests GC's endorsement to move forward on this mechanism and expects necessary revisions proposed and supported by Member to the NACA Agreement.

2.8.2 Global Conference on Aquaculture (GCA) 2020

NACA has been involved in co-organizing a series of global aquaculture development conferences since 2000, orienting development to shape global aquaculture in cooperation with FAO and host governments. This series of conferences has been built on the 1976 Kyoto Technical Conference on Aquaculture, with subsequent meetings held in Bangkok (2000) and Phuket (2010) organized by FAO, NACA, and the Government of Thailand. NACA signed a Letter of Agreement (LOA) with FAO in December 2018 to co-organize the third meeting, the Global Conference on Aquaculture 2020 (GCA2020). This joint activity will contribute to the organizational strategic objectives: i) elimination of hunger, food insecurity and malnutrition; ii) making agriculture, forestry, and fisheries more productive and sustainable; and iii) reducing rural poverty. Under the LOA, NACA agreed to perform the tasks i) establishing and running the internal organizing committee/external advisory board; ii) organisation of a regional review to produce a regional synthesis for the Asia-Pacific region to be presented at the conference; iii) drafting/posting the conference programme, organizing conference announcements/speakers and posters, and creating/maintaining a conference website; and promoting conference participation through key media and events; iv) coordinating the drafting of a high-level conference consensus document; and v) technical editing and publishing of a technical document, e.g. conference proceedings, in supporting the high-level consensus paper.

With the unprecedented pandemic COVID-19, GCA2020, which was due to be conducted on 26-30 October 2020 in Shanghai, China, had to be postponed. The organizers, i.e., FAO, NACA, and the Ministry of Agriculture and Rural Affairs of China (MARA), agreed to postpone the GCA2020 to 22-27 September 2021. The LOA was amended in response to the pandemic crisis and the related challenges.

NACA has collaborate with FAO and MARA to make progresses in the organization of GCA2020. The following are the major works.

- Co-establishing and maintaining organization mechanism for GCA2020
 - Established and ran an internal organizing committee/external advisory board.
 - Joined the International Organizing Committee and Programme Committee
 - Established the mechanism for the performance of its services by internal meetings.
 - Participated in efficient communication among organizing partners via WeChat, Skype, and online meetings.
 - Participated in preparatory meetings, committee meetings, and co-chair meetings.
 - Provided professional opinions with the experiences of the former conferences.
 - Disseminated information to its members.
 - Provided opinions and suggestions on various immediate affairs, including budget issues, registration, the matters of COVID-19, the hybrid conference, etc.
 - Discussed the impact of COVID-19 and decided to postpone the dates of GCA to 2021 among co-chairs.
 - Maintaining the inner, bilateral, trilateral, and multilateral communication mechanism and approaches to work with the co-chairs, IOC, IPC, LOC, and FAO team of the conference together.
 - Provided technical services and experiences, participated in the organisation of the conference and relevant meetings, and drafted and posted the conference programme.
 - Maintained and facilitated extensive communication to promote the conference through NACA networks and events such as the NACA GCM, the TAC Meeting, regular technical events, virtual training events, and webinars, etc.
 - Participated in all relevant events organized by FAO pertaining to the LOA and the organisation of the conference.
- Coordinated sub-regional and regional reviews on aquaculture development in Asia-Pacific.
 - Identified and invited four experts, Prof Qingyin Wang, Prof Sena De Silva, Dr Tarun Shridhar, and Mr Roy Palmer, to carry out sub-regional reviews on aquaculture development for Eastern Asia, South-eastern Asia, Southern/Central Asia and the Caucasus, and Oceania, respectively.
 - Circulated the first drafts of the reviews among NACA's TAC members and FAO.
 - Advised the authors to edit and revise the reviews with the latest datasets provided by FAO and finalized and submitted the reviews to FAO for publication.
 - Contracted with Prof Sena De Silva to edit the regional review with critical

reviews and comments from FAO, Dr. Derun Yuan took over the edition and revision after Prof Sena De Silva's passing away.

- Presented the review at the TAC13, FAO/NACA/WFT Regional Review + Global Synthesis Validation Meeting, and the Regional Review + Global Synthesis virtual dialogue.
- Communicated with FAO officers for their support and actively involved in the reviewing process throughout
- Further edited the reviews by a contracted expert to improve language and writing style to meet the requirements of the FAOSTYLE for English.
- Co-building and maintaining the website and information
 - Built the conference website in six UN languages, including the online registration and poster submission system and an automated correspondence system. At the time of writing, > 1,600 people have registered, which is around three times the number that attended the Phuket conference.
 - Prepared and maintained the registration information for the Webinars for the regional reviews and global consensus, participating in online serial meetings on the GCA.
 - Updated the website with conference announcements, conference programme, speakers' profiles etc.
- Participating in preparation of Shanghai Declaration
 - A consultant was contracted through NACA to coordinate the preparation of the Shanghai Declaration.
 - Participated in the FAO drafting team chaired by Dr. Devin M. Bartley with developing an annotated outline for the Shanghai Declaration.
 - Participated in the 1st group meeting and expressed appreciation to Dr Bartley's excellent chairing and the efforts made by the team and provided comments and suggestions regarding contents and format of the Shanghai Declaration document.
 - The Shanghai Declaration document, based on the six regional aquaculture reviews and the global synthesis - the State of World Aquaculture 2020, has been drafted and finally produced by the drafting team.
- Co-organizing thematic programs
 - Co-organizing IPC and its activities in thematic programs.
 - Participated in discussion and identification of thematic topics.
 - Co-identified relevant experts for each thematic topic.
 - Communicated with IOC for IPC progresses.
 - Contributed to the organization of thematic reviews.
 - Contracted with experts for thematic reviews.

- Involved in comments of thematic reviews.

As many of the above affairs depended on the promotion of daily trivial and frequent work and communication, many specific work processes and details are not listed in this report. However, most importantly, all of this work would not have been possible without the strong support and collaboration of FAO, MARA, and other partners. Therefore, the Secretariat would like to take this opportunity to express our gratitude to colleagues in FAO, MARA, and other partners, particularly to the co-Chair, Mr. Matthias Halwart and Mr. Xingzhong Liu, for their equanimity and firmness in the face of the unprecedented centurial challenges of the pandemic. DG NACA would also like to extend his sincere thanks to our colleagues, especially Yuan and Simon, in the Secretariat for their diligence.

2.8.3 Aquaculture governance in Asia-Pacific

NACA signed LOA with FAO for “Regional Consultation on Strengthening Governance of Aquaculture for Sustainable Development in Asia-Pacific and Related Country Review Studies” from January 2019 – December 2020. The goal of the regional consultation was to promote the sustainable growth of aquaculture so that it might make a greater contribution to food security and nutrition, poverty alleviation and overall socio-economic development through improved governance of the aquaculture sector in the Asia-Pacific. The objectives were: (i) to assess aquaculture governance in seven selected countries in Asia in terms of the governance framework, policies and regulations, governing mechanisms, efficiencies and effectiveness, gaps and challenges; (ii) to share the experiences and lessons learned in aquaculture governance among countries; and (iii) to recommend strategies and actions to improve aquaculture governance in Asia. The main outputs of the regional consultation were a set of clear recommendations to strengthen the governance of the sector to ensure its long-term sustainability.

The consultation has the following outputs:

- Country reviews on aquaculture governance were carried out in China, Cambodia, India, Indonesia, Malaysia, Thailand and Vietnam
- The Secretariat organized a regional Consultation on Strengthening Governance of Aquaculture for Sustainable Development in Asia-Pacific and consultation on Demographic Changes in Fishing Communities in Asia on 5-7 November 2019 in Bangkok, Thailand, attended by 33 participants including experts and government officers from 15 Asian countries and representatives from FAO, NACA and the Asian Institute of Technology.
- The experiences and lessons learned in aquaculture governance were shared among the member governments.
- Constraints and gaps in aquaculture governance were identified.
- Recommendations were generated for further actions to strengthen aquaculture governance across the region.
- A monograph was published that synthesize the findings from the consultation and will be widely disseminated.

2.8.4 Participation as an organization observer in FAO COFI Sub-Committee

DG NACA was invited to participate in the 10th Session of the FAO COFI Sub-Committee on Aquaculture as an organizational observer on 23-27 August 2019 in Trondheim, Norway. The participation in the important event provided NACA valuable chances to understand FAO's development priorities and strategic plan in recent years and find the potential opportunities in cooperation with FAO, other organizations, and other regions to better promote sustainable aquaculture in the region. The DG learnt all reports and made relevant intervention comments as invited. He was also invited to make a presentation on successful cases in a special session.

- Intervention comments to the session reports.
 - On FAO Fisheries and Aquaculture Department's efforts in implementing the recommendations of the past sessions of the COFI Sub-Committee on Aquaculture COFI:AQ/X/2019/2

NACA thanks FAO and the Norway government's invitation and arrangement for NACA to participate in this important session. NACA appreciate the FAO Fisheries and Aquaculture Department's efforts in implementing the recommendations of the past sessions of the COFI SCA and the support to NACA in Asia-Pacific aquaculture development. The topics implemented is very important in supporting global aquaculture sustainability, especially the Asia-Pacific as the biggest aquaculture region. The efforts have provided all aspects of priorities in our NACA members. NACA wishes to continuously work with FAO Fisheries and Aquaculture Department on the important aspects related to aquaculture sustainability, including aquaculture governance, genetics and biodiversity, biosecurity and aquatic animal health, food security and nutrition, ecosystem approach to aquaculture, climate change and environment, and aquaculture extension and capacity building, etc., NACA wish to enhance our network to better contribute to our region by involving in and supporting the FAO's future efforts. NACA is also looking forward to FAO's supports to strengthen the network by designating more NACA centres in our members to enhance the cooperation on strategy development and policymaking, innovation of science and technologies, academic education and technical training, internet of things and information technology, industry demonstration and development, marketing and trade, and gender and social issues, etc.

- On the State of the World's Aquatic Genetic Resources for Food and Agriculture and possible follow-up, COFI:AQ/X/2019/2.1

NACA thanks FAO's efforts on genetic breeding and genetic resources for aquaculture as these works has significantly provided fundamental supports to global aquaculture development. NACA wish to express two concerns about the genetics works in aquatic species. For one of our concerns, we believe that the diversity of farming species and complexity of the farming system are important characteristic aspects for aquaculture sustainability, especially for developing regions. We also realize that the use of bred strains will become the

tendency in aquaculture development. We wish FAO and regional organizations to initiate and coordinate long-term regional and global evaluation to estimate the impact of bred strains on aquaculture sustainability, characterized by high diversities, compared to terrestrial agriculture. Another concern is the current separation of genetic breeding and biosecurity in research and even in some standards, certification, and even industries. We cannot ignore the lesson from the great success of developing the *Penaeus vannamei* industry, which started from the establishment of SPF broodstock to support subsequent genetic breeding programs. This provides good management practice on the integrated combination between biosecurity and selected breeding. We wish FAO and relevant organizations encourage governments, institutions, scientists, and industries to set up standards for this combination between genetic breeding and biosecurity.

- On the Report from the Secretariat of the COFI Sub-Committee on Fish Trade: for information, COFI:AQ/X/2019/4

NACA appreciate FAO Sub-Committee on Trade's underlining improved dialogue and continuous consultation among countries, international organizations, relevant regional organizations, and stakeholders, including the private sector, who could benefit from international trade in fisheries products. As I mentioned in the morning, NACA wishes to develop the network by designation of centres on trade. I hope the network will bring an improved dialogue between our members. NACA also hopes to extend the trade not only on aquatic products but also the products and technologies used in aquaculture.

- On Preventing and managing aquatic animal disease risks in aquaculture through a Progressive Management Pathway, COFI:AQ/X/2019/5

NACA appreciates FAO's efforts, in collaboration with OIE, World Bank, and relevant experts globally on the initiative of a progressive management pathway for aquaculture biosecurity. We are also very happy to be involved in the collaboration of the initiative of PMP/AB. As the intergovernmental organization in the largest aquaculture region in the world, NACA believes that the initiative on PMP/AB will greatly help to establish a progressive improving approach for capability building of countries and enterprises on the management of aquatic animal health, as the 4 steps and the 5 pillars of PMP/AB set a serial of realizable stage targets and resources for countries and farms, which will not only help aquaculture developed countries and farms but also help aquaculture developing countries and farms, even small-scale farms. As shown in lessons of existing successful experiences and achievements in aquaculture biosecurity made at the country level or farm level for some aquatic species, PMP/AB will provide a global inclusive solution to improve aquatic animal health and aquaculture sustainability through a risk-mitigating based systemic better aquaculture management. An initiative of PMP/AB was introduced during the 30th Governing Council Meeting in March 2019. The delegates of NACA member governments expressed their support for the

proposal to develop a multi-donor supported long-term programme on PMP/AB. I would like to speak on behalf of 19 NACA Members to forward the strong support on the proposal and will devote ourselves to the development of guidelines and recommendations and promotion of the implementation of PMP/AB in the region in partnership with FAO, relevant organizations, and stakeholders.

- On aquaculture's contribution to ending hunger, securing food supplies and promoting good health and dietary practices, COFI:AQ/X/2019/6/Rev1

NACA strongly appreciates the contribution of aquaculture to ending hunger, securing food supplies and promoting good health and dietary practices. The contribution of aquaculture fits in the core objectives of NACA to assist NACA Members in increasing production, improving rural income and employment, and diversifying farm production. The contribution of aquaculture to global food security has significantly mitigated the consumption of natural aquatic resources and compensated the requirements of land resources due to the needs of a globally growing population. Compared with land-based agriculture, aquaculture has always grown based on technological development throughout its history. Its future development will certainly be further facilitated by global and regional cooperation in knowledge sharing and technology extension. As aquatic animals, plants, and aquatic products are almost universally loved by people. It is noteworthy that advocacy for aquaculture should not neglect its contribution to food security and cooperative requirements that has continued to bridge differences of faith, increase social inclusion and national reconciliation, and maintain peace in regions. NACA will coordinate with our members and cooperate with FAO and relevant partners to advocate aquaculture, promote aquaculture sustainability, and achieve our objectives in securing food supplies, ending hunger, and promoting good health and dietary practices in the region.

- On visiting the site of the advanced giant cage

Thanks for the Norwegian local organizer's thoughtful arrangements for yesterday's visit for the advanced giant cage, the modern traditional cages, the excellent presentations, and the beautiful village island. I have felt significant innovations in Norwegian cage farming during this visit compared with my memory of the last visit 16 years ago.

- On aquaculture innovations, their upscaling and technology transfer to increase efficiency, combat environmental degradation and adapt to climate change, COFI:AQ/X/2019/7

NACA appreciates FAO's Saturday report on aquaculture innovations, their upscaling and technology transfer to increase efficiency, combat environmental degradation and adapt to climate change. In recent decades, innovations in the aquaculture science and technologies emphasized in NACA Members have greatly contributed to these aspects of Asia-Pacific aquaculture. As I mentioned in the last intervention, aquaculture actually grows based on

technological development through its history, and the innovations have greatly promoted the development. NACA advocates our members to continuously invest and cooperate in the innovations in aquaculture to develop practical technologies to meet the features of diverse aquaculture industries and the needs of sustainability in the region. During the 30 years of development of the network, NACA has put our priorities in encouraging and coordinating NACA centres and experts of our members in promoting education, training, demonstration, and extension of technologies. We intend to strengthen our network on aquaculture innovations to include more institutions, academies, and enterprises as NACA centres to provide channels and opportunities in cooperation among our members. We wish to promote the collaboration in innovations and technology transferring in the region and among regions to share their competence of capabilities and annual activities through the NACA website for our centres. I also wish to highlight the importance of undergraduate and postgraduate aquaculture education in introducing youth resources needed in sustainable innovations and all other aspects of aquaculture development based on experiences in the Asia-Pacific region. We wish to have FAO, UNESCO, and other relevant organizations' support for NACA's proposal to extend our network to the cooperation of aquaculture education in the region.

- On special event on better management practices and guidelines for sustainable aquaculture development, COFI:AQ/X/2019/8

As I already had the chance to speak in the session on the Special events on better management practices for sustainable aquaculture development this morning, I'll not comment too much on this topic. However, I would like to represent NACA to express our strong support to FAO's works on the BMP for the sustainability of aquaculture. We wish the BMP guidance will keep the inclusion for the diverse features of global aquaculture in different regions. We also wish to be involved in the cooperation of establishing the evaluation methodologies of sustainability for different aquaculture and the development of BMP guidelines with the cases and experiences in Asia-Pacific.

- On first IOC meeting of GCA2020

NACA is honoured to continue cooperation with FAO in organizing the third Global Aquaculture Conference in 2020. Since the first conference held in Bangkok, Thailand, in February 2000 which has adopted the Bangkok Declaration and Strategy on Aquaculture Development Beyond 2000. The second conference was held in Phuket, Thailand, in September 2010. It aimed to discuss the sector's status, emerging issues and strategies for its sustainable development in the coming decade. One of the key achievements of the conference is the Phuket Consensus: a reaffirmation of the commitment to the Bangkok Declaration, which establishes the declaration on aquaculture development for the coming decade. With the Chinese government's support and the Shanghai Ocean University and China Aquaculture Society's effort, FAO and NACA will cooperate in organizing the Global Aquaculture Millennium +20

Conference, the 3rd conference in Shanghai. The conference will be a very important event for global aquaculture to achieve the SDG 2030. So I would like to welcome all of you to participate in the event and devote yourself to achieving sustainable aquaculture for the next decade.

- On side events on seaweeds

Thanks for very good side events on seaweeds with excellent presentations. As the second-largest production category of aquaculture organisms, Seaweeds provide a nonnegligible important part of sources for human consumption, animal production, and industrial raw materials. It also takes very important roles in maintaining ecosystem balance in the aquatic system and mitigation of climate change by nutrient recirculation, carbon sequestration, etc. Asia-Pacific is also the leading production region for seaweeds aquaculture. NACA would like to express our appreciation to the FAO's organization and speakers' efforts on the seaweeds value chain. Considering the comparatively lower concern on seaweed aquaculture, we appeal to bring more attention and give resources to cooperate on the whole value chain of seaweed aquaculture. NACA would like to support the proposal for international cooperation on seaweeds aquaculture value chain and would like to participate in coordinating the cooperation.

- Invited presentation during the session for the Special Event on Better Management Practices and Guidelines for Sustainable Aquaculture Development
DG NACA was invited to deliver a presentation on “Profile and Cases of Aquaculture for Sustainable Development in Asia-Pacific” during the Special Event on Better Management Practices and Guidelines for Sustainable Aquaculture Development, which provided typical regional cases for considering the strategy and governance in aquaculture. The presentation has attracted great concerns of the officers from the other regions and received many further contacts after the presentation.

2.8.5 Participate as an intergovernmental organization observer in the FAO APRC35

DG NACA was invited as an intergovernmental organization observer to participate in the FAO 35th Regional Conference for Asia and the Pacific (APRC35) on 1-4 September 2020. The participation provided NACA to understand FAO RAP's development priorities and strategic plan and find the potential opportunities in cooperation with FAO RAP to cooperate for the sustainable aquaculture in the region. The DG learnt all reports and made relevant intervention comments as invited.

- NACA comments for Item 15, The impact of COVID-19 on food and agriculture in Asia and the Pacific and FAO's response.

NACA would like to appreciate FAO and all governments' efforts in assessing and responding to the impact of COVID-19 on agriculture. NACA hopes to find resources and partners to initiate interdisciplinary and cross-sector cooperation among agriculture, aquaculture, and medicine sectors in fighting COVID-19. Our initiative is to recommend the combinations of agricultural products, which were found to have specific valuable natural components in resisting SARS-CoV-2, and aquatic

products, which were demonstrated to have essential nutrients in enhancing human immunity to resist the infection. Member governments and international organizations can work on recommendations for the public with the new approach of these combinations of agricultural products and aquatic products in fighting COVID-19. Applying these combinations will allow people to conduct self-intervention after facing the risks of exposure to SARS-CoV-2 and before available medical diagnosis and treatment. We believe that the cross-sector cooperation on these combinations will enable the agriculture, fisheries, and aquaculture sectors to be directly involved in fighting against COVID-19 and significantly promote the consumption of agricultural and aquatic products to mitigate the impacts of COVID-19 on agriculture and fisheries and aquaculture.

- NACA comments for Item 16 to 22

NACA emphasize the importance of cross-sectoral cooperation between agriculture and aquaculture. Agri-aqua farming approaches provide valuable eco-friendly development models for small-scale farms. Many modes of rice-fish farming, rice-shrimp farming, vegetable-fish, shrimp farming, etc., have been widely developed in developing countries. These cross-sectoral modes have attracted more and more concerns with their effects of increasing the production and value, diversifying the production, reducing the use of pesticides and fertilizers, improving product quality and safety, combating the threat posed by climate change, and extending the ecological chain of farming systems. Another widely overlooked aspect of cross-sectoral cooperation is the potential role of agricultural and aquatic products in the fight against COVID-19. Currently, a number of publications reported that specific natural ingredients in some agricultural products have the activity of inhabitation against the infection with SARS-CoV-2. The nutrition of aquatic products and micronutrients can effectively enhance human immunity. Combinations of both can also benefit the absorption of active ingredients and improve the food's taste. It's recommended that the public use these combinations for self-intervention in the early stage of exposure to the risk of SARS-CoV-2 and before available medical diagnosis and treatment. With these combinations, agriculture and aquaculture sectors have the opportunity to fight against COVID-19 directly. It is also powerful propaganda to the public for agriculture and aquaculture to stimulate market demands for agricultural and aquatic products and promote the comprehensive development of agriculture and aquaculture.

- NACA's comments for Item 20: Results and Priorities for FAO Activities in the Region

NACA compliments the contributions resulting from FAO activities in the region to meet the Member's requirements achieving the SDGs. We support FAO proposed regional priorities for the four Regional Initiatives on Zero Hunger, Climate Change, One Health, and SIDS, the programmatic areas of focus, and the regional mid/long-term response plan to COVID-19 and welcome the update on the development of the new strategic framework. NACA appreciates FAO collaborative efforts and supports contributing to the Member's requirements on the sustainable development of aquaculture. NACA supports FAO's partnership collaboration to extend the capabilities and capacities in relevant programs. We hope NACA will

have more opportunities to continue the collaboration with FAO Regional Office on the regional initiatives, the programmatic areas, and the regional mid/long-term response plan to COVID-19 related to aquaculture, including cross-sectoral cooperation between agriculture and fisheries and aquaculture.

- NACA's comments for Item 21: Decentralized Offices Network

The Network of Aquaculture Centres in Asia-Pacific (NACA) is pleased to learn that FAO will adopt the mechanism of a decentralized offices network. At the recent NACA 13th Technical Advisory Committee meeting, the NACA also initiated a mechanism for decentralized specific subject-focused networks (sNACA) to mobilize our Member's resources and enhance the cooperation among NACA Members. This mechanism will designate more NACA Regional Lead Centres and Participating Centres on relevant aquaculture subjects to the competent institutions in NACA Members and let the RLCs organize activities in the name of NACA to strengthen regional cooperation on particular subjects in Asia-Pacific. We hope that NACA sub-networks on specific subjects will mobilize more Member resources to facilitate Member's involvement and have more opportunities to cooperate with the FAO decentralized offices network.

- NACA response to the Ministerial Session of APRC35

The Network of Aquaculture Centres in Asia-Pacific (NACA) would like to express our sincere congratulations to the new Assistant Director-General Mr. Jong-Jin Kim of FAO Regional Representative for Asia and the Pacific. We thank FAO's invitation to participate as an observer in the Ministerial Session of the 35th FAO Regional Conference for Asia and the Pacific. NACA highly appreciates FAO's contributions in ensuring global food security and rural development to achieve 2030 SDGs, as well as the recent activities responding to the impact of COVID-19 on agriculture. We admire the efforts devoted by the FAO RRAP for our most complex region with the largest population and most diverse agriculture in the world. As a regional intergovernmental organisation for aquaculture since 1990 born out of FAO projects, NACA has been working to coordinate cooperation in aquaculture in the region to achieve the organisation's objectives of assisting its members to achieve the goals for sustainable aquaculture development. NACA emphasises the close collaboration with FAO and the FAO Regional Representative related to aquaculture. In our Five-Year Strategic Plan (2020-2024), the NACA Secretariat initiates a new mechanism to establish specific subjects-focused networks (sub-networks) targeting priorities demanded and resources owned by our Members. The sub-networks will promote regional level cooperation and communication among research, education, and private sectors in Members. We believe the initiating sub-network mechanism will provide an approach to support the FAO Hand-in-Hand Initiative. We would like to strongly support the FAO missions in all aspects related to the aquaculture sector or the cross-sector collaboration of agriculture and aquaculture.

2.9 One Community

2.9.1 Gender

- DG NACA welcomed Dr. Meryl J. Williams's visit to discuss the possible collaboration on gender in aquaculture in the NACA office on 9 July 2019 and in the following communications.

NACA appreciates Dr. Williams' recommendation on further collaboration on how to integrate gender into NACA's programme. She kindly recommended collaborations, mentoring on gender in aquaculture with Professor Kyoko Kusakabe, Asian Institute of Technology. She suggested using NACA Participating Centres to promote gender expertise, especially in education on gender in aquaculture. She noted that most of the centres lack strength and programmes in gender/women in aquaculture, but the Indian ICAR-Central Institute for Fisheries Education has a Gender, Livelihood and Development course. Also, in India, several other ICAR institutes, most notably CMFRI, are doing women and aquaculture work, usually, through the Self Help Groups. She proposed to put the gender dimension into NACA's priority work, especially on fish health. She kindly provided documents that summarized what NACA has done in relation to women/gender in the past. She reminded the NACA website has a Gender theme page that picks up all the publications and other material <https://enaca.org/?id=18>. She further recommended developing studies or policy analysis on how women and gender equality are included (or not) in various policy and legal documents key to aquaculture development. She warned that when policies and legal systems are silent on women and women's rights, women will be disadvantaged, often in unintended ways. With a review of the documents of the NACA-FAO Decadal Conference on Aquaculture (<https://enaca.org/?id=418>) and conference declaration, Ms. Williams made a strong plea that the GCA+20 to have a full chapter on gender in aquaculture and also make a requirement for each of the other chapter teams to integrate the gender aspects of their them in the chapters.

- COVID-19 pandemic impacts on gender in aquaculture

COVID-19 pandemic impacts on gender in aquaculture were noticed and reported in DG NACA's relevant presentations.

- Gender in aquaculture was addressed in NACA publications and activities

Gender in aquaculture was addressed in NACA publications and activities, including rice-fish farming in the region, the regional consultations on strengthening aquaculture governance and demographic changes in fishing communities, and gender issues in the fisheries sector of Members, etc.

- Gender issue proposed for GCA+20

In response to the previous work on gender, NACA, in cooperation with FAO and the Ministry of Agriculture and Rural Affairs of China, fully supported the inclusion of gender issues in the theme of GCA+20, especially in the context of the theme on Social and Human Dimensions of Aquaculture, which Ms. Williams was involved. She was invited to participate in the drafting group of the GCA+20 Shanghai Declaration. Gender issues were fully considered in the drafting procedures of the Shanghai Declaration and were included as a focus of the Call for Action.

2.9.2 Aquaesthetics: a human culture issue in aquaculture

To advocate sustainable aquaculture to the public, DG NACA proposed a concept aquaesthetics, which includes eco-friendly aquaculture, such as leisure fisheries, eco-aquaculture villages, agri-aqua farming system, and photovoltaic aquaculture, etc., ornamental aquatic organisms, such as public or commercial aquariums, and household ornamental fish; aqua culture, including introduction of the conception, introduction of aquatic organisms, histories of aquaculture, stories of aquaculture, biography of aquaculture notables, introduction of aquaculture villages, aquatic tourism, local festivals for aquatic products, and exhibition of aquatic products, etc.; arts and multimedia of aqua culture, such as, painting, pictures, cartoons, movies, fashions, handiworks, souvenirs, sculptures, and architectures, etc.; delicacy, such as introduction of aquatic foods, introduction of aquatic restaurants, and cooking technology for aquatic products, and aquatic healthcare, such as lifestyles, aquatic healthcare products, and fish spars, etc. It's believed the concept of aquaesthetics will bring many job opportunities, enlengthen the value chain, and add value for aquaculture. NACA hopes the network on aquaesthetics will greatly contribute to the sustainable development of our region.

- DG NACA was invited to participate in the International Day for the Fight Against IUU Fishing organized by the Department of Fisheries on 5 June 2019. He was impressed with the traditional Thai fish trade show and other relevant cultures, which brought him the idea about the concept.
- DG NACA was invited to attend China Fisheries & Seafood Expo in Zhanjiang, Guangdong Province, on 18-19 June 2019 and delivered a speech introducing NACA, promoting human culture-based development needs for aquaculture, and welcoming cooperation from the private sector. In addition, he took his interest in discussions with enterprises in the development of networks and got significant positive feedback.
- DG NACA was invited to participate in the Ocean Day celebration organized by International Ocean Institute on 8 June 2019, in Hua Hin, Thailand.
- DG NACA visited several major aquaculture media in China, including China Fisheries, FishFirst, etc., during June and October 2019, visiting China and discussing the concept. They expressed interest in the concept and the willingness to find opportunities in cooperation.
- DG NACA attended the Bangkok Expo for Aquatic Products on 3 December 2019.

3 General Administration and Staff Matters

3.1 General Administrative Matters

Regular staff meetings and communications via face-to-face, emails, or chat were convened as necessary to review general administration, evaluate project progress and development, and make major decisions on day-to-day administration.

The work from home approach was implemented during the pandemic period. Staff

communications via emails, google mail chat, and telephones were conducted for general administration, project evaluation, and major decision making.

3.2 Staff Matters – Recruitment to core coordinator positions:

None

3.3 Staff Matters – Interns & Mentors

The contract for Ms. Nongluk Pituktammanat, Assistant to Secretariat of conferences for 6 months from 1 September to 30 June 2017, was signed as Research Associate for 1 year from 1 July 2017 – 30 June 2018. The contract was extended from 1 July 2018 to 30 June 2019.

Ms. Li Zhang and Ms. Wenxin Yue were selected for 6-month interns from 5 candidates of Master students recommended by Shanghai Ocean University through a Zoom interview on 20 March 2020. They planned to come to the Secretariat in May. Unfortunately, the pandemic in Thailand made this plan implementable. The interns joined some online works on developing concept notes for the networks of enterprise and collaboration of college education in aquaculture and attended the online 13th TAC meeting.

3.4 Associated Members and Partnerships

- Exist Associated Members and Partnerships

NACA maintains the Associated Membership with Secretariat of the Pacific Community (SPC), Network of Aquaculture Centres in Central and Eastern Europe (NACEE), and Asia-Pacific Association of Agricultural Research Institutions (APAARI) and signed MoU with Bangladesh Shrimp and Fish Foundation (BSFF) before 2019.

- Newly signed partnerships

DG NACA signed a 5-year MOU with the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) located in the Philippines on 7 October 2020. The MOU shall be extended for another five years unless either Party gives written notice to terminate the agreement.

3.5 Regional Lead Centres

There are currently five regional lead centres as follows:

- Regional Lead Centre in China (Freshwater Fisheries Research Center-FFRC, Wuxi, P.R. China);
- Regional Lead Centre in India (Central Institute for Freshwater Aquaculture-CIFA, Bhubaneshwar, India)
- Regional Lead Centre in Islamic Republic of Iran (Coldwater Fisheries Research Center-CFRC, Mazandaran, Iran);
- Regional Lead Centre in the Philippines (SEAFDEC Aquaculture Department-SEAFDEC AQD, Iloilo, Philippines); and

- Regional Lead Centre in Thailand (Inland Aquaculture Research Institute-IARI, Bangsai, Ayudhya, Thailand -former Inland Fisheries Research and Development Bureau-IFRDB, Bangkok, Thailand).

4 Work accomplished in 2019-2020 and planned activities in 2021

NACA has successfully conducted projects and capacity building activities in 2019 and 2020 under all work programmes. COVID-19 pandemic in the Asia-Pacific region has significantly affected our activities. Almost no international travel took place in 2020, making study tours and face-to-face meetings and training impossible. Many plans for conferences, meetings, visits and other activities were cancelled or postponed. As a result, there were significantly decreased activities earlier in 2020. However, video conferences, webinars, and online training through virtual meeting platforms provide easily accessible approaches for people to connect at very low costs. Later in 2020, more and more online activities were taken place, and the involved people showed much more than the physical activities. This approach makes the regional aquaculture sector much more aware of the roles of NACA in contributing to the Members with much broader effects.

The planned activities are indicated in the NACA Strategic Plan, in which the first 2-3 bulleted items in each work programme have relevant higher priority. The activities will be selected or changed according to Member’s prioritized needs, availability of required resources, and project sponsor’s intention. The Secretariat encourages Regional Lead Centres and other partners to collaborate with the Secretariat to plan and implement activities. Upon Governing Council’s endorsement, the initiated subject-oriented networks will also join the implementation of NACA’s Strategic Plan.

5 The 30th Anniversary of NACA in 2020

The pandemic caused the original consideration for the 30th Anniversary of NACA in 2020 as a back-to-back event with the GCA+20 became unavailable due to the GCA+20 being postponed. Therefore, the Secretariat decided to cancel the commemoration of the 30th anniversary.

6 Participation of Members in NACA Activities

Due to the feature of online activities, the accurate data of Members’ participation in workshops, training courses, and project activities are dynamic and difficult to count. Based on the platform’s brief statistics, some data show the participants in 2020’s events.

Event	Participants
Second Online Training on Mariculture Technology for the Asia-Pacific Region: Aquaculture Biosecurity	264
International Forum of Aquaculture in Silk Road Countries	264
Regional Webinar on Infection with Decapod Iridescent Virus 1 (DIV1) and Preparedness for Emerging Shrimp Diseases	403
Online Training Course on Mariculture Technologies for the Asia-Pacific Region	150

Participants came from almost all Members and some other regions. The participants in online events which were not hosted by the Secretariat are unavailable unless the host reported the

numbers.

7 Meetings & Documents/Publications

Details of meetings attended/coordinated, invited presentations made by NACA Staff, and publications by the NACA Staff are presented in the Annex.

Board Papers for information and discussion

8 Financial Matters

The detailed financial report has been submitted regularly to the NACA Chair and Vice Chair each month. In addition, financial matters will be presented at the meeting in closed session.



GC31-03

Network of Aquaculture Centres in Asia-Pacific

31st Governing Council Meeting

29-30 November 2021 via Zoom meeting

NACA Strategic Plan 2020-2024

NACA Strategic Plan 2020-2024

**Networking the Regional Resources
for Sustainable Aquaculture**

Adopted at the 31st Governing Council Meeting

Network of Aquaculture Centres in Asia-Pacific (NACA)

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1. Asia-Pacific Aquaculture in Perspective

1.1 Vital to food and nutrition security

Wild fisheries are now fully exploited. By 2030 the world will need another 28 million tonnes of aquatic food just to maintain the per capita consumption at current levels.

This demand can only be met through responsible aquaculture. In 2018, aquaculture accounted for 52% of global aquatic food consumption, and this contribution is growing.

Aquaculture plays an important role in human health and nutrition by providing low-cost animal protein and essential nutrients to nutritionally challenged people in the world.

Aquatic food is often the only affordable source of animal protein available to the poor in developing nations.

Global aquaculture production in 2018 was estimated at 114.5 million tonnes, valued at US\$263.6 billion. More than 89% of this was produced in Asia by volume. Within the Asian region, approximately 54.6% of all aquatic food came from aquaculture farms rather than capture fisheries.

1.2 Diversity in production

Aquaculture is extending farm production from lands to waters bringing diversity to human production. Asia-Pacific aquaculture has the highest diversity in the world, characterised by the diversity of aquatic species, the variety of ecosystems, the differentiation of industries, the complementarity of capability and capacity, and the complexity of knowledge and technologies.

Asia-Pacific aquaculture systems have evolved and diversified from their beginnings in small-scale extensive ponds to encompass large-scale super-intensive industries, from family-operated farms to multinational aquaculture corporations, from earthen ponds to large modern deep-sea cages, from rice-fish culture fields to artificial marine ranches, and from fry-capturing nurseries to SPF breeding centres.

The diversity of aquaculture in Asia-Pacific highlights differential balances in productivity and sustainability for aquaculture development. Adaptation of capacity resources and conditions shall interact as reciprocal causation with the balance of productivity and sustainability. There is no single development model and a simple technological manner applicable to all countries and productions. Without considering the diversity of aquaculture production, a one-sided overemphasis on either end of the balance can create problems for the other.

1.3 Adaptation of industry

Aquaculture has developed much faster than any other agroindustry in recent decades. The rapid development of aquaculture is because of its comparative adaptation with regard to regional capacity resources and conditions.

The regional adaptation in capacity resources has been marked by the transition of aquaculture to a science-based activity engaging technology, investment, skilled labour, and markets. The regional adaptation in conditions includes large improvements in seed and feed supply, abundant water resources, and favourable climate, environment, and ecology.

However, small-scale family-operated farms are still the major source of income and employment for rural communities. In 2018, about 19.6 million people were directly employed. The small-scale nature of much of the sector poses special challenges in confronting issues such as globalisation, international trade, maintaining environmental integrity and the looming threat of climate change. Unstructured operations and skills shortages require technology, training, and community.

1.4 Risks in development

Aquaculture faces risks from biosecurity, the environment, food safety, and emerging issues such as climate change. In the Asia-Pacific region, the risks significantly threaten the sustainable development of aquaculture.

Biosecurity risks and health issues cause substantial losses in aquaculture due to transmission of infectious agents through broodstock, seed, water, and live feeds, among others. Infections not only cause massive mortalities or growth retardation but also increase the imprudent use of drugs and chemicals, which create safety issues, environmental pollution, and ecological problems.

Environmental hazards in aquaculture include water source quality issues, external pollution, accumulated sediment and feed residues. These may affect the cultivability, productivity, and carrying capacity of waters in the main production areas of Asia-Pacific countries.

Food safety risks can be caused by contaminated feed components, illegal additives, imprudently used drugs, antimicrobial resistance, infectious agents-causing public health issues, mycotoxins, algal toxins, and contamination of heavy metals, and may impact the safety of aquatic products, endanger the health of consumers, and damage market access and trade.

Climate change risks include abnormal and shifting temperature ranges, increased frequency and severity of climate disasters, and ecological imbalances. These may result in production losses, decreased biodiversity, instability of supply chains and markets, and withdrawal of investments.

Emerging global and regional issues are events that are often difficult to foresee, but that may significantly shock the aquaculture sector, such as COVID-19. The pandemic has restricted market demands for aquatic products, broken supply chains for aquaculture related commodities and services, and resulted in job losses, with impacts likely to continue for years.

1.5 Needs for regional cooperation

In comparison with capture fisheries, the beginning of aquaculture is a site-based economic activity with much fewer needs in international coordination. However, along with globalisation, the aquaculture industry has developed with more and more regional and global consultation, harmonisation, and negotiation.

International trade of aquatic products for human consumption is the primary need in regional and global cooperation. The Asia-Pacific region has become the largest producing region and also the largest market region of aquatic products trade worldwide. In region trade and interregional trade of aquatic products become an important income-earning approach for foreign currency and support a large part of the livelihoods of aquaculture. Regional and international standards/agreements significantly facilitate the regional and international trade of aquatic products and other aquaculture commodities. As a result, regional cooperation has become an urgent need to provide opportunities for international market development for aquatic commodities.

Subsequently, the aquaculture supply chain of commodities other than the final aquatic products, such as seed, broodstock, feed, drugs, chemicals, tools, and facilities, has become more and more international. Alien economic species, such as Pacific white shrimp *Penaeus vannamei*, tilapia *Oreochromis niloticus*, and bay scallop *Argopectens irradians*, etc., have become the major pillar species of aquaculture. Regional cooperation in aquaculture supply chain has become indispensable for aquaculture development in many countries.

As a consequence of international trade, the transboundary transmission of aquatic animal diseases has become a major risk to the sustainability of aquaculture. Almost all significant emerging diseases found in a country have shown transboundary spread associated with the international trade of seed, broodstock, ornamental fishes, live feed, aquatic products, or ballast water. Therefore, regional cooperation has significantly contributed to disease early warning, reporting, diagnosis, emergent response, and control strategy in different countries.

More importantly, knowledge and technology transference, technical assistance, information sharing, capacity building, human resource exchange, and training have become a major part of regional cooperation, significantly promoting regional sustainable aquaculture development and increasing interaction effect.

Communications on aquaculture strategy and policy among governments have raised the level of regional cooperation. Regional industrial cooperation and investment in aquaculture have significantly improved productivity, increased job opportunities, and ensured livelihoods without fisheries area dispute, which benefits the regional peace. In addition, non-governmental aquaculture-related cultural, tourist, and substance cooperation and exchanges among the public have enhanced the friendship and peace among countries.

2. About NACA

2.1 What NACA is

The Network of Aquaculture Centres in Asia-Pacific is an intergovernmental organisation that promotes regional cooperation for sustainable aquaculture development and resources management. NACA seeks regional solutions to improve the livelihoods of rural people, reduce poverty and improve food security. The ultimate beneficiaries of NACA are farmers and rural communities.

As a regional network for collaboration in aquaculture development, NACA is devoted to identifying regional resources on governance, innovation, education, training, industries, and social issues and promotes cooperation and communication across the aquaculture sector. NACA provides a platform for Members to connect to regional resources and facilitates regional cooperation.

2.2 How it works

NACA coordinates the implementation of research, policy and development assistance projects in partnership with scientific institutions, governments, development agencies, farmer associations and other organisations. NACA supports technical exchange, capacity building, institutional strengthening and policies for sustainable aquaculture development and aquatic resource management.

NACA intends to designate more Regional Lead Centres (RLC) and Regional Participating Centres (RPC) on specific subjects and initiate the mechanism to authorise the RLC to organise subject-oriented networks focusing on the specific subjects (sNACA) on behalf of NACA. The mechanism of sNACA will facilitate the decentralised multi-participant communication and cooperation over research, education, and industry in the aquaculture sector for the region.

3. NACA Structure

The original core of NACA is a collaborative network of research centres distributed throughout the region. Participating centres share their expertise and facilities for mutual benefit to avoid duplication of effort and maximise return on limited R&D resources. The network is also underpinned by five Regional Lead Centres, which serve as support hubs.

The network is coordinated and administered by a Secretariat based in Bangkok. NACA policy is determined by its Governing Council, consisting of Member government representatives, which meets annually to articulate needs and set priorities. The NACA work plan is developed by a Technical Advisory Committee formed by independent technical experts. The work plan is implemented by a network of research centres collaborating with governments, donor agencies, farmer associations and NGOs.

3.1 Framework

The NACA framework includes the organisation's infrastructure, rules, plans, publications, databases, technical reports, and activities, as empowered by the NACA Agreement, as follows:

- *Members*
- *Associate Members*
- *The Governing Council representing the Member governments (GC)*
- *The NACA Secretariat*
- *The NACA Technical Advisory Committee (TAC)*
- *The NACA Task Force (convened as required)*
- *NACA Regional Lead Centres (RLCs)*
- *NACA Regional Participating Centres (RPCs)*
- *NACA Expert Database*
- *The NACA Advisory Group on Aquatic Animal Health (AG)*
- *NACA Regional Reference Laboratories (RRLs), Regional Resource Centres (RRCs), and Regional Resource Experts (RREs) for aquatic animal health*
- *Subject-oriented Networks (sNACAs)*

3.2 Members

Government membership of NACA is via accession to the NACA Agreement, an international treaty. Current Members of NACA are:

- *Australia*
- *Bangladesh*
- *Cambodia*
- *China*
- *Hong Kong SAR, China*
- *India*
- *Indonesia*
- *Islamic Republic of Iran*
- *Democratic People's Republic of Korea*
- *Lao People's Democratic Republic*
- *Malaysia*
- *Maldives*
- *Myanmar*
- *Nepal*
- *Pakistan*
- *Philippines*
- *Sri Lanka*
- *Thailand*
- *Vietnam*

3.3 Associate Members

The NACA agreement provides for associate membership by intergovernmental organisations and donor agencies. Current Associate Members are:

- *Secretariat of the Pacific Community*
- *Network of Aquaculture Centres in Central and Eastern Europe*
- *Asia-Pacific Association of Agricultural Research Institutions*

3.4 Regional Lead Centres

RLCs are institutions with advanced capabilities that support the network in key fields of endeavour. The current functioning RLCs include five centres:

- *Freshwater Aquaculture Research and Development Center, Thailand*
- *Freshwater Fisheries Research Centre, China*
- *ICAR-Central Institute of Freshwater Aquaculture, India*
- *Iranian Fisheries Research Organisation, Islamic Republic of Iran*
- *SEAFDEC Aquaculture Department, Philippines*

The current RLCs were mostly recognised at the beginning of NACA without hosting a subnetwork. After 30 years of development, the region has established a large number of aquaculture research centres with expertise in specific fields. NACA plans to recognise more RLCs with competence in fields of regional relevance to strengthen collaboration by hosting subject-oriented networks on behalf of NACA.

3.5 Subject-oriented Networks (sNACA)

Subject-oriented Networks (sNACA) is an initiative to strengthen the capacity resource-based network under the NACA framework.

The pooling of technical resources and sharing of expertise between Members is a core value of NACA. In the early years of the 1970s to 1980s, when there was no such network and aquaculture development levels in countries were rudimentary, a network with a few research centres could serve as a very effective bridge and bond for the cooperation of aquaculture in the region.

NACA's projects over the years have involved many institutions and private companies, resulting in the formation of expertise-based networks. After more than 30 years of development, the Asia-Pacific region has established abundant capacity and technical resources in aquaculture. The scope of work has grown significantly as the industry has diversified. The current conditions and the decentralising trend make it both possible and necessary to build sNACAs to support the ongoing growth and directions of the aquaculture industry.

The NACA Secretariat can build an sNACA by recognising the application of an institution, a laboratory, or an enterprise with excellent competency in a specific subject as an RLC for a specific subject, authorising the RLC to coordinate a subject-specific subnetwork and activities on behalf of NACA. Partners, including institutions, laboratories, enterprises, and individuals in public and private sectors with the relevant competency and interest in regional cooperation, can apply or be

invited to join the sNACA. The multi-partner involvement of public and private sector actors will enable sNACA to organise regional, multidisciplinary, and intersectional cooperation over strategy, research, education, and industry sectors. The sNACA approach will provide a mechanism to mobilise the Member's capacity resources with better regional accessibility and convey ownership and initiative in regional cooperation.

Based on the earlier communications, the current interests expressed by institutions in the building of sNACA include:

- *Network for shrimp aquaculture biosecurity, proposed by Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences*
- *Network for the rice-fish system, proposed by Shanghai Ocean University*
- *Network for aquaculture of seaweed, proposed by Ocean University of China*
- *Network for aquatic alien species, proposed by Pearl River Fisheries Research Institute, Chinese Academy of Fishery Sciences*
- *Network for Artemia resources, proposed by Tianjin University of Science & Technology*
- *Network for ornamental fishes, interest expressed by Dalian Ocean University and Central Institute of Freshwater Aquaculture, Indian Council of Agriculture Research*

The concept note on establishing sNACA was provided as **Annex 1**.

4. Key achievements

4.1 Human resource development

NACA's Training Programme has played a key role in building regional capacity in aquaculture development. Since the early 80s, more than 3,000 people have participated in NACA's training activities. Many alumni are now leaders and senior officials in governments, development agencies, academia and industry.

4.2 Regional and global policy development

NACA has been at the forefront of international aquaculture policy, convening milestone consultations on development, such as the decennial Global Conference on Aquaculture series and producing guidance on key transboundary issues, such as the International Principles for Sustainable Shrimp Aquaculture and the Technical Guidelines on the Responsible Movement of Live Aquatic Animals.

4.3 Aquatic animal health

NACA pioneered the development of an aquatic animal health network for the Asian region, drawing together governments and technical experts to share information on the detection, containment and management of diseases. The network pools technical expertise and laboratory facilities.

4.4 Better management practices

NACA has been instrumental in developing guidelines that small-scale farmers can follow to improve crop outcomes and reduce environmental impact. Better management practices are available in key production systems for shrimp, striped catfish, and culture-based fisheries.

5. Work Programmes

The mandate of NACA is addressed through five interlinked thematic work programmes that support sustainable aquaculture and aquatic resource management, policy development and inter-governmental cooperation in the region. These are:

- *Productivity & Sustainability*
- *Health & Biosecurity*
- *Genetics & Biodiversity*
- *Safety & Quality*
- *Emerging Regional & Global Issues*

Four additional cross-cutting programmes facilitate and support the implementation of the thematic work programmes:

- *Education & Training*
- *Information & Networking*
- *Strategy & Governance*
- *One Community*

The strategic plan is implemented by NACA regional centres, subject-oriented networks, and Member governments through the development of collaborative projects and activities by partners in the network, addressing issues of common or regional interest.

Individual projects draw heavily on the personnel and facilities of participating centres. Projects are essentially implemented by the centres, with the Secretariat acting as a coordinating body.

NACA also works in close cooperation with FAO, international donor agencies and other regional and global organisations in implementing the work plan.

5.1 Productivity & Sustainability

The global population is forecast to reach around 9 billion by 2050. To feed the world, the global agricultural output must increase by around 60% from present levels, which must be achieved against a background of increasing competition for natural resources such as water, feed ingredients and farming sites.

Maintaining environmental integrity while massively increasing food production will require farming systems to reduce their unit production environmental footprint. Many farming practices that are regarded as sustainable today will not be acceptable when scaled up.

Sustainable intensification of aquaculture means doing more with less. The Productivity & Sustainability Programme aims to help aquaculture become a more efficient use of natural resources, both in terms of aquaculture productivity and sustainability.

The programme develops better management practices for major aquaculture systems and promotes aquaculture as a secondary or additional use of water resources, focussing on practical interventions that can be directly achieved by small-scale farmers in a developing country context.

Development, training, demonstration of new technologies and modes for better productivity and sustainability are highlighted. The programme also assists small-scale farmers to adapt to the changing trade and food safety environment. Cluster-based management approaches and the formation of farmer societies are promoted as practical mechanisms for implementing better management practices.

Key activities

- *Establishing sNACA on subjects for innovations and new industries**
- *Compiling annual reports on the regional aquaculture development**
- *Promoting global and regional initiatives for sustainable aquaculture development*
- *Organising technical consultations on environmental monitoring/protection/carrying capacity and zoning of aquaculture production areas (including by real-time/automated means) **
- *Developing strategic policy frameworks to guide governments and development agencies in promoting sustainable intensification of aquaculture*
- *Developing better management practices for key aquaculture production systems, such as more efficient, “green” farming systems (more efficient farming technology and practices) and different types of IMTA systems**
- *Bridging associations of small-scale farmers in facilitating cluster-based extension approaches and improving market access**
- *Developing culture-based fisheries as a secondary use of water bodies*

* Prioritised activities

Call for interest in establishing sNACA

NACA encourages Member institutions and agencies to establish sNACAs on subjects in productivity and sustainability issues as abovementioned, especially for technology innovations and new industrial development with a broad interest, such as:

- *Rice-fish system (regional workshop organised and interest expressed by Shanghai Ocean University) **
- *Facility farming systems*
- *Culture-based freshwater fisheries (regional workshop organised)*
- *Application of information technologies and artificial intelligence*
- *Cage culture of marine fish species*

- *Artificial reefs and marine ranches*
- *Cold-water species aquaculture*

* Pilot sNACA subjects

5.2 Health & Biosecurity

The Health & Biosecurity Programme assists Members to reduce the risks of aquaculture diseases impacting aquaculture productivity and sustainability, livelihoods of farmers, national economies, trade, environment, and human health.

NACA has maintained the continual aquatic animal health programme over decades. The programme has developed a distinctive mechanism for ongoing regional coordination on aquatic animal health. An inclusive Advisory Group (AG) comprised of experts invited globally from the public and the private sectors with representatives from FAO and the OIE were constituted. The AG was annually convened by the Secretariat to report and discuss the regional and global key updates of aquatic animal health issues and provide recommendations for responding measures. Member representatives nominated by the governments were invited as observers and joined the discussion. NACA has established and maintained a regional Quarter Aquatic Animal Disease (QAAD) report system in cooperation with the OIE and FAO. Regional important emerging diseases will be updated into the QAAD list during the AG meeting. As a support document for the emerging disease diagnosis and report, the Secretariat identifies one or two experts as the designated expert to formulate the Disease Card and requests the AG's review before publishing. Other actions, including early warning, disease advisory, consultation, and recommendations to respond to the disease emergency, may be taken into account as necessary.

NACA has recognised regional capacity resources on specific aquatic animal health issues as Regional Reference Laboratories (RRL), Regional Resource Centres (RRC), and Regional Resource Experts (RRE). However, the function of these capacity resources needs to be restored and strengthened.

The performance of Aquatic Animal Health Services (AAHS) represents the competency of a Member in the governance of aquatic animal health. The OIE has developed a PVS Tool-Aquatic to evaluate the national performance of AAHS. NACA would like to introduce this tool and coordinate training or consultations to improve Member's AAHS.

The recent development on the Progressive Management Pathway of Aquaculture Biosecurity (PMP/AB) and farm-level aquaculture biosecurity system provide excellent approaches to promote the regional biosecurity strategy. NACA agreed to cooperate with FAO in introducing the concept of PMP/AB, the Aquatic Animal Health Capacity, and Performance in the context of the PMP/AB. The Secretariat asks Member governments' endorsement to conduct the self-assessment survey on Aquatic Animal Health Capacity and Performance in the context of the PMP/AB for

NACA Members. Concept notes addressing more details about the PMP/AB are attached as **Annex 3**.

Key activities

- *Convening the annual meeting of the Regional Advisory Group on Aquaculture Health & Biosecurity to address key issues and provide solutions to regional aquaculture health and biosecurity **
- *Collecting the regional Quarter Aquatic Animal Disease (QAAD) information and publishing the regional QAAD report in cooperation with the OIE and FAO **
- *Disseminating information of early warning, diagnostic methods (Disease Card), and prevention advisory for emerging diseases **
- *Establishing a resource information-sharing platform for regional certificated disease diagnosis and prevention products, tools, and services, etc.*
- *Resuming and expanding regional capacity resources for health and biosecurity*
- *Developing sNACAs on subjects of biosecurity, surveillance, disease diagnostic or control technologies for specific categories of aquatic species **
- *Conducting a self-assessment survey and following-up actions on Aquatic Animal Health Capacity and Performance in the context of the PMP/AB for NACA Members, in cooperation with FAO **
- *Coordinating regional actions on improvement and official assessment of the performance of aquatic animal health services, in cooperation with the OIE*
- *Coordinating regional proficiency testing and other regional capacity-building activities in cooperation with regional capacity resources*
- *Organising regional consultation on regional important aquaculture health concerns or emerging diseases **

* Prioritised activities

Call for interest in establishing sNACA

NACA encourages Member institutions and agencies to establish sNACAs on subjects for specific aquaculture health and biosecurity issues, such as:

- *Shrimp biosecurity (application received from Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences) **
- *Specific disease issues (to be specified)*
- *Disease diagnostic technologies*
- *Fish vaccine technologies*
- *Aquaculture microbiome*
- *Application of probiotics*
- *Targeted surveillance programme*
- *Regional transboundary disease control*

* Pilot sNACA subjects

5.3 Genetics & Biodiversity

The Genetics & Biodiversity Programme supports Members in improving scientific knowledge of aquatic genetic resources and guiding strategic planning in their

management. The programme addresses both the conservation aspects of genetic resources and their responsible usage in aquaculture to minimise impacts on biodiversity and wild strains and assist Members in meeting their obligations under international treaties.

The programme promotes international linkages among Members, capacity building, research programs to develop improved strains of finfish and shellfish, genetic characterisation of existing strains, adoption of new genetic tools and technologies and consortia regional programmes to address common issues and species and strains of value from conservation and/or aquaculture perspectives.

Key activities

- *Establishing sNACAs on subjects for genetic breeding on a specific technology or a species category or a biodiversity issue (e.g., aquatic alien species) **
- *Establishing a regional information-sharing platform for national or international recognised or certified varieties on seed quality and its supply chains **
- *Building capacity in aquatic genetic resource management and application of new molecular technologies, tools, and strategies*
- *Developing criteria or guidelines by characterising genetic resources for the identification of species, varieties, stocks, and other valuable genomic resources*
- *Facilitating national and regional programs for domestication, genetic improvement, broodstock management, and conservation*
- *Assisting application of conservation aquaculture models to support diversification, fishery enhancement, and in-situ conservation of indigenous fish species*
- *Facilitating the responsible exchange of germplasm, safe propagation and access-benefit sharing **

* Prioritised activities

Call for interest in establishing sNACA

NACA strongly encourages Member institutions and major breeding centres to devote themselves as NACA centres to lead the establishment of sNACAs on subjects related to genetic breeding on technologies or specific species categories and biodiversity issues, such as:

- *Shrimp genetic breeding*
- *Tilapia breeding*
- *Artemia resources* (webinar organised and interest expressed by Tianjing University of Science & Technology)
- *Alien aquatic animals* (interest expressed by Pearl River Research Institute, Chinese Academy of Fishery Sciences)
- *A micro-algae species*
- *Seaweed farming* (application received from Ocean University of China) *
- *Ornamental species* (interest expressed by Dalian Ocean University and Central Institute of Freshwater Aquaculture, Indian Council of Agriculture Research)

* Pilot sNACA subjects

5.4 Safety & Quality

Safety & Quality Programme concerns the impact of issues in the aquaculture value chain on the international trade of aquaculture commodities. The constantly changing regulatory environment and safety requirements of importing countries pose a special challenge to small-scale aquaculture producers.

The programme assists Members in assuring the safety and quality of aquaculture commodities by adopting science-based better management practices through aquaculture and its value chain. Policy issues concerning aquaculture certification and activities in market access are also addressed.

Antimicrobial usage (AMU) in aquaculture causing antimicrobial resistance (AMR) is a crucial issue, which results in risks to animal and public health. Antibiotic residue and AMR are serious food safety concerns in the international trade of aquaculture products. In collaboration with international organisations, such as FAO and OIE, the programme coordinates Members in regional and international actions to facilitate the development of strategy and programmes related to AMU/AMR in aquaculture.

Feed and feed ingredients resulting in the profile and nutrition of farmed aquatic animals are significant concerns related to the quality issue in the aquaculture stage. NACA Members prioritise the issue in feed and feed ingredients and have developed a robust capacity in the policy, research, education, and industrial sectors, which provides potential resources to support establishing regional networks.

Key activities

- *Establishing sNACAs on subjects for safety and quality issues*
- *Establishing a regional information-sharing platform for national or international standards and recognised or certified feed and feed ingredients, feed additives, and aquatic products **
- *Coordinating regional and international actions to facilitate the development of strategy and programme related to AMU/AMR in aquaculture, in collaboration with FAO/OIE **
- *Organising regional consultations, webinars, and training courses on safety and quality issues, such as development and manufacture of local/cost-effective feeds, including fishmeal substitutes **
- *Safety and quality issues raised in the implementation of regional/international standards/agreements*

* Prioritised activities

Call for interest in establishing sNACA

NACA welcomes Member institutions and industries to apply as NACA centres to establish sNACAs on subjects for safety and quality issues, such as:

- *Antibiotic residue and resistance in aquatic products*
- *Aquatic products-borne human diseases*

- *Feed and nutrition for specific aquatic animal species*
- *Aquatic food processing technologies*

5.5 Emerging Regional & Global Issues

The Emerging Regional & Global Issues Programme provides policy guidance on key strategic and emerging issues such as climate change, COVID-19 impact on aquaculture, microplastics in aquaculture, energy efficiency and alternatives to the use of fish meal in aquaculture feeds.

The programme endeavours to bring to the public domain the positive aspects of aquaculture as a significant contributor to food security and the livelihoods of rural communities and actively promotes south-south cooperation.

Key activities

- *Organising consultations to analyse COVID-19 disruption of aquaculture production, logistics and market chains, including displacement of labourers, the need to improve occupational safety measures and increase the resilience of the industry **
- *Promoting concerns to aquaculture contributions in climate change mitigation through reduction of greenhouse gas emissions and increase of “cold-house gas” emissions by aquaculture **
- *Evaluating the vulnerabilities of aquaculture systems to climate change and development of adaptive measures*
- *Developing projects and policy guidance on emerging issues of regional interest*
- *Contributing to the regional and global dialogue on the use of fish meal and oil in animal feeds and resource usage in the reduction industry*
- *Playing a catalytic role in south-south cooperation in aquaculture development*

* Prioritised activities

Call for interest in establishing sNACA

NACA welcomes Member institutions to apply for NACA centres to establish sNACAs on emerging regional and global issues, such as:

- *carbon-sink aquaculture and fisheries*
- *dimethylsulfide and algae*
- *climate change adaptive measures in aquaculture*
- *fish meal and oil replacement feed ingredients*

5.6 Education & Training

The Education & Training Programme assists capacity building among NACA Members through exchanging and sharing knowledge and skills.

Activities may take the form of online training courses, webinars, physical training programs, study tours, recorded training videos, personnel exchange, and internships, etc. The programme also supports the training components of the other thematic programmes and serves as an outreach arm of NACA.

Regular training activities include collaborative or independent training courses on various topics of regional priority in sustainable aquaculture development. The NACA Secretariat and collaborative partners can offer certificates for the trainees who finished the training courses.

NACA intends to establish an sNACA for aquaculture education among universities, colleges, and faculties related to aquaculture and fisheries in the region to promote education collaboration for student exchanging, teacher training, virtual education, education assessment and acknowledgement, and other issues of mutual interest. NACA welcomes collaboration on the sNACA for aquaculture education with all interested Members, Associate Members, and organisations.

NACA welcomes requests of collaboration on the training of aquacultural technologies from Members, other countries and regions, Associate Members, and organisations to develop training programmes.

Key activities

- *Establishing sNACA for the college education in aquaculture*
- *Collecting and disseminating information related to aquaculture education **
- *Assisting Members to increase the skilled human resource base to support the development of the aquaculture industry **
- *Identifying training needs for aquaculture development in Members*
- *Identifying and organising relevant expertise and capacities to meet the training needs*
- *Developing training modules and materials*
- *Facilitating routine education and training activities of NACA **
- *Facilitating and coordinating exchange programmes among Members and with other regions*

* Prioritised activities

5.7 Information & Networking

The Information & Networking Programme provides a platform to extend outputs of each of NACA thematic programmes to the aquaculture community at large by building up web-based databases of resources, publishing content and information resources related to the programmes, sharing information of experiences, facilitating policy, technical, and industrial communication.

The programme demonstrates the connection of sNACAs under the entire network within a web-based profile and assists each sNACA to build and maintain this connection within its capacity in electronic publishing and the information system.

NACA encourages collaboration with aquaculture media among Members and welcomes the media partners to share the reports and articles without conflict of interest.

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Key activities

- *Communicating the outputs of the NACA work programmes **
- *Supporting sNACAs in sharing expertise among Members, Associate Members, organisations, and individuals. **
- *Hosting virtual consultations, workshops, and webinars on aquaculture development **
- *Producing online video and audio content on aquaculture technologies and practices **
- *Development of NACA's website and cloud infrastructure **
- *Building the capacity of sNACAs and partner organisations in website management and online publishing*
- *Building regional web-based databases for aquaculture-related resources highlighted technical innovations, and GIS on Asian aquaculture, etc. **
- *Production of NACA's serial publications **
- *Development of internal information databases for the Secretariat*

* Prioritised activities

5.8 Strategy & Governance

As an intergovernmental organisation, NACA has been deeply involved in regional strategy development and aquaculture governance issues. By organising regional consultations and international conferences and producing guidance on key transboundary issues, NACA has been at the forefront of international aquaculture strategy and governing policy.

Development strategies and governing policies provide guidelines and safeguards for the sustainability of scale expansion and development acceleration in aquaculture. Strategy and governance issues need to evolve with the times to ensure that they lead and support aquaculture development. Therefore, strategy and governance must interact dynamically with the aquaculture industry.

Along with economic globalisation, the focus of aquaculture is changing from domestic to regional and international interactions. NACA provides a platform for cooperation and communication in the development of aquaculture strategy and governance policies, which greatly promotes the improvement of the strategic and governing capabilities of Members. As the largest aquaculture region, the Asia-Pacific has strong common interests and values exchange in aquaculture development, which requires regional coordination mechanisms for strategy and governance issues beyond the national level.

The programme covers general strategy issues in aquaculture and fisheries and crosscuts to each thematic programme of productivity & sustainability, health &

biosecurity, genetics & biodiversity, safety & quality, and emerging regional & global issues.

A new initiative of blue transformation was proposed by FAO to maximise the contribution of aquatic food systems to food and nutrition security through socially, environmentally and economically sustainable production and value chains. NACA and FAO have agreed to collaborate on this issue to promote the blue transformation in aquaculture in the region. A high-level meeting is planned to be organised in November 2022. NACA seeks Members' support in the action. A concept note addressing more details about the blue transformation and relevant plans was attached as **Annex 4**.

NACA welcomes Member governments, Associate Members, organisations, and institutions to utilise the NACA platform to collaborate with the other Members, organisations, and the international community in the communication, consultation, dissemination of strategy and governing issues.

Key activities

- *Organising high-level, department-level, division-level meetings on general aquaculture strategy, global initiatives, and governance issues **
- *Conducting actions to promote Blue Transformation and respond to the Shanghai Declaration **
- *Providing a regional platform for Members to develop common policies and strategies to address emerging issues*
- *Conducting comparative studies of aquaculture-related strategies and policy regulations of Members to improve aquaculture governance (legislation, planning and management) **
- *Organising strategic studies on the regional implementation of aquaculture-related international standards*
- *Coordinating actions to promote self- or extra-assessment on the performance of aquaculture-related governance structures, regulations, and services*
- *Strengthening cooperation and coordination among Member governments, partners, and the private sector **
- *Organising consultations on the management of water resources and other common-shared resources related to aquaculture **

* Prioritised activities

5.9 One Community

The One Community Programme is an extension of the original Gender Mainstreaming Programme. The new title treats the regional aquaculture value chain, its stakeholders, and the public as one community in recognition of the interlinkages and integration of social issues, including gender equality, youth, the livelihood of all stakeholders, social and environmental impacts, culture and aesthetics, corporate culture value consensus, regional and international harmonisation, and concerns for the public opinion. This concept encourages NACA

Members to implement the actions on the goal of this social inclusiveness within their activities. With interest in embracing One Community integration among relevant agencies, NACA aims to build up the vision of Members in all its undertakings and motivate support and action.

Inadequate recognition of the complex interactions and connectivity between social issues hinders the effectiveness of programs seeking to resolve them in a piecemeal fashion. Adopting a 'One Community' dimension in aquaculture value chains will assure consumers that aquatic food has been produced sustainably in a wholistic, integrated manner.

NACA hopes to initiate human culture and aesthetic issues over the aquaculture value chain to promote advocacy for the eco-friendly and sustainable development of aquaculture. We welcome Member governments and local agencies, Associate Members, organisations, humanity and arts institutions, aquaculture related media, and other partners to cooperate on aquaculture culture and aquaesthetics.

Key activities

- *Organising and supporting symposia on topics related to One Community in Aquaculture and Fisheries, such as aquaculture for poverty alleviation and livelihood issues **
 - *Capacity building on issues under One Community integration and mainstreaming*
 - *Consulting on issues of ageing farmer population and need to attract youth to the aquaculture industry **
 - *Aquaculture harmonisation with regional and international standards/agreements, such as the RCEP **
 - *Curriculum development on One Community in Aquaculture and Fisheries Education*
 - *Regional consultation on efficient (low waste and loss) and socially inclusive value chains **
 - *Promoting farmer-friendly credit and finance arrangements*
 - *In-country One Community assessment reports for policy, action, and research*
 - *Publication of case studies and success stories on One Community in aquaculture value chains **
 - *Campaigns and policy advocacy for One Community integration in aquaculture **
- * Prioritised activities

6. Resource Mobilisation

6.1 Resources of Capacity

The resources of the capacity of NACA are recognised RLCs, RPCs, RRLs, RRCs, and RREs and other contacted or potential capacity resources in the public and private sectors of Members.

The Secretariat plans to improve contact and ask for more communications with recognised centres, laboratories, and experts to mobilise the existing resources of

the capacity. More joint activities, including training courses, webinars, and consultations, will be conducted under cooperative efforts. Staff exchanges, secondments and participation in subnetworks may be requested. Annual reports will be requested from RLCs and made accessible through the NACA website.

For other contacted or potential public and private sectors, the Secretariat requests Member's support to recommend more competent institutions and experts to join in NACA as RLC, RPC, or other appropriate capacity resources.

The Secretariat actively initiates the mechanism of Subject-oriented Networks (sNACA). It's believed that this mechanism provides a self-driving force in networking relevant capacity resources by offering autonomy and initiative to a recognised RLC in the name of NACA. We encourage that an sNACA is joined by capacity resources in the public and private sectors to build a research-education-industry collaborative network focusing on a specific subject. For the mechanism of sNACA, the Secretariat requests Member's endorsement from the GC. We are also welcome constructive suggestions to finalise the rules in the governance of sNACAs.

Based on the experience from the response to the COVID-19 pandemic, the Secretariat proposes virtual networking: moving the majority of NACA events online. The purpose of this proposal is to establish a virtual networking platform, built around video conferencing, that will allow NACA to:

- *Host interactive workshops, consultations, training courses, and events online.*
- *Provide a foundation for forming voluntary research networks and technical exchange.*
- *Allow decentralisation of elements of the NACA work programme to participating centres.*
- *Strengthen personal relationships by fostering a culture of informal video calls.*
- *Improve NACA's international profile.*
- *Attract more partners, donors and Member governments.*

Concept notes addressing more details about the Subject-oriented Networks (**Annex 1**) and virtual networking are attached (**Annex 2**).

6.2 Material resources

Material resources, including genetic materials, approved new varieties, licensed feed and feed ingredients, standard diagnostic samples, licensed diagnostic tools, licensed veterinary medicines, licensed aquaculture fertilisers and probiotics, registered farm implements, registered aquaculture control system and software applications, and certified aquatic products, etc., are the materials support the full value chain of aquaculture. The regional aquaculture-related trade includes not only the final aquatic products but also important commodities in supply chains supporting the aquaculture.

Information on material resources is mostly unavailable in the region. NACA plans to develop a database to collect the information and make it sharable if there are

significant needs from Members. Members are welcome to share their opinions in sharing such information in the region.

6.3 Information resources

Information resources include not only the NACA website, publications, news, reports, plans, expert database, videos, etc., which are openly accessible through enaca.org, NACA's social media (YouTube, Twitter, Facebook, and LinkedIn) but also the information in NACA Members and centres. NACA welcomes Member governments, Associate Members, and centres to share information with the Secretariat and make it accessible on the NACA website. The NACA website can provide Members with a well-known channel to disseminate the aquaculture development messages regionally and globally and promote your training courses and events.

The Secretariat will also contact Members, Associate Members, centres, TAC members, and other nominated experts for information upon specific projects or purposes. It's highly appreciated for the information provided by partners.

6.4 Financial resources

The Secretariat proposes to set a NACA Trust Fund (TF) to support the expenditure of NACA basic and important initiatives, such as annual reports on the regional aquaculture development, the sharable database for regional material resources, consultation and response to regional emerging and emergency issues, and One Community initiatives, etc. The TF will be operated within an independent account and mostly pay non-staff expert time and cost. The basic income of NACA TF can be a lower percentage deduction of annual surplus from Member's financial contributions and a higher percentage deduction of a project balance. If the TF proposal is supported and established, NACA would highly appreciate Members or organisations' donations directly to the NACA TF. The Secretariat may also seek donations from the private sector.

The sNACA initiative is proposed to be a self-funded mechanism. It's considered that the Secretariat will not offer financial support to any sNACA, but with virtual meetings, the cost should be minimal. An sNACA should need to find or provide its own financial resources, and an administrative fee paid to the Secretariat may be required. It's possible for sNACA to mobilise sponsorship from the private sector participating in the relevant network. The Secretariat will also welcome sNACA's donations to TF.

The current Member's financial contributions have not changed since the NACA was established over 30 years ago. It can only cover the basic expenditures of the Secretariat. The Director General of NACA requested an increment to the original amount during the 30th GCM in 2019. Due to the COVID-19 pandemic, we didn't follow the request in 2020. However, considering the difficulty in the financial situation, the Secretariat requests the increment can be approved by the Member governments as the last GCM requested.

Annex 1. Concept note: Establishing Subject-oriented Networks

Concept

In order to mobilise the capacity resources of NACA Members and activate regional activities, including herein regional research collaboration, training, education, information sharing, personnel exchanges, knowledge and technologies transference, consultations, workshops, webinars, study tours, cooperative projects, and other cooperative activities, in the field of aquaculture, we propose to initiate a regional mechanism of establishing subject-oriented networks (sNACA) under the NACA framework to focus on specific subjects in aquaculture. The network mechanism will enable NACA to:

- Identify available capability resources in a specific subject under a thematic programme;
- Strengthen regional activities by mobilising Members' resources of the capacity;
- Enable a long-term mechanism to actively maintain networks focus a specific subject;
- Expand the subjects and scope of NACA work programmes;
- Deepen impacts of regional activities in a specific subject;
- Bring a new approach for regional policy-research-education-industry cooperative activities;
- Reactivate significantly the NACA platform;
- Enhance the sense of Members' ownership of NACA;
- Mitigate impacts of COVID-19 and other emerging regional and global issues on regional activities in aquaculture;
- Share responsibility among Members for the regional aquaculture development; and
- Contribute to the regional sustainable aquaculture development with regional activities.

Rationale

The Subject-oriented Network (sNACA) is a proposed initiative to build long-term, decentralised, self-operating, all-Member involved, capacity resources-based networks under the framework of NACA to enhance regional aquaculture activities.

NACA was founded more than 30 years ago as a network of aquaculture centres. The partners that initiated the aquaculture collaboration included only four centres from different Members as Regional Lead Centres (RLCs). The original intention of establishing the network is to assist the sustainable development of aquaculture of Members in the objectives, including increasing production, improving rural income and employment, diversifying farm production, and increasing foreign exchange earnings and savings, defined by the NACA Agreement by mobilising the existing resources of Members in sharing the capacity resources for regional activities. Over years of operation, another RLC has been recognised, and more than 30 Regional Participating Centres (RPCs) have joined. RLCs and RPCs have significantly contributed to NACA Members' aquaculture development over the past decades.

However, because most of NACA's regional activities are carried out in projects, there is an imbalance and comprehensive coverage of centres' capabilities on different subjects, and project-based operations make the centres' participation unstable and durable. Along with the diversion of major resources from sponsors in recent years, there has been a gradual decline in the links between the Secretariat and the recognised centres. If we do not strengthen the ties with regional capacity resources, the network will lose its working base and targets. As a result, the regional support for sustainable aquaculture development will be vulnerable and impaired.

On the other hand, after 30 years of aquaculture development, more and more institutions, herein including institutes, universities, laboratories, enterprises, associations, or close working groups of capacity, have grown and participated in regional activities. Initial conversations with many

institutions have revealed that many of them are interested in further collaboration with NACA. They found that the NACA framework provides a widely aware regional platform for international collaborative works. Encouraging the continued involvement of more institutions in regional activities is a win-win strategy for all. Under the current trend of economic globalisation, it shows an urgent need for strengthening regional cooperation for sustainable aquaculture development. As we see, cooperation in aquaculture has reached multi-disciplines and the entire value chain, including production chain, supply chain, and trade chain. For NACA to better serve the sustainable aquaculture development in the region, strengthening the network is an urgent and important task.

Organisation of sNACA

General strategy to establish sNACA

- The Secretariat will develop and release the sNACA specific rules (trial implementation) after the proposed sNACA mechanism is endorsed by the NACA Governing Council (GC).
- The rules for sNACA operation will be finalised after a demonstration period in a certain pilot sNACAs.
- The key to this mechanism grants an RLC the responsibility to organise a subject-oriented subnetwork on behalf of NACA. This mechanism does not conflict with the NACA Agreement and is supported by Article 2, Paragraph 2 of Article 3, Article 4, Paragraph 3 of Article 5, Paragraph 3 of Article 16.

Operation in establishment of sNACA

- An institution, herein including an institute, a university, a laboratory, an enterprise, an association, or a close work team, with capacity on a specific subject, can be recommended by the Member or the Secretariat to submit an application to the Secretariat voluntarily to serve as an RLC.
- After the Secretariat approves the application on behalf of GC, the institution becomes an RLC on the specific subject.
- The RLC should be competent on a specific subject and willing to commit to regional activities.
- The RLC on the specific subjects is responsible for establishing and operating an sNACA on behalf of NACA.
- The RLC reports to the Secretariat on the status of the establishment of the sNACA. All applications for RPC in the sNACA should be submitted to the Secretariat for approval.
- GC will be informed of the establishment of the sNACA and its centres by the Secretariat.
- Existing RLC or its divisions, regional Reference Laboratories (RRLs) and Regional Resource Centres (RRCs) may identify a specific subject to establish an sNACA through the application procedure.
- The title and scope of an sNACA subject should be specific. The Secretariat may recommend changing the title and scope of the subject. A general or overly broad title and scope will not be accepted.
- Centres within the same subject can join the same sNACA to co-lead or rotate the leadership of the sNACA.
- Suppose a network is overgrown, with too many centres, and the sNACA performance or centres participation becomes attenuated. In this case, the Secretariat, the RLC, or centres within sNACA may consider splitting the sNACA into more specific subjects or establishing branches within the sNACA.
- An institution may join different sNACAs based on its capacity in the relevant subjects and willingness to work on regional activities.

Identification and designation of sNACA centres

- Before establishing an sNACA, an institution can contact the Secretariat or be asked to organise webinars, workshops, or other activities in collaboration with the Secretariat.
- The institution can identify possible partners for potential sNACA through the activities.
- The RLC on a specific subject can find existing NACA centres to be involved in sNACA.
- The RLC can recommend institutions for the specific subject.
- The recommended institution applies as a new NACA centre to join sNACA with the approval of the Secretariat.

Planning and organising regional activities

- An RLC is responsible for planning and organising the annual sNACA regional activities.
- The Secretariat shall be notified of regional activities to be organised on behalf of NACA.
- It's encouraged to organise regional activities with the involvement of the public and private sectors.
- Regional activities should be related to aquaculture and fisheries and not conflict with the NACA Agreement.
- The Secretariat reserves the right to propose or veto regional activities to be organised on behalf of NACA.

Rights and responsibilities of sNACA

- Being authorized to use the intellectual property rights associated with the name of the sNACA.
- Increasing the capacity, scale, and impact of the sNACA within the specific subject.
- Operating the sNACA, examining the capacity of its centres, and enhancing the capacity of centres through regional activities.
- Participating in the regional activities organized by NACA, including sNACAs.
- Organising sNACA regional activities on behalf of NACA, with the involvement of the public and private sectors.
- Representing NACA to attend, designated by the Secretariat, at international or regional activities.
- Operating the sNACA website or publishing sNACA publications.

Communication and annual reports

- All NACA centres shall submit an annual report to the NACA Secretariat for their regional activities on the specific subject.
- An RLC for a specific subject shall submit the annual report for the sNACA.
- The annual reports will be published on the NACA website.

Potential subjects for sNACAs

- The subjects for sNACA can be proposed by the Secretariat and also by Member institutions.
- The potential subjects should be specific but not general or too wild inclusive.
- Examples of potential subjects can be as follows.
 - ✧ Network for shrimp biosecurity system (application received from Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences)
 - ✧ Network for rice-fish system (interest received from Shanghai Ocean University)
 - ✧ Network for aquaculture of seaweed (application received from Ocean University of China)
 - ✧ Network for aquatic alien species (interest received from Pearl River Fisheries Research Institute, Chinese Academy of Fishery Sciences)
 - ✧ Network for Artemia resources (interest received from Tianjing University of Science & Technology)
 - ✧ Network for ornamental fishes (interest expressed by Dalian Ocean University and Central Institute of Freshwater Aquaculture, Indian Council of Agriculture Research)

✧

Financial issues

- Rules for financial issues shall be developed and consulted after the GC's endorsement on the proposed basic sNACA mechanism.
- The Secretariat welcomes comments to the financial issues as well as the other considerations in the Concept Note.
- Proposed considerations for financial issues are list as follows.
 - ✧ An sNACA shall establish and maintain a separate and auditable sNACA account to manage the income earned and the expenditure spent in the name of NACA (including sNACA).
 - ✧ The sNACA shall submit an annual financial report for the sNACA account with the audit of a third part with the international qualification.
 - ✧ An sNACA shall be established and operated for the purpose of promoting regional activities, not for profit.
 - ✧ The sNACA expenditure, including the cost for regional activities, will be self-funded by centres in the sNACA unless a specific budget has been covered by a project or an LoA accordingly.
 - ✧ sNACA centres shall find their own financial resources to participate in the network.
 - ✧ Members are appreciated for sponsoring sNACA's regional activities when necessary. However, the sponsorship shall not be considered a deduction for the financial contribution of the NACA membership.
 - ✧ Without approval from the Secretariat, the NACA budget from Members' contributions, including the budget operated at the local NACA account, will not be transferred to or be used by the sNACA and its centres, even Secretariat staff is involved in the regional activities.
 - ✧ The Secretariat may pay an sNACA service fee upon the budget in the Letter of Agreement signed for a specific task.
 - ✧ An annual administrative fee may be required to be paid to the Secretariat in a budget of X% of the total income of the sNACA account or not less than USD XXXX.
 - ✧ A preferential policy of administrative fee exemption can be made for a newly recognised sNACA within three years or an sNACA that has made significant contributions to non-profit regional activities in the previous year.
 - ✧ The Secretariat welcomes donations from sNACA or its centres to the NACA Trust Fund.
 - ✧ To facilitate regional activities, an sNACA may seek financial solutions to defray the expenses of regional activities, such as requesting financial contributions or sponsorship from the private sector or profit-making entities, which have joined sNACA, to generate revenue for the sNACA account, charging registration fees or request sponsorship for regional activities organised by sNACA, establishing syndicates or entities to generate income for sNACA accounts. All such sNACA-related financial solutions shall be reported to the Secretariat with the third-party annual audit.
 - ✧ If an sNACA is engaged in profitable activities that are likely to affect the reputation of its non-profit activities, or if an sNACA can be maintained to generate substantial profits, the profitable business shall not continue to use the name of NACA (including sNACA) or shall be divested from sNACA, unless permitted by the Secretariat, with respecting the NACA and sNACA intellectual property rights.

Annex 2. Virtual networking: moving NACA workshops and events online

Concept

Establish a virtual networking platform, built around video conferencing, that will allow NACA to:

- Host interactive workshops, consultations, training courses and events online.
- Provide a foundation for forming voluntary research networks and technical exchange.
- Allow decentralisation of elements of the NACA work programme to participating centres.
- Strengthen personal relationships by fostering a culture of informal video calls.
- Improve NACA's international profile.
- Attract more partners, donors and member governments.

Rationale

Much of NACA's work and project funding revolves around physical meetings and international travel, which are not possible for the next year or two. We need to move the network online, in order to keep operating.

All organisations will need to do this, but if NACA gains a first mover advantage we can position ourselves as a leading service provider for convening online workshops, consultations and events. We can also leverage our existing network and government relationships to generate an audience of researchers or policy makers.

Since the cost of hosting online events is extremely low, we can also open participation to non-member governments. This will help to boost NACA's international profile and recruit new members. When the situation improves, we may wish to continue to hold certain meetings via video to keep costs low.

There is also an opportunity: For the first time, NACA is not dependent on donor funding to run international consultations. We can choose to convene meetings on subjects that are most important to our members, instead of only those that donors are willing to fund.

Potential topics for video consultations

- Consultation on the effects of COVID-19 on small-scale farmers, markets and trade in aquaculture products.
- "Expert interview" series: A weekly podcast exploring policy, development and technical issues via interviews with scientists, policy makers and field workers (release as video for online viewing, download and podcast). Topics could include issues such as food security, gender, policy support to small-scale farmers, social issues, anti-microbial resistance, better management practices and many others.
- Training Programme: Ex situ Conservation of Fish Genetic Resources (as per expression of interest by India).
- Consultation on establishing a decentralised network of breeders' registries (concept proposed by India in several recent workshops).
- Smart farming: The current state of play in adoption of smart farming technologies in aquaculture throughout the region and their appropriate application. Include case studies from China, Thailand, Japan, South Korea.

Infrastructure required

- Zoom Pro account (video conferencing)
 - ✧ Streaming facilities
 - ✧ Online meetings.
 - ✧ Breakout rooms.
 - ✧ Shared whiteboard.
 - ✧ Polls
 - ✧ Raise hand / ask question via text.
- NACA website (host content)
 - ✧ Self-advertising of Zoom meetings, webinars and training courses
 - ✧ Downloads / podcasts of recorded content such as technical presentations from workshops.
 - ✧ Registration facilities (for some events; Zoom has an internal registration / payment system but it is limited and difficult to use due to geographic service restrictions).
 - ✧ Expert database.
- Udemy trainer account (host / charge for training courses).

Security issues

Despite some high-profile stories in the media, we are satisfied that the platform is safe for use, if configured correctly (ie. when good practice is followed, such as use of strong meeting passwords, use of waiting rooms to gate entry to known persons, and restrictions on who can transmit):

- Zoom's popularity exploded when the pandemic forced business meetings online. Some flaws in the platform were discovered.
- The company has proactively addressed most of the issues, hired a team of reputable cryptographers and security experts, added controls to prevent abuse. A system-wide encryption upgrade took place on 30 May, but end-to-end encryption is only available on paid accounts.
- Despite this, new vulnerabilities will continue to be found in Zoom and all other platforms; this is an unavoidable fact of life in using software.

Annex 3. Concept note: Development of a Regional and National Aquaculture Biosecurity Strategy through the Progressive Management Pathway (PMP/AB) for Asia

GCP/GLO/352/NOR: Smart and Sustainable Aquaculture through Effective Biosecurity and Digital Technology" and RP funds

Collaborating partners

- Food and Agriculture Organization of the United Nations (FAO)
- Network of Aquaculture Centres in Asia-Pacific (NACA)
- NACA Member competent authorities, institutions, and stakeholders related to aquatic animal health

Relevance and alignment to FAO Strategic Framework

- Sustainable Development Goals (SDGs)
- Four Betters and Priority Programme Area: One Health, Blue Transformation
- COFI/SCA 10th Session
- Code of Conduct for Responsible Fisheries – all health-related guidelines
 - ✧ Health management for responsible movement of live aquatic animals
 - ✧ Ecosystem approach to aquaculture
- GCA 2020: Shanghai Declaration: <https://aquaculture2020.org/declaration/>
- COFI Declaration on Sustainable Fisheries and Aquaculture
<http://www.fao.org/in-action/globefish/news-events/details-news/en/c/1392967/>

Background.

The Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB) is a new initiative that was developed by the Food and Agriculture Organization of the United Nations (FAO) and partners after a consensus was reached during two multi-stakeholder meetings held at the World Bank headquarters in Washington D.C. (April 2018)¹ and the World Organisation for Animal Health (OIE) headquarters in Paris (January 2019)², as well as an initial Technical Working Group meeting held at FAO headquarters (March 2019)³.

The PMP/AB consists of four stages that will progressively enhance aquaculture biosecurity capacity by building on existing frameworks, capacity and appropriate tools using risk-based approaches and forming strong public-private partnerships. The PMP/AB is expected to result in sustainable reduction of burden of disease; improvement of health at farm and national levels; minimization of global spread of diseases; optimization socioeconomic benefits from aquaculture; attraction of investment opportunities into aquaculture; and achievement of “One Health” goals.

The further development of the PMP/AB was endorsed, and the establishment of the PMP/AB TWG was requested by the tenth session of the Committee on Fisheries Sub-committee on Aquaculture (COFI/SCA)⁴. The Sub-Committee also urged Members to initiate a pilot PMP/AB programme.

¹ <http://www.fao.org/documents/card/en/c/ca4891en/>

² <https://doi.org/10.4060/cb0745en>

³ <https://doi.org/10.4060/cb0582en>

⁴ <http://www.fao.org/3/ca7417t/CA7417T.pdf>

The development of a National Strategy on Aquatic Animal Health (NSAAH), based on self-assessed risks and a gap analysis, is an important component and end-goal for completion of Stage 1 of the PMP/AB. Detailed and accurate completion of this questionnaire will assist a country to identify the key areas that need to be addressed in the NSAAH and focus on those areas that need to be addressed by specific projects and activities.

NACA and eight NACA Member countries: Bangladesh, Cambodia, China, India, Indonesia, Iran, Thailand, and Viet Nam participated during the 10th session of the COFI/SCA.

Overall Objective:

The overall objective is to develop Asia regional and national aquaculture biosecurity strategies through the Progressive Management Pathway.

Planned activities:

The following activities will assist in achieving the objective of the project during 2021 ~ 2022.

- Present the CN to NACA's Governing Council meeting
- Identify NACA Member focal points to organise the national self-assessment survey.
- Organise an inception virtual event to introduce the concept of PMP/AB, the Aquatic Animal Health Capacity and Performance in the context of the PMP/AB, and the method of self-assessment survey for all active NACA Members.
- Conduct a self-assessment survey on Aquatic Animal Health Capacity and Performance in the context of the PMP/AB for active NACA Members. Some NACA Members have been involved in similar self-assessments as part of some FAO projects – the survey returns need to be updated.
- Organise a virtual communication event to present and discuss the self-assessment survey outputs.
- Conduct an analysis of the survey returns as basis for developing a draft regional strategy
- Conduct a gap and SWOT analysis
- Prepare a draft strategy
- Organise a virtual event to present 6, 7, and 8 above, finalise the strategy, implementation plan including indicators and build consensus on the way forward.

Annex 4. Concept note: Key actions in collaboration between FAO and NACA in promoting blue transformation in aquaculture in support of the Shanghai Declaration

Background

Blue transformation is FAO's vision of how to achieve a balance between the need for positive societal outcomes and ecological sustainability in food production from the blue economy. It has three core components, namely:

- **Sustaining fish supplies and feed the world through aquaculture intensification.** As aquaculture will provide the majority of supply increases – scale-up, address resource-use bottlenecks and transfer knowledge through sustainable development of aquaculture.
- **Transforming fisheries through better management.** By addressing overfishing and overcapacity, combating illegal, unreported and unregulated (IUU) fishing and rebuilding overexploited stocks, fisheries can improve livelihoods and supply. However effective management is non-negotiable.
- **Upgrading fish value chains. Improving the efficiency,** viability and inclusiveness of fish value chains. Providing additional supply sources and ensuring socio-economic benefits, just distribution and access.

FAO has targeted a 30-45 percent growth in global aquaculture by 2030 through the following priority areas for blue transformation in aquaculture:

- Governance and policy reforms
- Socio-economic dimension of aquaculture
- Biosecurity and disease control
- Environmental control and regulation
- Feed ingredients and feeding technologies
- Genetic improvement and diversification
- Digital technologies and intelligent systems
- Value chain efficiency
- Climate change impacts and opportunities

The aim of blue transformation is to maximize the contribution of aquatic food systems to food and nutrition security through socially, environmentally and economically sustainable production and value chains. The actions also focus on building capacity of the stakeholders through transferring knowledge and direct training to enhance sustainable expansion of aquaculture. This is highly relevant to Asia in particular as the region provides 89 percent of global aquaculture production (82 million tonnes, excluding 32 million tonnes of aquatic plants) and the sector engages mostly small-scale producers which contribute more than 80 percent of total production. The Shanghai Declaration noting the potential and opportunities of emerging concept of blue transformation among others to influence the development of sustainable aquaculture and its future trajectory.⁵

⁵ <https://aquaculture2020.org/declaration/>

Key actions and timeline

The key actions between FAO Regional Office for Asia and the Pacific and NACA in promoting blue transformation in aquaculture in support of the Shanghai Declaration will be in the following activities:

FAO's regional technical cooperation programme (TCP/RAS)

A new FAO Technical Cooperation Project proposal on 'Support to upscaling and adoption of innovations and good practices for sustainable intensification and expansion of aquaculture in Asia' is being developed. The project aims at enhancing national capacities to transform aquaculture towards sustainable intensification and expansion and to leverage future investments. Specifically, this project will support upscaling and promote wider adoption of innovations and good practices in selected priority areas of the participating countries.

The potential collaboration between FAORAP and NACA under this project concerns be the project component on 'development of policy guidance documents on investment direction, strategies and actions at regional and national level for promoting sustainable intensification of aquaculture through upscaling and adoption of innovations and good practices'.

The implementation is expected to be started in January 2022 and will run for 24 months.

High-level meeting on 'investment strategies and action plan for blue transformation of aquaculture in Asia and the Pacific region' in support of the Shanghai Declaration

The meeting will give an opportunity for countries in the region and key partners to present and discuss priority areas for their aquaculture sector and investment directions for blue transformation based on a comprehensive white paper that will be developed with expert input over the next 8 months. The meeting and white paper will focus on 'delivering action on the Shanghai Declaration in support of blue transformation' and has three objectives:

- identify and agree on the objectives and targets to promote sustainable intensification and expansion of aquaculture in light with low/reduced carbon and resource use footprint and improved circular economy;
- develop the strategies and outline the action plans to leverage public and private investments; and
- identify investment opportunities and collaborative arrangements.

The meeting will be organized in early November 2022 and will be convened over 2 days (via zoom, 3 hours per day). The white paper will be developed and sent out to delegates by mid-September 2022.

Technical webinars in support of the regional technical platform on aquaculture (RTP-AQ)

RTP-AQ is an FAO's new initiative to support sustainable development of the sector by promoting best practices, sharing innovations, facilitating dialogues and disseminating information and knowledge products.

The RTP-AQ is envisioned to be a dynamic and interactive platform serving the needs of multiple stakeholders including FAO offices, governments, farmer organizations, financiers, researchers, private sector, CSOs, etc. The platform will include (but not be limited to) webinars and workshops to connect experts with those seeking support; and a web-based space listing events,

publications and training opportunities. The RTP-AQ aims to improve access to information from a wide range of sources and provide forums for dialogue between experts and stakeholders to share knowledge, perspectives and experiences, and to develop and finance new projects. The platform would open up global and regional opportunities to share best practice and innovation and develop networks both regionally and internationally, including increasing the opportunities for south-south collaboration and leveraging global and regional efforts and investment.

Through the platform, FAO and NACA may collaborate in co-organizing a series of technical webinars under the theme 'Blue Transformation of Aquaculture in the Asia-Pacific Region' throughout the year of 2022.



REPORT OF THE DIRECTOR GENERAL

31ST NACA GOVERNING COUNCIL

1

PROGRAMME STRUCTURE IMPROVEMENT

CURRENT

- **Thematic work programmes**
 - Sustainable Farming Systems (Yuan Derun)
 - Aquatic Animal Health (Eduardo Leano)
 - Genetics and Biodiversity (unstaffed*)
 - Food Safety, Quality and Certification (unstaffed*)
 - Emerging Global Issues (unstaffed*)
- **Cross cutting work programmes**
 - Education and Training (Yuan Derun)
 - Gender (unstaffed*)
 - Information and Communications (Simon Wilkinson)

IMPROVED

- **Thematic work programmes**
 - Productivity & Sustainability
 - Health & Biosecurity
 - Genetics & Biodiversity
 - Safety & Security
 - Emerging Regional & Global Issues
- **Cross-cutting work programmes**
 - Education & Training
 - Information & Networking
 - Strategy & Networking
 - One Community

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ACTIVITIES COMPLETED 2019 - 2020

3

PRODUCTIVITY & SUSTAINABILITY

- **Introduction of successful sustainable aquaculture modes in Asia-Pacific**
 - “Profile and Cases of Aquaculture for Sustainable Development in Asia-Pacific”
 - The Special Event on Better Management Practices and Guidelines for Sustainable Aquaculture Development on the FAO COFI Sub-Committee on Aquaculture held on 23 to 27 August 2019
 - The cases introduced in the presentation were highly concerned for the other regions of the world
- **Technology Innovation and Social Impact of Integrated Agro-Aquaculture**
 - The International Symposium on Technology Innovation and Social Impact of Integrated Agro-Aquaculture: Rice-Fish System in Shanghai on 13-15 October 2019
 - Shanghai Ocean University expressed interest in join NACA’s initiative to establish a rice-fish network for the region
- **Using Innovative Seaweed Production Technology for Large-scale Restoration of biodiversity and Ecosystem services**
 - NACA join the initiation of the EU Horizon 2020 proposal in cooperate with CIRDAP
 - Invited SAMS/UK as the leader, covered 22 organizations over the world with 6 NACA Members involved
- **FAO Asia Regional Consultation on Development of GSA**
 - NACA was actively involved in the event from 30 November to 2 December and provided comments and cases

4

HEALTH & BIOSECURITY

- **Quarterly Aquatic Animal Disease Reporting**
- **Asia Regional Advisory Group on Aquatic Animal Health**
 - AGM 18 in Bangkok on 18-19 Nov. 2019 and virtual AGM 19 on 26-27 Nov. 2020
- **Regional Proficiency Testing Program for Aquatic Animal Disease Diagnostic Laboratories**
 - Hosted the workshop for 33 laboratories from 12 regional countries on 13-14 March 2019
- **Response to DIV1 and Preparedness for Emerging Shrimp Diseases**
 - Published 4 important technical document on DIV1 on NACA website in 2020
 - Organized a virtual public consultation on 10-11 Sept. 2020 with 350 participants
 - Attended 5 regional and global meetings and delivered 4 valuable technical speech
- **Response to Emerging Shrimp Disease Glass Postlarvae Syndrome (GPL)**
 - A special interview to SMRT AGRIPPOST, an India media, on 20 May 2020 was published
 - Research progresses on GPL was delivered to 10th ASA Meeting on 20-22 Jun. 2020
 - OIE Regional Collaboration Framework on Aquatic Animal Health in Asia and the Pacific
 - Joined in 7 OIE events as Steering Committee or Evaluation Committee members to provide expertise in 2019-2020
 - Signed the an LoA on Collection and Evaluation of Guideline and Materials on Aquaculture Biosecurity for the region
- **Development and collaboration on Aquaculture Biosecurity**
 - Attended 8 FAO events to contribute to FAO initiative of PMP/AB in 2019-2020
 - Co-organized a training on AB with >260 trainee
 - Attended 6 workshops/conference in China, Vietnam, and India to deliver lectures on AB in 2019-2020

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GENETICS & BIODIVERSITY

- **Joining current actions on genetic & biodiversity**
 - APAARI Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration, 10-12 Jul 2019 in Sri Lanka
 - FAORAP Regional Consultative Meeting on Biodiversity Mainstreaming across Agriculture Sectors in Asia and Pacific on 17-19 Jul 2019 in Thailand
 - Supportive intervention for the State of the World's Aquatic Genetic Resources for Food and Agriculture , during 10th Session of the FAO COFI Sub-Com. on Aquaculture on 23 to 27 Aug 2019 in Norway
 - The consultation on Development of a Registry of Farmed Types of Aquatic Genetic Resources, 8-12 June 2020
 - The ICAR-NBFGR Regional Capacity Building Programme on Biotechnological Tools in Aquatic Genetic Resource Management and Ex-situ Conservation, 7-18 December 2020, India
- **Finding potential needs and partners interested in genetics & biodiversity**
 - Identify the highest priority at strategy & governance x genetic & biodiversity
 - Planned web-based database for government recognized genetic resources
 - Joined a proposal made by YSFRI of China on marine fishery genetic resources for China-ASEAN Maritime Cooperation Fund Program in 2019
 - Expressed NACA's high interest in developing the genetic network and the abundant capacity resources in NACA
 - Visited the top CP Broodstock Multiplication Center and Disease Challenge Center on 9 November 2019 in Thailand
 - Welcomed the Delegation of PRFRI of China on 14 November 2019 and identified their interest in the network for aquatic alien species

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SAFETY & QUALITY

- **Antimicrobial use (AMU) and antimicrobial resistance (AMR) in aquaculture**
 - Attended FAO RAP: Regional Forum on Antimicrobial Stewardship in Agriculture on 11-12 July 2019 in Thailand and presented on “Initiatives that Improved Practices which Fostered Antimicrobial Stewardship in Asia-Pacific Aquaculture”. Highlighted that the biosecurity system is of paramount importance in reducing AMU in aquaculture.
 - Dr. Eduardo Leña attended 5 AMR/AMU meetings and provided consultative opinions in 2019-2020
- **Other activities related to Safety & Quality in aquaculture**
 - Attended the Launch of Regional Overview of Food Security and Nutrition in Asia and the Pacific 2019: “Placing Nutrition at the Centre of Social Protection” organized by FAO RAP, in conjunction with the regional offices of United Nations Children’s Fund (UNICEF), World Food Programme (WFP) and World Health Organization (WHO) on 11 December 2019
 - Attended the Agricultural Policy Briefing under the theme “Agriculture: Safety, Security & Sustainability” held on 30 September 2020 in Thailand

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EMERGING REGIONAL & GLOBAL ISSUES

- **COVID-19 impacts and mitigating strategies related to the aquaculture sector**
 - Based knowledge on virology and biosecurity, DG NACA actively contributed to public-accessible COVID-19 early risk assessment, prevention approach, and analysis of its impact on the aquaculture sector, especially during the very early stage of the pandemic when no rapid diagnostic and treatment available for the public
 - Submitted 3 major suggestions on strategies, very early risk assessment approaches, and public-accessible self-intervention for anti-COVID-19 at very early stage of a risk exposure to 5 governmental authorities or agencies of NACA Members and made aware on IM platforms, as well as many friend in NACA Members
 - Published 3 co-authored papers, 1 technical note, and 2 interview on components with potential anti-COVID-19 activities and clarification of insusceptibility of aquatic animals to COVID-19.
 - Attended more than 6 webinars or online consultations as keynote or invited speaker to talk on science-based approaches to mitigate the impact of COVID-19 in aquaculture, including how aquatic products may help prevention of the disease, for more than a thousand people in NACA Members
 - Co-organized 1 International forum for Members on 24-25 November 2020 on the COVID-19 impacts and the mitigation strategies for aquaculture with more than 260 audiences
- **Activities on climate change issues**
 - International Conference on 'Impact of Climate Change on Hydrological Cycle, Ecosystem, Fisheries and Food Security (ClimFishCon2020), India, on 11-14 February 2020.
 - Aborted travel due at the flight connection to COVID-19
 - Making Information and Communication Infrastructure Resilient to Climate Change for Community-based Climate Smart Farming Practices, joint CIRDAP’s initiation for EU Horizon 2020 but failed

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EDUCATION & TRAINING

- **Aquaculture education and training network**
 - The region has strong aquaculture college education resources and significant needs for regional cooperation, based visits in 7 important aquaculture-related universities in 2019 and TAC member survey in 2020
 - Several university visited or communicated with NACA expressed cooperation interest
 - 2 interns were selected from online interview of 6 candidates, but the visit of interns were aborted due to COVID-19
- **Training cooperation on aquaculture**
 - ICAR-NACA School on Aquatic Epidemiology and Disease Surveillance on 1-6 March 2019 in India
 - IOI Training Programme on Regional Ocean Governance, Trade and Sustainable Development in the SEA Seas and the Indian Ocean in June - July 2019 in Thailand, Dr Derun Yuan provided lectures
 - YSFRI/NACA Online Training on Mariculture Technologies, 21 to 25 September 2020 for 146 trainees from 15 NACA Members
 - YSFRI/NACA Online Training focusing on Aquaculture Biosecurity and relevant technologies on 15-20 November 2020 for 279 trainees from 13 NACA Members
 - Education & training cooperation interest with organizations: 5-year MOU with Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) on 7 October 2020

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INFORMATION & NETWORKING

- **IT services development**
 - NACA hosted 5 video conferences with excellent impacts ("new normal" way of working)
 - 5-10 times more people attended a virtual meeting than a physical one with extraordinarily low cost
 - NACA website development with better capability, experience, and manageability
 - Technical production and management of the NACA website and its content is getting more attractive
 - Published under the GNU General Public License V2 and available for use by all members
 - Technical advice/support to partners on information and communication issues
 - GCA+20 website included online interaction and analytics systems with over 1600 registered
 - Maintenance of NACA IT infrastructure
- **Information publication services**
 - Publication production
 - NACA Newsletter, Aquaculture Asia Magazine, Ad hoc technical publications
 - Audio/video production
 - NACA YouTube channel for publication of materials from online training courses and meetings
- **Networking regional capacity resources**
 - Proposed the mechanism of building subject-oriented networks (sNACA)
 - Mobilizing Member's resources to establish all-member-involved, RLC-operated, self-funded, decentralized sNACAs
 - Discussed with Member institutions and enterprises and got positive supports
 - TAG discussion with supports
 - More than 20 Member capacity-resources exchanges with discussion/introduction sNACA mechanism
- **Facilitating regional collaboration among Members**
 - Facilitating regional collaboration requested from Bangladesh Shrimp and Fish Foundation
 - Response to request from India for regional collaboration

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STRATEGY & GOVERNANCE

- **13th Technical Advisory Committee meeting (TAC13)**
 - TAC13 was held virtually on 26-28 August 2020
 - 14 TAC members, 2 Consultants, 2 RLC representatives, 4 organization observers
 - Re-examination and identification of regional priorities and perspectives
 - The overall longitude priorities: Farm. tech. & facilities > Feed & nutrition > Genetics & biodiversity > Biosecurity & health > Safety prod. & proc. > Clim. change & envir. > Economics and finance > IT in aquaculture
 - The overall latitude priorities: Strategy & governance > 1st industry / production > Standard. & certification > College education > Sci. & Tech. Innovation = 2nd industry & trade > Training & extension > Social issues > 3rd industry & culture
- 16 Common issues raised by TAC 13 and were included into the NACA Strategic Plan 2020-2024
- Mechanism for establishing subnetworks on specific subjects and designating centres for the subjects
 - TAG members expressed their supports without demur to the subject-focused network mechanism.
 - The Secretariat requests GC's endorsement to move forward on this mechanism and expects necessary revisions proposed and supported by Member to the NACA Agreement

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STRATEGY & GOVERNANCE (CONTINUED)

Regional priorities

Regional	Genetics & biodiversity	Biosecurity & health	Farm. tech. & facilities	Clim. change & envir.	Feed & nutrition	Safety prod. & proc.	IT in aquaculture	Economics and finance	Average
Strategy & governance	7.6	7.0	7.3	5.9	6.4	6.5	3.9	5.3	6.2
Sci. & Tech. Innovation	7.2	6.7	6.1	5.4	6.1	4.5	2.8	3.1	5.2
College education	6.5	5.0	6.9	4.7	6.6	5.7	3.6	3.2	5.3
Training & extension	5.1	5.1	7.5	3.7	6.7	5.9	4.3	2.8	5.1
Standard. & certification	5.8	5.9	6.2	4.1	6.9	6.3	4.6	3.5	5.4
1st industry / production	6.5	5.8	6.4	5.3	6.1	5.7	4.3	4.7	5.6
2nd industry & trade	4.5	5.8	6.4	3.9	6.6	4.6	4.2	5.4	5.2
3rd industry & culture	3.3	3.3	4.4	4.1	4.7	4.3	3.9	3.2	3.9
Social issues	4.3	4.8	6.4	5.2	5.2	4.7	2.8	5.0	4.8
Average	5.6	5.5	6.4	4.7	6.1	5.4	3.8	4.0	5.2

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STRATEGY & GOVERNANCE (CONTINUED)

- **Global Conference on Aquaculture (GCA) 2020**
 - NACA has collaborate with FAO and MARA to make progresses in the organization of GCA2020
 - Co-establishing and maintaining organization mechanism for GCA2020
 - Coordinated sub-regional and regional reviews on aquaculture development in Asia-Pacific
 - Co-building and maintaining the website and information
 - Participating in preparation of Shanghai Declaration
 - Co-organizing thematic programs
 - Many of the above affairs depended on the promotion of daily trivial and frequent work and communication
 - Specific work processes and details are not listed in this report
- **Acknowledgement**
 - Most importantly, all of this work would not have been possible without the strong support and collaboration of FAO, MARA, and other partners.
 - The Secretariat would like to take this opportunity to express our gratitude to colleagues in FAO, MARA, and other partners, particularly to the co-Chair, Mr. Matthias Halwart and Mr. Xingzhong Liu, for their equanimity and firmness in the face of the unprecedented centurial challenges of the pandemic.
 - I would also like to extend my sincere thanks to our Secretariat staff, especially Yuan and Simon, for their diligence.

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STRATEGY & GOVERNANCE (CONTINUED)

- **Aquaculture governance in Asia-Pacific**
 - Collaboration with FAO on “Regional Consultation on Strengthening Governance of Aquaculture for Sustainable Development in Asia-Pacific and Related Country Review Studies” from January 2019 – December 2020
 - Organized a regional Consultation on Strengthening Governance of Aquaculture for Sustainable Development in Asia-Pacific and consultation on Demographic Changes in Fishing Communities in Asia on 5-7 November 2019 in Thailand, attended by 15 Asian countries
 - Country reviews on aquaculture governance, experiences and lessons, constraints and gaps, recommendations for further actions
 - A monograph was published
 - A important and valuable action, more actions need to be detailed to different governing aspects in aquaculture
- **Participation as an observer in FAO COFI Sub-Com. on 23-27 Aug 2019**
 - NACA totally intervened 10 special topics. Using these opportunities, NACA thanked FAO’s support and expressed our full support for FAO’s strategic approaches, as well as reintroducing NACA to the global aquaculture community
 - Invited presentation on “Profile and Cases of Aquaculture for Sustainable Development in Asia-Pacific” during the session for the Special Event on Better Management Practices and Guidelines for Sustainable Aquaculture Development, which attracted great concerns and interests
- **Participate as an organization observer in the FAO APRC35 on 1-4 September 2020**
 - NACA made 5 comments on 11 items to express our support for FAO RAP’s strategic approaches and our expectation to work with FAO RAP more closely to serve the regional aquaculture development.

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ONE COMMUNITY

- **Upgraded the concept of One Community**
 - The concept treats the regional aquaculture value chain, its stakeholders, and the public as one community with an integration of the issues on gender, youth, humanity, culture, arts, tradition, faith, social, ecosystem, environment, and economics, etc.
 - This concept encourages NACA Members to implement actions on the goal of One Community within their activities. With interest in embracing One Community integration among relevant agencies, NACA aims to build up the vision of Members in all its undertakings and motivate support and action.
- **Gender**
 - Dr. Meryl J. Williams's visited NACA on 9 July 2019 and kindly made valuable recommendations for expert resources and future work on gender
 - Gender issue was analysed in COVID-19 impacts and NACA publications
 - Gender issue was fully addressed in GCA+20 and Shanghai Declaration
- **Aquaesthetics: a human culture issue in aquaculture**
 - Aquaesthetics was proposed to advocate the beauty of aquaculture to the public
 - The contents of aquaesthetics were listed and posted to different people.
 - Eco-friendly aquaculture, ornamental aquatic organisms, culture in aquatic, arts and multimedia, aquatic gourmets, and aquatic healthcare, etc
 - The concept of aquaesthetics could bring job opportunities, enlengthen the value chain, and add value for aquaculture. NACA hopes networks on aquaesthetics will be established
 - Aquaesthetic elements were noticed when we participated in different activities

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GENERAL ADMINISTRATION AND STAFF MATTERS

- **General Administrative Matters**
- **Staff Matters – Interns & Mentors**
 - Ms. Nongluk Pituktamnat, Assistant to Secretariat, 1 July 2018 to 30 June 2019
 - Ms. Li Zhang and Ms. Wenxin Yue, interns selected from SHOU on 20 Mar 2020. Visit aborted due to COVID-19.
- **Associated Members and Partnerships**
 - Secretariat of the Pacific Community (SPC), Associate Member
 - Network of Aquaculture Centres in Central and Eastern Europe (NACEE), Associate Member
 - Asia-Pacific Association of Agricultural Research Institutions (APAARI), Associate Member
 - Bangladesh Shrimp and Fish Foundation (BSFF)
 - The SEA Regional Center for Graduate Study and Res. in Agri. (SEARCA), 7 Oct 2020
- **5 Regional Lead Centres as before, more RLCs for sNACA need to be recognized**
- **2019-2020 activities - accomplished, Planned activities - Strategic Plan**
- **The 30th Anniversary of NACA in 2020 was cancelled due to the postpone of GCA+20**
- **More than 1000 Participations of Members in NACA Activities**
- **Meetings & Documents/Publications, please see Annex**
- **Financial Matters, to be reported tomorrow at the close session**

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NACA STRATEGIC PLAN 2021-2024



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ASIAN AQUACULTURE IN PERSPECTIVE

- **Vital to food security**
 - 90% of global aquaculture production is produced in Asia
 - Fish is the most affordable source of animal protein in developing nations
 - Another 28 million tonnes needed by 2030
 - Aquaculture plays an important role in human health and nutrition
- **Diversity in production**
 - Asia-Pacific aquaculture has the highest diversity in the world (species, systems)
 - Wide differential in the practices and level of industrialisation between countries
- **Adaptation of the industry**
 - Family-operated farms still a major source of rural income and employment
 - Unstructured operations and skills shortages must be addressed through capacity building
- **Risks in development**
 - Many risks to the sustainable development of the industry
 - Risks include biosecurity, environment, food safety and climate change
 - Sector is subject to shocks, but emerging issues are difficult to foresee (e.g. COVID)
- **Needs for regional cooperation**
 - Aquaculture has become a regional activity Many common issues are transboundary and can only be solved working together
 - Pooling of member's technical expertise and resources is efficient and cost-effective
 - Exchange of ideas, technologies, materials and trade contributes to regional prosperity and friendship between countries

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NACA STRUCTURE

- **Framework**
 - Member Governments and Associate Members
 - Governing Council
 - Technical Advisory Committee
 - Regional Lead Centres and participating Centres
 - Regional Reference Laboratories, Resource Centres, and Resource Experts
 - Advisory Group on Aquatic Animal Health
 - Subject-oriented Networks (sNACA)
 - Secretariat

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NACA STRUCTURE

- **19 Members**
 - Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Indonesia, I.R. Iran, Korea (DPR), Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam
- **3 Associate Members**
 - APAARI, NACEE, SPC
- **5 Regional Lead Centres (more planned)**
 - Freshwater Aquaculture Research and Development Center, Thailand
 - Freshwater Fisheries Research Center, China
 - ICAR-Central Institute of Freshwater Aquaculture, India
 - Iranian Fisheries Research Organization, I.R. Iran
 - SEAFDEC Aquaculture Department, Philippines

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NACA STRUCTURE

- **Subject-oriented networks (sNACA): A new initiative to strengthen network capacity**
 - Recognise the competency of institutions, laboratories in specific fields
 - Improve linkages between centres with similar interests
 - Increase visibility and accessibility of network expertise to all Members
 - sNACA networks may play an active role in developing and implementing collaborative activities on behalf of NACA
- **GC endorsement of concept is requested**

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KEY ACHIEVEMENTS

- **Human resource development**
 - Key role in regional capacity building in aquaculture development
 - Thousands of alumni, many are industry leaders and senior officials in government and academia
- **Forefront of global policy development**
 - Global Aquaculture Conferences
 - International Principles for Sustainable Shrimp Aquaculture
 - Technical Guidelines on Responsible Movement of Live Aquatic Animals
 - Transboundary issues

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KEY ACHIEVEMENTS

- **Aquatic animal health**

- Pioneered development of strong regional network of experts and laboratories

- **Better management practices**

- Development of improvement management practices for key aquaculture sectors/systems
 - Shrimp
 - Pangasius
 - Culture-based fisheries

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STRATEGIC PLAN

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WORK PROGRAMMES

- **5 Thematic work programmes**
 - Productivity and Sustainability
 - Health & Biosecurity
 - Genetics & Biodiversity
 - Safety & Quality
 - Emerging Regional and Global Issues
- **4 Cross-cutting programmes**
 - Education & Training
 - Information & Networking
 - Strategy & Governance
 - One Community

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IMPLEMENTATION

- **Work programmes implemented through collaborative projects and activities of RLCs, sNACAs and Member governments**
 - Centres take lead in project implementation
 - Secretariat plays coordinating role and seeks external funding sources
- **NACA works in close cooperation with FAO, Associate Members, donors, and other partners**

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PRODUCTIVITY & SUSTAINABILITY: KEY ACTIVITIES

- **Establishing sNACA on subjects for innovations and new industries ***
- **Compiling annual reports on regional aquaculture development ***
- **Promoting global and regional initiatives for sustainable development**
- **Organising technical consultations ***
 - Environmental monitoring / protection / carrying capacity and zoning of aquaculture production areas
- **Promoting sustainable intensification of aquaculture**
 - Developing strategic policy frameworks in guiding governments and development agencies
- **Developing BMPs for key aquaculture production systems ***
- **Cluster-based approaches to capacity building of small-scale farmers ***
- **Developing culture-based fisheries as secondary use of water bodies**

*** Prioritised activities**

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PRODUCTIVITY & SUSTAINABILITY: SNACA

- **sNACA possibilities:**
 - Rice-fish (strong interest received) *
 - Smart farming and AI
 - Culture-based freshwater fisheries (regional workshop organised)
 - Marine cage culture
 - Artificial reefs and ranching
 - Cold-water aquaculture
 - ...

*** Pilot sNACA subjects**

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HEALTH & BIOSECURITY: KEY ACTIVITIES

- **Annual Advisory Group Meeting on key health issues ***
- **QAAD report system ***
- **Early warning, disease cards, and advisories on EDs ***
- **Establishing information-sharing platform for health resources**
- **Building regional capacity in health and biosecurity**
- **Developing sNACAs ***
- **Coordinating regional actions to improve health services ***
- **Regional actions on PMP/AB in collaboration with FAO ***
 - A concept note provided.
 - NACA has signed LoA with FAO for 2021's plan.
 - Members' supports and involvements are requested.

* **Prioritised activities**

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HEALTH & BIOSECURITY: SNACA

- **sNACA possibilities:**
 - Shrimp biosecurity (proposal received, training and webinars organised) *
 - Diagnostic technologies
 - Vaccine technologies
 - Aquaculture microbiome and probiotics
 - Targeted surveillance programmes
 - Regional transboundary disease control
 - ...

* Pilot sNACA subjects

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GENETICS & BIODIVERSITY: KEY ACTIVITIES

- **Establishing sNACAs ***
- **Information sharing platform for certified varieties ***
- **Building capacity in genetic resource management**
- **Guidelines for the identification of genetic resources**
- **Genetic improvement and conservation programmes**
- **Facilitating the responsible exchange of germplasm ***

*** Prioritised activities**

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GENETICS & BIODIVERSITY: SNACA

- **sNACA possibilities:**
 - Genetic improvement of shrimp
 - Genetic improvement of tilapia
 - Artemia genetic resource characterization (webinar organised and interest received)
 - Micro-algae aquaculture
 - Seaweed aquaculture (proposal received) *
 - Ornamental fish aquaculture (interests received)
 - ...

*** Pilot sNACA subjects**

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SAFETY & QUALITY: KEY ACTIVITIES

- **Establishing sNACAs**
- **Regional information sharing platform ***
 - Feed, ingredients and additives
- **Coordinating actions on AMU/AMR in aquaculture ***
- **Consultations, webinars and training courses ***
- **Safety and quality issues related to standards and trade**

* **Prioritised activities**

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SAFETY & QUALITY: SNACA

- **sNACA possibilities:**
 - Antibiotic residue and resistance
 - Microbial food safety issues
 - Feed and nutrition for specific species
 - Aquatic food processing technologies
 - ...

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EMERGING REGIONAL & GLOBAL ISSUES

- **COVID-19 impact mitigation strategies and consultations ***
- **Climate change vulnerability, impact and mitigation ***
- **Policy guidance on emerging issues**
- **Contributing to dialogues on fish meal and oil in feeds**
- **Catalytic role in south-south cooperation**

*** Prioritised activities**

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EMERGING REGIONAL & GLOBAL ISSUES

- **sNACA possibilities:**
 - Carbon sinks in aquaculture
 - Dimethylsulfide and algae
 - Climate change adaptation and mitigation
 - Fish meal and oil replacement
 - ...

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EDUCATION & TRAINING: KEY ACTIVITIES

- **Information sharing platform on aquaculture education ***
- **Assisting Members to increase the skilled resource base ***
- **Identifying training needs for aquaculture development**
- **Organising training modules and materials in support of needs**
- **Facilitating exchange programmes**
- **Facilitating routine education and training activities of NACA ***

*** Prioritised activities**

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INFORMATION & NETWORKING: KEY ACTIVITIES

- **Communicating outputs of work programmes and sNACAs ***
- **Virtual consultations, workshops & webinars on aquaculture ***
- **Producing online video and audio content on aquaculture ***
- **Developing NACA's website and cloud infrastructure ***
- **Building the capacity of partners and sNACAs in website management and online publishing**
- **Building web-based databases on aquaculture resources ***
- **Producing NACA's serial publications ***
- **Developing internal information databases for the Secretariat**

*** Prioritised activities**

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STRATEGY & GOVERNANCE: KEY ACTIVITIES

- Meetings on strategy, global initiatives and governance issues *
- Actions for Blue Transformation and Shanghai Declaration *
- Building a platform on policies and strategies for emerging issues
- Conducting actions to improve aquaculture governance *
- Studies on strategies, policy regulations and standards
- Actions to promote assessment of governance performance
- Cooperation amongst members, partners and the private sector *
- Management of water resources *

* Prioritised activities

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ONE COMMUNITY: KEY ACTIVITIES

- Organising symposia on One Community *
- Capacity building on One Community
- Issues of ageing farmers and need to attract youth *
- Harmonisation with regional and international standards *
- Developing the One Community concept in education
- Consultation on efficient and socially inclusive value chains *
- Conducting in-country One Community assessment reports
- Publishing case studies and success stories *
- Campaigns and policy advocacy for One Community *

* Prioritised activities

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RESOURCE MOBILISATION

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TECHNICAL CAPACITY MOBILISATION

- **Improve networking between resource centres, laboratories and technical experts**
- **Move events online and create virtual networking platform based on video conferencing**
- **Promote research-education-industry collaboration**
- **Annual reports requested and shared through NACA website**

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MATERIAL RESOURCE MOBILISATION

- **Development of web-based information systems to collect and share data on material resources of common interest**
- **Collaboration and sharing of data by Members' welcome**

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INFORMATION RESOURCE MOBILISATION

- **Expand the range of content offered through the NACA website and Youtube channel**
- **Explore the possibility of video-based training courses and educational content**
- **Drive engagement through social media and email newsletters**
- **Members and Associate Members welcome to advertise their training courses, events and publications via NACA channels**

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FINANCIAL RESOURCE MOBILISATION

- **Propose to establish a NACA Trust Fund, funded from annual savings, project residues & donations**
- **sNACA activities can be self-funded, sponsored, or via fees e.g., training courses, administrative fees**
- **Request Member Governments to approve the increment of financial contributions proposed during GC 30.**

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THANK YOU

- **Discussion, comments, suggestions**

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Global Conference on Aquaculture Millennium +20

Key outcomes

A brief report by the IOC Co-Chairs

Matthias Halwart, FAO
LIU Xinzhong, MARA
HUANG Jie NACA

NACA Governing Council Meeting 29 November 2021

Background

The GCA +20, held in Shanghai, China, 22 to 25 September 2021, was the fourth major aquaculture-related event since 1976.

First raised during NACA's 29th Governing Council Meeting (Malé, Maldives) the proposal to hold the GCA+20 was raised to FAO during its 33rd Session of the Committee on Fisheries.

COFI 33 requested FAO to collaborate with NACA with preparations for a GCA +20, as was done previously in 2000 and 2010, and COFI 34 welcomed the holding of the GCA +20 and encouraged all Members to participate in it.

Attendance

Of the >2700 people who registered their interest via the GCA +20 website, a total of 1728 participants from 113 countries attended the conference (500 in-person, 1228 online).

Participants represented a range of different stakeholders (IGOs/INGOs, public/private sectors; education, research and extension workers; producers groups; traders; civil society organizations (youth, development, research, food, gender, environment etc.)

Technical programme

Keynote addresses	3
Invited guest lectures	3
Regional reviews of aquaculture	6
Global synthesis of aquaculture	1
Thematic sessions (presentations and panels)	9
Expert panelists	47
Academic posters	113
Special Artemia workshop	1

Over 24 hours of recordings available at the following links:

	Plenary	Stream 1	Stream 2	Stream 3
Day 1	Link	Link	Link	Link
Day 2	Link	Link	Link	Link



Conference objectives

- **Review** status, trends and emerging issues in aquaculture development
 - **Identify** opportunities and challenges in aquaculture and its contributions to sustainable development
 - **Evaluate** the progress of aquaculture development in light of previously recommended strategies and policies at regional and global level
 - **Build** consensus on priorities and actions needed for advancing aquaculture as a global, sustainable and competitive food production sector
-



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Regional reviews



Regional + Global reviews

Asia and the Pacific

Europe

Latin America and the Caribbean

Near East and North Africa

North America

Sub Saharan Africa

Global Synthesis

Recordings and advanced drafts available:

www.aquaculture2020.org/regional



Global Synthesis: key messages

- Aquaculture continues to grow
- Aquaculture – one of the most diverse food producing sectors
- Innovation is happening and should continue
- Aquaculture is not homogenous globally, nor within regions
- Diverse aquaculture products
- Aquaculture is efficient user of fish meal and aquafeeds
- Aquaculture can and should provide decent employment
- Trade in aquaculture products is important, diverse within and among regions
- Market tools to promote sustainability have potential
- Aquaculture produces nutritious and safe food and should emphasize health
- Climate change and COVID-19 are major external factors causing impacts
- Good governance is increasing but more is needed
- Aquaculture stakeholders need to proactively work to improve its image
- Aquaculture can help achieve Agenda 2030, its SDGs and other international commitments

See the keynote speech here:

www.fao.org/webcast/home/en/item/5640/icode



Thematic reviews



Thematic reviews

Aquaculture systems

Innovation in aquaculture

Transforming aquaculture to achieve the SDGs

Aquaculture feed and feeding

Aquatic genetic resources and seed supply

Biosecurity: reducing the burden of disease

Dynamics of aquaculture governance

Social and human dimensions of aquaculture

Value chains and market access for
aquaculture products

Advanced drafts available here:

www.aquaculture2020.org/thematic



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The [Shanghai Declaration](#) was first outlined and developed by an invited group of experts, informed by regional and thematic aquaculture reviews commissioned by FAO in 2020 in advance of the Global Conference on Aquaculture Millennium +20.

The [Shanghai Declaration](#) consists of [a vision](#) for sustainable aquaculture, [5 overarching commitments](#) and [10 strategic priorities](#). The strategic priorities are further elaborated in a Call for Action which contains indicative actions to help achieve the vision for sustainable aquaculture.



The Shanghai Declaration

The [Shanghai Declaration](#) was unanimously adopted by the participants, and over 40 organizations provided written statements of support. About 20 organizations spoke to plenary during the GCA +20. Pledges and statements of support are available on the GCA +20 website;

The [Shanghai Declaration](#) is a [participants' declaration](#), representing an important step towards building consensus based on all the information and discussions of the GCA+20; regarding its status, it is not a document negotiated by FAO Members and hence is not endorsed by FAO nor determines FAO's priorities;

The [Shanghai Declaration](#) can be read in 6 languages here: www.aquaculture2020.org





Next steps

- A report on the outcomes of the GCA+20 will be presented to FAO Members at the next session of the FAO COFI Sub-Committee on Aquaculture
- Today: Interventions by NACA Members and Organizations on the GCA+20



Thank you!



Statement from CIRDAP by Dr. Cherdsak Virapat

at the 31st NACA Governing Council Meeting (GCM31)

held virtually on 29 November 2021

Excellency, Chair, Vice Chair, Governing Council Members, Regional Lead Centres, International & Regional Organization representatives and Partners, DG NACA and Colleagues, Ladies and Gentlemen

Greetings from CIRDAP (The Centre on Integrated Rural Development for Asia and the Pacific).

First of all, on behalf of CIRDAP, I would like to thank NACA for inviting me to attend the meeting. I would like to sincerely congratulate NACA and FAO and to express my sincere appreciation to the Government of People's Republic of China for hosting the Global Conference on Aquaculture Millennium +20 in September 2021 with significant achievements. I pledged a joint statement between CIRDAP and NACA on building climate resilience in Aquaculture and Agriculture Systems at the GCA+20 on 24 September. The Conference was a really great success and with important commitments by multi-stakeholder towards the 2030 Sustainable Development Goals.

I would also like to congratulate DG Huang Jie and his able team on the initiatives in developing of the NACA 5-year Strategic Plan 2020 – 2024 and important progress made during the last two years.

NACA and CIRDAP ultimate beneficiaries are farmers and rural communities. CIRDAP shares 12 member countries in Asia and the Pacific with NACA. With combing efforts, 21 member Governments and respective beneficiaries are directly benefits from their relevant programme activities.

CIRDAP is an intergovernmental organization which promote integrated rural development through regional cooperation in Asia and the Pacific region with 15 member countries, Bangladesh is the Host State. Its policy bodies are Governing Council consisting of the Ministers of relevant Ministries.

CIRDAP has been collaborating with NACA since 2020 in preparation and submission of two project proposals relevant to seaweed and information & communication on climate smart farming to the EU Horizon 2020. In 2021, CIRDAP co-organized the seabass and hilsa culture webinar with Thailand's

Department of Fisheries and Bangladesh Fisheries Research Institute on 15 January and the e-commerce in agriculture sector for rural transformation: Learning experiences from Thailand webinar in collaboration with Bangladesh on 26 October. We have now scheduled to meet on 11 January 2022 at NACA to discuss technology transfer and capacity building on seabass culture for Bangladesh in collaboration with BSFF and Thai Union Feedmill PCL.

In 2022, CIRDAP is planning to organize its 33rd Executive Committee and 23rd Governing Council Meetings virtually during 19-21 April hosted by Thailand's Ministry of Agriculture and Cooperatives. I am pleased to invite NACA to attend the meetings. Also, in case we reach the endpoint of the pandemic in October, CIRDAP will organize its 37th Technical Committee Meeting physically in Thailand. We plan to organize a conference back-to-back and will be pleased to invite NACA to cooperate in organizing the Conference relevant to production sector for rural development.

Last but not least, CIRDAP looks forward to cooperating and collaborating with NACA, FAO and partners to follow up on the GCA+20 and on the proposed building of climate resilience in aquaculture and agriculture systems as well as other relevant activities in the years to come. Thank you.



Bangladesh Shrimp and Fish Foundation

Flat-5A, House-3, Road-4, Banani, Block-F, Dhaka-1213, Bangladesh
 Tele: +88-02-222293406, Fax: +88-02-9891056, Website: www.shrimpfoundation.org

31st NACA Governing Council Meeting (GCM31)
29-30 November 2021 9:00 am (Dhaka Time)

Zoom Meeting Link:

<https://us02web.zoom.us/j/84192600356?pwd=MzArZ052cGZobmhTS1Z3c1FVeEx5Zz09>

Meeting ID and passcode:

Meeting ID: 841 9260 0356, Passcode: 625641

Statement from
Syed Mahmudul Huq
 Chairman
Bangladesh Shrimp and Fish Foundation

Mr. Chairman,

Distinguished members of the Governing Council of NACA,

Ladies and Gentlemen,

I am indeed honored to join you during the important meeting of the 31st session of the Governing Council of NACA and represent the Bangladesh Shrimp and Fish Foundation, a Business Support organization working in the areas of research, advocacy, creating enabling conditions for sustainable growth of aquaculture sector in Bangladesh and equally vital area of promotion of regional cooperation in these areas. Our cooperation with NACA within the framework of the MOU that we have with you is specially valued by us as particularly important to pursue some of common shared priorities which may help all our countries and people. I would like to specially thank you for inviting us to participate in the 31st Session of the Governing session of NACA.

The report of the Director General, which we have had the privilege to listen to, outlined how comprehensively and with a meticulous seriousness NACA has completed yet another cycle of its activities. We can see from his report that even in the midst of a global pandemic of unprecedented magnitude NACA has risen to the challenges of continuing the useful work and cooperation to sustain the development of fisheries and aquaculture. The Director General, his team and the member countries deserve all our profound thanks and deep appreciation for their good work.

The 31st session of the Governing session of NACA is taking place when we still remain deeply worried about the immediate and long term impact of the COVID-19 on our sector, our countries, our communities and our people. By now a sizeable amount of research and works have shown how widespread the negative impacts of the pandemic have been. The relevant findings in this regard have also made it absolutely clear that no single country can hope to overcome the COVID related challenges alone. Cooperation and more cooperation are needed now so that we are able to overcome our difficulties together.



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Only recently the momentous Global Conference on Aquaculture Millennium +20 to support the Shanghai Declaration has adopted a most timely strategy to support fisheries and aquaculture sector. Bangladesh Shrimp and Frozen Fish Foundation also pledged our full support to the broad objectives and the strategy for **Action for the Future** adopted on the occasion. We reiterate the same pledge on this occasion of the meeting of your Governing Council. We are ready, as your partner, to help play this vital role. We shall eagerly look forward to the positive outcomes of the 31st session of the NACA Governing Council for concrete guidance and well worked out plans which will help us to make concrete contribution for realization of pragmatic, timely and achievable objectives which will help us all.

We believe that we can do many important things at this important point of time at several levels. They may include, among others, the following:

- **Government to Government:** Within the framework of Joint Working Groups in the Fisheries Sector among different member countries, Inter Governmental Organizations (IGO) like Network of Aquaculture Centres in Asia-Pacific (**NACA**), Centre on Integrated Rural Development for Asia and the Pacific (**CIRDAP**), **INFOFISH**, Bay of Bengal Program (**BOBP**), Southeast Asian Fisheries Development Center (**SEAFDEC**), the Governments in the region may:
 - i. share their experiences on the details of the national recovery packages, especially post-COVID, for the fisheries and aquaculture sectors, their coverage, resources being allocated and delivery mechanisms
 - ii. enhance the crisis response/ mitigation capacity by learning from each other as to what works and what does not
 - iii. we can develop frameworks of cooperation both at bilateral and regional level to facilitate transfer of technologies, private sector investments with enabling Government support, trade and commerce.
- **Private to Private:**
 - i. The countries in the region offer a formidable consumer base providing a unique opportunity to strengthen and align our regional production potentials with our own consumer needs. The increased exports and imports between and among our countries and, vice versa, can help all of us open up opportunities for production augmentation, regional investment with buy back arrangements and significant economic gains.
 - ii. Bangladesh being the most vulnerable country in terms of climate change, there is already inclusion of saline water into the inland river system due to rise in sea level, threatening the livelihood of the people engaged in the farming of rice, vegetables, dairy and poultry. It is in this context that the brackish water aquaculture offers huge potential for culture of species like seabass, mullet, mud-crab, eel and seaweed. The private sector of the member countries may join efforts of Bangladesh to harness this potential with their technology, experience and resources.



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- **Institution to Institution:** There is a huge potential for developing partnership between and among R&D institutions, industry and academia in the region for development of sustainable aquaculture.

I believe the few ideas that I have presented will receive your considered attention.

Thank you very much for giving me the opportunity to participate in your deliberations and discussions. Let me also express my fervent hope in the conclusion that all our constructive and forward looking discussions and actions will positively help us to advance our common objectives.

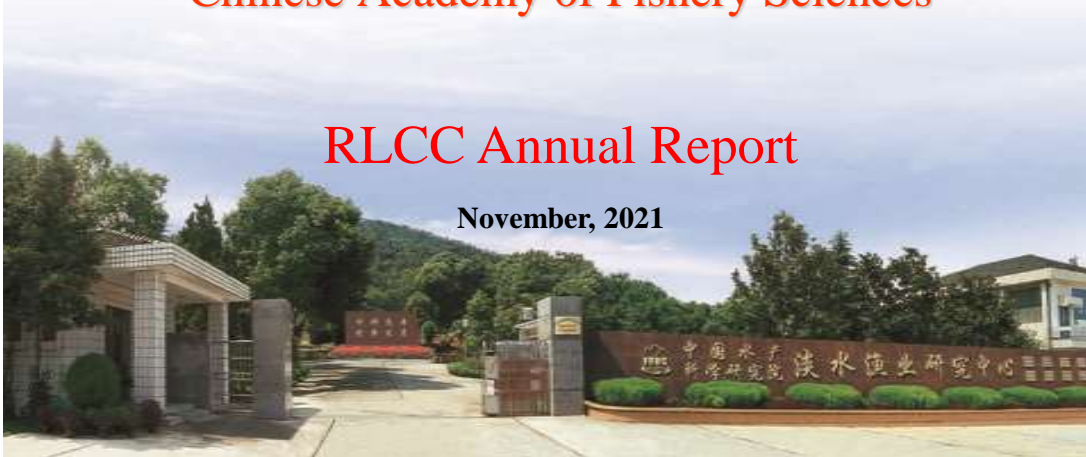
Thank you.



Freshwater Fisheries Research Center of Chinese Academy of Fishery Sciences

RLCC Annual Report

November, 2021



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Contents



- I. Fishery development in a new era 新时期渔业发展
- II. Research project 研究项目
- III. Technological supports 技术支持
- IV. International cooperation 国际合作
- V. Work plan for 2022 下一步工作计划

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I. Fishery Development in a New Era

新时期渔业发展

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Agriculture Development Strategy (农业发展战略) when Socialism with Chinese characteristics enters a New era

Rural revitalization strategy to improve the living standards of the peasants: 提高农民生活水平的乡村振兴战略:

- Supply-side structural reform
- Green development of agriculture
- Victory in the fight against poverty (2020)

The goal for fishery development: 渔业发展目标:

- Improve quality and efficiency
- Reduce production and increase income
- Green development
- Rich fishermen



4

Major Challenge挑战



- The demand for high quality and safe aquatic products and beautiful ecological environment of waters对优质安全水产品 and 优美水域生态环境的共同需求
- The structural contradiction of aquatic product supply and the overutilization of fishery resources and environment水产品供给与渔业资源环境过度利用的结构性矛盾

Therefore, the priority for future development of fishery should be:未来渔业重点

- Green and efficient
- Safe and standardized
- Integrated and open
- Resource-saving
- Environment-friendly

5

发展思路 Countermeasures



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II. Research Projects

科研项目

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Research capacity 实力

- Leading scientists:
MARA:2, CAFS:4
- R&D center for MARS: carps and high value species
- 10 post scientists for carps, high value species
- 11 PhD tutors assigned by NAU

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Research achievements 成果

- Paper: 619 (SCI/EI : 318)
- Book:6
- authorized patents 94 (invention patents: 45)
- New strains of river crab, common carp, river prawn(*Macrobrachium nipponense*) and *Takifugu obscurus*



中国水产科学研究院淡水渔业研究中心

9

Prizes for research 奖项

- Total: 27 prizes
 - National level prizes: 2
 - Ministerial and provincial level prizes: 15



中国水产科学研究院淡水渔业研究中心

10

Major technology breakthroughs 技术突破



- Making a breakthrough in artificial breeding of freshwater drumfish for the first time 淡水大黄鱼
- Solenia oleivora artificial breeding 橄榄蛭蚌全人工繁育关键技术
- Break through key technologies such as live marking, paternity testing, high-throughput character determination, and non-invasive genetic evaluation of river prawns
- 青虾繁育技术



中国水产科学研究院淡水渔业研究中心

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III. Technological Supports

技术支持

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为地方渔业产业发展提供技术支撑

Provide technical support for the development of local fishery industry



于康震副部长视察技术支持产业 邀请院士团在哈尼梯田开展调研 任振鹤副书记视察技术支持产业



开展长江渔业资源增殖



助推青虾产业发展



为稻渔综合种养提供技术支持

中国水产科学研究院淡水渔业研究中心

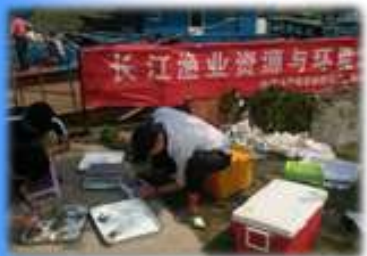
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助力长江大保护



∅ Fishery resource in lower reach of Yangtze River

∅ Law enforcement activity in Yangtze River



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Technical training and consultation for local fishery development 地方渔业发展的技术培训和咨询



- Training: 43 courses
- Participants : over 7300 from Jiangsu, Anhui, Ningxia, Jiangxi, Shandong, etc..



中国水产科学研究院淡水渔业研究中心

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Technological supports to enterprises 为企业提供技术支持



- **Jointly established**
 - Crab research institute
 - Crayfish research institute
 - Life science institute
 - Aquatic germplasm resource institute
- **Signed 37 agreements with local enterprises**



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Education in fishery 高等教育



Higher education in FFRC covers BsC, MsC and PhD both for domestic and international students with the joint cooperation with NAU



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IV. International Cooperation

国际合作

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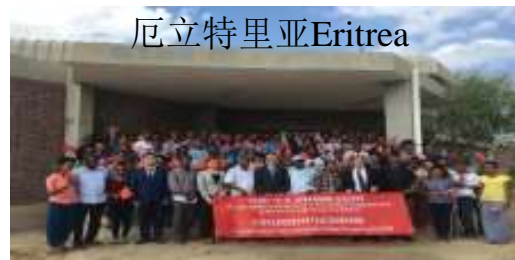
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Technical training programs 国际培训



Ø Projects: 45

Ø Participants : over 2320 fishery officers and technicians from over 60 countries



厄立特里亚 Eritrea

埃及 Egypt

中国水产科学研究院淡水渔业研究中心

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Virtual training programs in 2021 线上培训



20

Technical consultation 海外技术咨询



Ø 23 delegations have been dispatched to 16 countries for technical consultation and exchange



Ø Specialists in Indonesia

Ø Specialists in Thailand

Ø Specialists in Cambodia

中国水产科学研究院淡水渔业研究中心

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Collaborative research projects 国际科技合作



Sn.	Partner	Field
1	Auburn University; Virginia Tech	tilapia industry development; Mollusks
2	Sri Lanka, Myanmar	Carp and tilapia seed; rice-fish farming
3	HAKI	Constructed wetland, quality and safety of aquatic products
4	Slovakia	Fish disease prevent and treatment, improvement of fish immunity
5	University of Tokyo	Fishery resource management in open waters
6	inland fishery research institute of South Korea	Peal culture, IFF
7	FAO	value-chain and industry chain
8	Netherlands&Africa	Capacity building&Technology Transfer

22

Academic exchange and knowledge share 国际学术交流与知识分享



112 scientists participated in 33 international academic symposiums (offline and online) in 2019-2021



Attending GAC by Prof. XU



Workshop in Nertherlands



World Earth Day



Workshop in Uganda



Workshop South-south cooperation

中国水产科学研究院淡水渔业研究中心

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Platform establishment for "B&R" cooperation 一带一路合作平台建设 (淡水渔业科创院)



Responsible for taking the lead in building the "Science and Innovation China"- "Belt&Road" Innovation Institute for International Freshwater Fishery Industry Science and Technology Cooperation



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V. Work plan for 2022

工作计划

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Work plan for 2022

- **Capacity building for young scientists**
青年专家能力建设
Special research fund, academic exchange, CSC scholarship, collaborative research
- **Research and development of aquaculture technology**
养殖技术的研究开发
New variety for aquaculture, new model of aquaculture, quality feed development, immunity of aquatic animals, endangered species protection and utilization, information and things of internet, basic genetics of aquatic animals (Genome)
- **Technical extension and demonstration**
新技术推广与示范
New strains of species, new technology and model, etc.

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Work plan for 2022



- **Training and education**

 - 培训和教育**

 - Interns, degree education, overseas students program and international training program, etc.

- **International Cooperation and Exchange Programs**

 - 国际合作与交流项目**

 - Partnership with FAO, NACA and other NGOs, proposal for collaborative research, academic exchange and staff exchange

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31st GCM of Network of Aquaculture Centers in Asia Pacific 25-26 October 2021

Ushering Sustainable Freshwater Aquaculture for Nutritional Security & Livelihood Improvement



Regional Lead Centre on Carp Farming, India
ICAR- Central Institute of Freshwater Aquaculture
 Kausalyaganga, Bhubaneswar, Odisha, India

Saroj K Swain, PhD
DIRECTOR

1

ICAR-CIFA – A Quick Glance

VISION

Making Indian freshwater aquaculture globally competitive through eco-friendly and economically viable fish production systems for livelihood and nutritional security.

MISSION

Excellence in research for developing sustainable and diversified freshwater aquaculture practices for enhanced productivity, quality, water use efficiency and farm income

MANDATE

1. Basic and strategic research for the development of sustainable culture systems for freshwater finfish and shellfish;
2. Species and systems diversification in freshwater aquaculture; and
3. Human resource development through training, education and extension



ICAR-CIFA

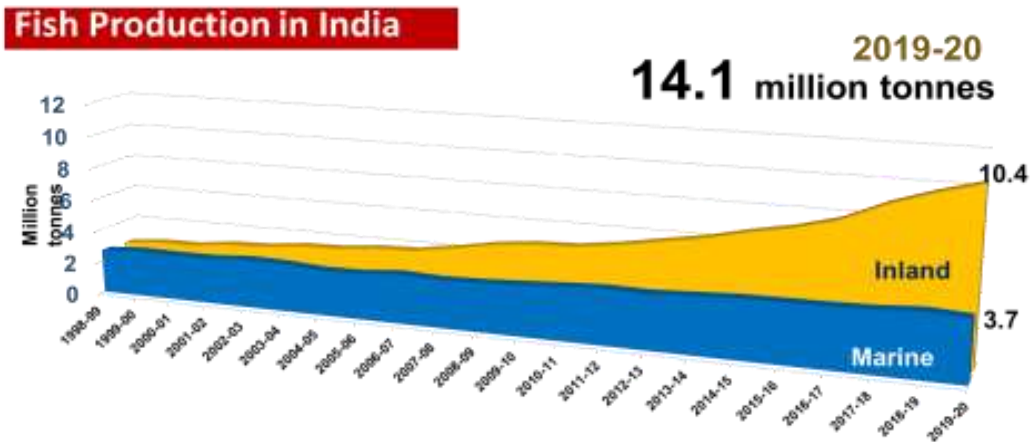
Grow Fish... Grow with Fish...

2

India's Aquaculture Potential and Production

Resources

- 2.4 million ha of ponds and tanks
- 1.07 million ha of derelict waters
- 0.12 million km of canals
- 3.15 million ha of reservoirs
- 0.72 million ha upland lakes



ICAR-CIFA

Grow Fish... Grow with Fish...

3

Our Strategies

- 1 To enhance the mean aquaculture productivity of ponds and tanks to **>5 t/ha** from existing 3 t/ha
- 2 Emphasis on quality seed production and supply of diversified finfish and shellfish species
- 3 Incorporation of 15-20 diversified species of finfish and shellfish for commercial production systems
- 4 Cost effective feed technology and farm made feed preparation strategies
- 5 Quality diagnostics, vaccines and other therapeutics
- 6 Affordable farm mechanization, gadgets for automation in aquaculture
- 7 To develop climate Resilient aquaculture technologies
- 8 Aquaculture as a major option for livelihood and nutritional security
- 9 Digital technology dissemination systems for enhanced information flow

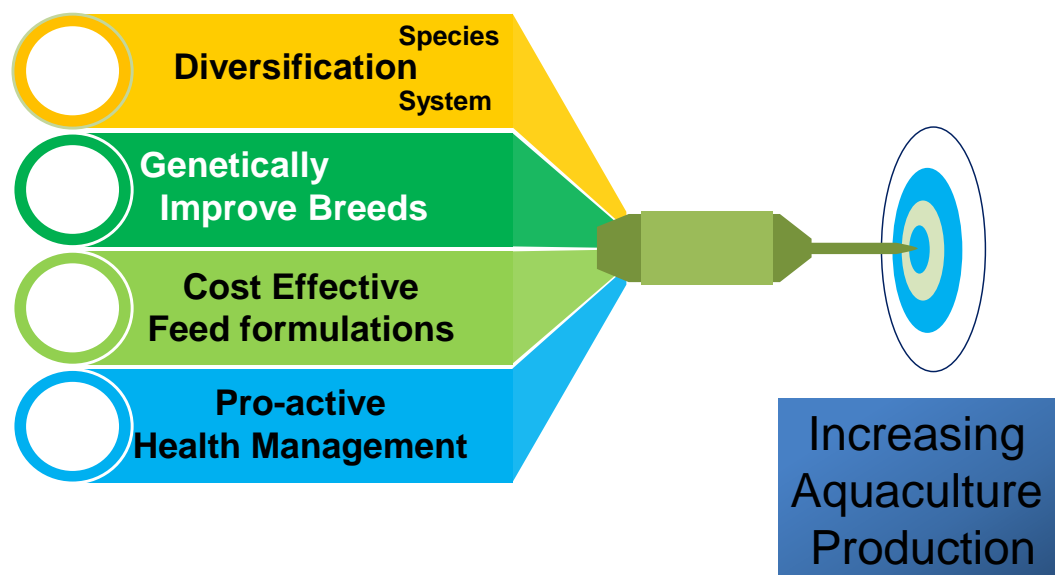


ICAR-CIFA

Grow Fish... Grow with Fish...

4

ICAR-CIFAs Strategy for Sustainable Fish Production



ICAR-CIFA

Grow Fish... Grow with Fish...

5

ICAR-CIFA Technologies

- **Technology Packages** - 20 + Food Fishes, 15 + Ornamental Fishes
- **Genetically Improved fish varieties:** Jayanti Rohu, CIFA GI Scampi, Improved Catla, Shining Barb
- **Therapeutic & preventive Aids:** CIFAX, Immunoboost-C, CIFACURE
- **FRP portable hatcheries:** Portable Carp Hatchery, Magur Hatchery
- **Fish semen Preservation:** CIFACRYO
- **Feed for carps:** CIFABROOD for early maturity, Carp Nursery Feed : CIFA Carp Starter, Carp Grower Feed:
- **Diagnostic Kits:** Spot Agglutination Kit, Dot ELISA Kit for on-farm diagnosis of bacterial diseases
- **Nanotech based products:** Nanoplus@CIFA- Zinc Selenium nanomixture for growth stimulation and disease resistance in carps
- **Waste Utilization:** Fish Hydrolysate

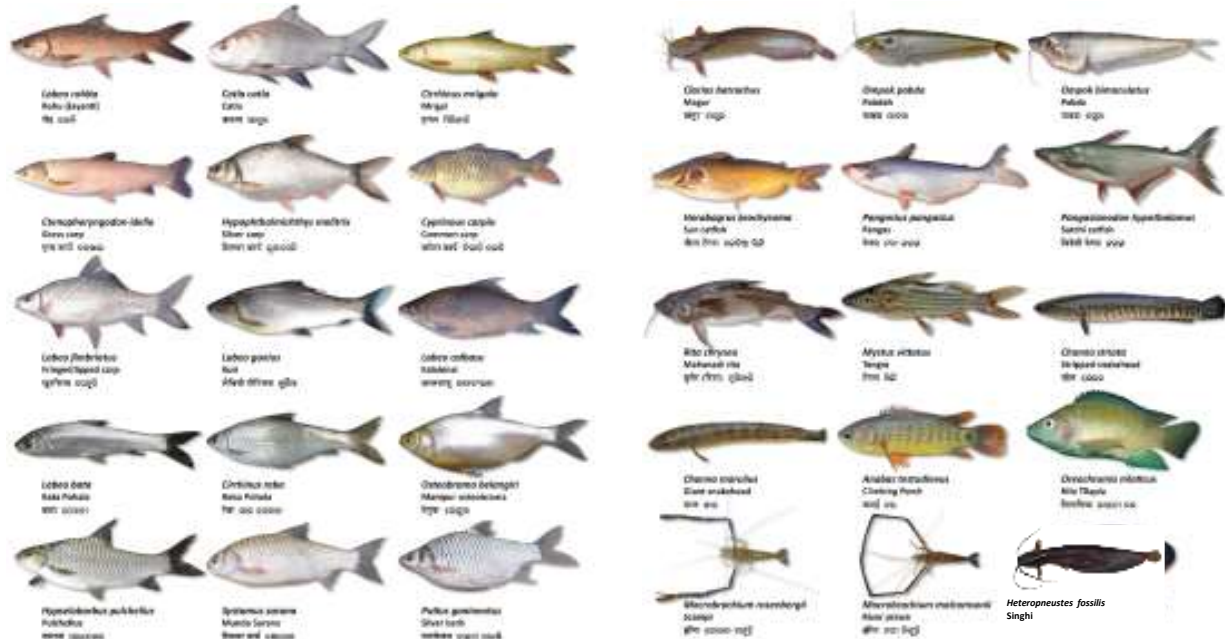


ICAR-CIFA

Grow Fish... Grow with Fish...

6

Species Diversification



ICAR-CIFA

Grow Fish... Grow with Fish...

7

Ornamental Aquaculture



ICAR-CIFA

Grow Fish... Grow with Fish...

8

System Diversification

Re-circulatory Aquaculture System- RAS



Integrated farming system -IFS



Aquaponics System



Bio-floc technology (BFT)

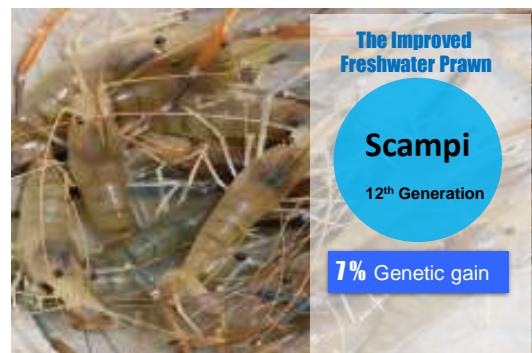


ICAR-CIFA

Grow Fish... Grow with Fish...

9

Breed Improvement: Rohu, Catla, Scampi, Shining barb



ICAR-CIFA

Grow Fish... Grow with Fish...

10

Cost Effective Feed Formulations

- ❑ Developed **Species specific pellet feed** or carp, catfish and prawn
- ❑ Development of **specific broodstock diet – CIFABROOD™**
- ❑ **Farm made feed** for small scale aquaculture
- ❑ Appropriate feeding devices



Feed formulations of ICAR-CIFA



Farm made feed making

Developed the Fish Feed Standards for BIS (Bureau of Indian Standards), New Delhi

Pro-active Health Management

CIFAX - an effective formulation against Epizootic Ulcerative Syndrome which often causes large scale fish mortality and crop loss in commercial aquaculture

Immunoboost - C, enhances the immune system of fish

CIFACURE - Specialised therapeutic formulation for ornamental fishes

Developed seven numbers of diagnostics for rapid diagnosis of fish ailments due to common bacterial and transboundary viral pathogens



Notable Developments

- Broodstock development and breeding of indigenous golden snakehead, *Channa stewartii* in captivity
- Development of protocol for natural spawning of *Channa striata* in concrete tanks under captive condition
- Successful breeding of *Hypselobarbus pulchellus* and *Puntius carnaticus* achieved during summer months
- Breeding and seed production protocol for *Mystus cavasius* has been developed
- Off-season and multiple breeding of *Heteropneustes fossilis* catfish
- The “endangered” Deccan Mahseer (*Tor khudree*) could be induced bred.
- Biofloc system (BFT) and organic fish farming are being standardized



Golden Snakehead



Pulchellus



Carnaticus



Mystus cavasius



ICAR-CIFA

Grow Fish... Grow with Fish...

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Notable Developments

- A PCR based *Clarias magur* and *C. gariepinus* hybrid detection system has been developed.
- Cloning and characterization of antibacterial activities of recombinant proteins of rohu antioxidant genes were carried out and indirect ELISA assays developed to measure level of antioxidant molecules in fish sera.
- Replacement of fishmeal with guar meal in the diets of rohu and its effect on growth, food conversion, digestive enzyme activity and final carcass composition.
- Molecular cloning and structural characterization of caspase-8 cDNA in *Labeo rohita* and analysis of caspase-8 gene expression following *Aeromonas hydrophila* and *Edwardsiella tarda* infections and rhabdovirus vaccinations.



ICAR-CIFA

Grow Fish... Grow with Fish...

14

Whole Genome Sequencing and Development of Allied Genomic Resources of *Labeo rohita*

Assembly statistics

Platforms included

454 GS FLX
Illumina (MiSeq)
Illumina (NextSeq 500)
Ion Torrent PGM

170.72 Gb

Platforms included

PacBio

12.4 Gb

Parameters	Contigs	Merged all scaffolds	After Gap Closing (Length>2000bp)
Total number	2,59,627	147,061	13,623
No. of bases	1,236,201,637	1,563,356,456	1,484,730,970
Max. size	12,383,302	15,225,768	15,225,769
N50 value	30,672	2,123,649	1,959,535
No. of N's	10,747,5278 [8.69%]	9,88,44,110 [6.3 %]	5,78,73,699 [3.90 %]

Technology Development/ Patents

- A FRP tank has been designed and fabricated for large scale fish seed transportation
- Some trademarked technologies viz., CIFA-Carp Starter, CIFA-Carp Grower, Nanoplus @ CIFA, Fish Hydrolysate and CIFA-GI SCAMPI were commercialized with support of AgIn, New Delhi.
- Patents granted on “An artificial medium for in vitro culture of glochidia larvae of freshwater mussels”
- Technology released: “Indirect ELISA based assays for estimation of antioxidant proteins and antimicrobial peptides in rohu (*Labeo rohita*)”.



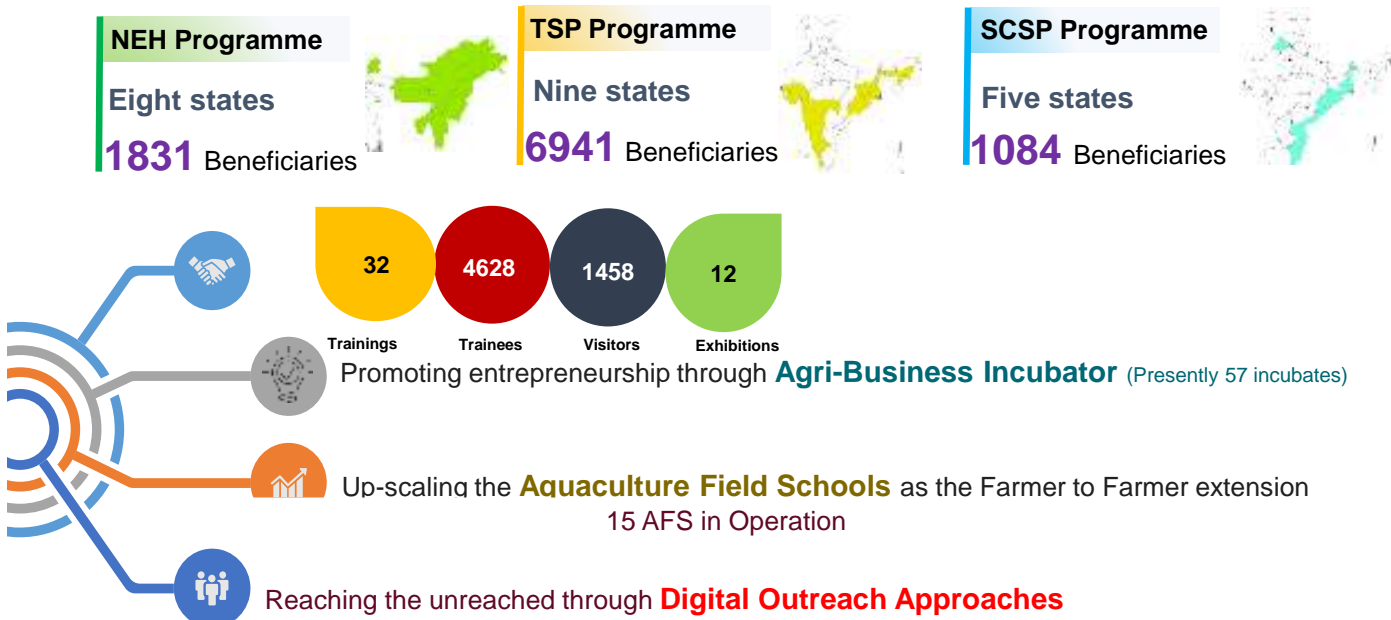
International Collaboration

- An Indo-Norway project on “**CRISPR/Cas9 editing to test and control genes implicated in influencing Aeromonas disease resistance in carp and salmon**” has been initiated.
- ICAR-CIFA and WorldFish, Malaysia collaborative project on “**Strengthening fisheries and aquaculture for food security and nutrition: Development of sustainable aquaculture practices through life cycle analysis (LCA) of selected aquaculture production systems and performance evaluation of improved varieties of carps and freshwater prawn**”
- A two days virtual workshop on “**Improved Variety of Carps and Freshwater Prawn for Enhancing Farmers’ Income**” during 18-19 November 2020 under ICAR-WorldFish collaborative project was organized for Fish farmers and Hatchery owners of Assam.
- SAARC Expert Consultation meeting on “**Promoting innovations in fisheries value chain for improving human nutrition in South Asia**” during 24-25 November 2020 organized by SAARC Agriculture Centre (SAC), Dhaka, Bangladesh on virtual mode.



17

Outreach & Policy Advocacy



Developed **National Strategic Action Plan** to increase the fish production in the country by 2025

18

Virtual Training / Stakeholders Consultations

Virtual Training Programmes



Freshwater Pearl Culture



Soil & Water Analysis



Freshwater Prawn

Stakeholders Consultations



19

World fisheries day lecture series 2020

LIVE Webinar on
Scenario of Freshwater Aquaculture in India during the COVID-19 Pandemic

INAUGURAL ADDRESS
Dr. S. Ayyappan
 National Secretary, ICAR & Director General, ICAR
 Director, Central Inland Fisheries Institute, Madurai
 and Director, National Institute of Freshwater Aquaculture

GUESTS OF HONOR
Dr. J.R. Jena, **Dr. A. Sankarabharathi**

PANELISTS
Shri M. V. S. Padmavathi, **Shri V. Ramachandrya Raju**, **Prof. D. Hanumanth**

ICAR-Central Institute of Freshwater Aquaculture
 Kausalyaganj, Bhubaneswar-751002, Odisha, India

World Fisheries Day - 2020
LECTURE SERIES
 22nd December, 2020
 Timing: 10:30 AM to 4:30 PM (IST)

Dr. Jie Huang
 Director General
 Network of Aquaculture Centres in Asia Pacific (NACA)
 Topic: Biosecurity - The Concept to Guarantee the Sustainable Development of Aquaculture

ICAR-Central Institute of Freshwater Aquaculture
 Kausalyaganj, Bhubaneswar-751002, Odisha, India

World Fisheries Day - 2020
LECTURE SERIES
Inaugural Lecture
 27th November, 2020

Dr. M. V. S. Padmavathi
 Topic: Indian Fisheries & Sustainable Development Goals

Dr. J.R. Jena
 Deputy Director General, Fisheries, ICAR

ICAR-Central Institute of Freshwater Aquaculture
 Kausalyaganj, Bhubaneswar-751002, Odisha, India

World Fisheries Day - 2020
LECTURE SERIES LECTURE-11
 27th November, 2020
 Timing: 1:30 PM to 4:30 PM

Dr. S. Ayyappan
 National Secretary, ICAR & Director General, ICAR

Dr. J.R. Jena
 Deputy Director General, Fisheries, ICAR

ICAR-Central Institute of Freshwater Aquaculture
 Kausalyaganj, Bhubaneswar-751002, Odisha, India

World Fisheries Day-2020
LECTURE SERIES #5
 17th January 2021

Dr. J.R. Jena
 Deputy Director General, Fisheries, ICAR

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Virtual Learning App for Fish Farmers



More than 25000 farmers enrolled

Video Modules with Self-assessment quiz & e-Certificate



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Future Research Programmes - ICAR-CIFA

1. Hitech Aquaculture Systems

- BIOFLOC, RAS, FIMTA and SMART Aquaculture

2. Species Diversification

Food Fishes

- Captive breeding & seed production - Hilsa, Mahanadi Mahseer, Pigmouth carp
- Grow-out Culture technology - Hilsa, Gangetic Mystus, Shooting barb, Carnatic carp

Ornamental Fishes

- Broodstock development & Seed production - Maskara barb, Dwarf gourami, Assamese Snakehead, Moustached Danio, Melon Barb

3. Genetic Improvement

- Trait improvement through genetic selection – catla, rohu, scampi
- Customisation of high throughput SNP genotyping - rohu
- Whole genome sequencing of 2 prioritised species – Scampi, *L. fimbriatus*

4. Climate Resilient Aquaculture

- Environment footprint through LCA studies
- Impact of climate change on the growth and reproductive performance of freshwater fish.

5. Improving Water Productivity

- Water and Nutrient in aquaculture systems.

6. Cost Effective Feed Formulations

- Broodstock and larval feed development for diversified food fish and ornamental fishes.
- Evaluation of insect meal, algal meal, microbial proteins as a alternate source of protein.

7. Proactive Health Management

- Development of vaccines against Argulus infection
- Development of field level diagnostics for important diseases of food & ornamental fish (Gill fluke, CEV & CyHV-2).

8. Socio-economics & Information systems

- Technology Transfer & Impact assessment
- Aquaculture Field School
- Aquaculture Information Systems

22

Proposed Programme with NACA

Proposed Action Plan/ Activities to be taken under NACA

The Institute has submitted the following proposals **for conducting training programs** with funding support from NACA

1. **Advances in quality seed production**
2. **Development of entrepreneurship and start-ups in the freshwater aquaculture value chain**
3. **Quality Fish Seed Production through Brood Fish Management**

- Importing Pearl mussel, *Hyriopsis cumingii* from Vietnam
- Importing *Pangasianodon hypophthalmus* pureline seeds from Vietnam or Thailand for broodstock development at ICAR-CIFA



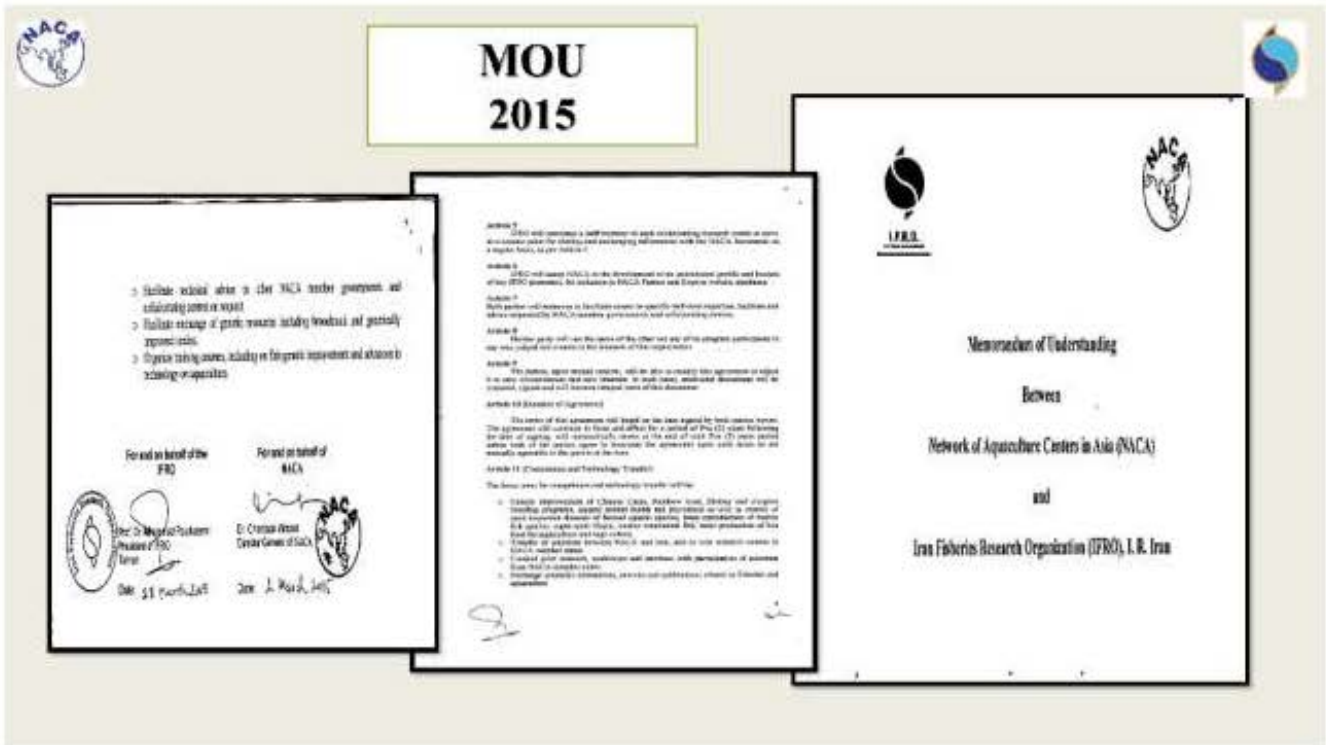
ICAR-CIFA

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**Coldwater fisheries
research center (CFRC)
as a NACA lead center
for international
cooperation**



Network of Aquaculture Centres in Asia-Pacific

Asian Fisheries Research Organization 27 November 2006
Tehran
IR of Iran

Dear Sir,
Recognition of Coldwater Fisheries Research Center as a NACA Lead Center for International Cooperation

This is to confirm that based on the information made to the Governing Council at the 17th meeting held in Tehran, IR, Iran, that NACA recognizes the above institution as a NACA Lead Centre for International Cooperation in the field of specialization. In this regard NACA will endeavor to cooperate with them institution in conducting training programmes and workshops of relevance and also to other member countries of NACA, and NACA at all time would encourage such initiatives.

Thanking you

Yours sincerely,

Sera De Silva
Director General

Cc: Asian Fisheries Organization
International Fisheries Research Institute
Coldwater Fisheries Research Center

Headquarters NACA 1000, New Road, Tehran, Islamic Republic of Iran Tel: +9811 222 1111 Fax: +9811 222 1111 E-mail: naca@naca.org	Office Address International Fisheries Research Institute International Fisheries Research Institute International Fisheries Research Institute International Fisheries Research Institute	International Cooperation Office NACA 1000, New Road, Tehran, Islamic Republic of Iran Tel: +9811 222 1111 Fax: +9811 222 1111 E-mail: naca@naca.org
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Cold-water Fisheries Research Center (CFRC)

Research activities :

- Rainbow Trout aquaculture
- Caspian Sea Salmon (*Salmo Trutta caspius*) as cold water species

- ❖ Reproduction
- ❖ Health and Diseases
- ❖ Nutrition and Feeding Technology
- ❖ Genetic and Breeding
- ❖ Ecology



Objectives



- **New technologies to increase production** per unit area in farming systems
- Establishment of live, cellular and molecular **gene bank and sperm bank**
- Cooperation with **Non-Governmental Organizations** and cold-water fish hatcheries
- **Promotion and sustainable development** of cold-water fish production at the national and regional levels
- **Promoting the knowledge** for Rainbow Trout aquaculture
- Increasing aquaculture productions for **rural development** and more income



The achievements of the center on Rainbow trout



- ❖ **All female Rainbow Trout population**
- ❖ **Rainbow Trout brood stocks**
- ❖ **Triploid population of rainbow trout by induction method**
- ❖ **Improving the health status and promoting the health management of cold-water fish**
- ❖ **Creating a Rainbow Trout gene bank**
- ❖ **Production of High Health Rainbow Trout**





The achievements of the center in the field of Caspian Sea salmon



- ❖ Preservation and reconstruction of Caspian Sea salmon stocks
- ❖ Determination of genetic diversity of Caspian Sea salmon population in important rivers
- ❖ Establishment of Caspian Sea salmon sperm bank
- ❖ Production of G4 generation
- ❖ Production of Caspian Sea salmon to support cage culture



The achievements of the center in the field of Caspian Sea salmon

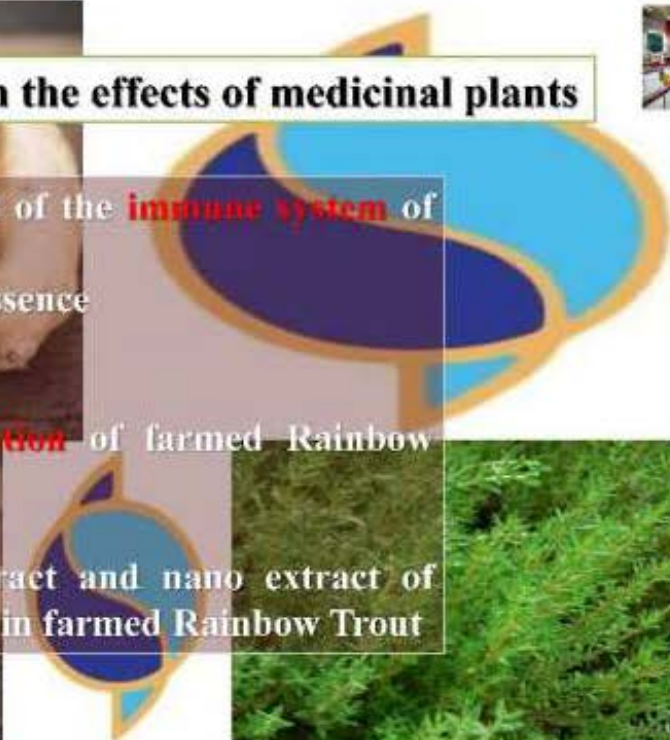




Some achievements on the effects of medicinal plants



- ❖ Stimulation and improvement of the **immune system** of farmed Rainbow Trout using:
 - ✓ **Ginger** rhizome powder and essence
 - ✓ **Marjoram** and **yellow aloe**
- ❖ **Control of fungal contamination** of farmed Rainbow Trout using **Thyme** essence
- ❖ **Antibacterial application** extract and nano extract of **Marjoram** in vitro and in vivo in farmed Rainbow Trout



Achievements : Production of Specific Pathogen Free (SPF) Rainbow Trout



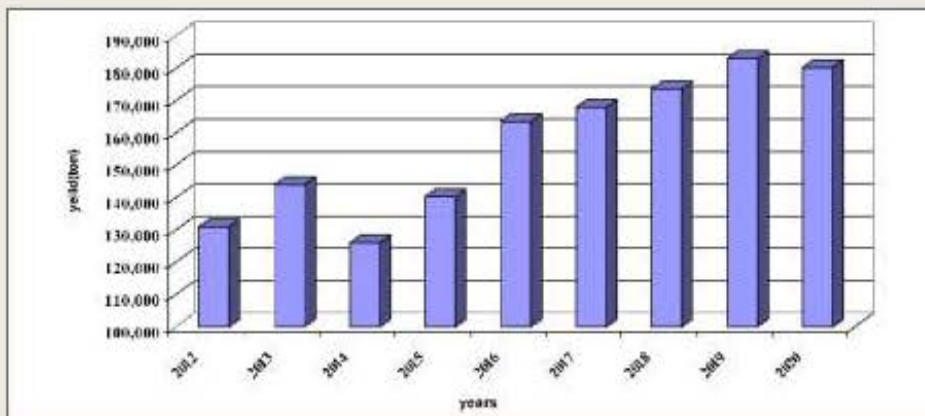
- ❖ First **semi-industrial pilot** model for the propagation and breeding of Rainbow Trout in full compliance with the principles of biosecurity.
- ❖ Production of fertilized eyed egg and fry of Rainbow Trout with High Health and genetic identity.
- ❖ Establishment of sperm bank from H. H. Rainbow Trout



First Semi-Industrial Pilot Model for SPF Trout Production In NACA -Cold water Lead Center (2020)



Rainbow Trout production trend in Iran from 2012 to 2020



2020	2019	2018	2017	2016	2015	2014	2013	2012	years
180,000	182,601	173,384	167,830	163,325	140,244	126,000	143,917	131,000	ycild (ton)



Educational and Extension Programs for farmers (2019-2021)

1. Extension training on cold water fish :

- ❖ Holding 1000 person training program for farmers

2. Educational Workshops on cold water fish :

- ❖ Holding more than 2000 person per day program for farmers



Educational and Extension programs held for farmers

Mechanization and wastewater management of Rainbow Trout farms

- ❖ Holding 100 person in 5 program for farmers





Educational and Extension training programs for farmers

Rainbow Trout monosex production technique



❖ Holding 300 person for farmers, researchers and experts



Educational and Extension programs held for farmers

Health management of cold-water fish farms



visiting the farmers, more than of 50 person (12 farm)

Investigate problems and provide solutions





Training and workshop programs on cold water fish Rainbow Trout and Caspian sea salmon breeding

Holding 50 person per day program for farmers, researchers and experts



Promoting Salmon Farming in Cages

Scientific Achievement Transfer Program ,Holding 100 person per day program for farmers, researchers and experts





Future collaboration NACA members



1. Researches:

- ❖ Mass production of SPF Rainbow trout
- ❖ Production of G5 generation of Caspian sea salmon

2. Training courses and workshops :

- ❖ Important Coldwater fish diseases and their control
- ❖ Methods for measuring physical and chemical factors affecting the propagation and breeding of Coldwater fish
- ❖ Physiological mechanisms of osmoregulation in the Caspian sea trout

3. Extension services

- ❖ Rainbow trout breeding
- ❖ Caspian sea salmon breeding



Training Course and Workshop



Important Coldwater Fish Diseases and their Control

1. Infectious Diseases (Viruses, Bacteria, Fungi)
2. Invasive Diseases (Parasites)
3. Non-infectious Diseases (Nutritional, Environmental, Genetic)
4. Diseases Control
5. Sample Collection to check for Disease

Teaching by: Dr. Masoud Haghghi

Date of the Workshop: 2022.02.17



Training Course and Workshop



Methods for Measuring Physical and Chemical Factors Affecting the Propagation and Breeding of Coldwater Fish

1. Temperature
2. Dissolved Oxygen
3. Acidity
4. Ammonia
5. Nitrite
6. Nitrate
7. Hydrogen Sulfide
8. Total Hardness
9. Total Suspended Solids
10. Total Dissolved Solids

Teaching by: Dr. Meysam Erfani

Date of the Workshop: 2022.02.18



Training Course and Workshop



1. Biology of Salmonid
2. Osmoregulation Physiology of Salmonid,
3. Application of Osmoregulatory Mechanisms in Aquaculture

Teaching by: Dr. Salman Malakpour Kolbadinezhad

Date of the Workshop: 2022.02.19



Network of Aquaculture Centres in Asia-Pacific



Iranian Fisheries Research Organization
Tehran
IR of Iran

27 November 2006

Dear Sir,

Recognition of International Sturgeon Research Institute as a NACA Lead Center for International Cooperation

This is to confirm that based on the submission made to the Governing Council at the 17th meeting held in Tahrani, IR Iran, that NACA recognizes the above institution as a NACA Lead Center for International Cooperation in its field of specialization. In this regard NACA will endeavor to provide the institution in conducting training programmes, member countries and use to other member countries. NACA will encourage such initiatives.

Thank

Sincerely,

Executive
Director



C/o: Fisheries
International
Cooperation

Address: ...

Phone: ...

Fax: ...

E-mail: ...

Address: ...

Phone: ...

Fax: ...

E-mail: ...



International Sturgeon Research Institute





The main objectives of the Institute are research on:

- Conservation and sustainable exploitation of Sturgeon stocks in the Caspian Sea
- Development of Sturgeon aquaculture



**International Sturgeon
Research Institute as a
NACA Lead Center for
International Cooperation
27 November 2006**





Research Departments

Aquaculture

Ecology

Fish Health and Diseases

Stocks Management

Physiology and Biochemistry

Genetics and Biotechnology – Gene Bank



**Number of active sturgeon farms in the country:
132 farms in 21 provinces (2021)**





Sturgeon Aquaculture Status in the Country

Production of farmed sturgeon meat in the country (ton)

Country/ year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Meat (ton)	20	251	312	456	600	900	1100	2146	2618	2366	2400	3500
Caviar (kg)	-	-	6.3	530	950	1200	2200	3150	3500	5000	9000	12000



The dominant farmed species for meat and caviar production are:

- Great sturgeon (*Huso huso*)
- Siberian sturgeon (*Acipenser baerii*)



Great sturgeon (*Huso huso*)

Siberian sturgeon (*Acipenser baerii*)



❖ ISRI has access to Caspian Sea internal & coastal waters by research vessels (Caspian Explorer and Gilan)

This research vessels provide opportunities to study issues of biologic, chemical and physical science, geophysics and climate sciences and emerging interdisciplinary areas.





The first patent of country about sturgeon in US patent entitled: New method for artificial breeding and egg removal of farmed sturgeon breeders for many times

International sturgeon research institute is capable to organize short term and knowledge based courses on propagation, rearing, hydrobiology, feeding, health, diseases, physiology and biotechnology, sex determination, and brood stock making on sturgeons.



Some of the key actions of the Sturgeon Institute



Holding the Fifth International Sturgeon Symposium of the World in 2005 with the participation of 600 researchers from 25 countries of the world



Iran is a candidate to host the 10th International Sturgeon Symposium ISS10

Date	Symposium	No
1989	(ISS 1) Bordeaux, France	1
1993	(ISS 2) Moscow, Russia	2
1998	(ISS 3) Piacenza, Italy	3
2001	(ISS 4) Oshkosh, Wisconsin, USA	4
2005 (Organizer)	(ISS 5) Ramsar, Iran	5
2009	(ISS 6) Wuhan, China	6
2013	(ISS 7) Nanaimo, Canada	7
2017	(ISS 8) Vienna, Austria	8
2021	(ISS 9) China	9



Connect with Consultation Group on International Agriculture Research (CGIAR)

**International Advisory Group on Agricultural Research
World Fish Center (Penang, Malaysia)**





Hungarian Research Institute for Fisheries,

Aquaculture and Irrigation

HAKI

Hungary

**Negotiation in
Tehran
22 May 2018**



International Sturgeon Research Institute

ISRI

**Exchange of draft memoranda of understanding on education and research cooperation
The visit of the President of HAKI
to the Institute in the fall of 2018 was postponed to 2019**

Iranian delegation visits HAKI Hungary and talks on joint projects (June 2019)



The Netherlands



**Wageningen University & Research
WUR**

**Signing of the agreement
of the Deputy Minister in
the Netherlands
2-4 may, 2018**



**International sturgeon Research
Institute**



Negotiation In Rasht, 12 May 2018

**Sturgeon RAS Technology Transfer Program, Recirculated
Aquaculture systems**



Ararat Armenia



Garik Sargsyan Appointed Ararat Provincial Governor



The Governor of Ararat sent an invitation requesting a delegation from the Caspian Sea Sturgeon International Research Institute to visit that country to study the feasibility of sturgeon breeding development and the possibility of establishing a fisheries research station or center in Ararat, Armenia (Spring, 2019)



The Governor of Ararat, Armenia visited International Sturgeon Research Institute 29 Aug, 2018.



Future collaboration for NACA members



- ❖ **Researches:**
 - **New methods in sex determination of sturgeons**
 - **Study of new systems in sturgeon breeding access to new fast growing species**
 - **Use of multi-purpose systems in breeding (co-cultivation, aquaponics, bioflocks, etc.)**
- ❖ **Suggested training courses and workshops :**
 - **Feeding management**
 - **Hormone therapy in sturgeons**
 - **Reproduction physiology**
- ❖ **Extension services**
 - **Sturgeon Rearing and Propagation**
 - **Management of nutrition and rearing in Sturgeons**
 - **Principles of health management in sturgeon rearing**



Educational and Extension programs held for farmers , 2020
Management of sturgeon farms



Educational and Extension programs held for farmers , 2020
Breeding of sturgeon in hatcheries



Meeting whit societies and sturgeon farmers, 2021



Training course for sturgeon farm management, 2020

برگزاری نشست تخصصی - ترویجی
مختصین معین موسسه (طرح باوران تولید)
با حضور "مهندس منشی زاده" معاون هماهنگی ترویج سازمان جهاد کشاورزی استان گیلان
در "موسسه تحقیقات بین المللی ناس ماهیان دریای خزر"

تاریخ برگزاری: یکشنبه ۱۷ اسفند ۱۳۹۹
ساعت ۹ الی ۱۱

Interspecies breeding and sturgeon sex reversal Webinar training course(2021)



Thank You for Your Attention



Annex L. Presentation of Annual Report of the Regional Lead Centre, Thailand