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AQUACULTURE ASIA

Sabaki tilapia in Saudi Arabia

Fish and fisheries in nutrition of Pakistan

Indian success story

Fishing gear of Kashmir Valley

Aquaculture Asia

is an autonomous publication that gives people in developing countries a voice. The views and opinions expressed herein are those of the contributors and do not represent the policies or position of NACA.

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NACA

An intergovernmental organisation that promotes rural development through sustainable aquaculture. NACA seeks to improve rural income, increase food production and foreign exchange earnings and to diversify farm production. The ultimate beneficiaries of NACA activities are farmers and rural communities.

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AQUACULTURE ASIA

And now for something completely different

Well, what a difference three months makes.

The scramble to bring the COVID-19 pandemic under control continues as I write; there have been a few notable successes but most countries are still fighting to contain it, and all are paying a heavy price.

The good news is that we now know that the virus can be effectively contained with social distancing and the triad of aggressive testing, contact tracing and rapid response to contain local outbreaks.

The bad news is that not everyone has the physical space or resources to do that, and it is the poor that will be hardest hit. A research report by UNU-WIDER (see page 23) suggests that the economic impact of COVID-19 alone could push half a billion people into poverty in developing countries – 8 % of the world population. FAO has warned that the pandemic could trigger a food crisis if action is not taken to protect the most vulnerable and secure global supply chains.

At the time of writing, the impact of the COVID-19 pandemic on the aquaculture sector is only just beginning to unfold. It is apparent that there has been extensive damage to market chains on both the supply and demand side, including:

- Curtailment of consumer spending due to massive business closures and job losses.
- Some disruption of food processing and packing facilities due to public health measures.
- Heavy disruption of the restaurant trade as per above.
- Extreme disruption of air freight, due to closure of borders and wholesale grounding of commercial airline fleets.

The extent of impact will vary by sub-sector. Export-oriented industries producing high-value live or chilled products such as abalone and tuna will be heavily impacted by loss of air freight links. The impact on shipping and frozen/processed products is not yet clear, but the risk/reward seems in of favour keeping shipping open.

Domestically-oriented aquaculture production is likely to face less disruption, particularly with regard to low-cost consumer staples. However, with such a large reduction in economic activity across the board the entire industry will be affected.

The big question is how long will a recovery take? Some countries, including the worst affected, are starting to experiment with relaxing controls. Mistakes will be made and setbacks will occur, drawing out the process. Even the most fortunate countries will find it difficult to recover while their trading partners struggle. Overshadowing the recovery is the fact that in much of the developing world the pandemic is still at an early stage. So the "V-shaped recovery" being touted by many economists seems unrealistic, in my opinion.

Simon Wilkinson

AQUACULTURE ASIA

CONTENTS

Potential new species in the Kingdom of Saudi Arabia: Sabaki tilapia (*Oreochromis spilurus*)

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Sabaki tilapia.

Broodstock.

The story of Saudi aquaculture industries

The accumulated reference suggests that due to economic development, market demand, and environmental factors, shrimp farming has been highly prosperous in the Kingdom of Saudi Arabia since the 1990s. In the beginning, the main cultivated species was the Indian prawn (*Fenneropenaeus indicus*). However, because white spot syndrome virus (WSSV) hit in 2010, the Saudi aquaculture industry started farming white shrimp (*Litopenaeus vannamei*) to cover the production shortage. Currently, shrimp farming in Saudi Arabia is still widespread because of the demand for global market.

Moreover, for the sustainable economic development of Saudi Arabia, the government set up the goals of Vision 2030. To make a long story short, we will only mention the goals about aquaculture. In 2030, the Saudi aquaculture industries expect to produce a combined 600,000 tonnes. At present, the total aquaculture production of Saudi Arabia is around 55,000 tonnes of which shrimp farming makes up almost 60%; the main farmed fish species, Asian sea bass (*Lates calcarifer*), makes up 7,000 tonnes of total output.

To match the production goal, we need to find some new species to farm. Candidate species should be unique, easy to manage, low cost, have high market demand, and, most importantly, we hope everyone loves it!

According to biological factors such as fry, broodstock and farming environment, and economic considerations such as market, cost, and promotion, the fisheries authority chose Sabaki tilapia (*Oreochromis spilurus*) to be our promotional species.

Female broodstock.

Male broodstock.

Why do we choose this fish for development targets?

Expansion of tilapia aquaculture has the potential to create job opportunities, promote economic growth, is easy to operate, has relatively low production costs, and can improve food security.

Furthermore, among the various tilapia species, Sabaki tilapia is one of the distinct species in the global tilapia aquaculture industry. Why makes Sabaki tilapia unique? First, Sabaki tilapia can be farmed in a high salinity and temperature environment. This is important because the average salinity in Saudi marine fish farms is over 42‰, so the tolerance of this species will assist with acclimatisation. Other common tilapia species farmed in saline environments, such as Java tilapia (*Oreochromis mossambicus*) are smaller than Sabaki tilapia, and yield lower value products due to shape, size and processing characteristics. Finally, Sabaki tilapia is not yet a popular commercial farming species. We have the opportunity to be a pioneer!

How do we manage the operations of Sabaki tilapia?

We introduced farm management of broodstock, fry, and grow-out, respectively.

Broodstock management

Qualified broodstock should be healthy, active, and free from disease. Moreover, the weight should be over 200g. We collected eligible broodstock of less than seven months, maintaining a sex ratio of 3 females : 1 male.

We have trialed three farming systems to understand the best result for the spawning, namely hapa net cages, raceways, and arenas, respectively. Our experience has been that the raceway and arena have superior fry production results than hapa net cages. The main reason is that the hapas needs higher management skills and costs.

We collect fertilised eggs every 15 days and produce fry every 21 days. A female can spawn 120 to 550 eggs in each period. The hatching rate is more than 95%. After spawning every 30 to 45 days we separate the male and female broodstock for a period to support their nutrition.

Outdoor raceway pond for broodstock.

Hapa for broodstock..

Above: Broodstock farming arena. Below: Outdoor raceway pond for larviculture.

21 day old Sabaki tilapia fry.

Larviculture

The fry of Sabaki tilapia are strongly cannibalistic. Therefore, 14 days after fry collection they must be graded. To save management costs and improve growth performance, we suggest that outdoor farming is a better choice for larviculture. Thus predator control is essential. When fry have reached 1 g they can be moved to the grow-out pond.

Grow-out management

Currently, several Saudi aquaculture companies have started running industry scale farms for Sabaki tilapia and the products are available on market. Current grow-out farming systems include marine cages, FRP tank, hapa net cages, and traditional ponds.

The challenge of farm management

Generally, the farming practices for Sabaki tilapia are not vastly different compared to other tilapia species. However, because of the unique farming environment in Saudi Arabia, the fishes are under high salinity (42‰) and temperature (37°C) in the production period. For this reason disease is frequently an issue, notably bacterial infections emerge in the winter season.

Role of fish & fisheries in national nutrition of Pakistan

Aslam Jarwar

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Fish and fish products have a vital role in nutrition and global food security, as they represent a rich source of proteins, healthy fats and vitamins. Fish contains certain essential dietary nutrients required for human health including omega-3 long-chain polyunsaturated fatty acids and some essential amino acids not readily available in many other foods. In addition, it contains good amounts of vitamins A, D, and minerals such as iron, zinc, iodine, magnesium, potassium, phosphorus and calcium. In low-income populations that depend heavily on a narrow range of calorie-dense staple foods, fish can represent a much-needed means of nutritional diversification that is relatively cheap and locally available (FAO, 2018).

Given its nutritional value, fish has an important place in agriculture- and food-based approaches to food security and nutrition (Kawarazuka and Béné, 2010). The United Nations General Assembly proclamation of the UN Decade of Action on Nutrition for 2016–2025 provides an opportunity to raise awareness about the role of fish and to ensure that it is mainstreamed in food security and nutrition policy. Greater weight is placed on the role of fisheries as source of livelihoods and a buffer against shocks for poor communities.

Fisheries and aquaculture have a lower environmental impact than ruminant meat production (Clark and Tilman, 2017). Inland fisheries have a particularly low carbon footprint in comparison with other food sources (Ainsworth et al., 2018 in (FAO, 2018). In 2016, global fish production was 171 million tonnes with an estimated value of USD 362 billion. Capture fishery production has been relatively static since the late 80s in comparison to aquaculture which is growing fast.

Importance of inland fisheries and aquaculture in nutrition

Although marine capture fisheries have the major share of fish production, inland capture fisheries and aquaculture are particularly important for many countries including Pakistan. Inland fisheries are critical for achieving sustainable development goals and can substantially contribute in alleviating and preventing poverty (Lynch et al., 2017). The contribution of aquaculture to global fish production has risen continuously, with an impressive growth in supply of fish for human consumption reaching 53% in 2016 with 110 million tonnes, valued at USD 243.5 billion. In 2016, 37 countries were producing more farmed than wild-caught fish. Globally, aquaculture growth rate 5.8% is faster than other major food production sectors (FAO, 2018).

High value fish and shellfish are produced in marine and coastal aquaculture. However, world production of farmed food fish relies increasingly on inland aquaculture, which is typically practiced in freshwater environments in most countries. According to the State of World Fisheries and Aquaculture 2018, inland aquaculture was the source of 51.4 million tonnes or 64.2% of the world's farmed food fish production in 2016. Among the top 20 fish species in aquaculture in the world, sixteen are from inland waters including silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), thaila (*Catla catla*), rohu (*Labeo rohita*), morakhi (*Cirrhinus mrigala*), tilapia spp., common carp (*Cyprinus carpio*) and other fish species commonly found in Pakistan.

Scope of unfed aquaculture farms in nutrition

In contrast to terrestrial animals, fish and other aquatic organisms have a plus point that these can also be cultured without providing any feeds. In unfed systems, fish obtain their food from natural food organisms found in the water. Production in these farms could be increased by applying fertilisers and animal manure or compost to stimulate the food chain and improve productivity. This is a very common practice in warm climates such as that of Pakistan. Globally, 24.4 million tonnes of fish and aquatic organisms were produced in unfed farming systems during 2016. In Pakistan the majority of fish farms are producing fish without feeding.

Potential of saline aquaculture and rice-fish farming

Culture of fish in rice fields is also expanding rapidly in various Asian countries. In some countries, aquaculture with saline-alkaline water is carried out where soil conditions and the chemical properties of available water are inhospitable for conventional food grain crops or pasture. Pakistan has also a great potential of aquaculture development in these two areas, which are still untapped in the country.

Extent of fisheries resources of Pakistan

In Pakistan, in addition to 290,000 square km of marine waters, there are more than 8.6 million ha of area under water in inland areas, which includes more than 56,000 kilometer of what is the world's largest canal irrigation system (FAO, 2009) consisting of rivers, streams and canals covering collectively more than of 3.45 million hectares. There are an additional 1.6 million km of water courses and farm channels. There are several lakes of various sizes, reservoirs and dams that cover around 0.322 million hectares. Additionally, about 4 million hectares of waterlogged and flood water areas also exist. These are those natural depressions where water accumulates each year developing into seasonal or perennial lagoons. Data for drainage canals, which have higher fish production potential due to higher primary productivity, is

not be available. Fish farming is another sector where fish is cultured intensively or semi-intensively and is the most potent in fish production in comparison to all of the above. According to cautious estimates the area of fish farms in Pakistan exceeds 200,000 hectares contrary to available data of 60,230 ha.

Production potential

As documented by FAO, the average production of fish from oceans is less than 2 kg/ha/year. However, fish production of flood plain rivers varies between 43 and 1,000 kg/ha depending on the climatic conditions. Productivity of lakes ranges between 27 to 329 kg/ha/year (Kawarazuka and Béné, 2010). The fish production from irrigation canals may reach up to 50–100 kg/ha (Chizhik, 1969). In a study in Sudan, an average of 660 kg/ha fish biomass was estimated in minor irrigation canals (Coates, 1984). In Bangladesh it was estimated that road and rail side irrigation channels could potentially produce 500 kg/ha/year (Marr, 1986 in (Redding and Midlen, 1990). A recent study in India has shown that fish yield of more than 4.5 t/ha was achievable through proper management of derelict waterbodies (Dash et al., 2008). These studies underscore high potentials of fish production form 8.6 million hectares of inland water bodies in Pakistan, as detailed above. Obviously, these water bodies are being harvested with full fishing effort around the country. However, the figures pertaining to fish catch do not reflect in official fish production statistics due to a variety of reasons (Hornby et al., 2014). If we ignore all the above studies and assume a minimal fish production potential of merely 50 kg/ha, there should be a gross production of 425,179 tonnes of fish from inland capture areas only, as compared to available data of 132,500 tonnes, plus reported 151,000 tonnes from fish farms (Patil et al., 2018), representing a combined total of 576,179 tonnes. This would be comparable to major inland fisheries producers in the region and will bring Pakistan among the world top countries in this category. This is in addition to the marine fisheries production of 376,266 tonnes (Khan, 2017). The statistics system pertaining to marine fisheries also needs reforms. It is noticeable that a review report published in 2014 evidently suggests actual marine fish catches are 2.6 times higher than the official data (Hornby et al., 2014).

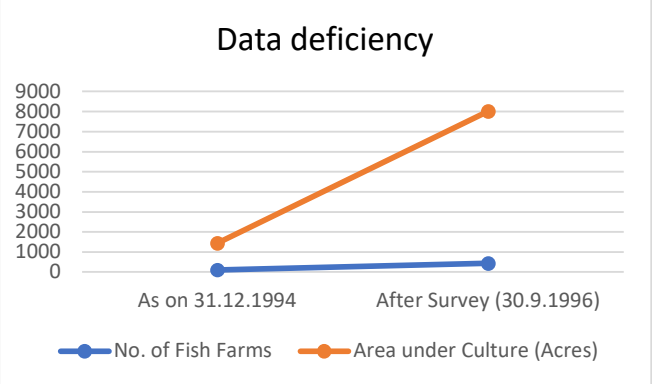
The quantity of harvested fish may be estimated from the fact that there are hundreds of wholesale fish markets (machhli mandi) in the country. Millions of kilograms of fish are handled on larger mandis every year. One month data of fish traded at fish wholesale mandi at Sukkur was collected from 20-1-2018 to 18-2-2018. According to these statistics more than 60,000 kgs of fish are traded in a single day during peak season at this mandi alone. It is understandable that the actual data may be more than that what is reported by fish dealers (CSF, 2008). There are 10-15 such large mandis in Sindh and Punjab each. Small wholesale markets exist in each potential town in these provinces alone. The quantity of fish sold locally by fish venders as purchased directly from fish farms or other inland water bodies is in addition to the fish brought to wholesale markets.

Off-the-record extent of sale and consumption of fish in Pakistan

Subsistence fish catches also need to be accounted for a complete picture of fish production (FAO, 2005). The author has rural background and can witness widescale fish catches by rural population. People in rural areas, whether young or old, often go fishing using local gadgets and fishing nets and it is a common sight in areas around canals, drains, lakes, flooded and waterlogged areas which offer abundant fish free of cost. In these trips handsome amounts of fish are caught. During childhood and teenage years, the author also used to catch fish with his buddies from nearby irrigation canals and waterlogged areas. Contrary to the urban areas where only large sized commercial fishes belonging to few species are preferred, the rural people have no preference for a specific size or kind. They consume even small fishes of unpopular varieties. Often, these fishes are eaten whole with head and spines. These non-commercial small fish species are rich in micronutrients required to address hidden hunger and child stunting (Patil et al., 2018). These subsistence fish catches provide a key food source for animal protein for most local communities living near lakes, canals and other water bodies (FAO, 2018).

Survey results on fish farms in one of the districts

As District Head of the Fisheries Department, the author surveyed fish farms in Shikarpur District in Sindh back in 1996 which revealed a striking deficiency in fish farms data alone. A difference of more than 500% was found in the data available from the year 1994 and the survey conducted in 1996. During the survey 8,008 acres were recorded as compared to 1,436 acres previously recorded in the District Fisheries Office. The number of fish farms increased from merely 91 to 427 (Jarwar, 2008). Similar differences were found in other districts also. This could be a satisfactory argument that the data of fish farms and the fish production both are much lower than actual on the ground. If we take such data deficiency into consideration, 40-60% of fish production seems to be missing from the record.



According to the World Bank, Pakistan has a potential of producing 560,000 tonnes from aquaculture alone and could annually produce more than 2.0 million tonnes in next few years if aquaculture growth trajectory matches that of its neighbours i.e. India and Bangladesh (Patil et al., 2018). Bangladesh has similar fish fauna and level of economic development, but produces about ten times more fish from inland sources despite having fresh water resources that are around half the size of Pakistan's (Patil et al., 2018). Yields in Pakistan are typically 2,400 to 3,000 kg per hectare per year (Khan and Chatta 2015 in (Patil et al., 2018), while yields in Bangladesh averaged 4,600 kg across all pond-based systems in 2015-16 (FRSS, 2017) and were substantially higher in intensive-input systems. It is strange to note that small countries like Uganda, Nigeria, Cambodia and Tanzania are producing more fish from inland capture and aquaculture than Pakistan.

Gaps in fisheries statistics collection, assessment and reporting (regional countries vs Pakistan)

According to FAO, people in developing countries have a higher share of fish protein in their diets than those in developed countries. The world per capita fish consumption has grown to more than 20 kg. The lowest levels, just above 2 kg, are in Central Asia and some landlocked countries such as Afghanistan, Ethiopia and Lesotho. Even in low-income food-deficit countries (LIFDCs) it is 7.7 kg. It is hard to believe that per capita fish consumption in Pakistan is 1.9 kg only, which indeed is much lower than many small countries, despite the fact that there are thousands of Fish Points throughout the country which serve tonnes of fried fish every day and fish venders are a common sight almost in every town. If the true fish production potentials of Pakistan are considered, the real per capita fish consumption might be much above the current 1.9 kg. A report in the Dawn in 2013 indicated considerable rise in fish consumption in the country (Dawn.com, 2013).

Many Asian countries are among top fisheries producers today including India, Indonesia, Vietnam, Myanmar, Philippines, Bangladesh, Malaysia and Thailand. Even Egypt, Morocco, Nigeria, Iran and Cambodia are doing well. A few years back some of these ranked much lower and were not in the top list. According to FAO, India reported additional 0.54 million tonnes in 2010 in comparison to 2009. Similarly, total fish production of Bangladesh grew by 67% between 2004 and 2009. Production of Myanmar quadrupled in last decade with 18% yearly growth thus jumping 11 positions to the top list. India reported dramatic growth of 179% in inland fish production between 2004 and 2010. Thanks to improvements in fisheries statistics collection, assessment and reporting they achieved this landmark as endorsed by FAO. Despite the fact that Pakistan has the largest canal-based irrigation system in the entire world; nearly 1,000 km long fertile coast and suitable agro-climatic conditions for fish growth and aquaculture development, stands 33rd in world ranking in fisheries production with a total of 669,586 metric tonnes in 2016, much below its Asian counterparts. Viet Nam, Thailand and India have climbed to be the top six fish exporters with annual exports of 7.3, 5.9 and 5.5 billion USD respectively. While the volume of Pakistan's Fisheries exports in last fiscal year was $451 million (The News, 2019). According to (TDAP, 2019), Fish and fish products are 3rd among primary commodity exports after rice and fruits; and have potential for substantial increase.

A ray of hope

It is lightening that, feeling the enormous potential of marine resources and bringing focus to their contribution to the national economic development agenda, the prime Minister of Pakistan has recently declared the year 2020 as the "Year of Blue Economy" in Pakistan.

Conclusion

The author is of the view that fish and fisheries are playing an important role in providing nutritious animal protein in the country. There is a need for transformation within the sector by paying greater attention to sustainability; strengthening of extension services; introduction of high-yielding farming systems and new aquaculture technologies; improved economic efficiency and benefits to fish farmers; strengthened business along the value chain; product diversity and value addition; and by optimising the processing industry. However, based on the potential as discussed above, there is no doubt that the scale of production and consumption of fish in Pakistan is underreported and is much higher than the current numbers. There is a need for taking necessary steps to ascertain the real contribution of fisheries sector to the national economy. A recent article in 'The Economist' says that "the world's most valuable resource today is data, as used to be oil and other sorts of wealth in the last century" (The Economist, 2017).

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Success story of first fish farmer in India to be awarded ‘Padma Shri’

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Sri Batakrushna Sahoo.

Padma Shri Award

Instituted in 1954, the Padma Shri is awarded by Government of India to Indian citizens on occasion of Republic Day in recognition of their distinguished service and contribution in the fields of art, education, literature, science, medicine, social service, public affairs, agriculture and others (animal husbandry). Padma Shri, the fourth highest civilian award of the country, is conferred by Hon. President of India at ceremonial function held at Rashtrapati Bhawan at New Delhi city, usually around March or April every year.

Sri Batakrushna Sahoo, an elderly, progressive and professional fish breeder-cum-fish seed producer of Odisha State, was conferred with the Padma Shri Award in 2020 in the discipline of animal husbandry. Reputed Indian fishery scientist and former Director of the ICAR-Central Inland Fisheries Research Institute, the late Dr Vishwa Gopal Jhingran, was awarded Padma Shri in 1977. In the history of this award, Sri Sahoo is only the second person to receive it from the fishery and aquaculture sector, under the broad discipline of animal husbandry. Scientists from Krishi Vigyan Kendra (KVK) or Farm Science Centre, Khurda District, recommended his name for the Padma Shri Award to the Government of India in mid 2019.

The beginnings of Sri Sahoo

Elderly fish breeders, hatchery operators and fish farmers often show strong passion and keen interest in fish farming. They provide extension services, demonstrate proper technology of induced breeding and hatchery-oriented fish seed production, and recommend the right dosages of fertilisers, manure, lime and other inputs in fish ponds so that other farmers can grow their crop profitably and sustainably.

Sri Batakrushna Sahoo is an ideal example of such. By virtue of good planning and management of carp hatchery and nursery/rearing ponds and unique efforts, he successfully established his vocation of spawn and fry production of major carps in hatchery and fish seed production units. 'Padma Shri' Sri Sahoo was pleased to spend much time with the author at his hatchery on 15th March 2020. The author noted the experience and achievements of Sri Sahoo, and his emphasis on 'dedication, perseverance and devout hard work' as key to success.

Sri B. Sahoo and the author.

The farm also serves as an Aquaculture Field School.

Sri Sahoo, presently aged 69, was born and brought up at Sarakana Village, Khurda District, Odisha. On 1 June 1986, he gained possession of a panchayat pond of some 11,000-12,000 m^2 in area for fish farming for the first time, leasing it for 3 years at a cost of Rs. 12,000/-, thus venturing into pisciculture. He met the late Dr Radheyshyam, then Senior Technical Officer and expert in aquaculture extension and rural aquaculture at KVK, Khurda (under aegis of the ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar) and sought technical advice. After constructing a night shelter hut on the embankment and establishing proper pond treatment, with the onset of the monsoon he stocked total 200 kg stunted major carp fingerlings. These were yearlings of 40-80 g and about 4000 in number, previously maintained in his 1200 m^2 parental pond and partly bought from fish seed traders. Every day he fed them with feed obtained from ICAR-CIFA and a mixture of wheat flour, rice bran and pulverised ground nut oilcake (GNOC) procured from market. He started harvesting fish from January 1987, selling 1.3 – 1.4 tonnes of fish weighing around 600-800 g apiece, in addition to those he used for household consumption. He invested Rs. 13,000/- in production costs in addition to lease and recouped the total investment within one year with a satisfactory profit as well.

Venturing into fish seed production

In order to stock major carp spawn in a 1,200 m^2 pond to raise as fingerlings, Sri Sahoo brought spawn from a distant source transported via rickshaw-trolley and aluminium hundi but experienced considerable mortality at the pond site due to transportation conditions. There was no provision of oxygenated packets for spawn transportation at that time. In 1988, he decided to produce good quality carp spawn at his pond site at Sarakana Village using inner and outer hapa (cloth) enclosures fitted in pond. With inspiration and guidance from Dr Radheyshyam, he started maintaining a part of his adult major carps as broodstock (2 -3+ years old) in a separate pond, using pituitary gland extract as an inducing agent. Beginning with induced breeding of *Cyprinus carpio* var *communis*, he obtained 400,000 spawn and stocked his pond for further rearing up to 60 days. He managed the tender stages efficiently with proper feeding, sold advanced fry (early fingerlings) to grow-out farmers and earned Rs. 8,000/-. He realised that fish seed production was more profitable than grow-out fish farming (Rs. 8,000/- earned in 2 months from small pond in comparison to Rs. 25,000/- in 8-10 months from much larger pond). It kindled his interest in fish seed production. He took 3-4 additional ponds on lease for spawn and fry rearing.

Carp hatchery of Sri Sahoo: a centre of learning

As observed in March at Sarakana Carp Hatchery, Sri Sahoo presently possesses sixteen well-maintained earthen ponds for broodstock, nursery and rearing units covering a total of 40,000 m^2 water area. He has widened his carp seed production operations, which he has been practicing commercially since 1992. He adopted the scientific package

of practices on major carp breeding, spawn and fry production and broodfish maintenance developed by scientists of ICAR-CIFA, Bhubaneswar and KVK, Khurda. Aquarium fishes such as black and red molly, gold fish and fertilised eggs of golden carp Carassius carassius attached to roots of water hyacinth and hatchlings are maintained in circular concrete enclosures of 3.0-4.0 m diameter. Chinese carp hatcheries exist at two sites 150-200 m distance apart; he has four fish breeding pools, eleven egg hatching-cum-incubation pools, two overhead tanks of 60,000 litres and 25,000 litres capacity. He produces spawn, fry and advanced fry of Indian major carps, *Puntius sarana*, exotic carps *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Cyprinus carpio* and *C. carassius*. About 160-200 million healthy spawn and five million carp fry are produced at this hatchery every season (during April to mid September), supplied in oxygenated packets to 40-45 regular fish farmers in 7-8 districts of Odisha, in addition to neighbouring villages. Spawn are stocked in nurseries @ 2.4-2.8 million / 4,000 m^2 pond for fry and advanced fry production. A mixture of rice polish and GNOC are used as feed. His three sons help him in this enterprise along with eight permanent labourers.

Some exceptional features

Many of the technologies developed by ICAR-CIFA in aquaculture have been tested and demonstrated at Sri Sahoo's hatchery (Courtesy: OrissaPost, 4th Feb, 2020).

Aquaculture Field School Training Centre at Sarakana.

In 2013, Sri Sahoo was advised by ICAR-CIFA scientists to test the broodstock feed "CIFABROOD" for early maturation of major carps in his pond. He observed attainment of fish gonadal maturity by the first week of April within 48 days of onset of feeding and achieved success in early breeding and spawn production with the help of this newly-developed special feed. The Aquaculture Field School was established by ICAR-CIFA at this hatchery site in 2009, where, according to Sri Sahoo, training programmes are organised 3-4 times every year. It is a school without walls where one farmer learns from another. Knowledge and improved technology

Fertilised eggs of Cyprinus carpio maintained in hatching pool.

A part of Sarakana Fish Hatchery and a nursery pond.

on fish breeding, grow-out fish culture, pond management practices and related aspects are disseminated by Sri Sahoo and other resource persons to participating fish farmers and experiences shared.

He has introduced many fish farmers in Khurda and other districts of Odisha to freshwater pond aquaculture, extended co-operation and motivated them to take it up as means of livelihood. Inspecting condition of fish ponds, he used to give necessary advice and extended help voluntarily without any remuneration to many fish farmers (upon receiving their phone calls) seeking for help. He also provides hands-on training and skills development to rural youth and fish farmers in carp spawn production through conventional hapa breeding systems and has visited 8-10 private carp hatcheries in Odisha as a consultant. Until January 2010, Sri Sahoo had been engaged in fish seed production in addition to his office responsibilities. He served as a permanent employee in the Finance Department, Government of Odisha for 24 years including 7 years in the posts of Head Clerk and Section Officer, and also as Desk Officer in the Home Election Department of the Odisha Government. He retired from government employment in 2010.

End note

Sri Sahoo was felicitated by ICAR-CIFA on occasion of the National Fish Farmers' Day on 10 July 2011 and on the Silver Jubilee Year of the institute on 30 January 2012. While talking with author, he fondly expressed gratitude and respect to technical consultant the late Dr Radheyshyam and former Principal Scientist of ICAR-CIFA Dr Sampad Kumar Sarkar, who helped him to grow. Dr Radheyshyam used to come to Sarakana Fish Hatchery frequently. Recently Sri Sahoo added an ornamental fish breeding and rearing component in his hatchery premises, and received a subsidy-based Government loan scheme, which is being implemented. According to him, guarding the ponds, good quality seed stocking, wise routine feeding and proper water quality maintenance will definitely bring good profit up to expectations. He spoke about importance of rural pisciculture for rural development and family nutrition, the benefit of stocking and rearing yearlings instead of normal major carp fingerlings (50-100 g yearling stocking and harvest done on the 5th month with two crops in a year). The expertise of Sri Sahoo is a boon to hundreds of young entrepreneurs in Odisha and neighbouring states willing to establish and operate carp hatcheries, as the availability of good quality fish seed in adequate quantity will dictate the success and progress of grow-out fish culture in days to come.

Insights into the fishing gear and ichthyofauna of major lentic water bodies of Kashmir Valley

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Bag net being operated in Wular Lake by a group of fishermen.

The Himalayas are a colossal, uneven, and resource rich region with abundant flora and fauna, extending for over 2,500 km. Capture fisheries for subsistence are a common form of exploitation in upland areas (DCFR, 2015). Being landlocked, fishes in the streams, lakes, rivers serve as a valuable and efficient source of animal protein for rural populations. However, there are certain constraints in the cold water fisheries sector, including accessibility problems due to hilly terrain, and marketing (CMFRI, 2015).

The abundant aquatic resources of Jammu and Kashmir harbour a wide variety of indigenous and exotic fish species make it one of the promising areas for coldwater and hill stream fisheries (Qadri et al., 2018). Though the fisheries sector in Kashmir valley has huge potential and could contribute significantly to the GDP of the valley, it is yet to gain momentum. While fishing is limited to harvesting and sale, culture fisheries do exist although they are at their infancy stage (Malik et al., 2018). Natural water resources, such as lakes, streams, rivers and springs covering a total area of 40,000 hectares, play a compelling role in the socio-economic and cultural development of the valley population (Malik et al., 2018). 70% of the total population in Kashmir valley has adopted agriculture as a primary occupation, of which 15% substantially have fisheries as a principal source of income (Qureshi et al., 2013).

The invigorating climate of the region suits aquatic life. Kashmir is one of the premier fishing destinations in the world, with a tremendous number of streams and a considerable number of high altitude snow-fed lakes full of brown and rainbow trout. Jammu and Kashmir is one of the most

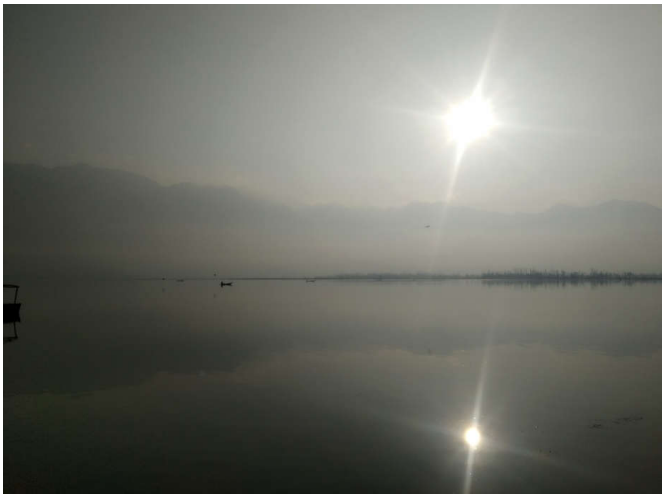
favored angling sites in the world (Ahmad, 2016), providing indispensable opportunities for anglers with its varied types of fish resources, especially trout and mahseer.

The fish fauna of Kashmir Valley is mainly represented by the families Cyprinidae, Cobitidae, Silurideae, Poecilideae, Sisorideae and Salmonideae (Yousuf, 1996; Balkhi, 2005; Bhat et al., 2012).

The current fish production from Jammu and Kashmir is 20,700 metric tonnes. The volume of fish production over the last decade has varied between 19,000 to 20,000 metric tonnes (Statista, 2019). The fisheries sector contributes a total revenue of Rs. 56,012,000 in Jammu and Kashmir (Economic survey, 2017).

Although fisheries have a burgeoning potential in the valley, it is generally considered a low-income profession in the valley and is mainly practiced by the poor.

The critical factor that has influenced the profession in the valley is the socio-economic condition of the fisher communities. For the proper development of the fishing industry, the socio-economic improvement of the fisher communities is necessary (Quyoom et al., 2016).



Dal Lake.

Lakes and their fish fauna

Kashmir valley is spread over an area of 1,594,800 hectares, with lakes covering about 32,765 hectares (Raina, 2002; Sodhi et al., 2013). The vital water bodies of Kashmir include Dal, Wular, Manasbal, Anchar, Khushalsar, Malpursar, Nilnag, Alapathar, Loolgul, Badsar, Kishansar, Vishansar, Gadsar, Gangabal, and River Jhelum. These glistening water bodies of Kashmir valley boast an intriguing assortment of fish species. These water resources possess great potential for

Table 1: Typical specifications of long lines in Dal and Wular lakes.

Specifications of the long line	Wular lake	Dal lake
Material of main line and branch line	PA multifilament	PA multifilament
Length of the mainline (m)	1000±125	431.25 ± 107.71
Length of a branch line (m)	55±1.88	20 ± 0
Distance between the branch line	2.75±1.75	1.62 ± 0.12m
Material and type of hook	Stainless steel and barbed hook	Stainless steel and barbed hook
Hook no.	No. 5, No. 6	No.3, No.4

Table 2: Typical specifications of spears in Dal and Wular lakes.

Specification of panzri	Wular lake	Dal lake	Specification of narchoo	Wular lake	Dal lake
Total length (m)	3.51 ±0.05	3.57 ± 0.14	Total length (m)	3.53 ± 0.06	3.59 ± 0.09
Material of pole	Wood	Wood	Material of pole	Wood	Wood
Length of a pole (m)	3.16 ± 0.08	3.25 ± 0.14	Length of pole (m)	3.26 ± 0.08	3.38 ± 0.12
Diameter of the pole (mm)	20 ± 0	22 ± 2	Diameter of pole (mm)	22.42 ± 2	21 ± 1.5
Length of prongs (m)	0.35 ± 0.04	0.28 ± 0.07	Length of prongs (m)	0.19 ± 0.02	0.17 ± 0.03
Barb length (mm)	4.42 ± 0.20	5.2 ± 2.5	Barb length (mm)	5.7 ± 0.2	5.8 ± 0.25
Number of barbs	2 ± 0	2 ± 0	Number of barbs	-	-

Table 3: Typical specifications of scoop nets in Dal and Wular lakes.

Specification	Wular lake	Dal lake
Material of webbing	Polyethylene	Polyethylene
Mesh size (mm) of webbing	12.14 ± 1.0	10.74 ± 3.8
Material of frame	Steel/iron	Steel/iron
Diameter (m) of frame	0.4 to 1.5	1.84 ± 0.08
Depth (mm) of frame	0.64	1.1
Material of pole	Wood	Wood
Length (m) of pole	0.83 ± 0.08	0.87 ± 0.05

Below: Manasbal Lake.

Mixed catch of small fish.

the improvement of different type of fisheries sectors such as cold water, warm water, sport, and reservoir fisheries, etc. (Ahmad, 2016).

Wular Lake is one of the largest in Asia and is known to be the fishing bowl of Kashmir (Shah et al., 2017; Malik et al., 2018). This lake is located at a distance of 50 km away from Srinagar at an average altitude of 1570 m AMSL. It is balloon-shaped with a maximum length of 16 km and breadth of 7.6 km and an average depth of 5.8m. With an enormous surface area of about 112.77 (Rashid et al., 2014) it possesses an immense potential to sustain the fisheries of the valley. It alone contributes 60% to the total fish production of Jammu and Kashmir (Rumysa et al., 2012). Both culture and capture mode of fisheries are being carried out in the lake. A total of 9 species, 7 of which are native to the valley and two being exotic, are of commercial importance. The exotic species (*Cyprinus carpio* var. *communis* and *C. carpio* var. *specularis*) predominate the fisheries of the lake contributing 52-67% of total fish production while schizothoracids (*Schizothorax esocinus*, *S. curvifrons*, *S. micropogon*, *S. niger*, *S. longipinnis*, *S. richardsonii*) and other miscellaneous species of less economic importance such as *B. conchonius*, *Gambusia affinis*, *Carassius carassius* contribute 25-30% to the total fish production (Qureshi et al., 2013).

Dal lake is the Himalayan urban lake located in the heart of Kashmir valley. It is Kidney-shaped and has an area of 11.20 , which was determined through the satellite imageries of the years 1994 and 1995. Owing to its valuable fisheries resources and being a famous tourist attraction spot, it has a prodigious significance from a socio-economic and ecological

Narchoo.

perspective (Bhat et al., 2005). The mainstay of fish and fisheries of Dal upto mid-twentieth century was schizothoracine species, however, with the introduction of exotic fish, common carp, schizothoracine fisheries gradually declined and common carp dominated the commercial catches (Das and Subla, 1964). In the current scenario as well, the fish catches in Dal are ruled by exotic carps. The majority of fish caught in Dal is contributed by mirror carp, followed by common carp. However, a total of 9 species are reported from Dal, two being exotic (*Cyprinus. carpio* var. *communis* and *C. carpio* var. *specularis*) and 7 being native species (*Crossocheilus diplochilus*, *Carassius carassius*, *Puntius conchonius*, *Gambusia holbrooki*, *Botia birdi*, *Schizothorax curvifrons*, *Schizothorax niger*) (Imtiaz et al., 2017).

Anchar Lake is a shallow freshwater lake located 10 km northwest of Srinagar city at an altitude of 1585 amsl. This lake has an area of about 680 hectares, half of which has now ultimately become marshland. Anchar is a typical suburban eutrophic lake with both rural and urban characteristics in an ideal rural environment. Lake fisheries of Anchar are mainly contributed by 15 species belonging to 4 orders; Cypriniformes, Siluriformes, Cyprinodontiformes, and Salmoniformes. Cypriniformes being dominant accounts for 12 of the 15 species caught from this lake. *Schizothorax* spp. forms the mainstay fisheries of Anchar lake, mainly dominated by *S. esocinus* followed by *S. plagiostomus* (Bashir et al., 2016)

Manasbal lake, also known as “gem of lakes,” is the deepest freshwater lake of Asia. The lake is situated about 30 kilometers northwest of Srinagar city in the direction of Wular Lake and is connected with river Jhelum by a canal. It has an oblong shape in an east-west direction. Manasbal lake has a total length of about 4.5 km and a width of about 300 meters. Seven fish species, namely *Schizothorax esocinus*, *S. curvifrons*, *S. niger*, *S. plagiostomus*, *Tryplophysa* sp., *Cyprinus carpio* var. *communis* and *C. carpio* var *specularis* and *Ctenopharyngodon idella* contribute to the commercial fisheries of this lake. *Schizothorax* species dominate the catches in the winter season (January and February), contributing 71% to the total catches while the exotic carps viz., *Cyprinus carpio* and *Ctenopharyngodon idella* contribute about 69% of the total catch in March and April (Mehraj et al., 2013).

Indigenous fishing gears employed for lake fisheries

To identify the Indigenous fishing gear employed for capture fisheries in different lakes of valley various studies have been carried out by Dar et al., 2012; Mehraj et al., 2013 Nimat et al., 2016; Malik et al., 2018 and have reported the following gears operated in Dal, Manasbal and Wular lake.

Cast net: locally known as zaal, cast net forms one of the dominant fishing gear in Dal, Wular, and Manasbal lake. It is the most commonly operated gear because of the apparent reason that it is operated single-handed though it requires expertise and skilled person for operation. The net is made up of nylon and cotton thread. Generally, the fishermen use nylon made cast net. It is circular, having the shape of an umbrella. The size range used is between 1.0 to 2.0 m in diameter. The mesh size varies between 1.2 to 3.0 cm bar to bar (Malik et al., 2018). In Dal Lake, two types of cast nets are operational based on mesh size, i.e., cast net with large mesh (4.55±0.21m total length) and the other with small mesh (4.13±0.31m total length) for capturing different size grops of the fish(Nimat et al., 2016).

Panzri.

Long lines: It is the primitive type of fishing gear employed inlentic waterbodies of the valley where the method of capture is based on the feeding and hunting behavior of targeted species. In this method the gear, here long line is spread over certain stretch of the water body at dusk with food laden on the hooks. It is then collected either on next morning or after 2-3 days depending upon the numbers of fish caught. In the local language, it is commonly known as ‘Walraaz’ and is operated in Dal to catch *Cyprinus* spp. and Manasbal and Wular to catch *Schizothorax* and *Cyprinus* spp. respectively. The detailed specifications of the gear employed in Dal and Wular lakes is hereby given in table 1.

Pole and line: This method of fishing is operational in Dal, Wular, and Manasbal lakes for capturing *Cyprinus* and *Schizothorax* spp. However, its economic importance is

comparatively less than other fishing methods. In both the lakes, the material of twine is of PA multifilament. However, the length of the twine differs in both lakes, with 4 to 6 m in Wular Lake and 3.5 to 5 m in Dal Lake. The higher length measurements in Wular Lake may be attributed to the more depth of water in this lake. Hook no. 5 and 6 are mostly used and are generally available in the local markets of these villages.

Bag net: Locally known as Kochibi/Sagean/Khurjaal, this fishing gear is operated in Wular and Manasbal lakes to catch fishes near waterfalls. It is known as Kochibi when the diameter of the mouth, depth of pouch, and the length of the bamboo handle are 1 meter each and is the common type Any other kind with a larger diameter and the deeper bag is called “Sagean”.

Spears: It is one of the ancient fishing gears used to catch fishes. This gear is being employed in Dal and Wular lake. Multiple headed spears are commonly known as *panzri*, and a double-pronged spears as *narchoo* in the local Kashmiri language. This type of gear requires skill and expertise for operation and is mainly operated in clear waters to catch big fishes like *Cyprinus* spp. The detailed specifications of the gear employed in Dal and Wular lakes are given in table 2.

Scoop net: This is commonly operated in Dal and Wular lake and is locally known as khashiv and kranzall. This is being used as a secondary gear to collect fishes caught from other gears like cast net, longline, lift net, or to draw fishes from storage boxes.

The detailed specifications of the gear employed in Dal and Wular lakes are given in table 3.

Gill nets: Commonly called Thani/ptaji, gill net forms suitable gear to catch fishes from deeper waters. The use of gill nets in wular lake has significantly affected the regenerative capacity of ichthyofauna of this lake. Gill nets are 15 to 40 m long and 1.5 to 3 m wide with mesh size ranging between 45 mm and 75 mm. Observing the negative impacts on the fish catches, fishers of Bandipora and Ganderbal have themselves imposed the ban on the use of this gear. However, fishers of Srinagar use it without any mesh size regulation.

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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

By Jiraporn Srisala, Piyachat Sanguanrut, Dararat Thaiue, Saensook Laiphrom, Jittima Siriwattano, Juthatip Khudet, Sorawit Powtongsook, Timothy W. Flegel and Kallaya Sritunyalucksana

From a survey of wild, adult *Penaeus monodon* of potential broodstock size from the Indian Ocean in April 2018, we obtained positive nested RT-PCR test results for infectious myonecrosis virus (IMNV) (2/26 shrimp in one specimen lot) and positive nested PCR test results for DIV1 (5/26 shrimp in a different lot). The test results were obtained using nucleic acid extracted from pleopods (swimming legs) and the PCR protocols used were those previously published for SHIV (Qiu, et al., 2017) and IMNV (Poulos Lightner, 2006; Poulos, et al., 2006); (Senapin, et al., 2007). The amplicon sequences from these tests were 99-100% identical to the matching regions published for the two viruses. As a confirmatory step, a second round of nested PCR tests was carried out using new, in-house primers designed from regions of the respective viral genomes distant from the target regions used in the first round of tests. These new tests had never been used previously in our laboratory and the positive and negative results for both viruses corresponded with those for the same individual specimens from the first round of testing for the partner target gene. Again, the amplicon sequences were 99-100% identical to the matching regions published for the two viruses.

These results suggested the possibility that the grossly normal, PCR-positive captured *P. monodon* specimens might be infected with the respective viruses at the carrier level. If so, they might serve as potential vehicles for introduction of IMNV and/or DIV1 into crustacean culture systems, especially if they were used in hatcheries for production of PL for distribution to shrimp farmers without proper precautions in place.

We recommend that wild, captured *P. monodon* from the Indian Ocean intended for use as broodstock be subjected to PCR testing before use in a hatchery and that they be discarded, if they are found to be positive. If not positive, their larvae and post-larvae (PL) should be monitored for presence of these 2 viruses periodically during production and again before they are sold to users. We also strongly recommend that industry practitioners using wild, captured *P. monodon* be discouraged from handling it together with broodstock of other crustaceans listed above in common maturation or hatchery facilities. We also recommend that shrimp farmers be discouraged from cultivating those species together with *P. monodon* in the same pond or on the same farm, especially if the latter originated from wild, captured broodstock that have not been tested for freedom from IMNV and/or DIV1 as applicable based on susceptibility of the specific species. Indeed, since domesticated stocks of *P. monodon* SPF for IMNV and DIV1 are available, we do not recommend the use of captured wild *P. monodon* broodstock for PL production at all.

To download the full document please visit:

https://enaca.org/?id=1093

COVID-19 news

Global Conference on Aquaculture 2020 postponed

The conference has been postponed due to the devastating impacts of the COVID-19 pandemic. New dates have not been fixed, but it is anticipated that the conference will be held in 2021 when circumstances allow. In the meantime, work on the programme will continue, and updates will be posted in due course. The location will remain Shanghai, China.

NACA Secretariat office closed

The NACA Secretariat office is closed and the staff are working remotely until further notice. Regrettably, our workshops and other in-person activities have also been disrupted. However, we are working on some online offerings that we hope will fill the gap.

For all enquiries please email info@enaca.org, or see our Staff Directory webpage for contact information for individual staff members:

https://enaca.org/?id=37

Got some spare computing power to fight COVID-19?

If you have an underutilised computer you can donate some of its spare processing capacity to support research on how COVID-19 viral proteins work, which is aimed at aiding the design of drugs to stop them. You can do this by participating in the Folding@Home project.

Folding@Home is a distributed computing project for simulating protein dynamics, including the process of protein folding and the movements of proteins implicated in a variety of diseases.

It brings together citizen scientists who volunteer to run simulations of protein dynamics on their personal computers.

Insights from this data are helping scientists to better understand biology and providing new opportunities for developing therapeutics.

The way it works is that you install a software client on your computer. Folding@Home will then send pieces of a protein folding simulation task to your computer, which will be processed in the background when you aren't using it. Folding@Home collates the work units processed by the community to assemble full simulations. You can choose to donate CPU time while you work or while your computer is idle, at different levels.

Over 100,000 people are currently contributing. The combined processing power is huge, currently around 1.5 x86 exoflops, making it the world's first exoflop computing system. This has allowed researchers to run computationally costly atomic-level simulations of protein folding thousands of times longer than formerly possible.

To participate, please visit the Folding@Home COVID-19 page. You will need to install their free software client and set the category to 'any'. For more information, please visit:

https://foldingathome.org/covid19/

Urgent announcement on usefulness of the lymphoid organ (LO) as an additional prime target for diagnosis of decapod iridescent virus 1 (DIV1) in diseased *P. vannamei*

By Piyachat Sanguanrut, Dararat Thaiue, Jumroensri Thawonsuwan, Timothy W. Flegel and Kallaya Sritunyalucksana

We carried out laboratory injection challenges that employed extracts prepared from shrimp naturally-infected with decapod iridovirus 1 (DIV1). We found that diseased shrimp from the injection trials showed pathognomonic lesions for DIV1 in the hematopoietic tissue that matched those reported for DIV1 in *P. vannamei* from China (Qiu et al. 2017. Scientific Reports. 7). In addition, we also found distinctive lesions in the lymphoid organ that could be used as an additional indicator in confirming diagnosis of DIV1 disease. Also, the lesions from shrimp challenged with the 10x dilution were more severe than those from 100x dilution, and for some shrimp in the 100x dilution, the lesions were very clear in the LO but absent in the HPT.

Altogether, the results suggested that histology of the HPT and LO could be used together to help in the diagnosis of DIV1 in conjunction with RT-PCR, amplicon sequencing and in situ hybridisation (ISH) analysis. This is particularly important in confirming the presence of virulent isolates of DIV1 in new geographical locations.

To download the full announcement, please visit: https://enaca.org/?id=1092

Fresh or frozen seafood?

Australia's Fisheries Research and Development Corporation (FRD) has released a free cookbook, "Fish fresh + frozen" showcasing a variety of seafood recipes.

The book is the product of an FRDC research project which proved that fresh fish is always better than frozen – expert panellists could not tell the difference!

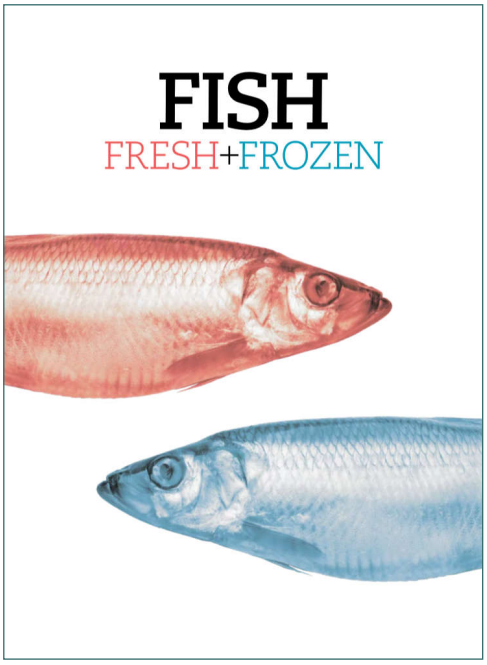
To download the book, please visit:

https://www.fishfiles.com.au/media/cook-books

To read about the research visit:

http://www.frdc.com.au/media-publications/fish/FISH-Vol-27-1/Seafood-quality-frozen-in-time

Source: FRDC.



Report of the Eighteenth Meeting of the Asia Regional Advisory Group on Aquatic Animal Health

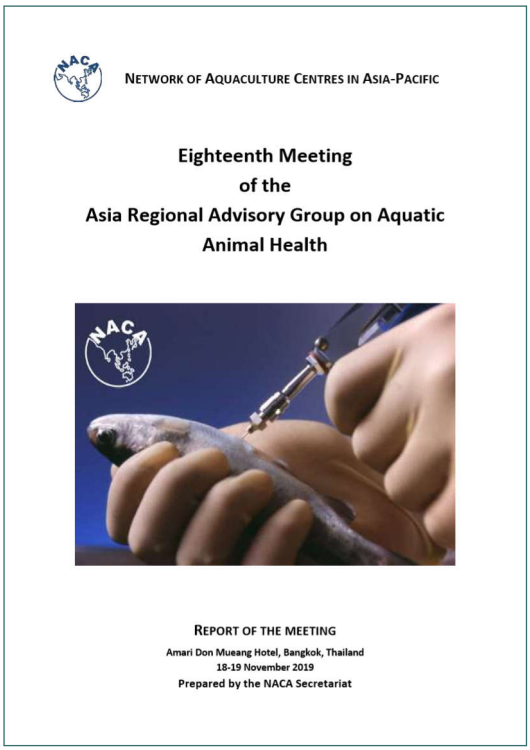
This report was prepared by the 18th Asia Regional Advisory Group on Aquatic Animal Health (AG) that met at Bangkok, Thailand on 18-19 November 2019. The group discussed:

- OIE standards and global issues, including progressive management pathways for aquaculture biosecurity.
- Review of regional disease status.
- Reports on the aquatic animal health programmes of partner agencies.
- Disease reporting.

Members of the Advisory Group include invited aquatic animal disease experts in the region, representatives of the World Animal Health Organisation (OIE) and the Food and Agricultural Organization of the United Nations (FAO), collaborating regional organisations such as SEAFDEC Aquaculture Department (SEAFDEC AQD) and OIE-Regional Representation in Asia and the Pacific (OIE-RRAP), and the private sector.

To download the report, please visit:

https://enaca.org/?id=1094



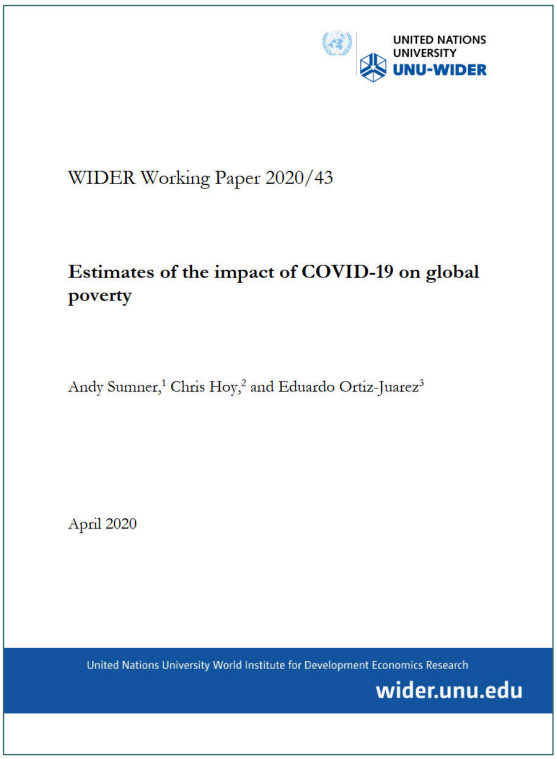
COVID-19 fallout could push half a billion people into poverty in developing countries

New research published by UNU-WIDER today warns that the economic fallout from the global pandemic could increase global poverty by as much as half a billion people, or 8% of the total human population. This would be the first time that poverty has increased globally in thirty years, since 1990.

The authors of the UNU-WIDER study - Andy Sumner and Eduardo Ortiz-Juarez of King's College London and Chris Hoy from Australian National University - find that a setback of this size would reverse a decade of global progress on poverty reduction.

"This study shows that the achievement of the 2030 Agenda, and in particular, the SDGs on no poverty and zero hunger, is under considerable threat. The need of the hour is to bring together development agencies, national governments, civil society and the private sector in a global effort to protect the livelihoods and lives of the poorest of the poor in the Global South." – Kunal Sen, Director of UNU-WIDER.

The results of the study have galvanised concern for vulnerable communities around the world. They are being cited by Oxfam International, today, in its call to world leaders to implement "an Economic Rescue Plan for All, to keep



poor countries and poor communities afloat," ahead of key meetings of the World Bank and International Monetary Fund (IMF) and G20 Finance Ministers' next week.

Oxfam is calling on world leaders to agree on an Emergency Rescue Package of 2.5 trillion USD paid for through the immediate cancellation or postponement of 1 trillion in debt repayments, a 1 trillion increase in IMF Special Drawing Rights (international financial reserves), and an additional 500 billion in aid.

The WIDER Working Paper estimates an outcome of a 400-600 million persons increase in global poverty given a scenario in which per capita consumption contracts by 20%. The study also estimates poverty increases for mitigated contractions of 10% and 5% and shows the impacts on poverty by region, as well as globally.

Andy Sumner, Professor of International Development at King's College London and a Senior Non-Resident Research Fellow at UNU-WIDER, said of the research:

"We were surprised at the sheer scale of the potential poverty tsunami that could follow COVID-19 in developing countries. Our findings point towards the importance of a dramatic expansion of social safety nets in developing countries as soon as possible and - more broadly - much greater attention to the impact of COVID in developing countries and what the international community can do to help".

To download the research report, please visit:

https://www.wider.unu.edu/publication/estimates-impact-covid-19-global-poverty

Source: UNU-Wider.

Simple techniques double crablet production

By Joesyl Marie de la Cruz

Crab farmers will be happier, and the environment hopefully better, with recent improvements at the mangrove crab hatchery of the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD) in Iloilo, Philippines.

Crablets used in the farming of the prized mangrove crabs, *Scylla serrata*, are usually collected from the wild and increasing demand has threatened their natural population with crablets becoming more difficult to find.

"Overfishing has pushed the local government of areas heavily exploited for crablets such as Catanduanes, Surigao, and Samar. They have implemented strict prohibitions in the collection of wild crablets," said Joana Joy Huervana, associate researcher at SEAFDEC/AQD and leader of the mangrove crab team.

Restrictions on wild collections in the Philippines led to the rise in demand for hatchery-bred crablets. Unfortunately, crab hatcheries suffer from very low survival rates caused by disease and cannibalism.

Crablets produced in the SEAFDEC/AQD mangrove crab hatchery in Iloilo, Philippines. Photo: Devcom Section.

However, Huervana recently revealed that simple tweaks in protocols at the SEAFDEC/AQD hatchery have led to a significant boost in their crablet production, with survival increasing twofold.

By feeding the crabs more frequently and providing cleaner water in the tanks, Huervana reported that they were able to increase the average survival rate from zoea (newly-hatched larvae) stage to crablet, from an average of one percent in 2017 to two percent in 2019.

Two percent might seem low to those unfamiliar with the hatchery business, but Huervana says crabs produce an average of 3 million larvae which translates to 60,000 crablets per spawner. She further disclosed that SEAFDEC sells crablets, as a byproduct of research, at US$ 0.10 per piece but wild crablets sold by traders in the Philippines reach as much as US$0.24 to US$0.30 per piece.

The simple tweaks helped them achieve the higher survival rate from zoea to crablet, reaching as much as 10 percent sometime last year, which contributed to the hatchery's production of over 650,000 pieces of crablets for 2019.

Increased feeding frequency, cleaner water

"Feeding frequency was increased from four to six times a day with an interval of four hours," Huervana shared, which is "based on the crabs' biomass at 100 percent feeding rate."

She said the intervention worked because cannibalism among the crabs is more prominent starting in the megalopa stage (intermediate larval phase), therefore increasing the available feeds, together with providing additional shelters in the larval tanks, increased the survival.

"As for the water replacement, the interval was shortened from five to four days. Siphoning of tank bottom to remove dead larvae, microalgae, and feeds is done every three days to further improve water quality. Also, monitoring of water parameters was consistently conducted," Huervana added.

"These techniques were tested throughout the years and were proven effective. It could also be easily adapted by hatchery owners and other stakeholders," Huervana shared.

She added that further improvements are still being done in the SEAFDEC/AQD hatchery, not only to cope with the industry's demand for crablets, but also to improve the science behind the technology of mangrove crab hatchery.

"We do our share in alleviating the pressure caused by overfishing in the wild by continuously improving production techniques of our mangrove crab hatchery to share with our stakeholders."

Above left, right: Staff of the SEAFDEC AQD mangrove crab hatchery in Iloilo, Philippines counts crablets prior to shipping out. Photo: J.D. Huervana.

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NACA is a network composed of 19 member governments in the Asia-Pacific Region.

Quarterly Aquatic Animal Disease Report, July-September 2019

The 83rd edition of the Quarterly Aquatic Animal Disease report contains information from twelve governments.

To download the report, please visit:

https://enaca.org/?id=1086