capacity developed by one nation serves as hub of learning, knowledge sharing and developing research programs with others in areas of common interest. Such programs will help nations to imbibe new technologies and carry out research in a cost-effective manner. Conservation programs, when taken up jointly by nations, will permit conservation of the genetic diversity of species over their complete native distribution, and across political boundaries. Such joint programs are likely to bring opportunities for funding from international donor agencies, which might be attracted to the possible multiple benefits to large populations and ecosystems. It is important to mention that countries with shared water resources also have shared gene pools which are linked by evolution and history.

Epilogue

The strength of the Asia-Pacific region, its rich and diverse biological wealth, is a potential pathway to transform the bioeconomy leading to regional growth supporting the livelihoods and income of farmers, producing safe and certified food, increased revenues through new products and opportunities of trade and social equitability. This transformation will need investments in capacity development of nations, mutual understanding on policy frameworks for sharing knowledge and resources, responsive institutional frameworks, research, and new technologies and opportunities for effective linkages between researchers and industry within the region and to global planning and development processes.

Cast nets: The dominant active fishing gear in the Kashmir Valley

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The State of Jammu and Kashmir falls in the great north-western, complex of the Himalayan ranges with marked relief variation, snow- capped summits, antecedent drainage, complex geological structures and rich temperate flora and fauna. Kashmir or the Jhelum Valley is situated between the Pir Panjal range and the Zanskar range. The average height of the valley is 1,850 metres above sea level but the surrounding mountains, which are always snow-clad, rise from three to four thousand metres above sea level. The surface of the valley is plains and abounds with springs, lakes and health resorts.

Kashmir Valley is bestowed with abundant water resources in the form of high altitude lakes, wetlands, rivers and springs and the geophysical conditions offer a great scope for fish to thrive. There are about 1,248 water bodies in the valley, of which lakes cover about 32,765 hectares (Raina, 2002; Sodhi et al., 2013). These harbour diverse species of fish both endemic and exotic in nature of which the predominant ones are snow trout, Chinese carps, and introduced trout. Although the fisheries sector in the Kashmir valley has enormous potential, which could ineluctably contribute to the GDP of the valley, it is yet to gain the required pace. While fishing is limited to harvesting and selling, aquaculture is in its infancy stage (Malik et al., 2018).

The huge water resources of the area play a compelling role in the socio-economic and cultural development of a large section of the population in the valley (Malik et al., 2018). At the national level fisheries form an important instrument of livelihood for a large section of the economically disadvantaged population of the country. More than seven million fishers in the country depend on capture fisheries and aquaculture for their livelihood. The story of Kashmir valley is no different as around 70% of the total population has adopted agriculture as a primary source of occupation, of

which 15% substantially has fisheries as a principal source of income (Qureshi et al., 2013). The existing fish production from Jammu and Kashmir is around 20.7 thousand metric tonnes, and the volume of fish production over a decade has varied between 19-20 thousand metric tonnes (Statista, 2019). The fisheries sector contributes around 0.48% of India's total freshwater fish production and 31% of total cold-water fishes produced in the country (Qureshi et al. 2016). The major share is from capture fishery wherein fishes are harvested from natural or open water bodies employing different types of harvesting crafts and gears. The different types of fishing gears employed in Kashmiri waters are gill net, long line, cast net, pole and line, scoop net, spears, and bag nets. The major and most commonly used is the cast net.

Cast nets

Cast nets are conical shaped; falling gear with weights attached at regular intervals on a lead rope with lengths varying from 4.20- 7.11m (Azeez, 1997). Such nets are narrow at the top and wider at the bottom to cover a large area of water. The weights on the net typically weigh around 5-7 kg. However, their weight can exceed 10-15 kilograms when loaded with squirming fish (Syed, 2018). The cast net typically has four panels and is usually made of monofilament nylon, polyethene (PE) and polyester (PES). PA twine with specifications 210 × 2 × 2 are used for the construction of cast nets in Trandava Reservoir, Andhra Pradesh (Rajeswari et al., 2015). The use of a cast net requires great skill to deploy the net efficiently, covering a large area. The durability of cast nets ranges from three months to three years with good care (Emmanuel et al., 2008). These nets are ideal for collecting fish in shallow habitats and for supplementing impoundment collection (Meador and Kelso, 1990; Stevens, 2006). They are cast from boat or shore and catch fish by falling and closing on them (Nedelec, 1982). The catch per fisher on each fishing operation can be 5-8 kg (Udolisa and Solarin, 1979). However, this gear has certain limitations such as being difficult to deploy, small area coverage and having a low catch efficiency (Leber, 1995; Emmanuel et al.2008).

In Kashmir, cast net is locally known as zaal, and cast nets are one of the dominant active fishing gear types in Dal, Wular, and Manasbal lakes of the valley. They are also known by names such as *gol zal*, *naushath zal* or *bahshath zal* (Syed et al., 2016). The nets here are circular and made of nylon and cotton thread; generally, the fishermen use nylon cast nets. The size range used is typically between 1.0 to 2.0 m in diameter, varying from 1.2 to 3.0 cm bar to bar. The nets are equipped with iron or lead sinkers of about 5.0 kg weight around the periphery (Dar et al. 2014). In Dal Lake, two types of cast nets are operational based on mesh size, i.e., large mesh (4.55±0.21m total length) and small mesh (4.13±0.31m total length) for capturing different size groups of the fish (Syed et al., 2016). In Wular Lake cast nets in use are known by different vernacular names such as *guran thap jal*, *yhap thap jal*, *naushuth jal*, *naskhul jal*, *pouch kul*, and *nor* (Dar et al.,2014). The dimensions, period of operation, species of fish caught by this net in different water bodies of Kashmir valley are given in the tables.

Conclusion

The fisheries sector of Kashmir valley is contributing to a great extent to the economy of the valley. It provides valuable foreign exchange and employment to thousands of people. At the same time it is an instrument of livelihood for a certain section of population of the valley. More than 10% of population in the valley depend on capture fisheries and aquaculture for their livelihood. Kashmir fisheries form an important component of the national fisheries with valley being the largest producer of coldwater fish in the country. The share of valley fish production to the national fish production has increased to a great extent. Since the major chunk of production is from capture fisheries a change of mindset is the need of hour as the resources, being limited, will exhaust soon if the pace of fishing is not capped. More aquaculture operations should be brought into practice to keep fish production growing at the required pace to meet the demands of the growing population. The use of technologically sound and environmentally friendly gears along with modern scientific, energy efficient farming methods will suffice the same. At the same the use of traditional fishing gears must not be side-lined. The most promising traditional gear in this direction is the cast net owing to its easy operation, size selectivity and affordability as well as durability.

Table 1: Typical specification of cast net used in Wular Lake.

Local name of the gear	Gol zal
No. of fishermen	1
Total length of net (m)	5.01 ± 0.22
Material of webbing	PA Multifilament
Specification of webbing	210D×2×2/210D×6×3
Colour of webbing	White
Mesh size of webbing (mm)	43 ± 1
Selvedge mesh no.	21.87 ± 5.82
Selvedge mesh size (mm)	64 ± 7
No. of pockets	91 ± 114
Length of pockets (m)	0.36 ± 0.03
Sinker per pocket	3.9 ± 0.1
Length of sinker line (m)	5-8
No. of sinkers	3.9 ± 0.1
Distance between sinkers (mm)	38 ± 3

Table 3: Typical cast net specifications used in Dal Lake.

Local name of the gear	Gol zal, naushath zal and bhahshath zal
Total length of net	4.55±0.21
Material of webbing	PA multifilament
Specification of webbing	210D × 6 × 3/210D × 2 × 2
Selvedge mesh size (mm	46.25 ± 2.39
Sinkers per pocket	3 ± 0
Material of sinker line	Polyethylene
Diameter of sinkers (mm)	5-8
Length of sinkers (m)	23.65 ± 0.50
Number of sinkers	337 ± 3.32
Material of sinkers	Lead/iron
Weight of sinkers (g)	32.5 ± 5.95
Diameter of sinkers (mm)	13.75 ± 1.25

Table 2: Typical specifications of different local types of cast nets operated along the Wular Lake, Jammu & Kashmir.

Local name	Length (m)	No.	Mesh size (mm)	Operation	Species of fish caught
Guran thap Jal	3.20	9	10	May-August	Latus-latus, *Puntius*, *Chonchonius*
Thap thap jal	4.5	9	10	August-Nov	Latus-latus, *Puntius*, *Chonchonius*
Naushuth jal	4.0	6	15-30	Whole year	*Schizothorax* and *Cyprinus carpio*
Naskhul jal	5.79	7	30	June-Sep	Fish weighing more than 100 g
Pouch kul	7.62	8	50	April-June	Fish weighing more than 500 g
Nor	3.66	7	25	Running water	*Schizothorax* species

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Moyna model of major carp farming in Purba Medinipur District, West Bengal, India

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Major carp farming in West Bengal and Andhra Pradesh

Major carp culture accounts for 80-85% of total inland fish production. West Bengal is the second largest producer of table-sized fish in India, next to Andhra Pradesh; with production amounting to 1.773 million tonnes in 2018-2019. West Bengal leads in hatchery-oriented fish seed production, which amounted to 22.6 million fry in the same year. In Andhra Pradesh, Krishna, West Godavari and Nellore districts are primary carp culture areas and the predominant centre is in and around Kolleru Lake. Grow-out ponds are often 0.4-4 ha in area but may extend up to 40 ha[1]. 'Bigger is better' for grow-out ponds, with an average of about 8.1 ha, and the optimum range considered to be around 10-20 ha[2]. The Kolleru system is the dominant production model for Indian major carp culture in India, termed 'yearling-based culture' which has proved highly profitable for Andhra Pradesh farmers. Large, stunted yearlings/stunted carps of 50-150 g are stocked in grow-out systems.

In West Bengal, progressive fish farmers mostly practice commercial carp farming in leased ponds. They prefer to produce sub-adult fishes that are harvested and transported live to market. In 254 treated domestic wastewater-fed fish culture ponds i.e., the East Kolkata Wetlands covering 3,944 ha, fish are harvested in 3-4 months to avoid bioaccumulation risk. The majority of Andhra Pradesh farmers harvest major carps at table size, whereas in West Bengal, major carps are mostly harvested as advanced fingerlings and juvenile fish because of high demand.

Purba Medinipur is the largest (in quantity) table-size major carp producing district out of 23 in West Bengal and uses large-scale production systems as followed in Moyna Community Development Block. In Moyna, suitable fish farming plots are taken on lease by fish farmers and the area of a single water body is comparable to conventional fish ponds with typical sizes in the ranges 6-8 ha, 20-21 ha or even 48-56 ha, although they may be less deep than a typical pond. State-of-the-art of carp farming at Moyna is the same as in Andhra Pradesh, aiming to produce large sized major carps from big, shallow water bodies in a modified extensive system.

Moyna fish production system as model

Moyna town is 90 km from Kolkata city via road. This block was declared as a fishery hub in West Bengal by the State Government and the 'Moyna Model' accepted as an example for freshwater fish culture throughout West Bengal. Moyna is a great example of the freshwater fish culture revolution in West Bengal and a new horizon for culture of the major carps. Moyna fish farmers have adapted the procedures of Andhra farmers incorporating their own blend of experience,