Original Research Article

Live Table Size Fish Transportation Practices in Nepal: Present Status and Its Prospective

ABSTRACT

This study provides insights into live fish transportation practices ~~of fisheries and aquaculture sectors~~ in Nepal. This study is based on ~~used~~ both primary and secondary data ~~which were~~ collected from various sources. Demands of fish have been increasing in the country due to awareness of peoples about health and also increased population of Nepal. Pond aquaculture contribution was 72.7 % in total fish production of Nepal. Aquaculture production is mainly from pond fish farming of Terai region from where live fish have been supplying in the major cities of Nepal. Live table size fish ~~have getting~~ fetch higher price in the market. However, farmers and venders were not using the proper protocol from harvest to deliver of fish to the destination and it~~s~~ causes stress on fish and detrimental effect on the muscle quality, mortality and economic losses. Since, the live fish traders/venders doesn't ~~not~~ know how the live fish is harvested, handled and transported, therefore to ~~give~~ impart practical knowledge, the farmers should be trained about the best practice~~d~~ of live table size fish handling and transportation to ensure healthy live fish for the consumer of Nepal.

Key words: Live fish, Transportation, Aquaculture, consumer

1.INTRODUCTION

Fish is an important source of food that provides nutrition (particularly protein) for humans. Muscle quality is the key determinant of the economic value of fish [1]. Throughout the industrial chain, live fish is exposed to a range of environmental stressors (e. g., temperature, oxygen, density, etc.) that may elicit the stress response, affecting muscle quality. Live fishes are a top-end value-added product that has guarantee the freshness and also fetch higher price than fresh, chilled or frozen goods. Live fish marketing mainly involves the transportation of fish after harvesting from the pond to the fish market in live condition for sale through the auctioneers. Globally live fish trade is well established mainly in most of Southeast Asia and southern Pacific regions [2]. Marketing live fish attracts consumers for its quality and ensures better revenue for farmers. Live fish is occupying a specialized segment in both domestic and international markets [3].

The transport of live fish for aquaculture, either for food or as companion animals, presents a major issue for animal welfare. The stressors associated with live transportation are well documented with a focus on maintaining water quality during transport to reduce stress. Stress in fish during live transportation is recognized to factors like harvesting and handling methods, water quality parameters such as dis-solved oxygen levels, increase in carbon dioxide, and drop in pH, increase in ammonia levels in the transportation system, fish loading weight transportation system, durations of transportation [4-6]. About 50 to 100% fish mortality was observed in the long-distance carriage or truck pool method in the carps weighing 300-1500 g without proper transportation protocol [7]. Stress leads to decreased immune system function, resulting in sickness and death [8]. Larger fish frequently leads to large-scale mortality due to stress arising out of handling, packing, crowding and physical injury [9-10].

Due to awareness of food safety and the quality of fish the demand for edible live fish has been increasing around the world. Live fish marketing is now becoming popular due to preference of consumer in Nepal also. Demands of fish have been increasing in the country due to awareness of peoples about health and

also increased population of Nepal. Live table size fish have getting higher price in the market [11]. There are 1681 fish markets and 22,406 farmer's pond sites from which fish marketing are carried out and 69 live fish selling stall for the selling of live fish in Nepal. More people want to buy live fish from the stall [11]. The objective of present is study was to assess the present status of live fish transportation practices and prospects in Nepal and also highlight the present status of fish production in Nepal.

2. MATERIALS AND METHODS

This study ~~was~~ was based on ~~used~~ both primary and secondary data ~~which were~~ collected from various sources. A survey was conducted in the year 2021 to 2022 to find out the farmers practices for the transportation of live fish (Table size) with semi structured questionnaire. This survey examines the methods which they used for fish harvest from ponds, fish handlings during harvest, taking of fish weight, loading of fish transport medium and care during transportation and unloading practices. Purposive sampling technique was used for the information's collection. The six live table fish supplier and six whole sellers from each five district (Bara, Sarlahi, Dhanusha, Mahottari, and Sunsari) respondents were selected and interviewed with semi structured questionnaire on the spots. Structured questionnaires were used to collect information from the key informant. Nine fish live fish suppliers were interviewed on the way of east-west high way during live fish transportation. Selected commercial fish growing farmers from each district were also interviewed about how they sell the table size live fish. The fish farms were visited on the time of fish catching and selling of live fish and procedure they adopted were noted. Secondary information's were gathered from Journals, books, proceedings, reports. The data were entered and then summarized and analyzed in MS excel var. 2013.

3. RESULTS

3.1 Present Status of Fish Production in Nepal

Total fish production in the fiscal year 2022-23 ~~2022/023~~ in Nepal was 113.73 metric ton, in which aquaculture contribution was 81.5 % and 18.5 % from capture fisheries. Among the 77 districts of Nepal, there was almost zero production from 11districts. ~~was zero fish production~~. Pond aquaculture contribution was 72.7 % in total fish production of Nepal. Aquaculture production was mainly from pond fish farming of Terai region. From total fish production of pond aquaculture, 91.6 % was from Terai region of Nepal (Fig.1) in the fiscal year 2022-23 ~~2022/023~~. The fish production from aquaculture ~~of~~ in 24 districts was above 100 metric ton, 13 districts was in the range of 25 to 100 metric ton, 16 districts was in the range of 5 to 25 metric ton and 13 districts was below 5 metric ton (Figure2) in the fiscal year 2022/023. Fish production from the pond aquaculture is in the increasing trends (Figure3). The major fish production districts are Bara, Dhanusha, Rupandehi, Sirha, Saptari, and Mahottrai of terai region of Nepal. Live table fish demand is mainly fulfilled from the pond aquaculture of Nepal.

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Ten fish species ~~is~~ are recommended for aquaculture and carps polyculture of seven species is dominant in Nepal. The main cultured species includes seven carp species: Bighead carp (*Aristichthys nobilis*), Silver carp (*Hypophthalmichthys molitrix*),Grass carp (*Ctenopharyngodon idella*), Rohu (*Labeo rohita*), Naini (*Cirrhinus mrigala*), Bhakur (*Catla catla*) and Common carp (*Cyprinus carpio*) from pond fish farming in Nepal. Rainbow trout (*Oncorhynchus mykiss*), Pangas (*Pangasius hypophthalmus*) and Nile Tilapia (*Oreochromius niloticus*) are also produced in the country. The per capita fish production was 3.8 kg in Nepal in the fiscal year 2022-23 ~~2022/023~~. The contribution of fisheries sector in GDP (Gross Domestic Products) is 0.44 % and AGDP (Agriculture Gross Domestic Products) is 1.83% in the fiscal year 2022-23 ~~2022/023~~[12].

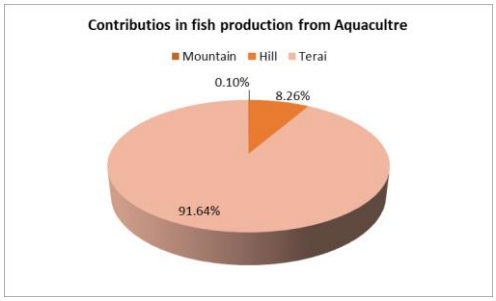

Fig.1. Physiographic region wise fish production from aquaculture

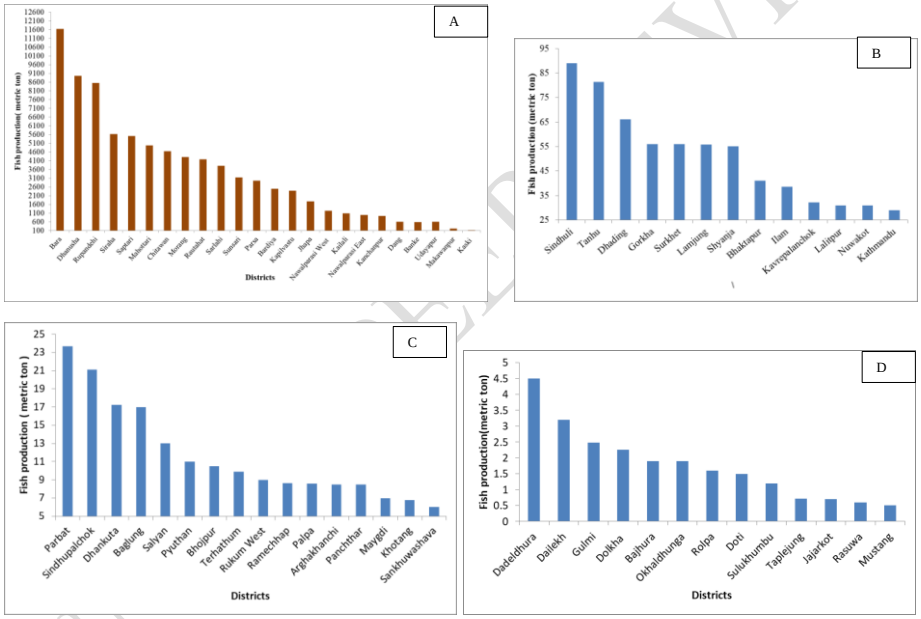

Fig. 2. Category of district wise fish production from aquaculture: >100metric ton (A), 25-100 metric ton (B), 5-25 metric ton(C) and <5 metric ton (D) in the fiscal year 2022/23.

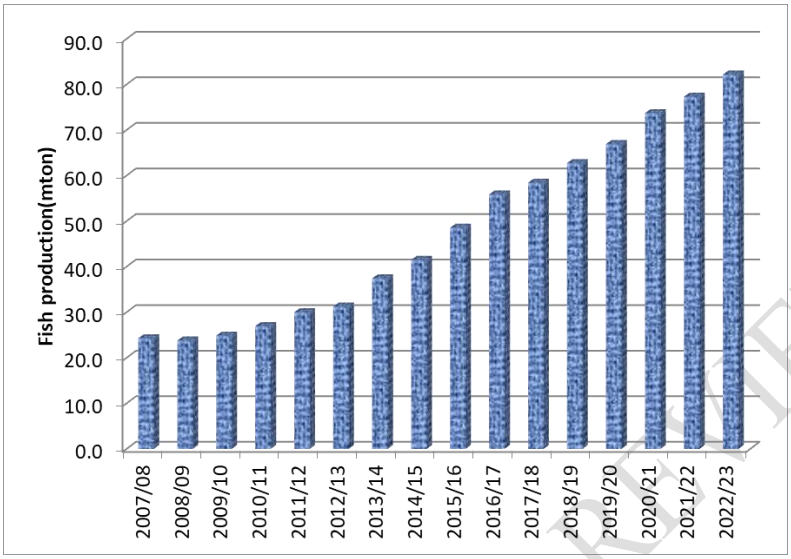

Fig. 3. Fish production trends of pond fish farming (12 CFPCC, 2023)

3.2. Fish Harvest and Handling Practices

According to respondents and field visit, for the selling to the venders, the live fish were harvested in the any time of day. They used chatti jal (drag net) to harvest the fish. They were not following the rules i.e. to stop the feeding of fish 24 hr prior to harvest. After fish harvest, the fish were kept in the plastic bag without water and taken weight by pouring in the dry bucket or in the aluminum hundies.

3.3. Conditioning Practices

Generally, live table fish were not subjected to conditioning before transportation. The harvested fish were immediately taken for the weight and then poured directly in the plastic drum or in the aluminum hundies which was filled with water. Currently, there is a lack of knowledge among operators regarding how to do handling and conditioning of live fish.

3.4. Vehicle and Container Used for Fish Transportation

According to the respondents, for the short distance and near market, the vender used aluminum hundies for loading fish and transported using motorcycle/ bicycle. For the long-distance market and bulk quantity vender use pick up van/mini truck with 250-500-liter plastic water tank to load fish (fig. 4). According to respondents and field visit, we found that for the continuous oxygen demand of fish, the plastic tank was equipped with oxygen cylinder as well as aerator to supply continuously air and oxygen for fish transported until the fish is delivered.

Fig. 4. The vehicles and containers used for live table fish transportation.

3.5. Fish Loading Weight and Transportation

According to the respondents the loading weight of fish varied species wise and seasons and it is ranges from 40-70 kg/500 litres of water in plastic water tank (Fig.4). However, they experienced that when loading weight is increased, the mortality of fish also increased (Fig.5).

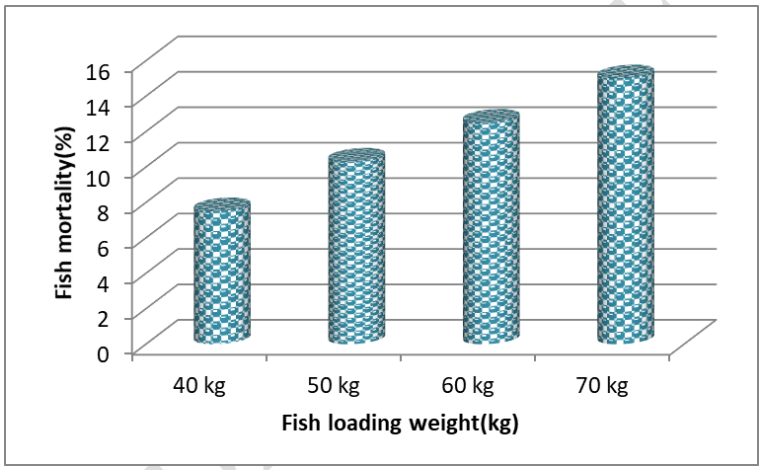

Fig.5. Fish mortality rate (%) in variable loading weight (kg) during 10 hr transportation in 500-liter water plastic tank (without conditioning) as reported by respondents and field visits.

3.6. Use of Sedative and Salt

The respondents said that the venders did not use any sedative as well as salt to cope the transportation stress. They have not any knowledge about the uses of sedative as well salt for the fish welfare during transportation.

3.7.Transportation Stress and Fish Mortality

Naini and Silver carp mortality were recorded up to 20% as reported by respondents, which is due to intolerance of transportation stress (Fig.6). Common carp and Bighead were found hardy and have less mortality in comparison to other fish. Grass carp and Rohu was found to moderate transportation tolerance.

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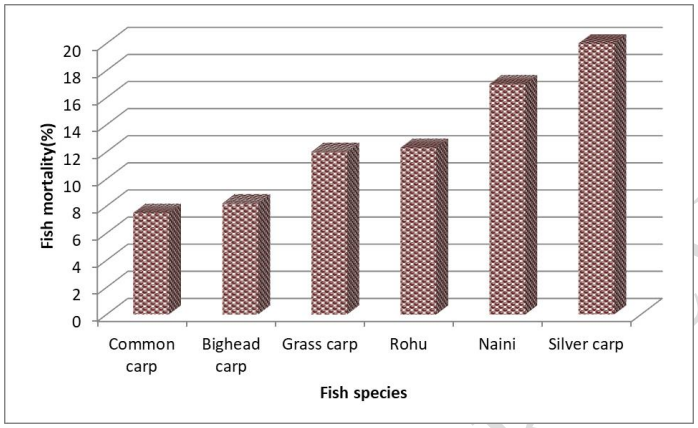

Fig. 6. Fish mortality rate (%)) during 10 hr transportation in the 500-liter water tank (without conditioning as reported by respondents and field visits.

4. DISCUSSIONS

Live fish transportation, a common practice in aquaculture, is primarily done by road, but it poses potential adverse effects on fish well-being [3,13]. Common stressors include improper handling, air exposure, inadequate food utilisation, poor conditioning, stomach evacuation before transportation, poor water quality, and inappropriate packaging densities concerning oxygen availability in the bags [5,6,14,15,16]. Sudden changes in water temperature and rapid water movement have also been identified as emerging stressors for fish during transportation [17]. Transportation is a stressful event due to physical stress, crowding and decline in water quality [18].

The present study findings have made clear that farmers and venders were not using the proper protocol from harvest to deliver of fish to the destination. Due to these reasons, the fish become stressed and detrimental effect on the muscle quality of live fish, mortality and economic losses. The lack of a systematic approach for live fish transportation, from on-farm handling to marketing, is the most significant issue faced by the stakeholders. For effective live fish transportation, in-depth understanding on the optimal environmental condition for minimal stress and maximum survival is required [19]. It is advised to use proper protocol for harvest of fish i.e. harvest of live fish in the early in the morning, harvesting of fish with knotless nets, conditioning for fish prior to transportation, proper loading weight, use of sedative and salt, maintaining optimum water quality during transportation, and acclimatization during unloading. Many researchers described methods for reducing such stress in order to reduce mortality of fish. Pre-conditioning at high density prior to packaging [20], oxygen packaging [20], mitigate the degree of stress response throughout the transportation, such as maintaining a low temperature in the water tank [20, 21], adding herbal anesthetics to the water [16, 22-27] and also adding a modest quantity of salt [28-29] are some of the strategies for transporting fish in live condition. it is also essential to ascertain safe or optimum loading

densities for different sizes of each fish species for temperature, transport duration, transportation system (18,30-36] for the successful live fish transportation.

5. PROSPECTIVE OF LIVE FISH IN NEPAL

Demands of fish have been increasing in the country due to awareness of peoples about health and also increased population of Nepal. Live table size fish have getting higher price in the market [11] in Nepal. Due to the public awareness of health and the consumer's preferences towards the live fish, live fish marketing is now becoming popular. The quality of the muscle of edible fish determines the economic value and the consumer's purchasing decision. Fish is fresh and good quality when it is alive. Fresh live fish tastes better and is also healthier. The stall of live fish is increasing day by day in Nepal. Muscle quality determines the economic worth of fish and the consumer's decision on purchase. Recent studies indicate that muscle quality is influenced by transportation stress response [37]. In that context, good quality live fish for consumer with their certificates indicating the productions sites, harvesting and transporting methods will determine the fish price in the market. Therefore, live table size fish for consumers must be quality by following the scientific protocol by mitigating stress of handling and transportation.

Better management practices suggested for live fish transportation (Suggest best practices for better live fish transportation including size of the fish to be transported, proper harvesting, best facilities for storage during transportation (with oxygen or without oxygen), best transport facilities, measures during transportation, display at the fish shops for sale etc.

6. CONCLUSIONS

The farmers and venders' adopting practices for live fish transportation was without proper protocol which leads to fish mortality as well as ~~loss~~ deterioration in the quality of fish. They did not know the how the live fish is harvested, handled and transported. Proper protocol for the live fish transportations should be developed and follow to ensure healthy live fish for the consumer of Nepal. The farmers should be trained about the best practiced of live table size fish handling and transportation.

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