

Research Article**DIVERSITY AND MARKETING OF DRIED FISH PRODUCTS IN NEPAL****N. Pradhan^{1*}, M. K Shrestha², S. Rai², D. K. Jha² and S. K. Sah²**¹Fisheries Research Division, Godawari, Kathmandu, Nepal²Agricultural and Forestry University, Rampur, Chitwan, Nepal**ABSTRACT**

Various dried fish products are available in Nepalese markets. The information on diversity and marketing system of dried fish products in the country is scanty. Survey on dried fish was carried out in 19 districts to elucidate the species diversity, market channels and consumer's preference of dried fish. Exotic species such as *Harpodon nehereus*, *Penaeus* spp., *Stolephorus* spp. imported from several Asian countries shares approximately 70 percent of the dried fish market of the country. The dried fish products available in the market are in the form of sun-dried, smoked, spicy instant fish and fish pickle. Marketing system of dried fish varies for indigenous captured fish, cultured fish and imported fish. Price of dried fish varied greatly being high in rainy season associated with short supply and increased demand, and relatively low during winter months because of excess supply. Survey findings indicated that consumer's preference on dried fish species is different with their different believes, traditional knowledge and eco-region. However, quality of dried fish available in market is a concern.

Key words: Sun-dried, smoked, consumer's preference, market channels**INTRODUCTION**

Drying is one of the most commonly practiced method of fish preservation in Nepal and is a traditional and primitive preservation method. It is also one of the world's oldest known preservation method (Govindan, 1985). Dried fish products are mostly used by all communities and considered sacred and is offered to various deities during festivals in Nepal (Pathak, 2007). Dried fish is as important as fresh in terms of protein consumption as the crude protein levels are likely to be almost twice those of fresh fish in terms of quantity, if not quality (Murray & Little, 2000). This is especially the case for the poor for whom dried fish represents the most cost-effective animal protein source. Dried fish has become one of the good sources of protein supply in remote areas of Nepal where fresh fish transportation is a constraint to mountainous regions and malnutrition is most severe. Moreover, dried fish has years of storage life and is a great source of protein, essential fatty acids, vitamins and many minerals (Banu et al., 1985). It is consumed all over the world for its nutritional value, taste and aroma. It is also considered as an important exportable fishery product (Nowsad, 2007).

Dried fish are used for several purposes in Nepal. The most common is the household purpose for daily or consumption in different festivals. The dried shrimp are also used in noodle factories as additive in instant noodles. The other industries which used the low cost dry fish are the feed industries for poultry where dry fish products are used as feed ingredient. Dried fish products

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Table 1. Survey locations of dried-fish products.

SN	District	Location	Respondent (no.)
Terai			
1	Sunsari	Itahari-2, Dharan	14
2	Morang	Biratnagar	7
Mid hill			
3	Lalitpur	Lagankhel, Mangalbazaar, Mahapaal	20
4	Kathmandu	Balkhu, Kalimati, Asan, Maruhity	20
5	Bhaktapur	Sukuldhoka, Nalanda and Kamal Binayak	16
6	Kavrepalanchowk	Dolakha	8
7	Chitwan	Narayanghat, Parsa	4
8	Sankhuwasabha	Tumlingtar	29
9	Kailali	Karnali Chisapaani, Kothiaghat	6
10	Nuwakot	Trishuli bazaar, Gadkhar, Dhikure	10
11	Dhading	Malekhu	6
12	Bara	Rahuwahi	14
13	Kaski	Mardi Khola, Begnas, Rupa, Phewa Lake side	7
14	Parbat	Dimuwa bazaar	3
15	Rupendehi	Thutepipal, Bhairahawa	4
16	Banke	Nepalganj	2
17	Bardiya	Rajapur, Daulatpur	2
18	High hill		
19	Rasuwa	Betrawati	5

RESULTS

Diversity of dried fish products

A total of 27 sun-dried fish species were identified from the collected samples during the survey (Table 2). Some species of dried fish such as *Stolephorus* spp., *Penaeus* spp., *Puntius conconius*, *Puntius sophore*, *Aspidoparia morar*, nathali, madali etc. were found displayed separately into two to three categories in market according to quality and size. Total body weight, total length and price of dried fish are presented in Table 2.

Table 2. Body weight, total length and price of sun-dried fishes in wholesale and retail market in Nepal (mean \pm standard deviation)

S. no.	Fish species	Body weight, (g)	Total length (cm)	Price (NRs /kg)
1	Bamala (<i>Harpodon nehereus</i>) (small size)	6.1 \pm 1.6	20.5 \pm 1.9	600 \pm 100
	Bamala (<i>Harpodon nehereus</i>) (big size)	23.2 \pm 9.9	27.8 \pm 2.3	1000 \pm 227
2	Bhulbhulaiya (<i>Glassogobius</i> spp.)	1.8 \pm 0.5	7.6 \pm 0.8	900 \pm 141
3	Bola (<i>Barilius bola</i>)	7.7 \pm 2.0	12.0 \pm 1.1	400 \pm 50

S. no.	Fish species	Body weight, (g)	Total length (cm)	Price (NRs /kg)
4	Buduna (<i>Garra gotyla</i>)	1.7±0.9	6.4±1.3	575±106
5	Chanerbijuwa (<i>Chanda</i> spp.)	0.3±0.3	2.5±0.4	500±354
6	Chelawa (<i>Clupisoma garua</i>)	0.7±0.4	6.1±0.9	625±321
7	Shrimp (<i>Penaeus</i> spp.) (medium size)	0.4±0.3	4.9±0.7	950±50
	Shrimp (<i>Penaeus</i> spp.) (big size)	0.7±0.3	3.3±0.5	1250±0
	Shrimp (<i>Penaeus</i> spp.) (small size)	0.3±0.1	3.9±0.7	783±176
8	Karti machha (<i>Gadusia chapra</i>)	0.3±0.1	4.1±0.9	200±0.0
9	Kauwa (<i>Xenentodon cancella</i>)			600±0
10	Kechaki (<i>Stolephorus</i> spp.) (medium size)	0.6±0.2	2.5±0.2	1200±100
	Kechaki (<i>Stolephorus</i> spp.) (big size)	0.7±0.1	3.3±0.3	1200±86
	Kechaki (<i>Stolephorus</i> spp.) (small size)	0.3±0.2	2.7±0.5	900±95
11	Maili (<i>Aspidoparia</i> spp.)	0.8±0.2	6.0±0.4	500±100
12	Malki/Sujala bam (<i>Mastacembalus armatus</i>)	8.6±1.8	18.5±4.5	1250±70
13	Muwa (<i>Aspidoparia morar</i>) (big size)	1.3±0.8	6.7±1.3	600±50
	Muwa (<i>Aspidoparia morar</i>) (small size)	0.9±0.4	5.2±0.9	550±71
14	Pothia (<i>Puntius</i> spp.)	1.5±0.4	5.8±0.5	600±200
15	Rahiya/Rewa (<i>Cirrhinus rewa</i>)	1.8±0.2	6.5±0.7	600±50
16	Seto machha (<i>Ompok bimaculatus</i>)	1.7±0.9	8.1±1.6	400±0
17	Sidra (<i>Puntius</i> spp.) (big size)	1.3±0.5	4.5±0.9	400±150
	Sidra (<i>Puntius</i> spp.) (small size)	1.0±0.3	4.0±0.6	400±100
18	Singhi (<i>Mystus seenghala</i>)	0.7±0.1	3.4±0.3	260±0
19	Silver carp (<i>Hypophthalmichthys</i> spp.)	12.0±1.7	13.7±0.7	300±70
20	Tilapia (<i>Oreochromis niloticus</i>)	3.2±3.4	6.9±3.3	200±50
21	Nathali (big size)	1.7±0.6	7.7±0.9	625±35
	Nathali (small size)	0.8±0.3	6.3±1.1	600±0
22	Madali (big size)	1.8±0.9	11.8±1.5	800±180
	Madali (small size)	0.8±0.3	6.6±0.6	500±100
23	Mara (<i>Aspidoparia jaya</i>)	1.1±0.4	6.2±0.7	440±57
24	Morai	0.6±0.2	5.3±8.0	450±60
25	Moti machha	2.2±0.6	7.8±0.7	300±0
26	Para	9.8±3.3	12.2±1.1	400±120
27	Kokila	16.3±1.5	16.3±0.3	550±71

During the survey, whole smoked local/indigenous fishes: asala (*Schizothorax* spp.), sahar (*Tor putitora*), mahseer (*Tor tor*), rohu (*Labeo rohita*), naini (*Cirrhinus mrigala*), kalanch (*Labeo dyocheilus*), gardi (*Labeo dero*), malki bam (*Mastacembalus armatus*), buduna (*Garra gotyla*), faketa (*Barilius* sp.) were found in the hotel and shop near the rivers and lake side (**Table 3; Figure 2**). Usually the whole fish were smoked without any additives. *Schizothorax* spp. fetched high price due

to high demand and good taste. While *Cirrhinus mrigala*, cultured species produced in mass scale comprised least price.

Table 3. List of indigenous fish species, collection site, body weight and length, price of whole smoked fish product (mean \pm standard deviation)

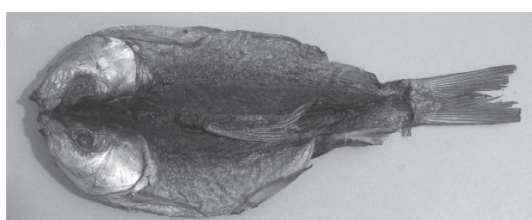
S. no.	Local name	Scientific name	Body wt (g)	TL (cm)	Price (NRs. /kg)	Collection site
1	Sahar	<i>Tor putitora</i>	35.2 \pm 14.0	24.6 \pm 3.9	3500 \pm 0	Karnali Chisapaani, Kailali
2	Mahseer	<i>Tor tor</i>	143.2 \pm 231.0	26.5 \pm 13.2	3500 \pm 0	Karnali Chisapaani, Kailali
3	Asala	<i>Schizothorax</i> spp.	100.1 \pm 43.9	30.6 \pm 5.0	4200 to 5000	Karnali Chisapaani, Kailali Pokhara, Kaski
4	Rohu	<i>Labeo rohita</i>	135.4 \pm 50.2	33.0 \pm 3.6	3500 \pm 0	Karnali Chisapaani, Kailali
5	Naini	<i>Cirrhinus mrigala</i>	23.7 \pm 10.0	14.9 \pm 2.7	1750\pm250	Malekhu, Dhading
6	Kalanch	<i>Labeo dyocheilus</i>	41.1 \pm 8.1	23.3 \pm 1.8	3500 \pm 0	Karnali Chisapaani, Kailali
7	Gardi	<i>Labeo dero</i>	86.5 \pm 1.0	29.0 \pm 0.4	3500 \pm 0	Karnali Chisapaani, Kailali
8	Malki bam	(<i>Mastacembalus armatus</i>)	7.5 \pm 5.0	18.5 \pm 4.5	4000 \pm 0	Pokhara, Kaski
9	Buduna	<i>Garra gotyla</i>	5.5 \pm 2.7	9.1 \pm 1.3	3000 \pm 0	Pokhara, Kaski
10	Faketa	<i>Barilius</i> sp	1.1 \pm 0.4	6.42 \pm 0.9	3000 \pm 0	Pokhara, Kaski



(a) *Tor putitora*



(b) *Tor tor*



(c) *Labeo rohita*



(d) *Labeo dero*

e) *Labeo dyocheilus* and *Tor putitora*(f) *Mastacembalus armatus*

Figure 2. Smoked indigenous fish species (a) to (f)

Besides whole smoked fish, fish smoked in pieces were also collected during survey. A total of thirty-two species of fish smoked in pieces are listed in Table 4. Most of them were indigenous species, captured from river, stream and lakes, and some were cultured species like *L. rohita*, *C. mrigala*, *O. mykiss*, *A. nobillis*, and *H. molitrix*. The fish smoked in pieces were mixed with salt and spices and smoked over mud oven.

Table 4. List of fish smoked in pieces available in market

S. no.	Local name	Scientific name	S. no.	Local name	Scientific name
1	Sahar	<i>Tor putitora</i>	17	Chuchche bam	<i>Xenentodon cancilla</i>
2	Mahseer	<i>Tor tor</i>	18	Karange	<i>Puntius chilinoids</i>
3	Asala	<i>Schizothorax</i> sp.	19	Buduna	<i>Garra gotyla</i>
4	Katle	<i>Acrossocheilus hexagonolepis</i>	20	Bhitte	<i>Puntius sarana</i>
5	Rohu	<i>Labeo rohita</i>	21	Rewa	<i>Cirrhinus rewa</i>
6	Naini	<i>Cirrhinus mrigala</i>	22	Kande	<i>Carassius carassius</i>
7	Bhakur	<i>Catla catla</i>	23	Baghi	<i>Botia</i> spp.
8	Hile	<i>Channa punctatus</i>	24	Faketa	<i>Barilius</i> spp.
9	Chelwa	<i>Clupisoma garua</i>	25	Malki bam	<i>Mastacembalus armatus</i>
10	Tengra	<i>Mystus seenghala</i>	26	Magur	<i>Clarias</i> sp.
11	Junge	<i>Mystus</i> spp.	27	Gardi	<i>Labeo dero</i>
12	Bhoti	<i>Channa</i> spp.	28	Kalanch	<i>Labeo dyocheilus</i>
13	Hile	<i>Channa punctatus</i>	29.	Tilapia	<i>Oreochromis niloticus</i>
14	Kavre	<i>Glyptothorax annandalei</i>	30	Bighead carp	<i>Aristichthys nobillis</i>
15	Lohari	<i>Crossocheilus latius</i>	31	Silver carp	<i>Hypophthalmichthys molitrix</i>
16	Bhurluk	<i>Puntius</i> spp.	32	Rainbow trout	<i>Oncorhynchus mykiss</i>

Various imported dried fish products available in the markets were: sun-dried, fried fish with spices, fish pickle, spicy instant fish (Table 5) and smoked fish. Imported dried fish products

available during survey were from India, China, Brunei and Thailand. The dried fish markets were dominated (75%) by fish imported from India. The sun-dried fish imported from India was mostly displayed openly. However, in some retailers the most common dried fish were found in plastic bag packet in convenient size. Instant dried fish packed in plastic bag and fish pickle were observed in retailers.

Table 5. Preserved fish product types available in market and place of origin

Product type	Fish species	Price (NRs/kg)	Market type	Distribution
Nepalese product				
Smoked fish with curing	32 fish species (Table 4)	3000 to 5000	Hotels and retail	Karnali Chisapaani, Kailali, Pokhara, Kaski, Malekhu, Dhading
Indian product				
Sun dried fish without curing and packing	27 fish species (Table 2)	200 to 1300	Wholesale, retail	All surveyed districts
Sun dried fish with ordinary packing	5 species (Table 2)	400 to 1000	Retail	Kathmandu, Lalitpur, Banke
Fried fish with spices and in packing	Kechaki, Muwa	780 to 800	Retail	Kathmandu, Lalitpur,
Fish pickle	Kechaki and Shrimp	1100 to 1400	Retail	Kathmandu, Lalitpur, Kaski
Chinese product				
Instant spicy fish	Not known	400	Retail	Kathmandu, Lalitpur, Bhaktapur, Kaski
Brunei product				
Well processed sun-dried fish with packing	<i>Stolephorus</i> spp.	1000	Retail	Kathmandu, Lalitpur, Kaski
Thai product				
Well processed sun-dried shrimp with packing	<i>Penaeus</i> spp.		Retail	Kathmandu, Lalitpur,

Marketing channel of imported dried fish

The main source of sun-dried fish in the country was India. The sun-dried fish imported from India were transported in heavy trucks by packing in jute bags and delivered to wholesale markets of dried fish. There were about 12 wholesale markets of dried fish in the country, distributing in Kathmandu, Kaski, Butwal, Banke districts. One variety of instant spicy-dried fish in vacuum packed plastic bag was imported from China by road through Tatopanni. Processed *Penaeus* spp. and

processed *Stolephorus* spp. imported by cargo from Thailand and Brunei, respectively by packing in plastic bags (Figure 3).

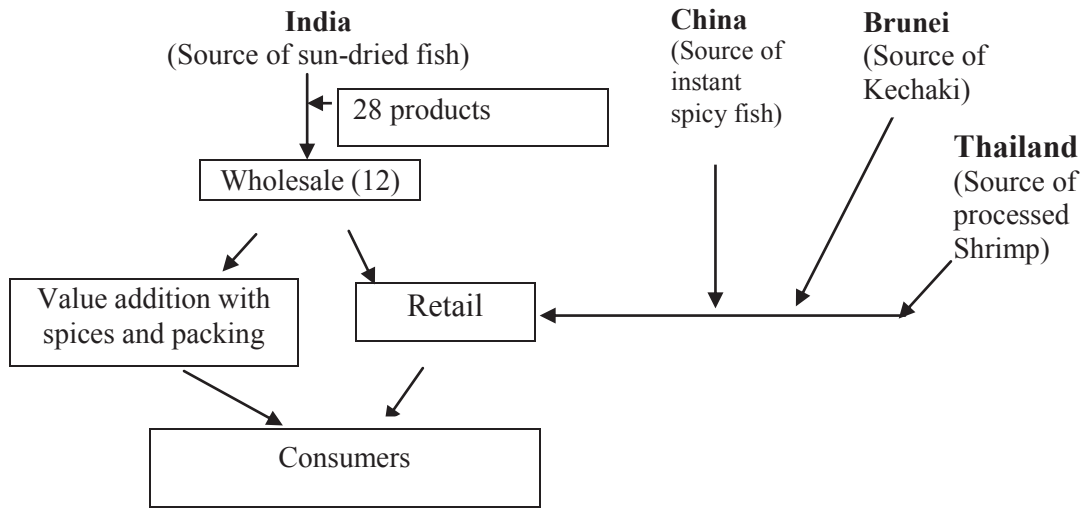


Figure 3. Marketing channel of dried fish products imported from India, China, Brunei and Thailand to Nepal

Marketing channel of domestic dried fish

The marketing channels of domestic origin of dried fish depend on location and access to the source (Figure 4). Production of dried fish was always at or near important fish landing areas or fishing villages.

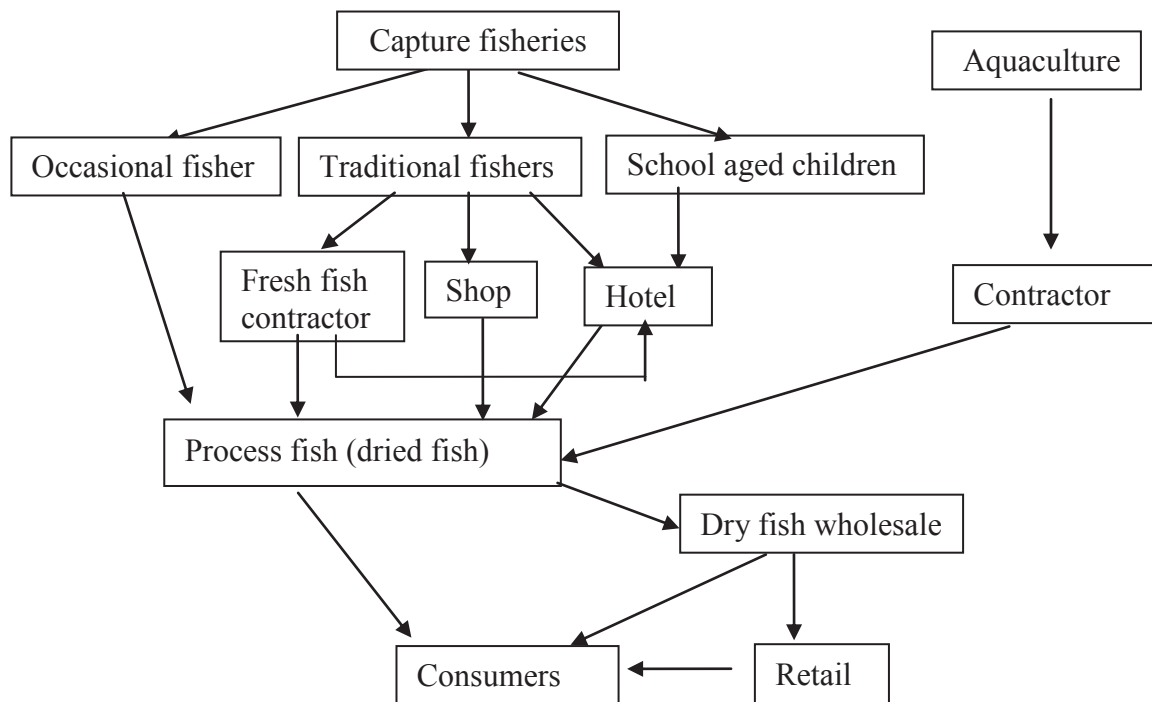


Figure 4. Marketing channel of domestic origin dried fish

Market Share by dried fish

Pothia (*Puntius* spp.) covered the 40% market of dried fish in Terai region, followed by silver (marine) (5%), bamala (*Harpodon nehereus*), medini and kechaki (*Stolephorus* spp.) (Figure 5). Other species were in low preference and they were displayed to increase product diversity.

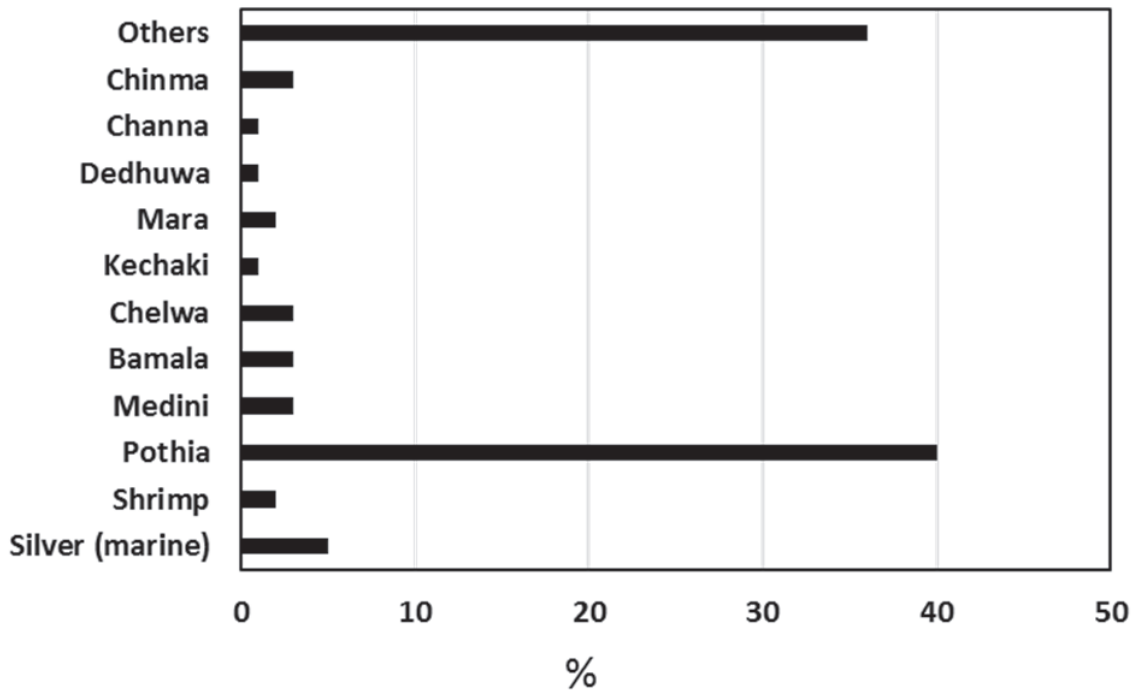


Figure 5. Market coverage percentage of different dried fish in Terai region

Kechaki (*Stolephorus* spp.) was dominated covering 25% market share in Kathmandu valley (Figure 6) followed by nathali covering 20% market. Shrimp (*Penaeus* spp.) and bamala (*Harpodon nehereus*) covered 15 % and 10% market share respectively.

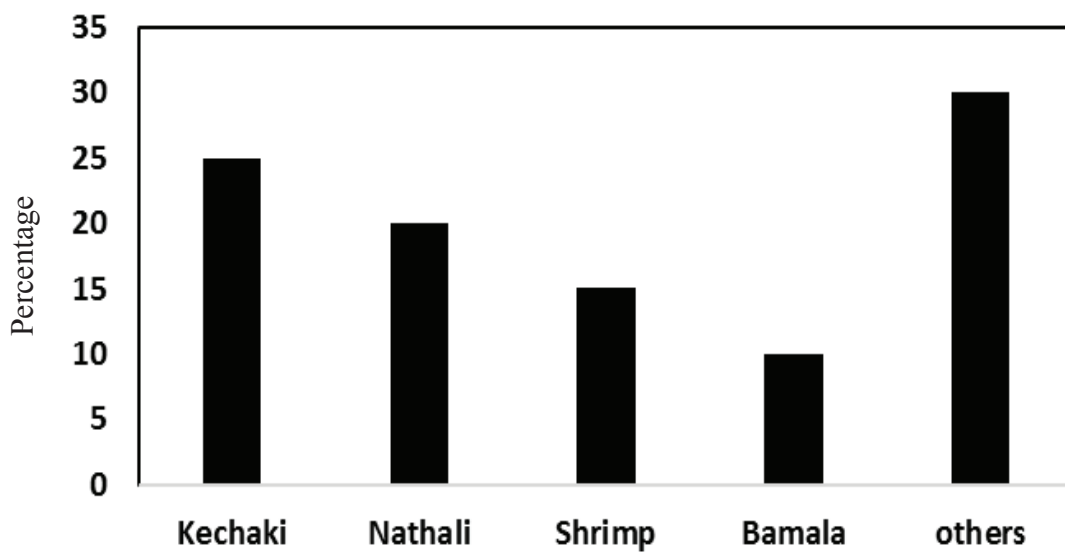


Figure 6. Market coverage percentage of different dried fish in Kathmandu Valley

Price of dried fish

The price of bamala (*Harpodon nehereus*), buduna (*Garra gotyla*), shrimp (*Penaeus spp.*), kokila and nathali was presented in Figure 7. Price of bamala (*Harpodon nehereus*), increased to very high in retail market comparative to origin (India) and wholesale.

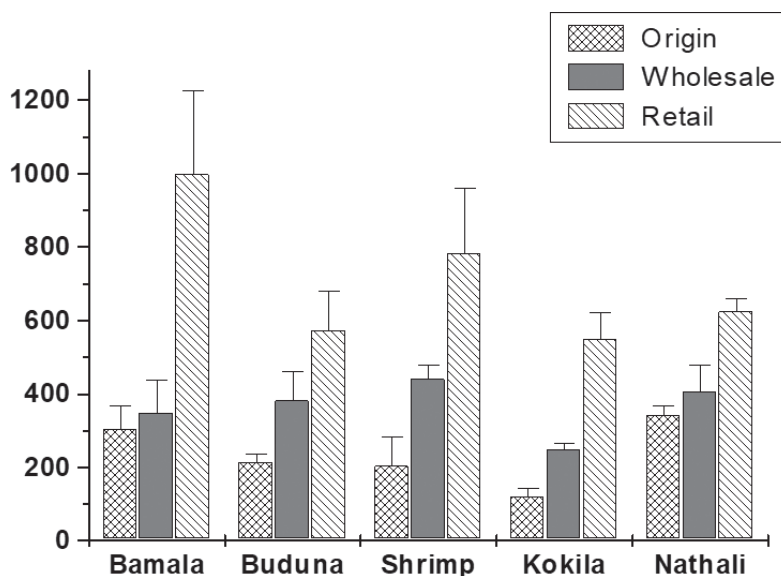


Figure 7. Price of dried fish (NRs/kg) in origin (India), wholesale and retail markets in Nepal

Seasonal trend of dried fish supply

Availability of species varies from season to season. Most variety is found in winter season than other seasons. According to the respondents of wholesale demand and supply were highest during winter season (Figure 8).

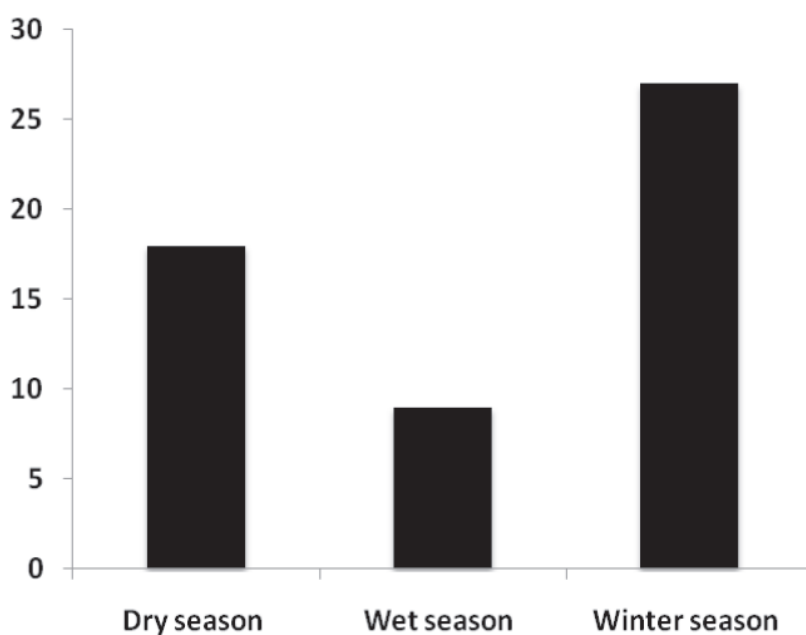


Figure 8. Seasonal trend of dried fish supply at surveyed sites

Consumer's preference

Consumer's preference on dried fish in Terai and Hill according to the attributes of dried fish is presented in Table 6.

Table 6. Consumer's preference of dried fish in Terai and Hill region.

Attributes of dry fish	Consumer's preference	
	Terai	Hill
Belief of symbol of good luck	+	+++
High self-life and easy for transportation	+	++
Medicinal value	++	++
Energy provider	+++	+++
Alternative to fresh fish and green vegetable	+++	+++
Recipe diversity	+++	+++

+ Fair, ++ high, +++ very high

DISCUSSION

Various dried fish products prepared locally in country and imported from other countries like India, China, Thailand and Brunei are available in Nepal. The fundamental difference of the dried fish between Nepalese products and other countries are mostly of fish species. Asala (*Schizothorax* spp.) was the most abundantly available dried fish species in hilly areas of Nepal. Asala were exclusively collected from cold water streams and river as these have not been started to cultivate commercially. The other captured species abundantly dried were sahar (*Tor putitora*), magur (*Clarias* spp.), tilapia (*O. niloticus*), bhurluk (*Puntius* spp.), bhitte (*Puntius sarana*) etc. silver carp (*Hypophthalmichthys molitrix*) and big head carp (*Aristichthys nobillis*) were easily available in catch in the lakes where they were stocked by the communities. Due to high market demand for fresh fish, the majority of dried fish product in lake side of Pokhara Valley were smoked on demand by the hoteliers. Rainbow trout (*Oncorhynchus mykiss*) was smoked in private trout farm in Kaski district.

Some species of dried fish such as kechaki (*Stolephorus* spp.), shrimp (*Penaeus* spp.), bamala (*Harpodon nehereus*), pothia (*Puntius conconius*), nathali, madali, muwa (*Aspidoparia morar*), sidra (*Puntius sophore*) etc. were displayed separately into two to three categories according to quality and size. Similar display of dried fish was observed in other countries. A report prepared by Maynard, J. in 1988 by surveying different Asian countries showed some common product preferences, namely, dried anchovy (*Stolephorus* spp.), dried small shrimp (*Penaeus* spp.) and dried squid and they could all be found in markets from Colombo to Hong Kong. In the more quality discriminating countries such as Thailand, Singapore and Hong Kong, these varieties can be separated into as many as eight categories according to the quality, grade and size. Consumers of these countries were very quality conscious because of the separation into several grades of each species of product in retail markets. Dried shrimp display was observed to have eight different grades, sorted as to color and size, to please the discriminating buyers.

The traditional methods of dried fish production are sun-drying and smoking in Nepal (Shrestha 1999). These drying methods basically are similar to those employed in several other countries

(Sachithanathan *et al.*, 1985; Cutting 1996). In Nepal, people living around the natural water bodies (river, stream, lakes) preserved captured indigenous fish by smoking. The respondents reported that if they could not sell the fresh fish they preserved it by smoking. They also smoked the fish on demand. The fish were either smoked whole or in pieces. Usually the whole fish were smoked without any additives. Usually the hoteliers at Karnali Chisapani, Kailali smoked fish in pieces mixing with salt and spices.

Marketing system

The marketing channels of domestic origin of dried fish depend on location and access to the source (**Figure 4**). Most of the local peoples in Tumlingtar of Sankhuwashava district, irrespective of cast living nearby natural water resources catch fish at their free time and smoked over earthen oven and sale in haat bazaar (weekly market). They also prepared smoked dried fish according to the consumer's demand. The traditional fishers inhabiting in lakes of Pokhara valley (Phewa, Begnas and Rupa) caught fish and sold to the fresh fish contractor. The contractor sold the fresh fish to shops and hotels. The school aged children living nearby natural water resources catch fish from rivers, stream and lakes and sell to shops and hotels. The smoked fish were sold to wholesaler, and from wholesaler to retailer and finally to consumers. Whereas in the case of dried fish prepared from cultured species the contractors buy the fresh fish from the commercial fish farmers mainly from Bara, Parsa and Rautahat districts and sell to the dry fish processor. It was estimated that 90 % of commercially produced fish used for smoke drying is naini (*C. mrigala*). Peoples used to export smoked Asala (*Schizothorax* sp.) from Dimuwa bazaar of Parbat district to Hongkok according to the demand Asala (*Schizothorax* spp.) fetched high price due to high demand and good taste. While the commercially cultured naini (*C. mrigala*) comprised least price. Unsubstantiated claim that and rainbow trout (*Oncorhynchus mykiss*) was being exported from private farm of Nepal to Hongkong and USA and earned foreign currency (personnel communication, Amrit Gurung, Gandak Trout farm, Kaski).

Kechaki (*Stolephorus* spp.) was dominated covering 25% market share in Kathmandu valley (Figure 6). This species is used to prepare different dried fish products such as fish pickle, mixed with peanut and bitten rice, fried with salt and spices. The countries surveyed by Maynard, J. in 1988 showed some common product preferences, namely, dried anchovy (Kechaki), dried small shrimp and dried squid and they can all be found in markets from Colombo to Hong Kong. In Thailand, the most favored species was the freshwater gourami (*Trichopodus pectoralis*). In Malaysia, anchovy (*Stolephorus* spp.) was the most favored dried fish species followed by dried-boiled shrimp. Anchovy accounts for almost half of the dried fish marketed and is favorite in all markets. It had a wide variety of uses and is purchased by all sectors of the society. it is mainly used as snacks. Mothers grind it and add it to a rice porridge to feed their babies (Maynard, J.,1988).

In Nepal, the retailer markets of dried fish were generally located alongside vegetables. Whereas the wholesale markets of dried fish were located in distance market. As in case of other Asian culture, dried fish were generally marketed alongside vegetables for which it is almost interchangeable commodities that should be clearly distinguished when investing consumer preference.

Tonnes of dried fish are imported from India to 12 wholesale markets of Nepal. The price of dried fish at wholesale and retail markets depends upon the demand, supply and quality. For

instance, price of bamala (*Harpodon nehereus*) increased to very high in retail market comparative to origin and wholesale due to its high demand.

A study of Asadganj dry fish market, Chittagong, Bangladesh reports the prices of dried marine fish depends on the size, availability, quality of the species, transport, labor and season (Faruque et al., 2012). The price of Bombay duck ranged from 65-100 Tk./kg, Shark 65-90 Tk./kg, Shapla pata 28-55 Tk./kg, Suna bain 50-80 Tk./kg Kleih et al. (2003). This type of variations might be the reason of differences in processing cost, labor cost and price of fish in different areas.

Fish is one of the commodity which are sun-dried, oil-fried and smoked for preservation to add value in the products (Cutting 1996). Pothia (*Puntius* spp.) was preferred by people due to its good taste (for example pickle prepared by pothia (*Puntius* spp.) with tomato is very delicious). The cast, Bhote also preferred pothia (*Puntius* spp.). Respondents reported that dried fishes were popular for some religious purpose and an essential food in some cast for sagun. Recipes of dried fish were well established in local peoples. Consumers also believed that some dried fish such as magur (*Clarias* spp.) could cure rickets disease in human being. Consumers preferred dried fish particularly in those areas where fresh fish was not easily available. Demand of dried fish was high during low supply of green vegetables. Mountain people prefer dried fish because of its longer shelf-life.

In dry fish marketing, there were various problems such as lack of scientific knowledge and technology, price instability, lack of transport facilities, lack of inadequate storage facilities, lack of physical marketing facilities and lack of marketing information. (Ahmed et al., 2007). Hygiene and sanitation and, the standard practices for handling, washing, sorting, grading, cleaning and drying has been the concern for consumer's health. Similar concerns have been reported from Bangladesh (Ahmed and Sturrock, 2006). Wholesalers did not maintain cold storage facilities to keep their inventory of dried fish products in good quality condition. Therefore, in summer season there was loss of dried fish due to insect infestation. During storage in monsoon season visible fungal colonies appeared quickly in large number on all types of samples. Fungal growth was a major cause of spoilage with the increase of moisture content. Retailers generally keep small inventory so that the product did not deteriorate before being sold.

CONCLUSION

Dried fish are used for various purposes has high demand. Price of dried fish varied according to the species, size, season, quality, demand and supply. Most commercially available sun-dried fish were imported from India. The bulk of commercially produce smoked inland fish that appears on the market comes from Terai region, particularly from Bara, Parsa and Dhading districts. There was irregular supply of smoked fish prepared from captured indigenous fish species. Most of the dried fish were openly displayed in most of the markets. The quality of dried fish usually judged by market players by fragmentation, fungal infestation and insect infestation. The dried fish could be promoted and valued further by quality assurance of the product in future. Wrappers, vacuum packing and dehydrant could be used to increase the value of dried fish in terms of durability in storage and high market opportunities.

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