Biological Forum – An International Journal **15(10): 980-985(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

To Determine the Marketing System of Fish in Purnea, North Eastern Bihar, India

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(Received: 15 August 2023; Revised: 08 September 2023; Accepted: 30 September 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: The study was conducted on the fish marketing system of Purnea district over a duration of two years (January, 2021 to December, 2022). The usually higher demand for fish and unavailability of market infrastructure including storage facilities was the major challenges for fish marketing in Purnea, Bihar. The survey of famous fish markets was designed to have a depiction, direct observation and personal interview technique applied to an objective record marketing system in Purnea, Bihar India. The paper agreements with the present fish market structure, marketing channel, fish price, demand and other factors influence the fish marketing system. Results indicated that the fish seller, four type of fish (Indigenous, live, small and exotic fish) estimate 21900 ton / year were sold, where 70 % of fishes (15330 tons / year) were came from the local wetland (capture & culture fisheries) and rest 30 % (6570 tons / year) fish imported from other states like West Bengal and Andhra Pradesh. The chain of fish markets from producer to retailer goes through a number of intermediaries, whereas the price of fish is influenced by fish species, size and weight of fish. Live fish (IMC) have a higher price (Rs: 200-300 / kg) in the market and imported fish from other states (iced fish), price was lesser than local fish. Four types of marketing channels were identified and there was also involved fisherwomen in the fish marketing system in these areas. According to estimates Indian Major Carps (IMC) make up 25 % fish sold in marketplaces, whereas, 15 % exotic carps & catfishes, 10 % others carps, 7 % live fishes, 5 % snake-head fishes & small indigenous fishes, 3 % freshwater prawn and shrimps, 02 % Hilsa, and 13 % others including tilapia, chingri and marine fishes were also sold in the markets. The study revealed the problem of fish seller during marketing time, market facilities etc are briefly discussed in the paper.

Keywords: Fish transportation, marketing channel, aquaculture, wetland, Purnea.

INTRODUCTION

In India, the fisheries sector is rapidly growing with an annual rate of over 7 % freshwater aquaculture contributes over 95 % of the total annual aquaculture production of 5.77 million of inland fisheries, Jayasankar (2018). According to FAO (2020), aquaculture contributes 82.1 million tons (46 %) out of estimated 179 million tons of global production, whereas, more than 16 million people are directly engaged part time or full time in primary production of fish either by fishing of in aquaculture, it also support the livelihoods of 10-12 % of world production. The matter of fact, the fish production growth is highly dependent on an efficient fish marketing system, because fish is a highly perishable commodity. Devadasan (2005), reported regarding post-harvest loss in the fisheries sector and emphasized on the efficient fish marketing channels to minimize post-harvest losses. Whereas (Datta *et al.,* 2017), reported progression of fish marketing system and employment in Punjab with emphasis on maximum number of fish species recorded in Ludhiana fish market. They suggested a simplified marketing channel, so that the fish produced in farms and also harvested from natural sources can directly be reached to the consumer without the intervention of intermediates. In fact, Bihar is a landlocked agriculturally dominated state where fish and fisheries production is strictly restricted from the inland sector only. North Bihar is blessed with dominant wetlands' resources with an immense range of aquatic diversity. Fish is the major source of animal protein in Koshi region Bihar and it plays an important role in upliftment of socio-economic status, income and getting employment for many rural people. The main source of fishes in Purnea fish market is wetland, rivers, reservoirs and ponds which supply various varieties of fishes. Fisheries is done by different type of conservative gears i.e. Drag net, Scoop net, Gill net and Cast net. Gill nets are suspended by the fishermen at intermediate depth. Most fishermen catch fish on all the days of the month of the year except two month from is 15th June to 15th August. The fish production system and marketing is one of the main reasons for the upliftment of socio- economic condition of the local people. The supply of fish to consumers are in the form of live, fresh, dried and pieces of fish in the local market and Khuskibagh, City Naka Chauk, Bhatta Bazar and Madhubani fish market. Fish produced in individual and community ponds and harvested from natural sources are marketed fresh condition. Freshwater and marine fish from far off state Andhra

Pradesh is iced and living conditions from West Bengal also have a huge demand among consumers.

In this background, the present study was undertaken to have a depiction of the prevailing famous fish market also to know the existing fish marking system, market structure, fish production, harvesting, major marketing channels have been estimated in addition endorsement to improve fish markets in Purnea have also been discussed.

MATERIAL AND METHODS

A. Study site

The present investigation was conducted in the fish marketing system in Purnea, district (Bihar), geographically extended from 25º 25º and 26º 08 North Latitude and 86º 59 and 87º 51 East longitude and located at north-eastern part of Bihar state India. The total area of the district is 3203 sq km, and it is bounded by Araria & Kishanganj district on the north, West Bengal state on the East, whereas Katihar Bhagalpur districts on South and Madhepura district on West, (Fig. 1, a). The wholesale famous big fish market place is presently situated at the back side of railway station near bazar samiti Purnea. It is one the oldest, most common and well known fish markets in the Purnea District, whereas, import, export of fish selling and also distribution in other nearby districts of Bihar (Fig. 1). The fish market was visited and a survey was conducted on a specific day in the month during the period from January, 2021 to December 2022.

B. Methodology

Present work is based on both, primary and secondary sources of data. The primary data were collected through intensive surveys of the fish market. The necessary information was also collected through direct observations, personal interviews technique with fish venders, wholesalers, retailers, consumers and Fishery department Govt. of Bihar, Purnea, which represent different fisheries activities under going resources available in the district. The study area was visited officially to check on standard in terms of fish distribution and marking information. Apart from this, the first author took a room on rent and resides (April, 2019-July, 2023) in Purnea city Naka Chauk, near fish market. Facts & figures were collected as per the availability of different fish and shellfish species, demand and supply of fish produced within Bihar and procured from other states, price of fish, marketing channels, marketing costs, estimated price etc.

C. Data analysis

All the obtained relevant data have been scientifically applied in predicting the existing condition of the fish marketing system in Purnea, Bihar. The data recorded at each and every stage of the study. Using MS-Excel software data from different relevant sources were collected into a database system and to make certain the accuracy. Simple, tubular, percentage analysis was done.

RESULTS AND DISCUSSION

A. Fishery Resources and utilization

North Bihar especially Koshi region (including Purnea) has a web of wetlands. In fact, a number of diverse habitation sorts fisheries possessions happens within the Purnea district that is chiefly comprised as ponds, tanks, small reservoirs, rivers itself and water logged areas, like permanent and semi permanent (ox-bow lakes and chaurs) standing water bodies (Chand and Prasad 2021). District Purnea geographically donated 12402 ha nearby 4 % areas of wetland. Other areas are in the form of rivers/streams that paid 61 % (7564 ha) of water spread of the district. The open water areas fluctuated around 36 % during post monsoon (5279 ha), National Wetland Atlas, Bihar (2010). These resources provide a basis to its sustainable development and also offer an excessive potential for aquaculture, enhancing fish and shellfish production for national and international markets (Jha *et al.*, 2014). In the present investigation the post-harvest of fish (capture and culture fisheries) approximately 42,000 kg/day came from wetlands areas. Jha (2009), reported more than 17498 people in Purnea depending on fish culture whereas, 63.49 % engaged in primary occupation by fishery or aquaculture in the production of fish. Abdurrahman *et al.* (2017) estimated 200 – 600 Rs / kg daily supply of fish in Dhamawala fish market in Dehradun, Uttarakhand India. In Present study, it was observed that interrupted fishers or part-time fishers, fishing on the wetlands in the monsoon period when there is at least supposedly exposed access to the fishery. In facts, these wetlands having many natural fishes and more than 65 species of fishes found in these water bodies where as some important indigenous fishes suffering depletion such as Singhi, Magur, Reetha, Kauwa, Gaincha, Saurathi, Buwari, Suiya, Garai, Garchunni, Pothi, Chelwa, Bulla, Tengra, Ichna (small freshwater prawns) were found in very poor natural water bodies.

B. Transportation and preservation

A notable amount of fish caught from wetland areas as rivers, like (Saura (Fig.1b), Katua, Kankai and Riga locally known as dhar), and chaur, ponds, swamps, floodplains meanders of rivers and water-logged) were came to the Purnea fish markets (wholesaler and retailer) by the interference of fishermen, paikar or wholesaler. During the summer season, it was observed that the culture and capture fisheries both produce more or less all fish species which accounts for high prices. In fact, transportation and marketing of any fresh food items is the backbone of the food chain. The way and mode of conveyance mainly depend on the number & quality of fishes, distance covered, economic value of fishes and the economic status of the stockman.

The conveyance system of fish also regulates demand and hygienic condition, because with the change of time fish will perish rapidly. No doubt, Purnea gets a facility from the topography, and the main wholesale fish market is situated at the side of the national highway. Three conditions of fishes were found here as live fishes, fresh dead fish, and ice packed (ice was used as 1:3 for carriage of long distance fishes) for dead fishes. The fishes were transported to long distances by loading them in trucks, pickup vans, and short distance

tractor-trolleys etc. other usable vehicles like (head & shoulder load, bicycle, motorcycle, van tempo etc.) as per suitable. The local people/ farmers/fishermen were used to different kinds of bamboo basket, plastic baskets, leaves of palm trees, plastic bag, aluminium can, drum, for transportation, packaging and preservation of fish and fishery products (Alam *et al.*, 2010). In the present study it was observed that 70 % of fish estimated (42 ton/day) came from the local areas (capture & culture fisheries) and the rest 30 % (18 ton/day) imported from outside of Bihar. The preservation of fish at Naka Chauk, Khuskibag, Harda, Bhatta Bazar, etc. include use of ice in thermos-coal boxes only, no other persevering techniques such as sun drying, salting & canning are available due to lack of knowledge.

C. Fish Marketing and consumer preference

During the investigation period, total 8 number of main fish market (Khuskibag near Bazar samiti, Khuskibag main market, City Naka Chauk, Batta Bazar, Harda,, Dagarua, Madhubani, and Srinagar) were noticed in Purnea district details presented in (Table-1 & Fig-1c,d,e & f)**.**

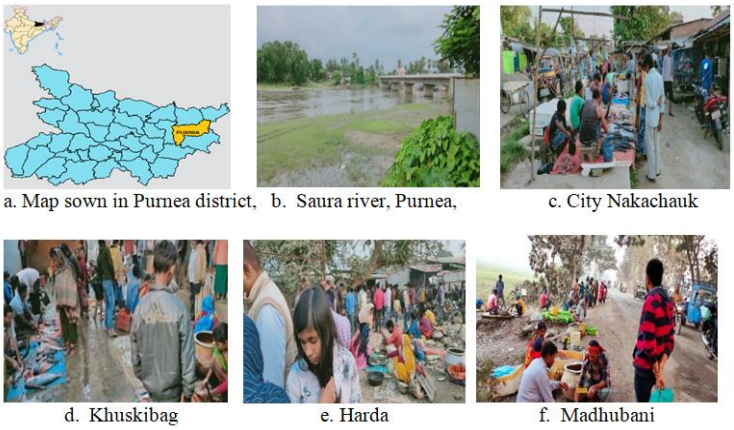

Fig. 1. (a,b,c,d,e&f): Map of Bihar, Saura dhar&fish markets in Purnea, Bihar.

Indian Major Carps (IMC), Exotic Carps and some others fishes like Pugnacious and Rup-chanda were the main farmed species in these areas whereas, IMC (Catla, Rohu and Mrigal) local fishes were the main food for a selective class of people. They also preferred and demanded Indian Magur, Singhi, Grass carp and local large and small freshwater prawns if available. They were ready to pay a high price. Whereas, Pugnacious and Rup-chanda marketed with moderate demand at a suitable rate, prefer catering to the demand of consumers of low income category. The framework of retailing, it was found that marketing costs including handling and transportation of big size of fishes were comparatively higher than that of small varieties of fishes, fisherman selling fishes is one market.

It is observed that the fluctuation in prices of live & fresh fish is very high because of the uncertain nature of production, perishable in nature and variation in short run supply. Because the supply of fish is highly inclusive, a bumper catch on any day will slash down the fish prices and small catch will boost the prices to high levels. The Directorate of Fishery, Govt. of Bihar about two month (15th June to 14th August) banded for fish catches (fry net) from the natural water bodies, because this duration is the reproductive period of most of the fishes. Jhingran (2003) reported Koshi region has become an important centre for the collection of fish spawn of superior quality in India. Fishermen from West Bengal and Bangladesh also prefer to come over to the Koshi region for collection of fish spawn.

Table 1: Show the list of wholesale/retail selling fish markets in Purnea.

Sr. No.	Name of fish market /place	Marketing time /day		No. of retailer /Wholesale	Type of fish market
1.	Khuskibagh (Bazar Samiti) market	Morning	4.00 - 8:00 am	45 and 200 (worked with traders)	Wholesaler & Retailer
2.	Khuskibagh (Main market)	Morning Evening	7:00-10:00 am 3:30 - 7:00 pm	30-40 people worked	Retailer
3.	PurneaCity (Naka Chauk)	Evening	3:30 - 8:30pm	20-25 people worked	Retailer
4.	Bhatta Bazar fish market	Morning Evening	7:00-10:00 am 3:30 - 7:00 pm	35-40 people worked	Retailer
5.	Harda fish market	Morning Evening	7:00-10:00 am 3:30 - 7:00 pm	40-50 people worked	Retailer
6.	Madhubani fish market	Morning Evening	7:00-10:00 am 3:30 - 7:00 pm	30-40 people worked	Retailer
7.	Dagarua fish market	Morning	5:00 - 8:00 am	5-6 and 30 people worked	Wholesaler & Retailer
8.	Srinagar fish market	Morning	5:00 - 8:00 am	5-6 and 25-30 people worked	Wholesaler & Retailer

Fish markets and channel. Fish marketing system has a significant role, fish before reaching to the consumers who have varying incomes table and presentation. Fishers were assembled, transported, stored, processed, and passed through several intermediate channels. In the Khuskibagh near Bazar Samiti, wholesales fish market, number of wholesalers/aratdar were noticed and 40-44 people were act as Aratdar, whereas, more than 250 (two hundred fifty) people were involved/engaged with the traders as day labourers and they got Rs. 300/day for their work. Khuskibag fish market is performed only for a few hours in the early morning where traders are involved in fish trading from 4 am to 8 am and more than 250-300 people were worked on distributed of fish from Khuskibag to different places of Purnea and its nearby other districts. In Khuskibagh fish market a number of ardtdar were found 6 big and main traders namely, Nawal Kishore Jha, Ji, Utpal Kumar, Devnath, Ajay Chandra Das, Umesh Chaudhary, and Tinku Rai they were noticed. We discussed with Sri Ajit Chauhan and Nirmal who one of the traders / paikar, working in Khuskibagh near Bazar samiti, fish market, according to them, live fish as a Magur (*Clarias gariepinus)*, IMC, Grass carp, Golden, Bata, Tilapia, Pungas, Kabai, Bighead etc were (imported) from West Bengal in Pickup Van and large truck with filled water. A number of middlemen were involved between farmers and consumers in the fish marketing system in Khuskibagh. The market chain from farmers to consumers passed through a number of intermediaries such as : local fish traders (Paikars), Wholesalers and retailers. During the study period we noticed the following chart that indicated the path of movement of fish from the producer to the consumers.

1. Fish farmers – Producer - Consumers
2. Fisherman/Producer - Retailer - Consumer
3. Fisherman/Producer - Wholesaler - Retailer - Consumer
4. Fisherman/Producer - Auctioneers - Commission - Wholesaler - Retailer.

Kumar *et al.* (2016) reported three marketing channels that operate and dispose of fish from wetlands like Chaur areas of northern Bihar. In fact, Bihar is an agriculturally dominated terrestrial sealed state whereas aquaculture production is strictly limited from the inland sector only. Various types of fish species were available in the markets exclusively from capture fisheries within the district mainly harvested from wetlands and these fishes came in the market. Moreover, harvesting and marketing of fish provides enormous employment to local people. More or less similar observations reported by Chourey *et al.* (2014) reported regarding postharvest operations of fish afford more engagement to laborers than the production sector. In the present scenario in comparison to the advancements the fish production according to the fish marketing system is very poor and highly inefficient in Purnea, Bihar. More or less similar observation reported by Kumar *et al.* (2008).

D. Price and demand of Fish

In Purnea fish market, the price of fish is secure neither by the government nor by the fisheries co-operatives, not even by the trade associations but by the price of fish tending according to the species and size of fish. The price of fish turns out to fluctuate with the season of the year and freshness of the fish. It was detected under culture fisheries fish produced in individual and community ponds, marketed in live or fresh (no ice preserved) condition. Usually, all spiritual and communal groups in Purnea mostly like live or fresh fish (without ice) or preserved fish. It was observed, everyday supply of fish in market places is contingent on the difference in catches during peak or off season. Effectively most of the fish (near about 70%) is locally supplied and about 30 % is imported from outside the state, or other parts of Bihar, like West Bengal and Andhra Pradesh. In the present time among imported fishes from other states (Andhra) *P. hypothalamas*, has the highest demand and frequently an average retail price Rs 160/ kg by middle and lower class families in this region.

Due to the uncertain production of fish, perishable nature and variation in short run supply, the fluctuation in price of fish raised very high, Jamali *et al.* (2013); Chaurey *et al.* (2014). In present study demand of fish especially Indian Major Carp (IMC) was very high. due to limited supply. The retail price of IMC fluctuated from 250-300 Rs/Kg. It was found the price per kilogram of carp increases with size for native fish comparisons to the exotic species details presented in (Table 2). Our recent study documented the price of carp depends on market structure, location, species, quality, size and weight. Whereas, Ahmad *et al*. (2008); Abdurrahman *et al.* (2017) reported the price of fish was also influenced by supply and demand of fishes and variations in prices with the highest in summer and the lowest in winter, during the fish harvesting season. Moreover, the local consumption of rural markets fishes were also sent to different bigger cities/markets like Siliguri (W.B.) Patna, Bhagalpur, Katihar, Araia etc. Our recent study Prasad *et al.* (2023), four freshwater prawn species like (*Macrobrachium gangeticum, M. gandaki, M. Tiwari*, and *M. lameraii*) were recorded in Purnea fish market during summer and rainy season, these prawn species generally catches from Koshi river near Kursella, Katihar and Purnea (Bunkar *et al.*, 2023) reported that Indian Major Carps were the most preferred and consumed fish group nearly 50% in almost all the markets in Haryana, while Pangasius nearly 65% occupied in Punjab.

E. Market share by fish

During investigation, we observed, most of the market shared by fishes on condition with Indian and Exotic carps, in addition to small quantities of other fish i.e. more than exotic one. It was assessed around an average 25% of Indian Major Carps, supplied in markets, whereas, 15 % exotic carps and catfishes, nearby 10 % others carps, 7 % live fishes, 5% snake-head fishes & small indigenous fishes, 3% freshwater prawn (*M. rosenbergii* and *M. malcolmsonii*) and shrimps, 02 % Hilsa, and 13% others including tilapia, chingri and marine fishes were also sold in the market (Fig. 2).

Table 2: Average selling price of fish (Rs/Kg) and demand of fish in Purnea.

Fish within the Purnea and nearest districts (culture and capture fishery)				Fish outside from state of Bihar (capture & culture fishery) Andhra & West Bengal		
Name of Fish	**Scientific name**	**Price**	**D**	**Name of Fish**	**Price**	**D**
Indian Major Carps						
Catla	*Catla catla*	300	H	Catla	150	M
Rohu	*Labeo rohita*	250	H	Rohu	150	M
Mrigal	*Cirrhinus mrigala*	225	H	Mrigal	125	M
Exotic Carps						
Silver carp	*Hypopthalmichthys moltrix*	150	M	Silver Carps	100	M
Grass carp	*Ctenopharyngedon idela*	200	H	Grass Carps	100	H
Common carp	*Cyprinus carpio*	120	M	Common carps	100	M
Other carps/ fishes						
Bata	*Labeo bata*	190	H	Bata	180	H
Pothi, Sindhari	*Puntius* spp.	130	L	Pontius	90	L
Bighead	*Hypopthalmichthys nobilis*	160	M	Bighead	150	M
Rup-Chand	*Piaractus brachypomus*	130	M	Red-bellied Pacu	120	M
Cat fishes						
Singhi	*Heteropneustes* spp.	400	H	Singhi	400	H
Thai Magur	*Clarius garipinus*	120	M	Thai Magur	120	M
Pangasius spp	*Pangasiodo* spp.	160	M	Pungasius	160	M
Bowari	*Wallago. attu*	160	M	Bowari	160	M
Tengra	*Mystus* spp.	200	H	Tengra	180	H
Magur	*Clarius magur*	600	H	*Silonia silondia*	160	H
Chital/Moi	*Notopterus* spp	150	M	*Notopterus* spp	120	M
Others/ large / small fishes						
Tilapia,	*Oreochromis niloticus*	130	M	Tilapia	120	M
Snakehead fish	*Channa* spp.	140	M	*Channa spp.,*	140	M
Prawnsmall	*Macrobrachium species*	600	H	Others prawns	400	H
Gaichi	*Macrognathus* spp.	200	M	Crabs	150	M
Kabai	*Anabas* spp.	170	M	Kabai	170	M
Rita & Chelwa	*Rita* spp.& (*Oxygaster bacaila*)	150	M	Hilsa (*Tenulosailisa*)	900	H

Abbreviations: H-High, M-Moderate, L-Low, D- Demand

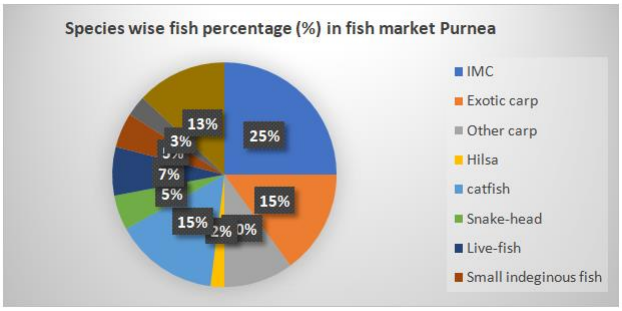

Fig. 2. Pi chart showing the percentage of different fish species in Purnea fish market.

Other shellfishes like apple snail (*Pila globosa)*, crab (*Scylla serrata*) were also recorded in Harda fish market Purnea. Some fishes like Kaua, (*Xenentodon cancila)*, Chanwa (*Chanda nama*), Khosti (*Colisa fasciatus)*, Sindhari (*Puntius* spp), Pothi (*Puntius ticto)*, *Esomusdaniricus*, Pava/jalkapur (*Ompokpabda*), *Oreochromis mossambicus*, *Lapidoce-phalichthysguntia*, *Mastacembelus armatus* etc were also medium consumer demand. Hence medium market value: these species were generally entered into the market as by-catch of other targeted species from capture as well as the culture fisheries sector.

F. Restrictions of fish marketing

According to the traders, marketing and transportation of fishes are affected by political/police stations/traffic police generally during night time. Fishes tend to damage and the traders sold these at lower prices. The present system of official inspection and quality control is restricted mainly to the processed products, which gives large scope for deterioration of raw fishes during transit from harvest or landing centre to the consumers and cannot assure the quality of fish entering the internal markets. Fish marketing system in Purnea is not so systematic and still highly unorganized due to lack of permanent marketing infrastructure and market facilities. It has long been neglected for different reasons and serious efforts have not been made to improve the marketing of fishes as compared to its production. Due to the highly perishable nature of fish, these are faced with many problems like greater uncertainty in fish production. Fish farmers and other related people are looking forward to the upgrade of

freshwater aqua farming marketing from a domestic activity to an industrial activity.

CONCLUSIONS

The study concludes that four types of marketing channels were identified and there was also involved fisherwomen in the fish marketing system in these areas. According to estimates Indian Major Carps (IMC) make up 25 % fish sold in marketplaces, whereas, 15 % exotic carps & catfishes, 10 % others carps, 7 % live fishes, 5 % snake-head fishes & small indigenous fishes, 3 % freshwater prawn and shrimps, 02 % Hilsa, and 13 % others including tilapia, chingri and marine fishes were also sold in the markets.

Acknowledgement. The authors are thankful to the Associate Dean-cum-Principal, BPS Agricultural College, Purnea, Bihar and Department & Directorate of Fisheries, Govt. of Bihar for their kind cooperation.
Conflict of Interest. None.

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How to cite this article: Suday Prasad, D.N. Choudhary and Sushant Bhanu (2023). To Determine the Marketing System of Fish in Purnea, North Eastern Bihar, India. *Biological Forum – An International Journal, 15*(10): 980-985.