



Catch Efficiency of Cast Nets for Snow Trout Fishing in Dal Lake, Kashmir

Mudassir Azhar^{1*}, Leela Edwin², B. Manoj Kumar³, Saly N. Thomas² and M. P. Remesan²

¹Kerala University of Fisheries and Ocean Studies, Panangad, Cochin - 682 506, India

²ICAR- Central Institute of Fisheries Technology, Willingdon Island, P. O. Matsyapuri, Cochin - 682 029, India

³Special Officer Kerala University of Fisheries and Ocean Studies, Research Regional Centre, Payyannur

Abstract

Experimental cast net fishing was carried out in the Dal Lake of Kashmir to study the catching efficiency, species wise catch composition and size frequency. In terms of fish caught by numbers, cast net Type II monofilament stringed landed 107 fishes and Type I monofilament stringless landed 104 fishes. Multifilament stringed net caught 65 fishes and multifilament stringless net caught only 64 fishes out of 50 operations of each cast net. Four species of snow trout were caught in experimental operations. During the study the monofilament cast nets were found to have better catching efficiency than the multifilament cast nets.

Keywords: Cast nets, snow trout, catching efficiency, Dal Lake

Introduction

Cast nets were originally developed in India and subsequently spread to east and south Asia, Oceania, the Near East and Europe and later to other countries Von Brandt (1972). FAO (1969) also reported its wide use in artisanal fishing in Nigerian brackish as well as coastal waters. The cast nets are falling gear, conical in shape with lead sinkers or weights attached at regular intervals on the foot rope forming the circumference of the cone.

The operation of a cast net requires considerable practice, and several different variations are known. The correct method of casting the nets can only be acquired by practical experience as it is done by a

skilled movement of the whole body. The fishermen of southern India are said to be skillful especially in operating cast nets from a boat. Peruvian fishermen are able to cast their nets while sitting on a raft. In case the casting point is very near to the water surface, it needs great skill to cast the net under these circumstance (Nachtigall, 1966). Many of the African cast nets are sample entangling fishing gear or designed to keep the fish in the mesh as with gillnets. Also, the cast net may have pockets at the edge, in which the fish get caught when the net is been hauled (Floyd 1965). Cast nets in Dal Lake were of different mesh sizes. The net was operated throughout the day either from craft or from the bank of the lake. Prior to fishing a bait was prepared by boiling wheat and water for one to two hours. This mixture was rolled into small balls and thrown at 10 to 15 places in the lake for aggregating fishes after which the net was cast. The average catch in a cast net was 8 to 10 kg per day in Wular Lake, Kashmir (Nimat et al., 2016). The cast net fishermen of the Dal Lake are engaged in agriculture or small scale business to generate supplementary income. Gillnet fishing is banned by the Jammu and Kashmir Fisheries Department for the conservation of indigenous species.

The Dal Lake is an urban lake that lies to the east of Srinagar city, at the foot of Zabarwan Hills, and is situated at an average elevation of 1,583 m (5,194 ft) above sea level with a maximum depth of 6 m (20 ft) with total water area of 11.45 km². The genus *Schizothorax* inhabits the streams, rivers and lakes of the Kashmir valley (Das & Subla, 1963).

Native fish *Schizothorax niger* (Heckel et al., 1838) is locally called as snow trout and at present five species of this genus are found in the water bodies of Kashmir. The snow trout fish species are highly demanded in the valley out of all the species available in the valley. The fish population in Dal

Received 13 March 2019; Revised 23 September 2019; Accepted 16 December 2019

*E-mail: mudassirazhar99@gmail.com

Lake has been declining due to encroachment, urbanization, agricultural activities, eutrophication and overfishing.

Though often overlooked, cast net is a ubiquitous and efficient fishing gear and it is a sustainable method of fishing. This paper reports the catching efficiency and species composition of different designs of cast nets.

Material and Methods

Details of Cast nets used for the experiment.

Type I Monofilament stringless cast net

These pockets are fixed by turning up the lower edge of the net and fastening it by short lengths of twine, forming a cast net with fixed pockets (sometimes erroneously called 'Spanish type' (Fig 2 b).

Type II Monofilament stringed cast net

In the case of the stringed cast net, the strings can be connected individually to the lead line or each string can end with three tie cords. During the hauling of the central line pockets are formed to retain the catch (Fig 2 a).

Type III Multifilament stringed cast net

The strings can be connected individually to the lead line or each string can end with three tie cords.

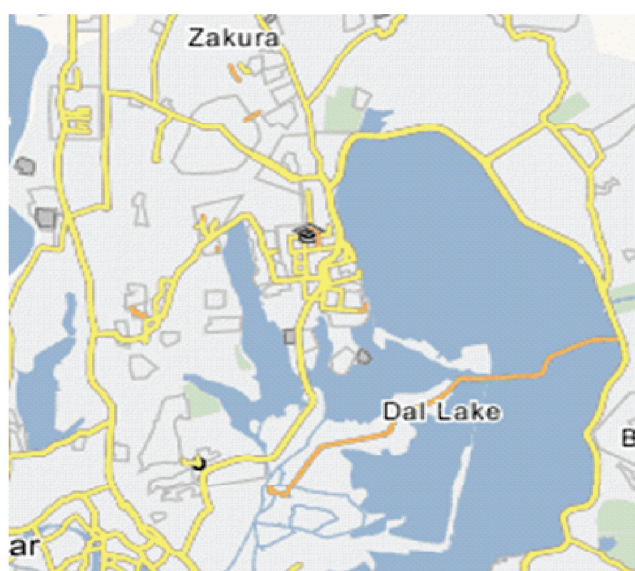
During the hauling of the central line the pockets are formed (Fig. 2 a)

Type IV Multifilament Stringless cast net

These pockets can be fixed by turning up the lower edge of the net and fastening it by short lengths of twine, forming a cast net with fixed pockets (sometimes erroneously called 'Spanish type' (Fig 2 b).

The PA multifilament type III and IV was fabricated with 210 D×1×2 specification where as the PA monofilament type I and II cast nets were fabricated with a thickness of 0.23 mm and the mesh size of all the cast nets was 30 mm.

Dal lake of Kashmir was selected as sampling site for the present study. Fifty operations each were conducted using the four fabricated cast nets with a total of 200 operations (Fig. 1). A traditional wooden canoe locally known as *Naav* was used by fishermen to operate a cast net in different parts of Dal Lake. Different fishermen operated experimental cast nets during the study period. The net was allowed to stay for about 1 to 2 min underwater after casting. The catch was collected and all samples were transported to the laboratory and put in a freezer immediately. The measurement (in centimeter) of the fishes (total length) and weight of the fishes (in grams) were later recorded.



34°5' to 34°6' N latitude

74°8' to 74°12' E longitude

Fig. 1. Map of Dal Lake

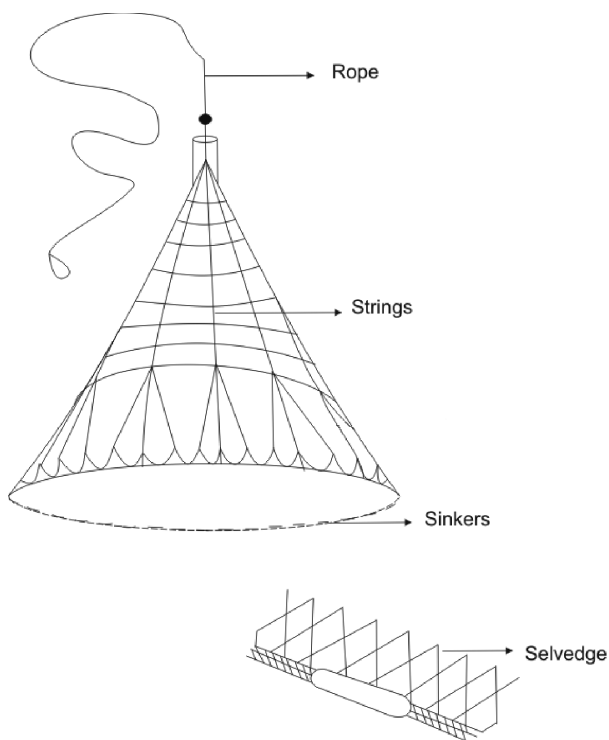


Fig. 2 a. Design of Stringed cast nets (type II and III)

Results and Discussion

During study period a total of four species of Snow trout were caught in the cast nets. Among these species *Schizothorax labiatus* (locally named as *Chuss*) contributed 39.4% of the total catch from all the nets followed by *Schizothorax niger* (locally named as *Ale Gaad*) (39.1%). *Schizothorax esocinus* (locally named as *Chhurru*) contributed 15.2% and *Schizothorax curviformis* (locally named as *Satter Gad*) contributed only 6.1%. A list of fish species caught by cast nets is given in (Table 1.) All the four species of snow trout are indigenous to Kashmir Valley. Nimat et al. (2016) reported that the catch from cast net comprised mainly of *Cyprinus* spp. and *Schizothorax* spp. in Dal lake of Kashmir. The two way analysis of variance was carried to find the effect of material and design of cast net types on number of fish caught (NOFC) and weight of fish (WOF). Means were compared using Tukey's test and t-test at 5% level of significance. The values of NOFC were transformed by square root transformation and WOF was transformed by logarithmic transformation. These transformed values were then used for analysis. All the analysis was carried out by using SAS 9.3.

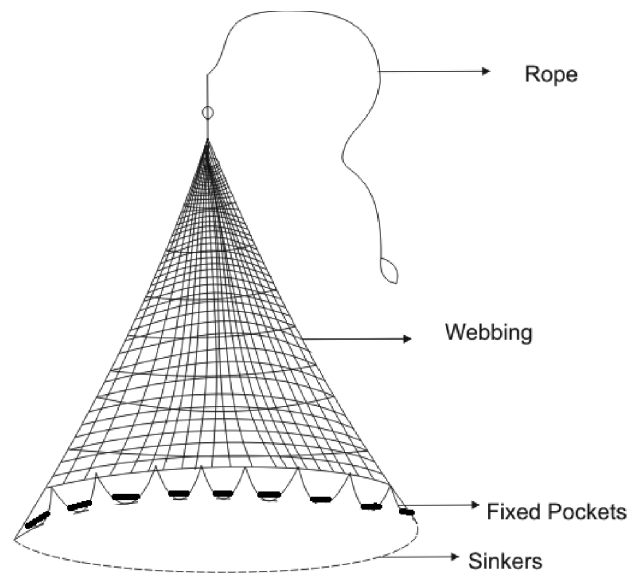


Fig. 2 b. Design of Stringless cast nets (type I and IV)

Two way ANOVA analysis of fish caught in each cast net showed no significant difference ($p > 0.05$) between the Type I and Type II (monofilament). Significant difference was observed between the monofilament Type I and multifilament Type IV. The average number of fish caught per haul was 3.00 in monofilament Type I and Type II. In monofilament Type I cast net three species were caught and the maximum percentage of catch by number was *Schizothorax niger* (55.7%) followed by *Schizothorax labiatus* (31.7%) and *Schizothorax esocinus* (12.5%). The smallest size of fish catch was *schizothorax niger* 11.9 cm whereas the highest was in *S. labiatus* in Type I monofilament cast net as given in Table 2. *Schizothorax labiatus* was the maximum as a percentage of catch from the operation of monofilament Type II cast net (48.5%) followed by the *Schizothorax niger* (30.8%) *Schizothorax esocinus* (11.2%) and *Schizothorax curviformis* (9.3%).

Based on the weight, there was no significant difference ($p > 0.05$) between monofilament nets (Type I and Type II). Significant difference was noted between the monofilament Type I and multifilament Type IV as well as with the monofilament (Type II) respectively. Average fish weight per cast was 210.65 g in monofilaments (Type I and II). The total weight of fishes was 8.053 kg from monofilament Type I cast net are given in Table 2. *Schizothorax niger* represented the highest percent-

Table 1. Species caught in cast nets

Family/Species	Local Name	Number of fishes caught	Total length (cm)	Weight (kg)	Conservation Status	Population trend	No. of Cast Nets operation
Cyprinidae							
<i>Schizothorax niger</i>	Ale gaad	133	11.9-27.5	7.379	NE	unknown	50
<i>Schizothorax labiatus</i>	Chuss	134	11.5-27.9	9.106	NE	unknown	50
<i>Schizothorax esocinus</i>	Chhurru	52	12.2-27.8	4.731	NE	unknown	50
<i>Schizothorax curviforms</i>	Satter gaad	21	11.3-26.6	1.722	NE	unknown	50
		340					200

age by weight among the three species (41.4%) followed by *Schizothorax labiatus* (37.1%) and *Schizothorax esocinus* (21.4%) in monofilament Type I cast net. The details of the species caught in Type I monofilament cast net are given in Table 2 and Fig. 3. According to the weight the smallest percentage (13.8%) were recorded in *Schizothorax curviforms* in monofilament Type II. The total weight of fishes from monofilament Type II was 7.014 kg. The details of species caught the Type II monofilament cast net are given Table 2 and Fig. 4.

There was no significant difference ($p > 0.05$) in species caught between the multifilament Type III and Type IV but there was a significant difference between type IV multifilament and Type II monofilament. In case of multifilament Type IV and monofilament type I there was also significant

difference. In Type III multifilament the maximum proportion of catch was by *Schizothorax labiatus* (34.3%) and in terms of smallest length size 11.3 cm were recorded in *Schizothorax curviforms* where as in Type IV multifilament the maximum amount of catch were also *schizothorax labiatus* (41.5%) followed by *schizothorax niger* (35.3%), *Schizothorax esocinus* (23.07%) as shown in Table 2 and Fig. 5 and 6. The average number of fish caught during cast net operation was 2.00/cast, in both multifilament Type III and IV.

Two way ANOVA reveals that multifilament Type III and Type IV was not significantly different in terms of weights ($p > 0.05$) of fish caught. But in case of multifilament Type IV and monofilament Type I showed significant difference. The total weight of fishes was 4.191 kg in Type III multifilament.

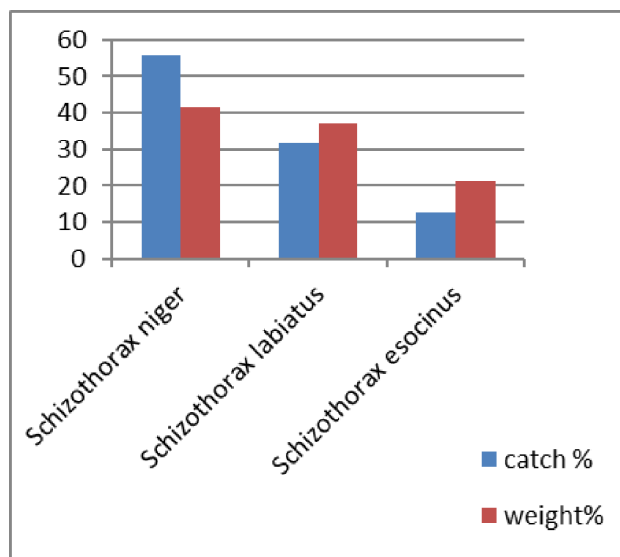


Fig. 3. Percentage of catch based on number and weight of fishes caught in Type I monofilament cast net

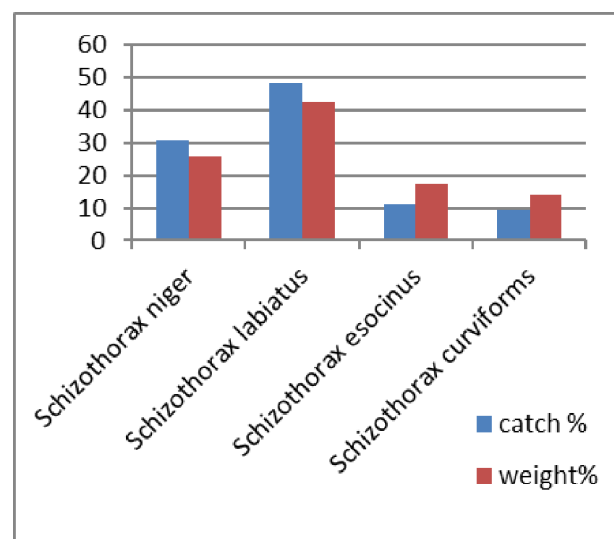


Fig. 4. Percentage of catch based on number and weight of fishes caught in Type II monofilament cast net

Schizothorax labiatus contribute maximum weight in type III multifilament. Total weight of fishes was 3.73 kg from the Type IV multifilament. Detail of the Type III and IV multifilament cast net is given in Table 2 and Fig. 5 and 6. The average weight of fish caught in multifilament Type III and Type IV was 118.48 g.

The design and netting material of all type of cast nets revealed variation in catching efficiency. Emmanuel (2008) reported that design had no effect on the catch. In Dal Lake of Kashmir, cast net catches

more fishes than any other fishing gear because it is most commonly used gear in comparison to other gears such as lift net, scoop net and other traditional methods. Reeds et al. (1967) similarly reported in Northern Nigeria fisheries, the cast net catches more fish than any other single type of fishing gear. Cast nets are selective for lower and larger size ranges; still the faster-moving fish can escape the falling net, but may become entangled in the process (Welcomme, 2001). Dienye et al. (2018) mentioned that the fish catch decreased in number as the mesh size increased from 15 to 25 mm. But catch depends

Table 2. Detail of snow trout catch in cast nets

<i>Monofilament Type I cast net</i>				<i>Monofilament Type II cast net</i>			Total Catch and weight from <i>Monofilament (Type I and II)</i>	
<i>Family/Species</i>	No. of fishes caught	Weight (kg)	Size Range Min-Max. (cm)	No. of fishes caught	Weight (kg)	Size Range (cm)	No of fishes	Weight of fishes
<i>Schizothorax niger</i>	58	3.334	11.9-26.7	33	1.820	13.2-26.6	91	5.154
<i>Schizothorax labiatus</i>	33	2.944	18.7-27.9	52	3.000	12.5-26.5	85	5.944
<i>Schizothorax esocinus</i>	13	1.725	13.2-24.9	12	1.224	16.7-26.6	25	2.949
<i>Schizothorax Curviforms</i>	0	0	0	10	0.970	12.3-26.6	10	0.970
Total	104	8.053		107	7.014		211	15.017
<i>Multifilament Type III cast net</i>				<i>Multifilament Type IV cast net</i>			Total Catch and weight from <i>Multifilament (Type I and II)</i>	
<i>Family/Species</i>	No. of fishes caught	Weight (kg)	Size Range (cm)	No. of fishes caught	Weight (kg)	Size Range (cm)	No of fishes	Weight of fishes
<i>Schizothorax niger</i>	19	1.115	14.1-26.9	23	1.110	12.2-27.5	42	2.225
<i>Schizothorax labiatus</i>	22	1.332	11.5-25.2	27	1.830	12.9-24.5	49	3.162
<i>Schizothorax esocinus</i>	12	0.992	14.1-27.8	15	0.790	12.2-24.6	27	1.782
<i>Schizothorax Curviforms</i>	11	0.752	11.3-23.3	----	-----		11	0.752
Total	64	4.191		65	3.73		129	7.921

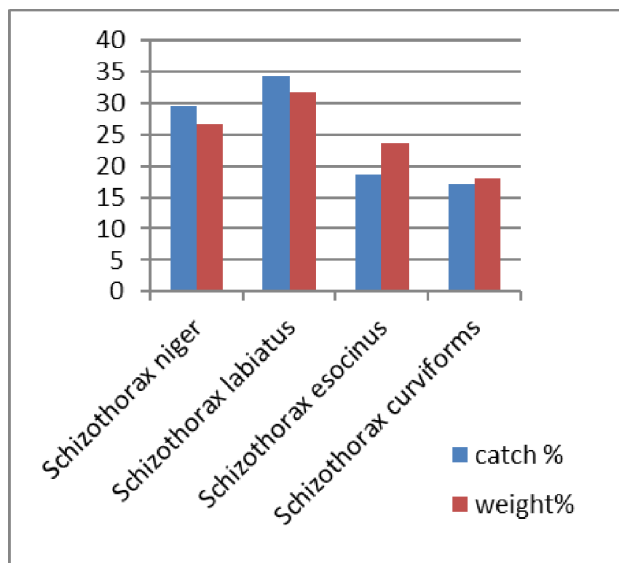


Fig. 5. Percentage of catch based on number and weight of fishes caught in Type I multifilament cast net

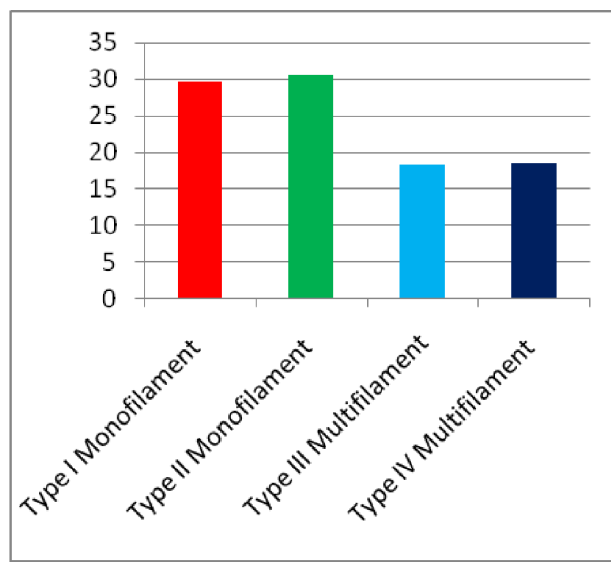


Fig. 7. Catching percentage in term number of fishes caught from all type of cast nets

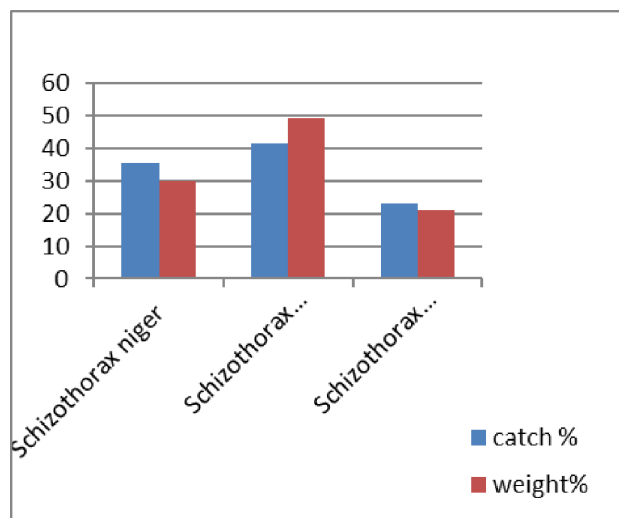


Fig. 6. Percentage of catch based on number and weight of fishes caught in Type II multifilament cast net

not only on the decreasing or increasing the mesh size but it also depends upon on the netting material. Cast net can cover a large area as per the deployment, compared with a throw trap, and is efficient where the gill net and the seine net are ineffective to use (Stein III et al., 2014).

Total 350 snow trout fishes weighing 22.938 kg were caught in monofilament and multifilament experimental cast nets that were operated of which 211 fishes weighing of 15.017 kg caught in Type I and Type II monofilament cast net and 129 were caught with Type III and Type IV multifilament cast nets.

Table 2 and Fig. 7 shows catch from monofilament and multifilament cast nets. In Type I and Type II monofilament nets the most dominant fish was *S. niger* (43.12 %) followed by the *S. labiatus* (40.2%), *S. esocinus* (11.8%) and *S. curviforms* (4.7%) *S. labiatus* contribute highest percentage of catch (37.9%) whereas *S. niger* contribute (32.5%) followed by *S. esocinus* (20.9%), *S. curviforms* (8.5%) in Type III and Type IV multifilament. The study reveals that Type I and Type II monofilament cast nets were more effective in terms of catch than the Type III and Type IV multifilament cast nets.

PA monofilament stringed cast net recorded highest catching efficiency (31.4%) followed by monofilament stringless cast net (30.5%) multifilament stringless net (19.1%) and multifilament stringed net having least catching efficiency of 18.8%. Cast nets of Dal lake are exclusively made of nylon multifilament. The present study revealed that nylon monofilament stringed cast nets can considerably increase the catch rate. It is recommended that nylon monofilament stringed cast net may be introduced in Dal lake to improve the catch rate and income of the artisanal fishermen. While introducing the monofilament net minimum material thickness should be ensured to prolong the service life of the net and making the fishing operation sustainable.

Acknowledgements

Authors are grateful to Prof. A. Ramachandran, Vice-Chancellor Kerala University of Fisheries & Ocean studies

(KUFOS) and Dr. Ravishankar, C.N., Director, ICAR-Central Institute of Fisheries Technology, Cochin for providing valuable support in conducting this research work.

References

- Azeez, L.O. (1997) A comparative study of cast net and gillnet fishing gears in Lagos lagoon. M.Sc. dissertation in Fisheries, University of Lagos, Nigeria 185 p
- Das, S. M. and Subla, B. A. (1963) The ichthyofauna of Kashmir, Part-I. History, topography, origin, ecology and general distribution. *Ichthyologica*. 2(1-2): 87-106
- Dienye, H. E., Olopade, O. A. and Toby, S. A. (2018) Species composition and diversity of cast net fisheries in new calabar river, Niger Delta, Nigeria. *J. Biodivers. Conserv. Bioresour. Manag.* 4(1)
- Emmanuel, B. E., Chukwu, L.O. and Azeez, L.O. (2008) Cast net design characteristics, catch composition and selectivity in tropical open lagoon. *African J. Biotechnol.* 7(12): 2081
- Floyd, H.M. (1965) Castnets constructed of machine made netting. USA Bureau of Commercial Fisheries. Leaflet 579
- FAO (1969) Fisheries survey in Western and Midwestern Region of Nigeria. United Nations Development Programme (UNDP), Food and Agricultural Organization, SF: 74/NIR 6, Rome, Italy. 142 p
- Heckel, J.J. (1838) *Fischeaus Cashmir*. Carl Freiherrn V. Hugel, Wien
- Nimat, S. and Mohite, A.S. and Rahul, S. (2016) Cast nets of Dal Lake of Kashmir: design characteristics and specification. *J. Exp. Zool. India*. 16:1219-1222
- Nachtigall, H. (1966) *Indianische Fischer, Feldbauernundviehzuchter*. Beitragezurperuanischen Volkerkunde Marburger Studien zur Volkerkunde 2. Berlin
- Reed, W., Burchard, J. and A. J. Hopson (1967) Fish and fisheries of Northern Nigeria. Ministry of Agriculture, Kaduna Government Printer, Northern Nigeria. 226 p
- Stein III, W., P.W. Smith and G. Smith. (2014) The cast net: an overlooked sampling gear. *Mar Coast Fish.* 6: 12-19
- Von Brandt, A. (1972) *Fish catching methods of the world*. Fishing news Books Ltd London: 240 p
- Welcomme, R. L. (2001) *Inland fisheries: ecology and management*. Fishing News Books, Blackwell Science, Oxford, UK. 358 p