CHAPTER V

MESH SIZE OF GEARS AND LEVEL OF CPGH

Research Question: *What are the different mesh sizes of gears commonly used in different beels of Assam and the level of CPGH of mesh sizes of the gears used?*

MESH SIZES
OF GEARS USED IN BEEL FISHERIES

INTRODUCTION

Periodic harvesting of marketable size fish with minimum effort can reduce the expenditure and increase the profit margin in fish culture (Rout, et al., 1986). Moreover, mesh size selectivity is important from management point of view of fisheries and also to obtain accurate information concerning fish population from catch data, to protect the immature fishes and to improve the exploitation of exploitable stock. Therefore, information on mesh selectivity of gear is essential for recommending conservation practices based on mesh regulation and judicious exploitation of fishery resources. Keeping in view of the importance of mesh sizes in the effectiveness of a fishing gear an attempt has been made in this chapter to discuss about different mesh sizes of gears with the level of effectiveness on the basis of CPGH (Catch per person per gear per hour) study.

The selection of suitable mesh size is imperative in the case of different nets and gears. It determines the size of the fish to be caught and hence helps the fishermen to exploit fishes of the desired size. Moreover, selective sizes in stocking of the desirable species are important for the management of reservoir fisheries (Lepitzky, 1965 and Anon, 1976). Thus the conservation as well as judicial exploitation of a fishery is governed by the mesh size of the gear under operation in a particular environment. Hence due emphasis is required to this aspect while fabricating the fishing gears including the nets.

Keeping in view of its influence on the effectiveness of gears, an attempt has been made in this chapter to identify and discuss about different mesh sizes of the gears along with their level of catch per person per gear per hour (CPGH).

REVIEW OF LITERATURE

Mesh selectivity curve is important from the management point of view of fisheries. It signals accurate information regarding fish population. It also helps to protect the immature fishes and improves the exploitation of desired stock. Keeping the importance of mesh size in view, mesh selectivity studies were conducted by various workers in the past. Some of the important works on mesh size selectivity has been described below.

The effect of mesh size on the fishery in respect of trawling gears and gill nets were extensively studied by many researchers such as Buchanan-Wallastron (1927), Hodgson (1933), Baranov (1948), Jensen (1949), Holt (1957), Oslen (1959), Nomura (1961), Aoyama (1961), Joseph and Sebastian (1964), and David, et al. (1969).

Alagaraja (1977) studied on the mesh size of gill net selectivity. Khan, et al. (1980) discussed the importance of mesh size on eradication of uneconomical fishes whereas Varghese, et al.(1983) studied the mesh size from conservation point of view.

Similarly, Craig, et al. (1986); Rout, et al. (1986); Khan, et al. (1989) and Kartha, et al. (1991) studied on mesh selectivity for some freshwater carps. Khan, et al. (1992) in his report mentioned certain effective mesh size for gill nets. Kunjipalu, et al., has reported similar works on mesh sizes of trawl nets in 1994.

MATERIALS AND METHODS

MATERIALS AND METHODS

The methodology for collecting the relevant data has been outlined in chapter 2. The data on catch and some other necessary data were obtained through the spot verifications during the operation of the fishing gears and the same were recorded in the appropriate format in the questionnaire (Section III.A and Section III.B). The study followed the methodology as suggested by Jhingran, et al. (1988).

OBSERVATIONS

ANALYSIS OF MESH SIZES OF GEARS AND THEIR LEVEL OF CPGH

The mesh sizes of different fishing gears have been shown in Table-5 along with the level of CPGH and discussed below:

Mesh Sizes and CPGH of Gill nets

The mesh sizes of gill nets were recorded in great variation ranging from 8 mm (*Puthi langi*) to 165 mm (*Ari phansi*). There are mainly two types of gill nets operated in the beel fisheries of Assam namely langi jal and phansi jal, the description of which has been given in chapter-III. It has been observed from the study that the mesh size of the langijal appears to be comparatively smaller than the mesh size of the phansijal. Further, langijals are used to catch mostly smaller fish groups, such as Anabas sp., Channa sp., Minnows, minor carps and fingerlings and *juveniles* of certain major carps of similar size. On the other hand, phansijals are used to catch comparatively larger species, such as Hilsa sp., labeo spp., Catla sp. and other fish species of the similar size.

135

The study on CPGH in relation to their mesh sizes (Table. 5) reveals that the levels of CPGH of all types of langijal vary widely from beel to beel. The CPGH of *puthi langi* (mesh size or m.s., 8.0-10.0 mm) found in the range between 0.051 to 0.09 Kg with an average of 0.085 Kg. The CPGH of *mola langi* (m.s., 12.5 mm) is found between 0.06 and 0.128 Kg with an average of 0.091 Kg. *kaoi langi,* on the other hand, exhibits similar CPGH level as *puthi langi* and *mola langi* and found in the range of 0.08 to 0.112 Kg in different beels with an average of 0.91 Kg. Likewise, *Goroi langi* (m.s., 20.0 mm), which is used to catch Channa spp., show the level of CPGH in the range from 0.05 to 0.120 Kg with an average of 0.096 Kg. Similarly, *sittica langi* (m.s., 40.0 mm.) exhibits the CPGH between 0.06 to 0.135 Kg in different beels with an average of 0.103 Kg. Finally, *ari langi* (m.s., 55-60 mm.), which has the larger mesh size than the other langijals shows the better CPGH level between 0.058 to 0.148 Kg in different beels of Assam with an average of 0.108 Kg.

The study on mesh size and their CPGH for phansijal reveals that the level of CPGH varies widely in different beel fisheries of Assam. As far as the study is concerned *ilisha phansi* has the smaller mesh size (30-40mm) in comparison to other phansijals the CPGH level of which varies between 0.050 to 0.145 Kg with an average of 0.109 Kg. *Rau phansi,* which means to catch Labeo sp., shows the variation of CPGH level in between 0.075 to 0.180 Kg with an average of 0.121 Kg. Likewise, in *karal phansijals,* the mesh size of which varies from 120 to 135 mm are found to exhibit the CPGH from0.070 to0.222 Kg with an average of 0.142 Kg. Finally, *ari phansijals,* which have the larger mesh size(m.s., 150-165 mm) among the gill nets, shows the level of CPGH in between 0.065 to 0.222 Kg with an average of 0.138.

Mesh Sizes and CPGH of Encircling Nets

The mesh sizes across the encircling gears also vary greatly and range between 1.0 (*musari jal* and *athar jal*) to 30 mm (*ber jal and gulli jal*). However, the variation in particular gear is not significant across the beels (Table- 5).

Among the encircling gears *musarijal* and *atharjal* have very small mesh size ranging between of 1.0 and 1.5 mm. The mesh sizes of *panjal* vary from 12.0 to 15.0 mm and are used to catch intermediate and major groups fishes. Likewise, *gullijal*, with mesh size of 20.0 to 30.0 mm are also used to capture intermediate and major groups fishes. Finally, *berjal*, which shows variation of the mesh size between 25.0 to 30.0 mm is employed for capturing fishes of larger sizes including major carps.

Depending on the variation of mesh sizes and other constructional differences the cast nets or falling nets are categorized in to two types namely, *Khewalijal* and *Angthajal*. In *Khewali jal* the mesh size is ranged between 8 and 15 mm and are used to capture the fishes from all types of fish groups. *Angtha jal*, which bears mesh size between 20 to 25 mm and are used for capturing major group fishes.

The study on CPGH of different encircling gears in relation to mesh sizes reveals that the level of CPGH varies widely from beel to beel and gear to gear (Table- 5). The CPGH level of *musarijal* has yielded fish biomass varying from 0.061 to 0.235 kg with an average value of 0.145 Kg. Surface and column feeders mainly dominate the catch composition obtained through this net. *Atharjal*, which has similar mesh size to *musarijal*, shows the CPGH level between 0.064 to 0.186 Kg with an average of 0.120 Kg. *Panjal* on the other hand, exhibits the CPGH value in the range from 0.082 to 0.185 Kg with an average of 0.131 Kg and the gear is found to catch the intermediate and major group fishes. Likewise, *gullijal*, the catch composition comprising of the fishes from intermediate and major fish groups, shows the CPGH value between 0.066 to 0.235 Kg with an average of 0.120 Kg. Similarly, the level of

CPGH of *berjal* lies between 0.094 and 0.236 Kg with an average of 0.162 Kg and the gear is used to capture mainly major carps.

Khewalijal (cast net) shows the level of CPGH between 0.08 to 0.10 Kg with an average of 0.085 Kg. But on the other hand, *angthajal,* which is also a cast net, shows the CPGH value better than the *khewlijal* and ranges between 0.111 and 0.248 Kg with an average of 0.158 Kg.

Mesh Size and CPGH of Scooping Gears

The mesh sizes of different scooping gears do not vary significantly and found between 5.0 mm (*Jatajal*) and 12.5 mm (*Dhenkijal*). The variation in mesh size in a particular gear is also negligible and the studies shows that *jatajal* and *dharmajal* have the similar mesh size of 5.0 to 10.0 mm. *Thella jal* shows the mesh size in between 8.0 and 10.0 mm, while *dhenkijal* has the mesh size of 7.5 to 12.5 mm.

The study on CPGH in relation to their mesh sizes (Table. 5) reveals that the level of CPGH varies widely not only from beel to beel but also from gear to gear. As far as the study is concerned *jatajal* shows the level of CPGH in between 0.006 and 0.054 Kg with an average of 0.007 Kg. The CPGH level of *dharmajal* is found between 0.0007 and 0.004 Kg with an average of 0.001 kg. Likewise, *thellajal* shows the minimum level of CPGH in comparison to other scooping gears and the value is found between 0.0011 to 0.0018 Kg with an average of 0.0012 Kg. Thus, among the scooping gears the mesh size of *jatajal* (5.0 to 10.0 mm) is found as the most effective on the basis of the study on CPGH (0.007 Kg.).

Mesh Size and CPGH of Trawling Gears

Trawling gears have the mesh sizes between 8.0 mm (*horhorijal*) and 50.0 mm (*shanglajal*). It indicates that the gear has a wide variation in their mesh sizes. *Doli*

138

Table- 5 Levels of CPGH of different fishing gears

Gears	Types	Mesh Size (mm)	Range of C P G H (Kg) at different beels	Average (Kg)	Fish species Sought
Puthi langi	Entangling nets	8.0 – 10.0	0.051 – 0.09	0.085	Minor Carp sps.
Kaoi langi	Entangling nets	15.0 –17.0	0.08 – 0.112	0.102	Anabas sps
Mola langi	Entangling nets	12.5	0.06 – 0.128	0.098	Mola sp. (A.mola)
Goroi langi	Entangling nets	20.0	0.05 – 0.120	0.091	Channa sp.
Sittica langi	Entangling nets	40.0	0.06 – 0.135	0.108	Minor carps
Ari langi	Entangling nets	55.0 – 60.0	0.058 – 0.148	0.103	Ari (M.seenghala)
Ilisha phansi	Entangling nets	35.0 – 40.0	0.050 – 0.145	0.109	Hilsa sps.
Rau phansi	Entangling nets	107.5	0.075 – 0.180	0.121	Labeo sps.
Karal phansi	Entangling nets	120 – 135	0.070 – 0.222	0.142	Catla sps.
Ari phansi	Entangling nets	150 - 165	0.065 – 0.220	0.138	Ari (Mystus sps.)
Musarijal	Encircling nets	1.0 – 1.5	0.061 – 0.235	0.145	Surface and column feeders
Atharjal	Encircling nets	1.0 – 1.5	0.064 – 0.186	0.120	All types
Panjal	Encircling nets	12.0 – 15.0	0.082 – 0.185	0.131	Major and intermediate groups
Gullijal	Encircling nets	20.0 – 30.0	0.066 – 0.235	0.128	Major and intermediate groups
Berjal	Encircling nets	25.0 – 30.0	0.094 – 0.236	0.162	Major carps
Khewalijal	Encircling nets (Cast nets)	8.0 – 15.0	0.08 – 0.10	0.06	All types
Angthajal	Encircling nets (Cast nets)	20.0 – 25.0	0.111 – 0.248	0.158	Major groups
Jatajal	Scooping gear	5.0 – 10.0	0.006 – 0.054	0.007	Intermediate and major groups
Dharmajal	Scooping gear	5.0 – 10.0	0.0007 – 0.004	0.001	Intermediate and major groups
Dhenkijal	Scooping gear	7.5 – 12.5	0.007 – 0.065	0.021	Intermediate and major groups
Thellajal	Scooping gear,	8.0 – 10.0	0.0011 – 0.0018	0.00012	Intermediate and major groups
Horhorijal	Trawling gear	8.0 – 12.0	0.012 – 0.016	0.011	Intermediate and major groups
Dolijal	Trawling gear	10.0 –12.0	0.087 – 0.247	0.145	Mainly intermediate groups
Shanglajal	Trawling gear	35.0 – 50.0	0.018 – 0.025	0.018	Hilsa and other major groups
			Grand Mean of CPGH	**0.103**	

jal, which means for the capture of intermediate and major groups has the mesh size in between 10.0 – and 12.0 mm. Thus, the study reveals that though there is a wide variation in mesh sizes among different trawling gears but no such significant variations for a particular gear have been observed.

The study on CPGH in relation to their mesh sizes (Table. 5) reveals that the level of CPGH of scooping gears vary from beel to beel and from gear to gear. The level of CPGH in case of *dolijal* has been found in wide variation and raged between 0.087 and 0.247 Kg with an average of 0.145 Kg. *Horhorijal*, on the other hand, shows the minimum CPGH value in comparison to other scooping gears and found between 0.012 and 0.016 Kg with an average of 0.011 Kg. Similarly, the level of CPGH for *shanglajal* has been found in the range between 0.018 and 0.025 Kg in different beels of Assam with an average of 0.180 Kg.

The grand mean of CPGH (i.e., the mean of average CPGH values of different gears) for all types of gears has been found 0.103 Kg.

DISCUSSION

Gill nets being selective could be employed to catch fish of a particular size and to some extent the required quantity (Rout, et al., 1986). It is evident from the present research that the mesh size of langijal vary from 8 mm (*puthilangi*) to 60.0 mm (*arilangi*) which are used to capture mainly minor and intermediate groups. The levels of CPGH also have found in wide variation in different beels. The average value of CPGH in comparison to grand mean of CPGH (0.103 Kg) reveals that *puthi langi* (CPGH, 0.085 Kg), *kaoi langi* (CPGH, 0.091 Kg.), *mola langi* (CPGH, 0.091 Kg), *goroi langi* (CPGH, 0.096 Kg), are not effective. On the other hand, CPGH of *sittica langi* (0.103 Kg) and *ari langi* (0.108 Kg are found above the grand mean (0.103 Kg), which indicates the effectiveness of the gear in the beel fisheries of Assam.

Like langijals, phansijals also show great variations (0.050 to 0.222 Kg) in their level of CPGH (Table. 5). The average CPGH levels of all types of phansijals are found between 0.109 Kg (*ilisha phansi*) to 0.142 Kg (*karal phansi*), which are found above the grand mean of CPGH indicating the effectiveness of the gears in the beels of Assam. The effectiveness of gill nets are also supported from the works of various workers, such as Holt, 1963; Reiger and Robson, 1966; Lagler, 1968; Hamley, 1972; Hamley and Reiger, 1973; Rout, et al., 1986. Moreover, as most of the beel fisheries of Assam are highly manifested by the submerged, floating and free floating vegetations, gill nets are found most suitable from the operational point of view also.

The mesh size of encircling nets varies from 1.0 mm (*musarijal* and *atharjal*) to 30.0 mm (*berjal*). The study on their level of CPGH (Table. 8) reveals that the average CPGH values (0.120 to 0.162 Kg) exceed the grand mean of CPGH (i.e., 0.103 Kg) except *khewalijal* (0.06 Kg). Though *musarijal* and *athar jal* are found as effective gears as far as the study of CPGH (0.061 – 0.236 Kg) is concerned but side-by-side they are found harmful also from the conservation point of view due to their smaller mesh size, which causes great damage to the fries and fingerlings of Indian Major Carps. This fact was also supported from the works of Varghese et al., 1983. Since the occurrence of the juveniles of IMC : (Indian Major Carps) is seasonal and it is restricted by the Govt. of Assam during this period

The mesh size and CPGH level of scooping gears do not vary significantly across the beels. The analysis (Table. 5) reveals that the CPGH value of all types of gears such as *jatajal* (0.007 Kg), *dharmajal* (0.001 Kg), *dhenkijal* (0.021 Kg), and *thellajal* (0.0004 Kg) are below the grand mean of CPGH (0.103 Kg). Hence, the scooping gears are not found effective as far as the present study is concerned.

Three types of trawling gears have been found in use in the beel fisheries of Assam, such as *dolijal, horhorijal,* and *shanglajal.* The mesh size of *horhorijal* (8.0 to 12.0 mm) and *dolijal* (10.0 to 12.0 mm) are comparatively found much smaller than the

shanglajal (35.0 to 50.0 mm). From the study of average CPGH level it is evident that *dolijal* (0.145 Kg) and *shanglajal* (0.180 Kg) are the effective gears, the CPGH of which exceeds the grand mean (0.103 Kg). On the other hand, the CPGH of *horhorijal* (0.011 Kg) is found below the grand mean, which indicates the non-effectiveness of the gear in comparison to other gear types.

CONCLUSION

The study of mesh sizes of different gears exhibited that gill nets have the highest range of variation in their mesh sizes and hence are found to serve selective fish catch. Moreover, except *puthi langi, kaoi langi, goroi langi* and *mola langi* all other langi jals and phansijals are found above the effective level (i.e. above the grand mean). *Musarijal* on the other hand, though exhibited effective level of CPGH the due to its smaller mesh sizes (1.0 – 1.5 mm) found harmful in particular season. Hence, the use of the gears with such type of mesh size should be strictly prohibited. Finally, among all types of gears *berjal* is found, as the most effective gear in comparison to other gears as far as the study of CPGH level is concerned.