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Seasonal studies on food and feeding habit of different age groups of *Garra gotyla gotyla* (Gray) inhabiting River Tawi.

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Abstract
The study deals with the seasonal variation in relative abundance of natural diet, Gastro-somatic index (GaSI) and relative gut length (RLG) values of different age groups *viz*. 0^+,1^+,2^+,3^+ & 4^+ of *Garra gotyla gotyla* ranging from 4.2 to 14.7 cm TL, captured from different sections of River Tawi. (Latitude 32° 02' 20.23" N & Longitude 75° 16' 56.14" E) The result revealed that fish is planktyherbivorous and bottom feeder feeding on approximately 75.03%, 76.13 %, 78.82 %, 79.88%, and 81.52% phytoplanktons in 0^+, 1^+, 2^+, 3^+ & 4^+age groups respectively. The RLG values was observed to increase from 0^+ (5.51) age group to 4^+ (6.82) age group while GaSI was maximum (12.65) in immature 0^+ age group and decreases with increase in the fish age.

Keywords: *Garra gotyla gotyla*, gastro-somatic index, relative gut length, planktyherbivorous, River Tawi

Introduction
Food is the basic prerequisite for growth, development, survival and existance of all organisms. It plays an important role in migration, growth and spawning. As the nature of food depends to a great extent upon the nature of environment the problem is interesting from specific, as well as ecological point of view. (Bhuinyan *et al*. 2006) [8]. Further, studies on diet composition are important in community ecology because the issue of available resources by the organism has a major influence on population interaction within the community.
Assessment of food and feeding habits is necessary to determine the general tropic level of fishes. Studies on food and feeding habits of fish help to determine the niche in aquatic ecosystem and preferred food items (Basudha and Visvanath 1999) [7]. Analysis of food components in the gut of species provides the information on how much the species is selective in choice of food and how flexible in feeding on different food items. The natural food of fish species changes as they grow through different stages as fry, fingerlings and adults. This age related feeding behaviour is a key factor in management of hatchery and nursery (Mercy *et al.* 2002) [22]. Feeding habit is an important factor to be considered while introducing a species to new ecosystem so as to leave the natural fauna in their natural habitat with least disturbance. Attempts have been made to study the food and feeding of fish and also feeding experiments were conducted to develop aquaculture production throughout the country (Kader *et al.* 1988) [19].
The present study on food and feeding habits of small hill stream Cyprinid indigenous fish, rich in animal protein and micronutrients is a subject of continous research as it constitutes a base for development of successful fishery and aquaculture management programme.

Material and methods
About 350 numbers of Garra *gotyla gotyla* ranges from 4.2cm to 14.7 cm Total length were captured monthly from January to December 2016 in River Tawi and its tributaries from Jammu region (J&K) with the help of cast net and hand nets. Immediately after collection, the abdomen of the fish was cut opened and preserved in 5% formalin for further investigations. To study systematically, the fishes were arranged into different length /age groups *viz*. 0^+,1^+,2^+,3^+ & 4^+after determining their age through scale (by counting the annuali on them).
Further, the entire gut was dissected out, uncoiled, washed and evacuated and then total length of the gut was measured.
The relative length of the gut (RLG) was calculated by the formula:

$$RLG = \frac{\text{Total length of Alimentary canal}}{\text{Total length of Fish}}$$

Gastro somatic Index (GaSI) was determined for each fish to study the seasonal variations in food intake of the fishes by the formula.

$$GaSI = \frac{\text{Weight of Stomach content}}{\text{Weight of the Fish}} \times 100$$

To calculate GSI, the gut of each fish was first weighed with food contents. The gut was than emptied by extracting its contents into a petridish and finally reweighed. The difference between the full and empty gut give the weight of gut contents.
For the qualitative study of different food items, the stomach content were identified under a light microscope with the help of standard taxonomic books (Edmonson,1959 and Pennak 1953) [11, 27] and quantitative was done using point method proposed by Pillay (1952) [28]. The points were given to different food items present in the alimentary canal. The points were then converted into percentage to obtain the contribution of different items in fish.

Results and discussion

Gut analysis: Persuals of Table (1-5) regarding qualitative and quantitative analysis of gut contents of different age groups *viz.* 0^+,1^+,2^+,3^+ and 4^+ of *Garra gotyla gotyla* reveals that fish feed on variety of food stuffs *viz.* Green algae, Blue green algae, Desmids, Diatoms and (plant matter),Sand and detritus and Miscellaneous items etc.

Seasonal studies further shows maxima of Cynophyceae (Blue green algae) *viz*. *Polycystis, Merismopedia, Aphanocapsa* etc. were registered in the month of December and minimum during the month of June, i.e 37.14%, 33.08%, 33.85%, 32.04% and, 34.21% in 0^+,1^+,2^+,3^+ & 4^+ age groups respectively. Similarly its minimum values i.e 26.35%,25.63%,24.40%,23.51% and 26.35% were recorded in 0^+, 1^+, 2^+, $3^+$and 4^+ age groups respectively.

Chlorophyceae (Green algae) were represented by *viz. Cosmarium sps, Spirogyra communis, Oedogonium sps, Spyrogyra reticulates, Volvox*, etc. were found maximum in December and minimum in the month of February. i.e 28.26%, 27.56%, 27.57% 28.54%, 29.26% in 0^+,1^+,2^+, $3^+$and 4 $^+$ age groups respectively. Similarly its minimum values i.e 22.36%, 21.32%, 22.03%, 23.21%, and 26.80% were calculated in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively.

Bacillariophyceae **(**Diatoms) were represented by *Fragillaria sps, Diatoma sps, Nitzschia sps, Navicula sps, Gomphonema sps Cymbella gracilaris*, etc. were found to be highest in the month of March and minimum in the month of December, i.e 15.78%,16.22%,16.32%,15.98% and 17.76% in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively. Similarly its minimum values i.e 14.12%, 13.23%, 15.05%, 13.09% and 8.62% were registered in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively.

Desmids were represented by *Gonatozygon, Closterius, Netrium, Desmedium* etc. and its highest frequency of occurance was recorded maximum during January and minimum in the month of April, i.e 9.98%, 10.88%, 10.76%, 10.12%, and 9.56% in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively. Similarly its minimum value i.e 7.27%, 7.96%, 8.28%, 6.92% and 7.42% was found in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively.

Sand and detritus were found to be maximum in the month of February and minimum during the month of July, i.e 14.23%,12.56%, 1366%,16.52% and 15.45% in0^+,1^+,2^+,$3^+$and 4^+ age groups respectively. Similarly its minimum value i.e 7.27%, 7.89%, 8.65%, 7.56% and 7.03% were calculated in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively.

Miscellaneous items were contributed by pollens, cysts and unidentified matters were found to be maximum in the month of July and minimum during the month of February i.e 19.93%, 16.03% 12.56%, 14.55% and 14.04% in 0^+,1^+,2^+,$3^+$and 4^+ age groups respectively. Similarly its minimum value i.e7.15%, 7.02%, 8.08%, 8.12% and 6.23% were registered in 0^+,1^+,2^+,3^+ and 4^+ age groups respectively.

Table 1: Monthly percentage of qualitative and quantitative variations in food and feeding habit of *Garra gotyla gotyla* in 0^+ age group.

S. No.	Name of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1	Blue Green Algae	29.63	30.68	31.26	30.75	29.59	26.35	26.51	27.9	28.11	28.56	30.23	37.14	27.72
2	Green Algae	25.54	22.36	24.13	27.89	26.35	22.26	25.25	27.02	27.56	28.26	25.25	23.23	24.42
3	Desmid	9.98	9.88	9.42	7.27	9.91	8.01	7.53	9.23	9.87	8.98	9.82	7.99	9.14
4	Diatoms	15.34	15.66	15.78	15.56	14.34	14.34	13.43	15.66	14.48	14.34	14.72	14.12	14.02
6	Sand and Detritus	10.36	14.23	11.23	11.21	8.85	10.25	7.35	9.25	9.16	8.84	9.44	9.39	12.2
7	Miscellaneous	9.15	7.19	8.18	7.32	10.96	18.79	19.93	10.94	10.82	11.02	10.54	8.13	11.21

Table 2: Monthly percentage of qualitative and quantitative variations in food and feeding habit of *Garra gotyla gotyla* in 1^+ age group.

S. No.	Name of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1	Blue Green Algae	27.52	29.65	28.69	31.25	33.08	31.03	30.23	29.23	28.25	24.4	26.26	28.65	28.9
2	Green Algae	25.08	25.8	25.68	26.32	21.34	22.27	21.32	27.56	26.35	26.33	27.45	26.32	24.02
3	Desmid	9.12	9.92	10.88	7.96	10.43	8.54	10.04	8.67	10.45	10.66	9.82	8.99	9.12
4	Diatoms	14.36	15.07	13.57	14.9	16.22	13.26	13.78	14.08	14.34	15.87	14.72	13.23	14.09
6	Sand and Detritus	7.89	12.36	12.56	12.03	7.91	9.86	10.4	10.61	10.84	11.65	9.26	14.5	11.13
7	Miscellaneous	16.03	7.2	8.62	7.54	11.02	15.04	14.23	9.85	9.77	11.09	12.49	8.31	12.3

Table 3: Monthly percentage of qualitative and quantitative variations in food and feeding habit of *Garra gotyla gotyla* in 2^+ age group.

S. No.	Name of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1	Blue Green Algae	28.56	28.53	28.95	29.56	31.25	33.85	30.23	29.89	28.96	25.65	26.65	28.16	29.18
2	Green Algae	26.31	27.56	26.59	26.35	26.02	22.03	23.31	23.77	25.55	26.35	26.13	27.87	25.65
3	Desmid	10.76	8.34	9.54	8.25	9.23	8.4	8.3	9.45	10.22	9.98	10.11	9.88	9.37
4	Diatoms	15.05	15.66	15.39	16.04	16.32	15.22	15.85	15.43	15.98	15.89	15.67	15.02	14.62
6	Sand and Detritus	10.12	11.89	11.17	12.38	8.65	11.93	9.75	9.88	10.23	11.81	9.54	9.88	10.12
7	Miscellaneous	9.2	8.02	8.36	7.42	8.53	8.57	12.56	11.58	9.06	10.32	11.9	9.19	10.6

Table 4: Monthly percentage of qualitative and quantitative variations in food and feeding habit of *Garra gotyla gotyla* in 3^+ age group.

S. No.	Name of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1	Blue Green Algae	32.04	29.17	27.21	28.65	28.96	28.05	24.23	28.81	27.85	26.56	26.66	23.51	30.12
2	Green Algae	24.41	28.54	26.35	26.32	25.64	25.63	24.56	23.21	24.56	24.65	27.11	27.66	26.06
3	Desmid	7.89	10.12	8.45	6.92	9.86	8.02	8.02	8.9	10.12	9.56	10.12	8.9	8.9
4	Diatoms	13.9	13.9	14.87	15.45	15.53	14.67	14.89	14.22	15.23	15.98	14.34	15.03	14.8
6	Sand and Detritus	7.56	9.65	8.57	13.64	9.63	15.51	8.35	16.52	12.28	12.48	10.73	11.69	9.09
7	Miscellaneous	14.2	8.62	14.55	9.02	10.38	8.12	19.95	8.34	9.96	10.77	11.04	13.21	11.01

Table 5: Monthly percentage of qualitative and quantitative variations in food and feeding habit of *Garra gotyla gotyla* in 4^{+} age group.

S. No.	Name of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1	Blue Green Algae	34.21	32.34	31.52	26.35	27.23	27.56	27.33	28.56	27.45	27.22	27.08	31.65	31.04
2	Green Algae	24.11	29.26	29.13	29.09	27.11	26.53	25.87	24.56	26.35	28.45	26.61	24.54	27.09
3	Desmid	9.14	9.56	9.42	7.42	9.56	9.23	8.09	9.13	9.44	8.65	9.45	7.89	8.91
4	Diatoms	14.34	13.23	8.62	17.21	14.56	12.45	12.76	15.23	17.23	15.34	15.14	17.76	14.48
6	Sand and Detritus	8.82	7.98	7.3	12.61	7.49	10.67	11.97	11.28	8.52	14.11	15.45	9.98	8.21
7	Miscellaneous	9.38	7.63	14.01	7.32	14.05	13.56	13.98	11.24	11.01	6.23	6.27	8.18	9.08

From the present data it was found that Phytoplankton contributed 75.03% of the average annual food content in 0^{+}, 76.13% in 1^{+} 78.82 % in 2 $^{+}$ 79.88 % in 3 $^{+}$ 81.52% in 4 $^{+}$ age group. Phytoplanktons are the main nutrients of *Garra gotyla gotyla*. These phytoplanktons are benthic algae with epipelic, epilithic and epiphytic properties. A large part of these benthic algae is composed of organisms that belong to Chlorophyceae, Cynophyceae and Bacillariophyceae. The main reason for *Garra gotyla gotyla* to prefer Phytoplanktons is the relatively easier grazing on these species due to the structure of the mouth and adhesive disc. A similar situation was observed by Anthony (1983 [13], in *Garra mullya*, Froese and Pauly (2004) [12], Ozdilek and Ekmekci (2016) [26] in *Garra rufa*. Kanwal and Pathani (2012) [20], in *Garra lamta*, Gaur *et al.* (2013) [15] in *Garra gotyla gotyla* and Gupta and Banerjee (2013) [16, 17] in *Amblypharyngodon mol.*,

Based on the study of food items, Das and Moitra (1955) classified fishes into herbivorous (fishes which consume 75% or more plant food), carnivorous (which consume 75% or more animal food) while omnivores consume both animal and plant food in considerably equal amount. On the basis of feeding habits Das and Moitra (1955) divided fishes into three groups *viz.* The surface feeders, the mid feeders and bottom feeders. Das and Moitra 1963 [10] also mentioned the RLG value is generally low in carnivorous fish, high in omnivorous fish and highest in Planktyherbivorous fish.

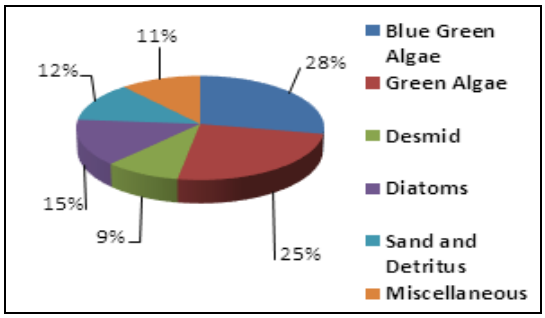

Fig 1: Percentage distribution of different food items in 0 $^{+}$age group

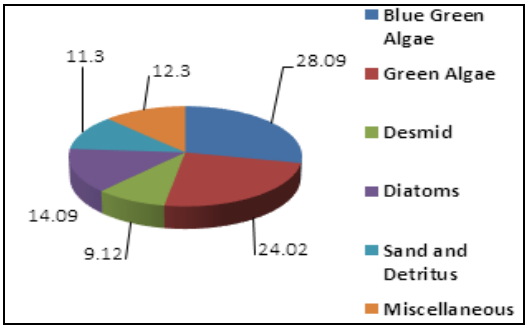

Fig 2: Percentage distribution of different food items in 1 $^{+}$age group

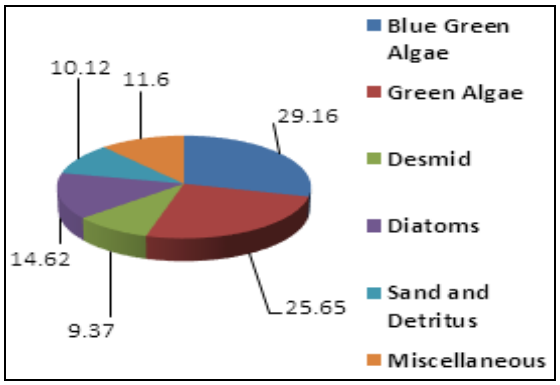

Fig 3: Percentage distribution of different food items in 2 $^{+}$age group

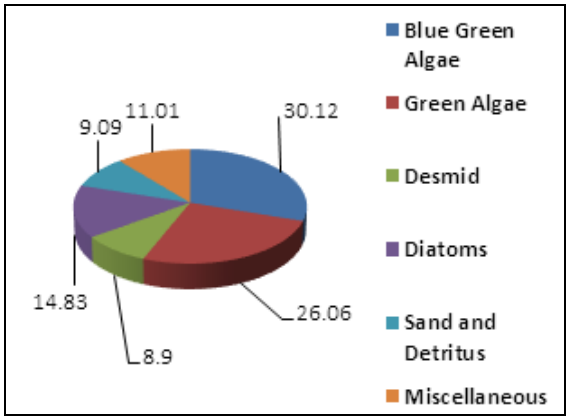

Fig 4: Percentage distribution of different food items in 3 $^{+}$age group

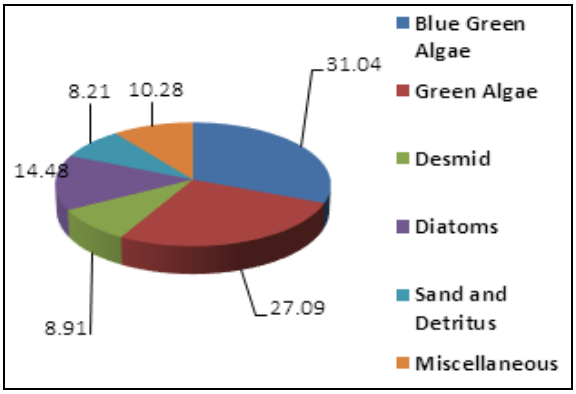

Fig 5: Percentage distribution of different food items in 4 $^{+}$age group

Therefore, from the present study the higher (>75%) percentage composition of the Phytoplankton as the main items of the gut constituents of *Garra gotyla gotyla* reveals the bottom grazing nature and planktyherbivorous feeding habit of the fish. The present findings are in conformity with Bahuguna and Singh (1984) [5], Badola and Singh (1980) [4],

Mamun *et al.* (2004) [21, 22] in *Amblypharyngodon mola*, Mondol *et al.* (2005) [24], in *Puntius gonionotus*, Gandotra *et al.* (2007) [13] Sagar (2010) [29], Kanwal and Pathani (2012) [20], in *Garra lamta* Gaur *et al.* (2013) [15] in *Garra gotyla gotyla* and Gupta and Banerjee (2013) [16, 17] in *Amblypharyngodon mola* and Gandotra *et al.* (2015) [14].

Gastro-Somatic Index

In 0⁺ Age group. The highest value of GaSI i.e (14.20-14.54) was found during summer months (April-June) but lowest (10.35-13.10) during winter months i.e November to January with mean value of 12.65 The value of RLG varied from (4.50-5.98) with a mean value of 5.51.

In 1⁺ Age group. GaSI calculated maxima (12.25-12.32) during summer months but lowest during winter months from November to January (11.90-12.04).With a mean value of 11.85 The value of RLG varied from (5.30- 6.58).With an average mean value of 6.11.

In 2 ⁺Age group. The value of GaSI was found maximum (10.30-10.43) in summer months but lowest during winter months (9.80-10.11).With a mean value of 9.87.The value of RLG varied from (6.10- 7.89). With an average mean value of 6.69.

In 3 ⁺Age group. The highest value of GaSI (10.50-10.80) was found during summer months but lowest during winter months (9.35-10.25). With a mean value of 9.57.The value of RLG varied from (6.30- 7.72) with an average mean value of 6.83.

In 4⁺Age group. GaSI registered at peak (9.15-9.70) during summer months but lowest during winter months (8.80-8.98). With a mean value of 8.72.The value of RLG varied from (6.27- 7.75).With an average mean value of 6.82.

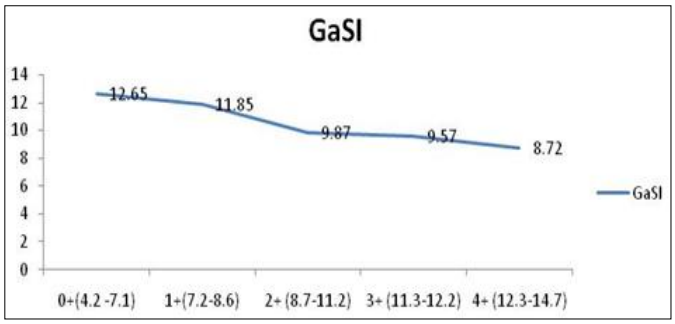

Fig 6: GaSI at different age groups of *Garra gotyla gotyla*

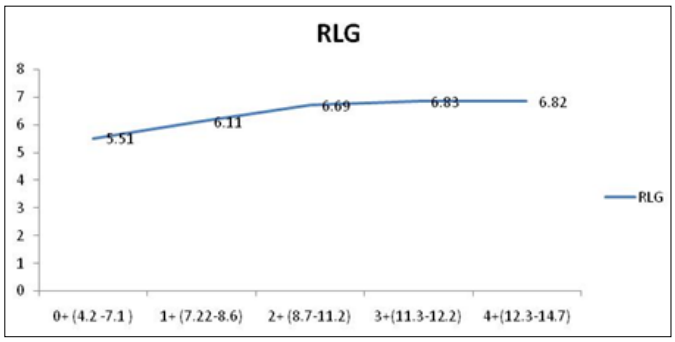

Fig 7: RLG at different age groups of *Garra gotyla gotyla*

The correlation coefficient 'r' between Total length 4.2 to 14.7 cm and gut length (0.799) was found to be slightly significant at 0.5%.The value of regression coefficient 'b' indicated that a unit increment in the size of TL showed an increment in the gut length by 0.243 cm and overall equation was plotted as Y=4.2.8+0.243TL. The variation in the gut length due to standard length was found to be 64.93%.

In the present study the value of RLG for 0 ⁺,1 ⁺,2 ⁺,3 ⁺and 4 ⁺ age groups were obtained as 5.51, 6.11, 6.69, 6.83 and 6.82 respectively. Further increment in gut length was observed with increasing size of fish. The highest value (6.82) was obtained with the largest size of *Garra gotyla gotyla* (fig.7). According to Alhussaini (1947) [2] earlier enlisted the RLG values for carnivorous (0.5-2.4), omnivorous (1.3-4.3) and herbivorous (3.7-6.0). The present RLG value depicted herbivorous feeding habit of this fish. The present results are in line with that of Alhussaini (1947) [2], Nath (1979) [25], in *Crossocheilus latius*, Anthony (1983) [3], in *Garra mullya*, Sunder (1985) [30] in *Puntius conchonius*, Ward-Campbell *et al.* (2005) [32], Abass (2010) [1] in *Eutropiichthys vacha*, Kanwal and Pathani (2012) [20] in *Garra lamta*, Verma, (2013) [15, 31] in *Labeo dyocheilus*, Gupta and Banerjee (2013) [16, 17] in *Amblypharyngodon mola*, Hossain (2016) [18] in *Glossogobius giuris.* Baqi *et al.* (2017) [6].d

Further, during the present investigation (Fig. 6) the GaSI value shows a decreasing trend with increasing size of *Garra gotyla gotyla*. The highest (12.65) was observed in 0⁺age group (42-71mm) TL. Which showed the voracious nature of this fish. The smaller sized fish exhibited more voracious nature as compared to larger. The samples belonging to this size group (42-71mm) TL were usually in their pre breeding period as a result they showed high feeding intensity. Usually the requirement of food is more before and after the breeding season of fish depending upon the requirement of energy. A decrease in the value of GaSI was noticed in size group 72-86 mm TL i.e 1⁺age group this could be attributed to the fact that fish belonging to this size were fully mature and most of the body cavity is covered by gonads and hence intake of food was less. The feeding rate decreases during spawning season and after that it increases to recover from fast. These findings are in line with Rao *et al.* (1998), Kanwal and Pathani (2012) [20], in *Garra lamta*, and Gandotra *et al.* (2015) [14].

Conclusion

On the basis of gut analysis *Garra gotyla gotyla* can be classified as Planktyherbivorous fish and on the basis of ecological niche, a bottom feeder. GaSI decreases with the increase in size of fish and its analysis shows that the feeding intensity was highest before and after breeding season. The RLG increases with the increase in age of fish the highest value (6.82) was obtained with the largest size of *Garra gotyla gotyla*.

References

1. Abbas A. Food and feeding habit of freshwater cat fish, *Eutropiichthys vacha* (Bleeker). Indian J Sci. Res. 2010; 1:83-86.
2. Al-hussaini AH. The anatomy and histology of the alimentary tract of plankton feeder, *Atherina forskali.* J Marph, Philadelphia. 1947a; 80(2):251-286.
3. Anthony AD. Food and feeding habits of *Garra mulya*

(Sykes) and Garra mcClellandi (Jordon), Matsya. 1983; 9(10):151-156.
4. Badola SP, Singh HR. Food and feeding habit og fishes og genra Tor, Puntius and Barilus. Proceedings of Indian National Science Academy. 1980; 47(3):58-62.
5. Bahuguna SN, Singh HR. Food and feeding with gross morphology of a hillstream fish *Barilius vagra* (Ham.). Journal of Animal Morphology and Physiology. 1984; 31:183-187.
6. Baqi SA, Achakzai MA, Kamran K, Saddozai S. Length-weight relationships (LWRs) and gut analysis of fresh water shark (*Wallago attu*) collected from local fish market of Quetta City, Pakistan. Journal of Biodiversity and Environmental Sciences. 2017; 11(4):114-120.
7. Basuda CH, Vishwanath. Food feeding habits of an endemic carp *Osteobrama belangeri* (vol.) in Manipur Indian J fish. 1999; 46(1):71-72.
8. Bhuiyan AS, Afroz S, Zaman T. Food and feeding habit of the juvenile and adult snakehead, Channa punctatus (Bloch). Journal of Life and Earth Science. 2006; 1(2):53-54.
9. Das SM, Moitra SK. Feeding habits of few fishes of U.P. current sci. 1955; 24:417.
10. Das SM, Moitra SK. Studies on food and feeding habit of some fresh water fishes of India, part IV. A review on the food and feeding habits with general conclusion. *Ichthyologica*. 1963; 2(1-2):107-115.
11. Edmonson WT. Freshwater Biology. New York: John Wiley & Sons, INC, 1959, 1248.
12. Frose R, Pauly D. Fish base. world wide web electronic publication revision, 2004.
13. Gandotra R, Ahmed S, Shanker R. Food and feeding habits of *Barilius vagra* (Ham.) a minor carp in different age groups from jhajjar stream, Jammu (J&K). Aquacult. 2007; 8(1):1-11.
14. Gandotra R, Vivek, Singh D. Food and feeding habit of differentage groups of *Aspidoparia morar* (Ham.) J Inland Fish Soc India. 2015; 47(1):18-26.
15. Gaur KS, Sharma V, Sharma MS, Verma BK. Food and feeding habits of the hill stream fish *Garra gotyla gotlya* (teleost cyprindae) in the stream of south eastern Rajasthan. Eco. Env. and Cons. 2013; 19(4):1025-1030.
16. Gupta S, Banerjee S. Studies on some aspects of reproductive biology of *Amblypharyngodon mola* (Hamilton-Buchanan, 1822) International Research Journal of Biological Sciences. 2013; 2(2):69-77.
17. Gupta S, Banerjee S. Indigenous ornamental fish resources of West Bengal. LAP-LAMBERT Academic Publishing, Germany, 2013, 164.
18. Hossain MS, Roy A, Rahman ML. Food and feeding habit of Bele Glossogobius giuris (Hamilton and Buchannan, 1822) collected from *Mithamain haor* of kishoreganj district. North-Eastern Bangladesh. International journal of fisheries and aquatic studies. 2016; 4(5):84-88.
19. Kader MA, Bhuiyan AL, Manzur-i-khada. Food and feeding of *Gobioides rubicundus* and feeding experiment on it Indian J Fish. 1988; 35(A):312-316.
20. Kanwal BPS, Pathni SS. Food and feeding habits of a hill stream fish, Garra lamta (Hamilton- Buchanan) in some tributaries of Suyal River, kuman Himalaya, Uttarakhand (India). International Journal of Food and Nutrition Science. 2012; 1(2):16-22.
21. Mamun A, Tareq KMA, Azadi MA. Food and feeding habit of *Amblypharyngodon mola* (Hamilton) from Role of morphometry in determining the feeding success of small freshwater fish species: Multivariate... 89 Kaptai Reservoir, Bangladesh. Pak. J Biol. Sci. 2004; 7:584-588.
22. Mamun A, Taregad KMA, Azadi MA. Food and feeding habits of Amblypharyngodon mola (Ham.) from kuptal reservoir Bangladesh. Pakistan J Bio. Sci. 2004; 17(4)584-588.
23. Mercy TVA, Thomas KR, Jacob E. Food feeding habits of *Puntius melanamphyx* (Day) an endemic ornamental fish of the Western Ghats in the riverine and Reservoir fisheries of India M.R. Boopenderanath (Ed.), 2002, 172-175.
24. Mondol MR, Dewan, Hossian MA, Aaduzzaman M, Islam MA, Rozario GM. Food and feeding habits of *Puntius gonionotus* (thai sarpuntis) in rice field. Pakistan J Bio. Sci. 2005; 8(3):386-395.
25. Nath S. On the food, feeding habits and alimentary canal of *Crossocheilus latius diplocheilus* (Heckel) in Kashmir valley and adjacent area. Matsya. 1979; 5:74-76.
26. Ozdilek Y, Ekmekci SK. Preliminary data on the diet of *Garra rufa* (Cyprinidae) in the Basin Asi (Orontes), Turkey. Cybium. 2006; 30(2):177-184.
27. Pennak PW. Fresh water invertebrates of the united states, 2nd edition. John Wiley and Sons. New York, 1953, 512-533.
28. Pillay TVR. A critique of the study of food of fishes. J Zool. Soc. India. 1952; 4:185-200.
29. Sagar S. Eco-Biological studies of *Barilius benedisis* and *Barilius vagra* (Ham.) from jhajjar stream, Jammu J&K. Ph.D Thesis university of jammu, 2010.
30. Sunder S. Food and feeding habits of *Puntius conchonius* (Ham.) from Lake Dal, Kashmir. *Geobios New reports*. 1985; 4:131-136.
31. Verma R. Current status of physico-chemical characteristics and biological factor of W. Ramganga River in Kumaun Himalaya, India. Int. J Curr. Microbiol. App. Sci. 2013; 2(8):114-123.
32. Ward-campbell BMS, *et al*. Morphological characteristics in relation to diet in five coexisting Thai fish species. Journal of Fish Biology. 2005; 67(5):1266-1279.