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ORIGINAL ARTICLE

Gut Content Analysis of *Wallago attu* and *Mystus (Sperata) seenghala* The Common Catfishes from Godavari River System in Maharastra State

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ABSTRACT
Gut content analysis in freshwater common catfishes Mystus (Sperata) seenghala and Wallago attu from Godavari river system indicate that in both the fish species the gut content consists of about 80-90% is animal food matter of which the major food components are locally available weed fish species Puntius ticto, Chela phulo, Ambasis nama. The percentage of animal matter in the diet of both the species increased by 5-10% with increase in body size from small (20-25cm) to large (60-65cm)in Mystus seenghala and small (30-35 cm.) to large(105-110 cm.). There are no major variations in the gut content of Mystus (Sperata) seenghala & Wallago attu with difference in their habitat from Godavari river system in Maharashtra State of India, indicating the food of the both fish species do not change though they live in different habitats of a major ecological niche.
Key words: Gut content analysis, W. attu, M. seenghala, Godavari river, M.S.

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INTRODUCTION

Wallago attu (Family- Siluridae) (Bloch & Schneider, 1801) and *Mystus (Sperata) seenghala* (Family-Bagridae) (Sykes, 1939) are one of the common catfishes from rivers and reservoirs of India, Bangladesh, Afghanistan, Pakistan and Nepal [7, 12]. These species are also reported as common catfish from Maharashtra State in India. These species regularly occur in the catch composition from this region. *Wallago attu* and *Mystus seenghala* are at the top most tropic level in freshwater fish food chain. The details of biology including gut content analysis was studied by various researchers [5, 7, 12, 13]. Due to pollution of rivers and reservoirs in recent time there are effects on zooplankton population and changes in the tropic levels of various food materials leading to changes in food and feeding habit of top carnivores in aquatic food chain. Therefore, it is essential to determine the food composition in the gut of these two important predatory fish species. Gut content analysis gives an overall reflection about the type of food material available to the animals in food chain and ultimately it is a representation of food in the ecosystem. Gut content study of predatory fishes is an important aspect in the determination of dependence of these top carnivores to maintain the balance in ecosystem.

MATERIALS AND METHODS

Study area:

The specimen of different age groups of the two predatory fish species *Mystus (Sperata) seenghala* and *Wallago attu* were collected by random sampling method from different localities in the Godavari river basin and the reservoirs. The details are as given in the Table-1. and Fig. 1.
Samples of both fish species were collected during monthly the period of September 2009 to August 2010 in fresh condition from the fresh catch at the fishing centers (Table-1, and Fig. 1.).

Gut content analysis:

Total 521 specimens of both the species of which 182 *M. seenghala* and 339 *W. attu* were collected, dissected and gutted at the site of collection. The content in the stomach and intestine in partially or undigested state were removed by using soft brush and collected in glass petri dishes separately and fixed in 4% formalin. The large sized food materials collected especially from stomach of both the species were counted numerically. The small sized rest of the materials were collected in 50-100 ml. vials containing 4% formalin. Numerical and volumetric methods of gut content analysis [6], Sidgewick-Rafter counting cell method [16], Haemocytometer method for micro-plankton were used in this study. Gut content of different size group of both the fish species were analyzed for different variables like undigested food, digested food, semi-digested food, number of food items, % of food type (plant origin/animal origin/Detritus), volume of food, Correlation of size group of fishes and type of food were studied. The difference in gut content and its relation to habitat variations were also analyzed.

Table-1: Details of Different habitats selected for the fish sampling.

Sr. No.	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**
Locality	Bori, Purna river, Dist. Parbhani	Masoli reservoir Tq. Gangakhed	Niwali dam river Karpara	Yeldari reser-voir,Yeldari camp Dist. Parbhani	Fishing center on river Purna Dist. Parbhani	Nanded fishing center at Vishnupuri, river Godavari .
Distance (Km)/Area (Hectors)	20 km from Parbhani	352 ha.	279 ha.	3220 ha.	30km. from Parbhani	100 ha.

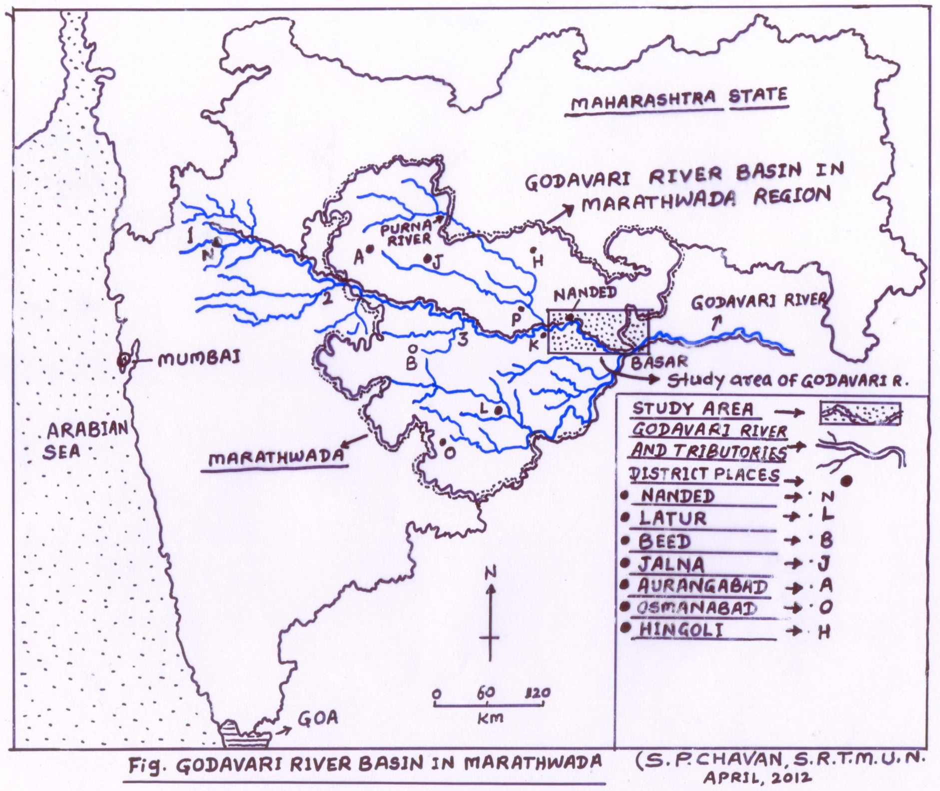

Fig.1. Study area selected for the sample collection of *Mystus seenghala* and *Wallago attu* of Maharashtra

RESULTS AND DISCUSSION

The gut of *Mystus (Sperata seenghala)* is formed from distinguishable elongated sac shaped stomach with blind stomach portion and a narrow short intestine. Gut of *Wallago attu* consists of a thick, muscular, roughly spherical, highly extensible stomach bag and narrow, medium, thick intestine. For the gut content analysis, the collected and fixed gut content sample including content from stomach and intestine was used for further studies. The details of gut content in various size groups of *Mystus seenghala* and *Wallago attu* from different localities in the selected study area is given in the Table-2 (a), 2(b).

The gut content from fishes in a lake Haleji from Pakistan were analyzed [11] to study the importance of phytoplankton as a fish food. Similarly, The fish food and feeding of two species of gray mullets *Valamugil buchanani* (Bleeker) and *Liza Vagiensis* from brakish water environment in Sri Lanka were analyzed [15] and it was found that, the amount of plant matter and animal matter in the diet did not change significantly with body size in the both species of *Mullets.* Whereas, in the present investigation *Mystus (Sperata) seenghala* show considerable variations in the plant and animal matter, the animal matter found increased with increase in body size of *Mystus (Sperata) seenghala* and *Wallago attu,* it was 5% and10% respectively.

Table-2(a): Gut Content in Various size Groups of *Mystus (Sperata) seenghala*.

Sr. No.	Standard Length group(cm.)	Average Body Wt. (gm)	No. of fish dissected	% of Animal Matter	% of Plant Matter	Detritus and Unidentified
1	20-25	110	20	80	08	12
2	25-30	200	20	80	08	12
3	30-35	280	26	90	02	08
4	35-40	380	30	90	08	02
5	40-45	700	28	80	08	12
6	45-50	800	30	90	08	02
7	50-55	900	20	94	04	02
8	55-60	1000	04	80	08	12
9	60-65	1500	04	80	08	12

Table-2(b) Different Species /Body parts of Plants and animals in the gut content of different Length groups of *Mystus (Sperata) seenghala.*

Sr. No.	Standard Length Group (cm.)	Animal species status	Plant species status
1	20-25	*Cycloid scales, Ctenoid scale, Crustacean shells*	*Spyrogyra, Spirulina,Nostoc, Closterium, Euglena spp.*
2	25-30	*Cycloid Scale, Argulus foliceous, Chela phulo, Daphnia*	*Syrogyra, Spirulina, Anabaena, Anacystic phormidium, Bascillaria, Nitzschia.*
3	30-35	*Puntius ticto, Ambisis nama, Chela phulo, Monia species, Al -ora spp.*	*Closterium merismopodia, Oscillaria, Anabaena, Anacystic phormidium, Bascillaria, Nitzschia.*
4	35-40	*Canthocymptus spp., Diatoms Ceriodaphnia, Limnocalanus, Neo diaptonus spp., Bosmonia spp., Cypris subglobosa.*	*Closterium merismopodia, Oscillaria, Anabaena, Anacystic phormidium, Bascillaria, Nitzsch, Helimeda, Vragillar, Navicula.*
5	40-45	*Puntius ticto, Ambasis nama, Cycloid scale, Ctenoid scale, Insect leg.*	*Closteridium merimopodia, Oscillatoria, Anabaena, Anacystic phormidium, Bascillaria, Nitzchia, Euglena, Vragillaria, Helimeda, Diatoms, Spiru-lina, Spyrogyra.*
6	45-50	*Cycloid scale, Keratella, Filinia, Argulus foliceous, Chela phulo, Daphnia, Gangesia macrons.*	*Anabaena, Anacystic phormidium, merismopodia, Oscillaria, Bascillaria, Spyrogyra, Spirulina, Nostoc, Closterium.*
7	50-55	*Cycloid scales, Ctenoid scales, Puntius ticto, Ambasis nama, Chela phulo, Insect legs, Monia spp., Alora spp., Bosmania spp., Gangesia macrons, Gangesia agraensis.*	*Vragillaria, Navicula, Closterium merismopodium, Oscillaria, Anabaena, Anacystis phormidium, Diatoms, Bascillaria, Nitzsch.*
8	55-60	*Neo diaplonus spp., Bosmonia spp., Cypris Subglobosa, Puntius ticto, Ambasis nama. Gangesia macrones*	*Anabaena, Anacystic phormidium, Bascillaria Nitzsch, Helimedia, Diatoms, Vragillaria, Navicula.*
9	65-70	*Chela phulo, Crustacean shells, Insect legs, Obensa, Stenocypris, Neo diaptonus, Bosmonia spp.*	*Closterium merismopodia, Anacystic phormidium, Bascillaria, Nitzsch, Heimedia, Navicula.*

The stomach content and feeding habits of Tilapia sp. from Abu-Zabal Lake in Egypt were analyzed [8] by frequency, occurrence and numerical method and found *diatoms, blue green algae & green algae* as main plant originated constituents and also found that the Tilapia *Oriochromis niloticus* (L.) prefer mostly the *diatoms* (68.0%) *Rotifers, Cladocerance, Ostracodes, Copepods, Molluscs and* animal derivatives were 45.0%. While, the sand particals 33.3% of the examined gut of the fish. Food and feeding habits of cichlid *Sarotherodon galilaeus* from a shallow tropical reservoir in Ghana were investigated [3] in the interest of dietary requirement of the fish. They observed the stomach content of fish species varies with the time of the day, size of the fish and season of the year but there was no significant difference ($P>0.05$) in the food items ingested by the juvenile and adult stages while in the present study there are difference in percentage of food composition with reference in the body size of *Wallago attu* and *Mystus seenghala*. Food and Nutritive value of gut contents of rudd (*Sardinius erythrophthalmus L.*) from Vrana lake, Croatia were examined [14] and found that the benthic micro and macro algae were major food content. Stomach content of freshwater stingray from Nigro River in Brazil was analyzed and found that, all species of stingrays feed upon nearly same % of invertebrate and vertebrate animals but differences are in the type of animal species in diet composition, it may be due to different mechanism of prey detection and capture by stingray species; therefore, it is essential to determine the difference in ability of *Mystus (Sperata) seenghala* and *Wallago attu* to locate and consume different species of animals. The food and feeding habits of *Ophiocephalus obscura* in the Cross river estuary, Cross river state, Nigeria were studied [4] between February and April 2009 revealed that the species feed mostly on food from animal origin, although diatoms and other plant material were also identified. A total of 149 plant materials (15.95%) and 77 diatoms (8.24%) were consumed by the species, food from animal origin consumed by this species included Polycheate worm (11.77%), Shrimps 84 (8.99%), Shrimp parts 33 (3.55%), juvenile fish 33 (3.33%), fish bones 44(4.7%), fish scales 40 (4.28%), bivalve 61(6.63%), insect larvae 2 (0.2%), adult insects 2 (0.21%), daphnia 62 (6.63%) and water snails 2 (0.21%). The condition factor calculated for the species varied during the study period with a mean value of 2.09 in February, 1.05 in March and 0.76 in April. In the present study, percentage of animal food found in gut content taken into consideration, as compared to African snakehead fish *O. obscura* has more plant material and diatoms of animal nature. The fishes under study have nearly 40% fish bone matter fragments indicate that both the fish species require the small fishes like *Ambasis spp., Puntius ticto, Chela phulo* in their routin diet. Hence to maintain food chain and tropic levels, the selected habitat, there is equal importance of these weed fishes forming one of the main food constituent in the diet of these two catfish selected for this study. Similarly the gut content analysis of Pangasiid catfish *Helicophagus waandersii* (Bleeker, 1858) from Mekong River, Thiland was studied [17] for possibilities of the fish use as a model for freshwater aquaculture. [1] analyzed food and feeding habits of *Protopterus annectens* from Gbedikere lake in Nigeria observed the diversity of food substances in the stomach of juvenile and adults from different water bodies and season in the study area whereas, in the present investigation it was observed that there are no measure differences in the gut content of *W. attu* and *M. seenghala* collected from different habitat (Table-1).

Body size and diet of organisms or fundamental attributes which determine their ecology, habitat biology and their place in food chain [10]. It was observed that the relationship between change in morphometric and diet shifts in different size classes of the *Iheringichthys labrosus (Lutken,1874),* the results are same in case of the young stages (yearlings) and fully grown adults of the fishes under study because comparatively high concentration of animal matter is found in the large individuals of *W. attu* and *M. seenghala*.

Table -3(a): Gut content in various groups of *Wallago attu*

Sr.No.	Standard Length Group(cm)	Average Body Wt. (gm)	No. of fish dissected	% of Animal Matter	% of Plant Matter	Detritus and Unidentified
1	30-35	250	20	90	02	08
2	35-40	300	20	90	02	08
3	40-45	350	20	90	03	07
4	45-50	450	26	95	02	03
5	50-55	500	30	94	02	04
6	55-60	580	28	95	03	02
7	60-65	680	30	96	02	02
8	65-70	710	30	96	02	02
9	70-75	850	29	94	02	04
10	75-80	950	29	94	02	04
11	80-85	1500	30	94	02	04
12	85-90	3500	30	96	02	02
13	90-95	4500	05	96	02	02
14	95-100	5500	04	96	02	02
15	100-105	6000	04	96	02	02
16	105-110	7000	04	96	02	02

It might be due to well developed jaws and teeth of adult stages of both species. Food habit of catfish *Chrysichthys auratus* (Geoffrey-Hilaire, 1808) were analyzed [18] and observed that the fish has ability to feed upon wide range of food items including plants and animals but the percent fullness of stomach and number of food items consume was high during rainy season as compared to low in dry season whereas the stomach content in *W. attu* and *M.* seenghala in any developing stage or adult stage do not show this kind of correlation. Distribution, size and feeding habits of pond fish *Nanaethiops unitaeniatus* from Nigeria were studied [9]; found that this small size species feed on 21 different food items including algae and detritus, in the present study, it was found that *M. seenghala* and *W.ttu* feed upon nearly 14 plant species including colonial, unicellular and filamentous algae and detritus; The animal species in the diet comprises 20 in number it indicate that the species under study have broad trophic spectrum with 34 dietaries in total. There are various methods of stomach content analysis also called as Gut content analysis worked upon by various scientists in fishes, insects, higher vertebrates including mammals. Occurrence method, Numerical method, Volumetric method, Gravimetric method, Subjective method and Stomach content flushing [6]. Gut content analysis would not be correct term because it is difficult to collect and identify the food items collected from the intestinal region of animals where the food get partially digested called chime or nearly digested and in the stage of absorption. Therefore, 'stomach content analysis' will be the best term to know the food item consumed by fishes and various other animals. Sidgwick-Rafter counting cell method, Haemocytometric analysis, Volumetric analysis index, Importance index in relation to stomach content with difference in age of fish habitat, season, morphometric variation in relatively close or allied species, stage in life cycle or other important consideration in stomach content analysis. In the present study, different size groups and their preference to animal and plant matter in their diet is taken into account.

Table-3(b) : Different Species /Body parts of Plants and animals in different Length groups of *Wallago attu*

Sr.No.	Standard Length Group (cm)	Animal species status	Plant species status
1	30-35	*Puntius ticto, Ambasis nama, Chela phulo, Crustacean shells, Insect legs, Cycloid scales, Ctenoid scale, Monia spp.*	*Spyrogyra, Spirulina, Nostoc, Closterium, Helimeda, Diatoms, Vragillaria, Navicula, Euglena.*
2	35-40	*Keratela, Filinia, Cycloid scales, Argulus foliceous, Chela phulo, Daphnia.*	*Oscillaria, Anabaena, Anacystic phormidium, Bascillaria, Closterium merismopodia.*
3	40-45	*Puntius ticto, Ambasis nama, Chela phulo, Monia spp., Daphnia, Gangesia agraensis,*	*Spyrogyra, Spirulina, Nostoc Closterium merismopodia, Oscillaria, Anabaena, Anacystic phormidium, Bascillaria, Nitzschia.*
4	45-50	*Canthocymptus spp., Stenocypris, Ceriodaphnia, Limnocalanus, Neo diaptonus spp., Bosmonia spp., Cypris subglobosa, Cypris bensa.*	*Anabaena, Anacystic phormidium Closterium merismopodia, Oscillaria, Bascillaria, Nitzschia, Diatoms, Vragillaria, Navicula, Heimedia.*
5	50-55	*Crustacean shells, Insect legs, Cycloid scales, Ctenoid scale, Puntius ticto, Ambasis nama, Chela phulo.*	*Bascillaria, Nitzschia, Diatoms, Navicula, Heimedia, Anabaena, Anacystic phormidium Closterium merismopodia , Oscillaria,.*
6	55-60	*Monia spp., Keratela, Filinia, Cycloid scales, Argulus foliceous, Chela phulo, Daphnia. Gangesia bengalensis*	*Anabaena, Anacystic phormidium Closterium merismopodia, Oscillaria, Nitzschia, Diatoms, Vragillaria, Navicula, Heimedia.*
7	60-65	*Neo diaptonus spp., Bosmonia spp., Cypris subglobosa, Puntius ticto, Ambasis nama, Chela phulo, Crustacean shells*	*Vragillaria, Navicula, Closterium merismopodia*
8	65-70	*Ambasis nama, Chela phulo, Crustacean shells, Insect legs, Cycloid scales, Ctenoid scale, Cypris subglobosa, Philometra hyderabadensis.*	*Anacystic phormidium Closterium merismopodia, Bascillaria, Nitzschia, Vragillaria.*
9	70-75	*Chela phulo, Crustacean shells, Insect legs, Cycloid scales Ambasis nama, Ambasis nama*	*Oscillaria, Anabaena, Anacystic phormidium, Spirulina, Nostoc*
10	75-80	*Cycloid scales, Keratela, Filinia, Argulus foliceous, Chela phulo, Daphnia.*	*Spyrogyra, Spirulina, Nostoc, Closterium merismopodia*
11	80-85	*Bosmonia spp., Cypris subglobosa Ambasis nama, Chela phulo, Crustacean shells, Neo diaptonus spp., Gangesia agraensis.*	*Closterium merismopodia, Anacystic phormidium, Bascillaria, Nostoc*
12	85-90	*Chela phulo, Crustacean shells, Cypris subglobosa, Ambasis nama, Argulus foliceous, Keratela,Filinia*	*Spyrogyra, Spirulina, Nostoc, Closterium merismopodia, Helimeda*
13	90-95	*Ambasis nama, Chela phulo, Argulus foliceous, Neo diaptonus spp., Bosmonia spp., Cypris subglobosa*	*Closterium merismopodia, Oscillaria, Nitzschia, Vragillaria, Navicula, Heimedia, Anabaena*
14	95-100	*Puntius ticto, Ambasis nama, Chela phulo, Crustacean shells, Insect legs, Cycloid scales, Ctenoid scale, Monia spp.*	*Spirulina, Nostoc, Closterium merismopodi, Oscillaria, Anabaena, Anacystic phormidium, Bascillaria, Nitzschia.*
15	100-105	*Canthocymptus spp., Stenocypris, Ceriodaphnia, Limnocalanus, Neo diaptonus spp., Bosmonia*	*Bascillaria, Nitzschia, Vragillaria. Spirulina, Nostoc, Closterium merismopodia*
16	105-110	*Cycloid scales, Keratela, Filinia, Argulus foliceous*	*Oscillaria, Anabaena, Anacystic phormidium, Spirulina, Nostoc*

CONCLUSION

Gut content analysis of *Mystus seenghala* and *Wallago attu* from Godavari river system in Maharashtra was analyzed first time during this investigation. Both the species of fishes consume 90% food items of animal origin of which 90% are locally available weed fish species. Total number of food item in the diet of both species are 34% (20 animal species and 14 plant species) but with increase body size the % of animal matter in the diet increase in *W. attu* as compared to the same in *M. seenghala*. There are no major variations in the gut content of both the catfish species collected from different habitats in Godavari river system.

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