SUMMARY

The food analysis of *Channa punctatus*, *Cyprinus carpio* and *Oreochromis mossambicus* were carried out by weight percentage, frequency of occurrence and index of preponderance methods. The food analysis revealed that food items of *Channa punctatus* consisted of crustaceans, insects, molluscs, fishes, plant materials sand and mud particles. *Channa punctatus* feed on higher percentage of crustaceans, insects, molluscs, fishes and sand and mud particles and lowest percentage of plant material. Smaller fishes and their larvae were dominant food items of *Channa punctatus*. Thus *Channa punctatus* shows carnivorous type of feeding habit.

The food analysis of *Cyprinus carpio* revealed that it consisted of diatoms, unicellular algae, aquatic plants, detritus, multicellular algae, sand and mud particles. Thus *Cyprinus carpio* shows carnivorous type of feeding habit.

The food analysis of *Oreochromis mossambicus* revealed that it consisted of algae, diatoms, rotifers, crustaceans, insect larvae and sand and mud particles. The ability to exploit different varieties of food makes *Oreochromis mossambicus* to be omnivorous.

The study of jaws and teeth of *Channa punctatus* revealed that the mouth of *Channa punctatus* is horizontal and terminal in position and the gap of the mouth is wider which is surrounded by upper and lower jaws. The buccal cavity is wide and spacious. The pharynx is also wide and spacious. A pair of ovoid upper pharyngeal pads are present on the roof of the pharynx. The tongue is well
developed and mobile which is affixed along the mid dorsal line of the floor of the buccal cavity. Teeth are numerous, present in the bucco pharyngeal region in groups. On the roof of the buccal cavity, maxillary, palatine, vomerine and pharyngeal teeth are present, the maxillary teeth on the upper jaw are small and sharp. The palatine teeth are located just behind the maxillary teeth on the palate. Just behind and parallel to the upper jaw, the vomerine teeth are present in a small patch. The lower jaw of *Channa punctatus* has villiform teeth, horny pad teeth and mandibular teeth. The arrangement and direction of teeth on the pharyngeal pads suggest that they aid in preventing the escape of prey. The gill rakers are modified into flat circular plates and are situated on each side of the gill arch in a single row.

The study of jaws and teeth of *Cyprinus carpio* revealed that the snout is blunt and mouth is large and crescentic. The buccal cavity is not very large. Teeth are absent on upper and lower jaws. The fifth branchial arch is reduced to a single strong bone on each side which is usually referred in cyprinids as the 'pharyngeal jaw'. There are three rows of teeth converging towards each other forming a stud-like 'molariform' prominence on the pharyngeal jaws. The tongue is immobile and affixed along the mid dorsal line of the floor of the buccal cavity. The gill-rakers are long, numerous, and thin arranged in five rows on the branchial arches.

The study of jaws and teeth of *Oreochromis mossambicus* revealed that the mouth of *Oreochromis mossambicus* is large surrounded by upper and lower lips which are thick. The buccal cavity of *Oreochromis mossambicus* is not very large,
the pharynx is dorso-ventrally compressed. The tongue is present, which is observed to be affixed along the mid dorsal line of the floor of the buccal cavity. There are two types of teeth present in *Oreochromis mossambicus*, one which are present on jaws and the other which are present on the pharyngeal bone, several rows of teeth are present on the upper and lower jaw. The teeth are uniformly small, distally flattened, unicuspid, bicuspid and tricuspid enameloid structures. The outer row of teeth is capped with a brown material, and is bicuspid whereas the inner line of teeth is tricuspid to bite and tear plant material. The pharyngeal teeth are fine, thin, unicuspid and hooked on the pharyngeal bones. The tongue is affixed along the mid dorsal line of the floor of the buccal cavity. The gill-rakers are long, numerous, arranged in four rows on the branchial arches.

The study of morphological characters of alimentary canal of *Channa punctatus* reveal that it is demarked into oesophagus, stomach, pyloric caecae, intestine and rectum. The oesophagus is a short, straight, highly muscular tube. The stomach is demarcated into anterior cardiac and posterior pyloric portions. It bears a pair of pyloric caecae one on either side of the stomach, of the two pyloric caecae, the left one is longer than the right. The intestine is short, coiled tube, having descending limbs and ascending limb and the rectum is well defined. The mean total length (TL) of *Channa punctatus* was 19.8 ± 14.0 cm and the mean alimentary canal length (ACL) was 17.4 ± 12.4 cm. The ratio of alimentary canal length to total length of *Channa punctatus* was 0.88:1. The mean relative length of gut (RLG) of *Channa punctatus* was 0.88 ± 0.87. The regression equation for
relationship between total length (TL) and alimentary canal length (ACL) of *Channa punctatus* is \( ACL = 0.0541 + 0.877 \text{ TL} \). When total length (TL) increases, then the alimentary canal length (ACL) increases by 0.877 per unit of total length (TL). The Pearson correlation coefficient of alimentary canal length (ACL) and total length (TL) of *Channa punctatus*, \((r) = 0.999\), The analysis of relationship between the total length (TL) and alimentary canal length (ACL) of *Channa punctatus* reveals that there is positive correlation between the total length (TL) and alimentary canal length (ACL) of *Channa punctatus*.

The study of morphological characters of alimentary canal of *Cyprinus carpio* revealed that the alimentary canal lacks stomach. The structure of digestive tract is observed to be differentiated into three distinct regions. The anterior intestine (oesophagus, prestomach), the median intestine (narrow) and the posterior intestine (broad). Following the oesophagus the alimentary canal widens to form intestinal swelling. The oesophagus is short and extensible tube more or less cylindrical in form. The intestine is long which coils extensively throughout the visceral cavity. Liver is present around the intestine filling all available space in viscera. The mean total length (TL) of *Cyprinus carpio* was 24.0 ± 15.0 cm and the mean alimentary canal length (ACL) of *Cyprinus carpio* was 260.0 ± 162.0 cm. The ratio of alimentary canal length to total length of *Cyprinus carpio* was 10.63:1. The mean relative length of gut (RLG) of *Cyprinus carpio* was 10.86 ± 10.80. The regression equation for relationship between total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* is \( ACL = -0.0265 + 10.84 \text{ TL} \).
When total length (TL) increases, the alimentary canal length (ACL) increases by 10.84 per unit of total length (TL) of *Cyprinus carpio*. The Pearson correlation coefficient of alimentary canal length (ACL) and total length (TL) of *Cyprinus carpio* \(r = 0.999\). The analysis of relationship between the total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* reveals that there is positive correlation between the total length (TL) and alimentary canal length (ACL).

The study morphological characters of alimentary canal of *Oreochromis mossambicus* revealed that the alimentary canal does not demarcate oesophagus from the stomach. Pyloric cecae are absent. Digestive tract is differentiated into three distinct regions, the anterior intestine (oesophagus, prestomach). The median intestine (narrow) and the posterior intestine (broad). The oesophagus of *Oreochromis mossambicus* is very short and narrow, expandable and leads into stomach. The stomach is sac like. The stomach leads to a long coiled intestine. The intestine of *Oreochromis mossambicus* is long which coils extensively throughout the visceral cavity. The mean total length (TL) of *Oreochromis mossambicus* was 15.6 ± 9.0 cm and the mean alimentary canal length (ACL) of *Oreochromis mossambicus* was 190.0 ± 110.0 cm. The ratio of alimentary canal length (ACL) to total length (TL) of *Oreochromis mossambicus* was 12.26:1. The mean relative length of gut (RLG) of *Oreochromis mossambicus* was 13.90 ± 12.14. The regression equation for relationship between total length (TL) and alimentary canal length (ACL) of *Oreochromis mossambicus* is \(ACL = -0.38 + 12.3\) TL. When total length (TL) increases, the alimentary canal length (ACL)
increases by 12.3 per unit of total length (TL) of Oreochromis mossambicus. The Pearson correlation coefficient of alimentary canal length (ACL) and total length (TL) of Oreochromis mossambicus (r) = 0.98. Analysis of relationship between the total length (TL) and alimentary canal length (ACL) of Oreochromis mossambicus reveals that there is positive correlation between the total length (TL) and alimentary canal length (ACL).

Assays of digestive enzymes in the gut of Channa punctatus reveal that, a various glycosidases (amylase, sucrase, maltase and lactase), proteases (trypsin, chymotrypsin and pepsin) and lipases were detected in the different regions of gut. Cellulase was not detected in the entire gut of Channa punctatus. There is higher activity of proteases in the stomach and small intestine. The variety of glycosidases detected indicates the ability of Channa punctatus to digest a variety of carbohydrate food components. As Channa punctatus is piscivorous, feeding mainly on insects and small fishes (Chapter. 2), higher activity of proteases and lipases are recorded. The study reveals that Channa punctatus can digest carbohydrate component in addition to both protein and lipid components in its diet.

Assays of digestive enzymes in the gut of Cyprinus carpio reveal that, a variety of glycosidases (amylase, sucrase, maltase and cellulase), proteases (trypsin, chymotrypsin and pepsin) and lipases were detected in the small intestine and large intestine of Cyprinus carpio. Lactase was not detected in the entire gut
of *Cyprinus carpio*. The variety of glycosidases detected indicate the ability of *Cyprinus carpio* to digest a variety of carbohydrate food components.

Assays of digestive enzymes in the gut of *Oreochromis mossambicus* revealed that, a variety of glycosidases (amylase, sucrase, maltase and cellulase), proteases (trypsin, chymotrypsin and pepsin) and lipases were detected in the stomach, small intestine and large intestine of *Oreochromis mossambica*. 