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# The Feeding Habits of Common Carp in South Australian waters

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## Introduction

Since the spread of common carp into South Australia in the early 1970's, they have remained abundant in the River Murray and the lower lakes. With the continued high catch rates (Fig. 1) there has been concern as to the effects carp may have on the environment and on native fish. This impact will be determined largely by the feeding habits of carp. Although carp are recognized as the most widely distributed freshwater fish, very little is known of their ecology in natural environments. Overseas studies have suggested that carp feed by 'roiling' the mud and selecting food particles from the suspended matter. This study aimed to determine the diet of carp in Lake Alexandrina and to make inferences on the environmental effects carp may produce.

Catching the carp

Samples of carp were caught from the Narrows area between Lake Alexandrina and Lake Albert from March 1981 until March 1982 using an electrofishing system. The electrofisher was operated by Mr J.V. Lucieer and Mr T. Lucieer. The generator and electronics are housed in a small fibreglass boat which is towed by a similar boat (Fig. 2). The generator provides an electric current to a fibreglass handled dip net manipulated by the fisherman in the front boat; this acts as both the anode and the collecting net. The cathode consists of two copper strips on the underside of the rear boat. The circuit is completed when the anode net touches the water. Fish within a small radius of the anode become stunned and are caught in the dip net. The electrofisher was operated within a few metres of the reed beds. It caught fish ranging from 150 to 770 mm, which corresponds to weights from 70 gm to 6.4 kg (Fig. 3). All fish were measured, weighed, sexed and the guts removed and preserved for food analysis.

The gut contents of the carp

The main food items were filamentous algae, small invertebrate animals and detritus. Food items were counted to assess which were most important. Because portions of filamentous algae and detritus varied widely in size, the number of standard areal units was estimated. Figure 4 shows some of the invertebrates eaten by carp and shows the standard areal units of algae and detritus drawn to the same scale. The invertebrates include some small crustaceans that live in contact with the bottom sediments or on the surface of the reeds (Fig. 4E, F, H and J) and others that are planktonic, floating in the water column. Another slightly larger crustacean (to 20 mm), the amphipod *Austrochiltonia*, which is common in the reed beds was also fed upon. The small micro-crustaceans (Fig. 4E-J) were important in the diet of smaller fish and were rarely found in fish larger than 250 mm. These larger fish ate large crustaceans, especially Daphnia, copepods and amphipods. All size classes ate filamentous algae and detritus, but these generally represented less than half of the gut contents.

## Feeding behaviour

Carp use their gill rakers as a seive and only those particles large enough to be trapped by the gill rakers can be ingested. Smaller particles are expelled through the gills with the breathing current. Large, hard, indigestible particles are expelled forwards through the mouth. The distance between the gill rakers increased in larger fish (Fig. 5). The gill raker spacing was related to the size and type of invertebrate ingested, with the small micro-crustaceans passing through the gill rakers of larger fish. None of the carp guts contained any of the larger invertebrates such as shrimps, yabbies, worms or insects. This may have been because these were quite rare in the area in which the carp were feeding, although shrimps and yabbies certainly did occur there.

## The effects of carp

Although carp do undoubtedly have adverse effects in some environments, especially in clear-water systems, this feeding study has not identified any particular problems. In feeding on detritus, filamentous algae and micro-crustacea, the carp occupy a feeding niche that may not be fully utilized by our native fish. They then appear to supply an extra food source for predatory species such as callop and Murray cod. However, the major environmental damage by carp may have occurred in the years before this study. They may have uprooted and eaten submerged aquatic plants which are said to have been common before carp arrived. Interactions of carp with the breeding cycle and fry of native fishes also needs to be investigated. Their feeding habits suggest that they may take eggs and fry of native fish and, perhaps, of yabbies.

The detailed results of this study are presented in a B.Sc. Honours thesis "The feeding ecology of European carp (*Cyprinus carpio* L.) in Lake Alexandrina and the lower River Murray, South Australia" by David Hall, 1981, Department of Zoology, University of Adelaide.

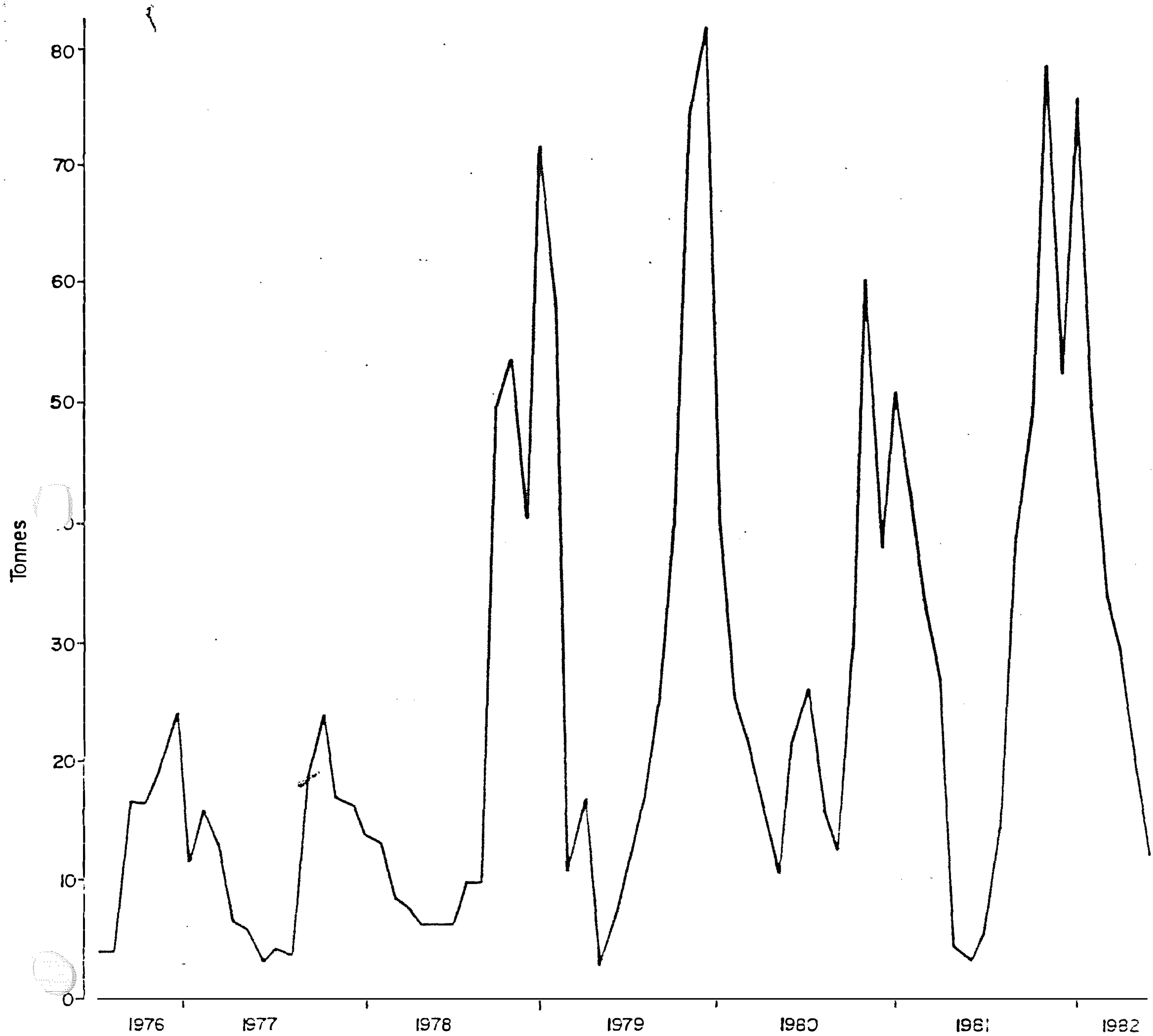
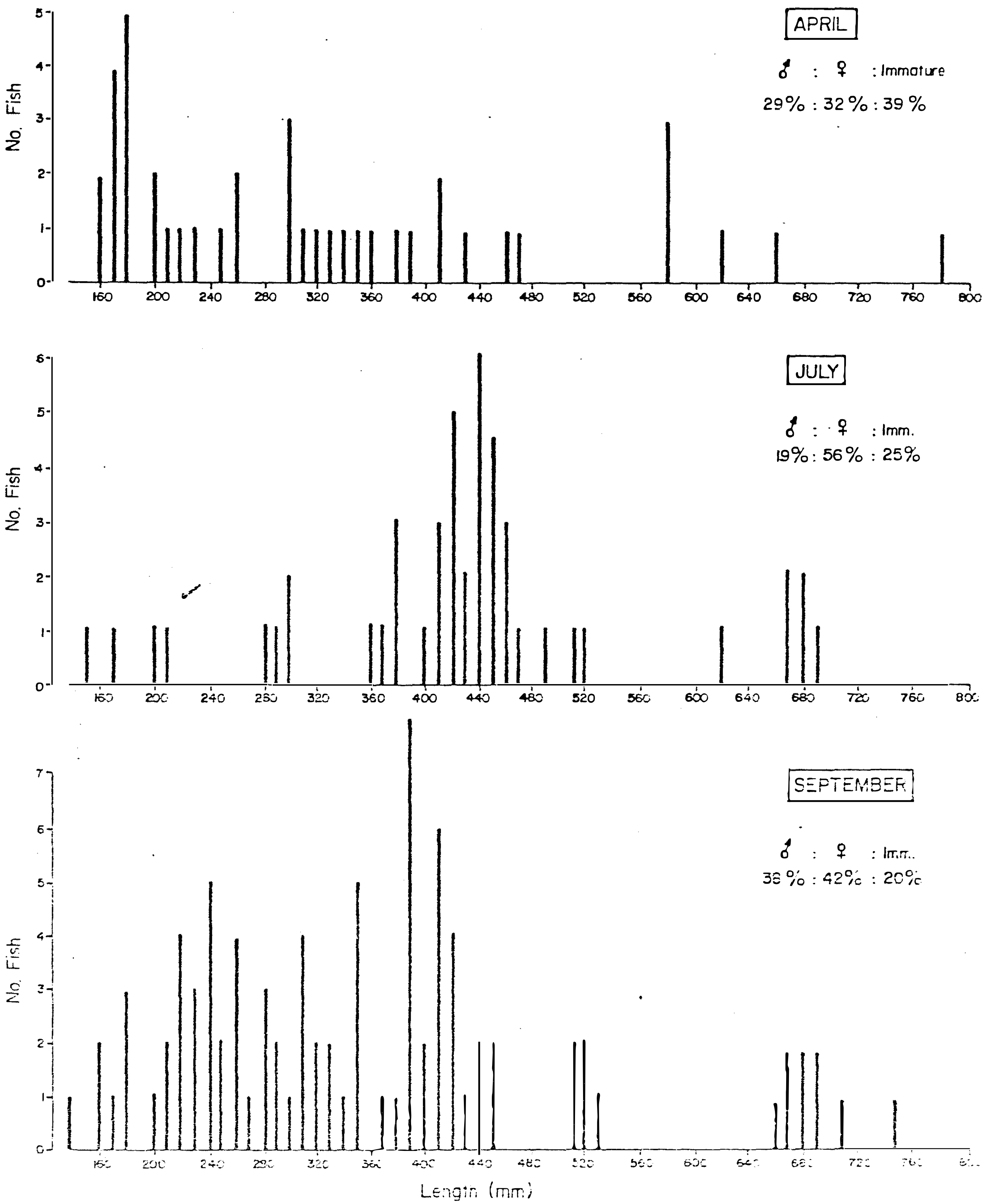



FIG. 1. Commercial catches (kg whole weight) of Common carp from the Lakes of Coorong 1976-1982.

Fig. 3. The size distributions and sex ratios of carp caught in April, July and September; Narrung, Lake Alexandrina.



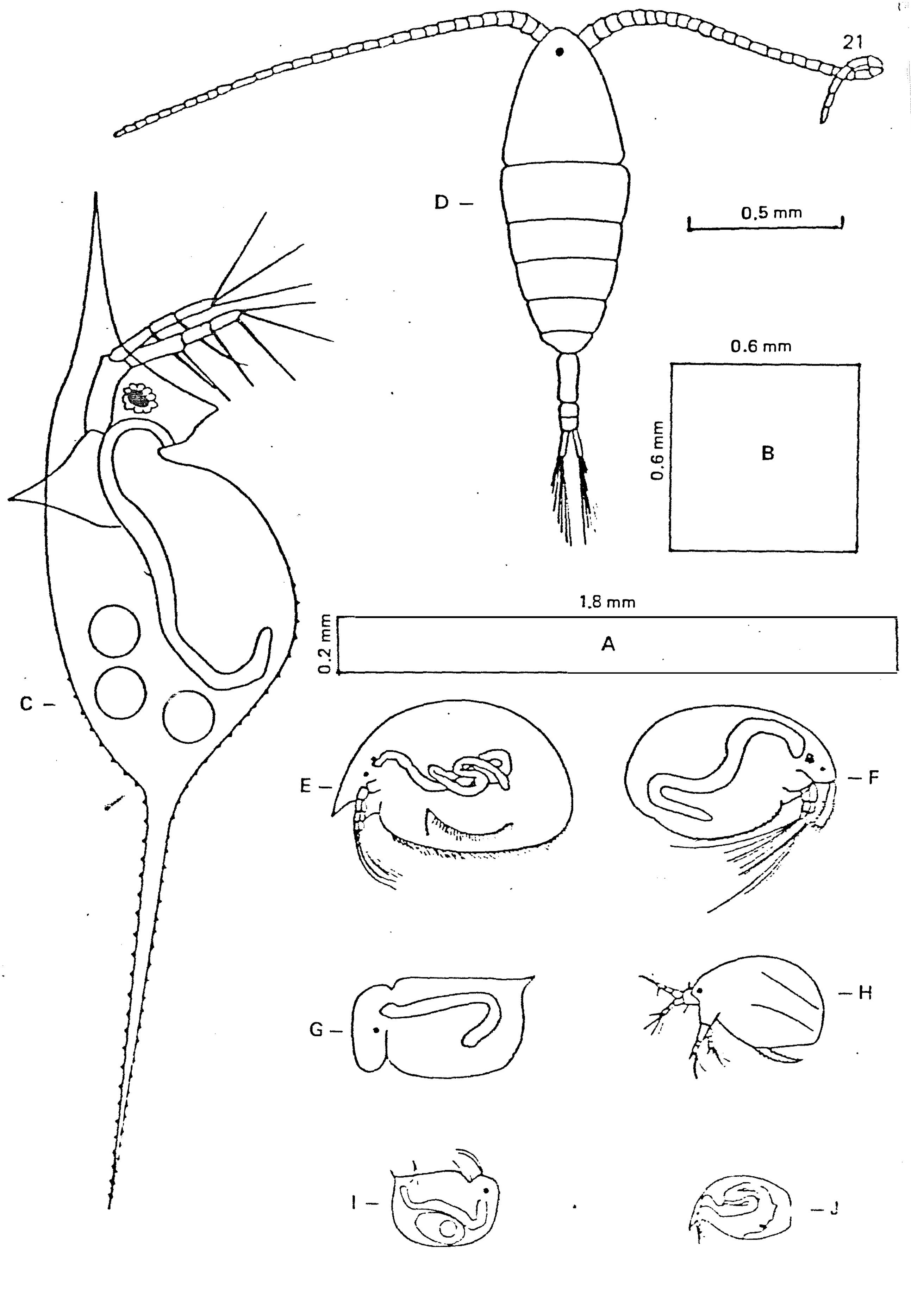



Fig. 4 Major genera of invertebrates (C-H) eaten by carp, drawn to a common scale. Arbitrary units of area used to count filamentous algae (A) and detritus (B) are also shown; C = *Daphnia;* D = *Boeckelia;* E = *Leydigia;* F = *Macrothrix;* G = *Ceriodaphnia;* H = *Hyocryptus;* I = *Bosmina;* J = *Biapertura.* Filamentous algae eaten by carp includes both *Spirogyra sp.* and *Cladophora sp.*

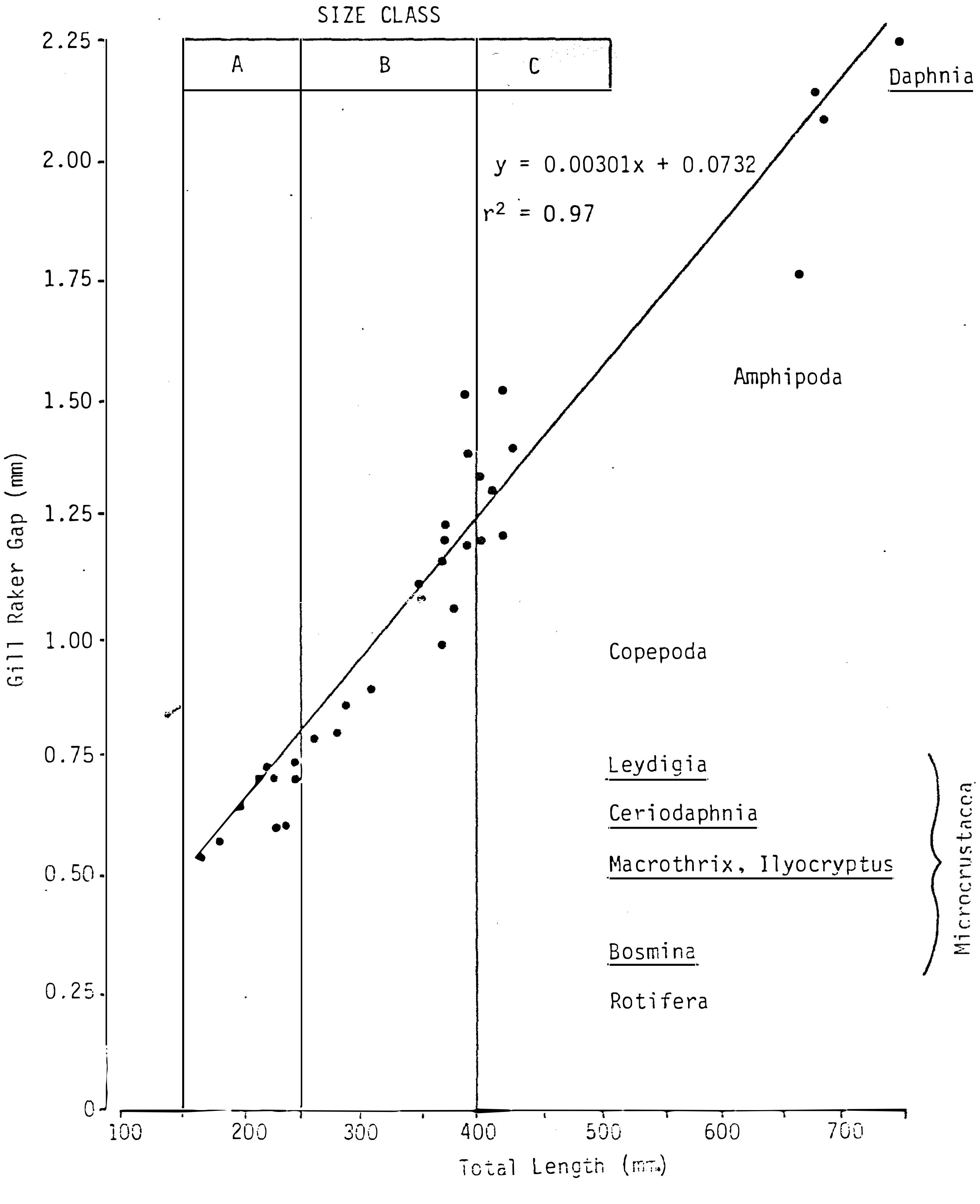



Fig. 5 The relationship between gill raker gap and fish length related to the mean lengths of major invertebrates in the habitat; vertical scale corresponds to both gill raker gap (mm) and mean lengths (mm) of invertebrates; data based on combined April-July data, Narrung, Lake Alexandria.