chobiensis from Botswana by Hoogstraal & El Kammah (1974).

Table 2 shows the monthly distribution of hosts and parasites. No record was kept of the relative abundance of the parasites and their distribution on the bodies of hosts, but most were found under the arm, around the anus, posterior to and in the ears, on the neck and eye-lids. Ectoparasites were more abundant on adults than on juveniles, probably as a result of the extensive allogrooming of youngsters.

ACKNOWLEDGEMENTS

My sincere thanks are due to Dr J A Ledger and his staff at the Entomology Department, South African Institute for Medical Research, Johannesburg, for identifying mites, fleas and sucking lice and to Miss J Walker at Onderstepoort Veterinary Research Institute for tick identifications. I also wish to thank Prof. J D Skinner for making the study possible.

REFERENCES

HOOGSTRAAL, H & EL KAMMAH, K M 1974. Notes on African *Haemaphysalis* ticks. XII. *H. (Rhipistoma) zumpti* sp.n., a parasite of small carnivores and squirrels in Southern Africa (Ixodoidea: Ixodidae). *J. Parasit.* 60: 188–197.

LEDGER, J A 1976. The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian Region) Vol IV. Phthiraptera. D.Sc. thesis.

PAOLA, B 1969. Description of a new species of *Hirstionyssus* Fonseca (Acarina: Dermanyssidae) from the Ethiopian geographical region, with notes on other known species. *Revue Zool. Bot. afr.* 80: 67–79.

RAHM, U 1972. Note sur la réproduction, l'écologie et le régime alimentaire des Sciuridés au Kivu (Zaïre). *Revue Zool. Bot. afr.* 58: 321–339.

THEILER, G 1962. The Ixodoidea parasites of vertebrates in Africa south of the Sahara (Ethiopean Region). Report to the Director of Veterinary Services, Onderstepoort, Pretoria.

VILJOEN, S 1975. Aspects of the ecology, reproductive physiology and ethology of the bush squirrel, *Paraxerus cepapi cepapi* (A Smith, 1863). MSc thesis, University of Pretoria.

ZUMPT, F (ed.) 1966. The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian Region). Vol. III. (Insecta excl. Phthiraptera). *Publs S. Afr. Inst. med. Res.* 13 (52): 1–283.

STOMACH CONTENT ANALYSES OF *POMADASYS COMMERSONNI* FROM THE SWARTKOPS ESTUARY (PISCES: POMADASYIDAE)

H C VAN DER WESTHUIZEN AND J F K MARAIS
University of Port Elizabeth

Accepted: April 1977

INTRODUCTION

Pomadasys commersonni (Lacépède 1802), the spotted grunter, occurs in the warmer water of the east Coast of South Africa with a special preference for the calm water of estuaries (Smith 1950; Smith 1961; Wallace 1975). It is a very popular sporting fish and contributes to a large extent to recreation in the Swartkops Estuary. Records of the Swartkops Angling Club were analysed by Marais (1976) who found that in terms of biomass, 82 per cent of the catches of anglers consisted of *Pomadasys commersonni* and in terms of numbers this species contributed 87 per cent. Average *P. commersonni* catches by angling club members from April 1972 to March 1975 in the Swartkops Estuary were 127 per month. An equal number of fish is probably caught by non-members of angling clubs. Next in abundance was *Lithognathus lithognathus* with only 4 per month.

A further indication of the relative abundance of *P. commersonni* in the Swartkops Estuary was obtained from a study of the catches made by

anglers during the 1976 Eastern Province angling week (26 March to 3 April 1976). During this week *P. commersonni* made up 69 per cent of fishes caught, followed by *Argyrosomus hololepidotus* (16 per cent). It is thus clear that *P. commersonni* is by far the most important angling fish in Swartkops Estuary.

It was therefore decided to study the natural food preference of this species by means of stomach content analyses and to compare the results with the type of bait normally used by anglers.

MATERIALS AND METHODS

Pomadasys commersonni was obtained from the Swartkops River in two ways:

(i) With the aid of gill-nets.
(ii) From fishermen's catches, in which case questionnaires were handed to the fishermen to determine the most popular bait used.

Stomachs of 92 fish were removed and preserved in 10 per cent formalin for subsequent content analyses in the laboratory with a stereo-microscope. In certain specimens, most of the contents were digested to a state where the items could not be accurately determined. In certain cases only chelae were available for identification. To overcome this problem only a numerical estimate of the food items was made and the data analysed by means of the occurrence method (Hynes 1950; Windell 1971). In this method the number of fish, in which a certain food item was found, is expressed as a percentage of the total number of fish.

RESULTS AND DISCUSSION

The results, according to the occurrence method, are given in Table 1. The data show that Crustacea formed the most important food component, and appeared in 94 per cent of the stomachs. *Upogebia africana* appeared in 33 per cent of the fish and Brachyura in 35 per cent. *Sesarma catenata* formed the largest component of the latter (14 per cent) whereas 15 per cent of the Brachyura could not be identified.

Mollusca were next in importance and were found in 28 per cent of the fish. Mollusca consisted mainly of *Assiminea* spp. (10 per cent) and the bivalves *Psammotellina capensis* (9 per cent) and *Solen capensis* (3 per cent).

The next largest component was Annelida (22 per cent). Polychaetes formed the most important class of Annelida and were found in 14 per cent of the fish.

Plants were found in 25 per cent of the fish, and included *Zostera* (4 per cent) and *Gracilaria verrucosa* which appeared in 21 per cent of the analysed stomachs. This alga was not digested but found undamaged in the intestine. It was first thought that *G. verrucosa* was ingested primarily to obtain the associated epifauna as was found by Fish (1951) for *Tilapia esculenta* in Lake Victoria and Blaber (1973) for *Rhabdosargus holubi* in the West Kleinemond Estuary. However, further stereo-microscopic investigation showed no epifauna on freshly sampled *G. verrucosa* from Swartkops Estuary. Another possibility was that *G. verrucosa* was ingested accidentally with other material. This seems unlikely since in one case 24,8g of *G. verrucosa* was found in a stomach together with one specimen of *Sesarma catenata* weighing only 1,2g.

When the individual food items were added and expressed as a percentage of the total it was found that Crustacea formed 67 per cent of the diet whereas Polychaeta and Mollusca formed 21 per cent and 12 per cent respectively. The questionnaires were analysed to establish how the fishermen's bait-choice agrees with the above-determined diet.

Table 2 indicates that Crustacea are being used by 79 per cent of the fishermen and Polychaeta by 14 per cent. The polychaet species most commonly used is *Diopatra neopolitana neopolitana* of the family Eunicidae.

CONCLUSION

Stomach content analyses revealed that Crustacea (in particular the mudprawn *Upogebia africana*) form the most important component of the natural diet of *Pomadasys commersonni* in the Swartkops Estuary. As could be expected, anglers operative in the same area showed a preference for the same bait species.

The fact that 25 per cent of the 92 stomachs of *Pomadasys commersonni*, a carnivorous fish, contained plant material (mostly *Gracilaria verrucosa*) is noteworthy. The nutritional significance of this material warrants further investigation.

No difference in the diets of different size ranges of *Pomadasys commersonni* was observed during the study period.

TABLE 1

Food obtained from the stomachs of *Pomadasys commersonni* caught in the Swartkops Estuary (percentage of total number of fish in which found).

	Month									
	F	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*Tot. Period*
CRUSTACEA										
Brachyura										
Unidentified	25	13	33	8		33	28			15
Sesarma catenata				8	57				25	14
Rhynchoplax bovis or *Hymenosoma orbiculare*				8						1
Cleistostoma spp.					43	17	4			5
Macrura										
Alpheus crassimanus		7				17	4			3
Anomura										
Upogebia africana		13		83	71	33	24	25	38	33
Callianassa kraussi		27	33			33	12	38		14
Mysidacea										
Mesopodopsis slabberi		13								2
Amphipoda										
Unidentified							4		8	2
Melita zeylanica									8	2
Tanaidacea										
Apseudes cooperi									4	1
Isopoda										
Sphaeromid spp.									8	2
MOLLUSCA										
Gastropoda										
Assiminea spp.	50	7	33			17	12		8	10
Nassa kraussiana	50	7					8			5
Cephalopoda		7								1
Pelecypoda										
Psammotellina capensis		20				17	16			9
Solen capensis							4		25	3
ANNELIDA										
Unidentified	25	13	67				4			7
Polychaeta	25						36	38		14
Oligochaeta							4			1

TABLE 1 (continued)

	Month									
	F	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*Tot. Period*
NEMATODA										
Unidentified			33							1
PISCES										
Glossogobius spp. ?					14					1
Fish scales		13								2
Insect larvae							4			1
Broken shells		20		8			4			5
ANGIOSPERMAE										
Zostera							4	13	17	4
ALGAE										
Gracilaria verrucosa			8		14	50	20			21

TABLE 2

Bait preference of 30 regular anglers operating in Swartkops estuary.

Bait used	*Percentage of fishermen*
Upogebia africana	72
Polychaeta	14
Callianassa kraussi	7
Solen	7

ACKNOWLEDGEMENTS

Grateful acknowledgement is made of the financial assistance given by the Department of Planning and Environment, and the University of Port Elizabeth. The Department of Nature Conservation of the Cape is thanked for authorizing the use of gill nets.

REFERENCES

BLABER, S J M 1973. The ecology of juvenile *Rhabdosargus holubi* (Steindachner) (Teleostei: Sparidae). Ph.D. thesis, Rhodes University, Grahamstown.

FISH, G R 1951. Digestion in *Tilapia esculenta*. *Nature, Lond.* 167: 900–901.

HYNES, H B N 1950. The food of freshwater sticklebacks (*Gasterosteus aculeatus* and *Pygosteus pungitius*), with a review of methods used in studies of the food of fishes. *J. anim. Ecol.* 19: 36–58.

MARAIS, J F K 1976. Comparative studies on the nutritional ecology of mullet in the Swartkops Estuary. Ph.D. thesis, University of Port Elizabeth, Port Elizabeth.

SMITH, J L B 1950. *Pomadasys operculare* and the South African seas. *Ann. Mag. nat. Hist.* (12) 3: 778–785.

SMITH, J L B 1961. The spotted grunters of Africa. *Fld. Tide*, 3: 16–17.

WALLACE, J H 1975. Biology and ecology of the estuarine fishes of the east coast of South Africa. Ph.D. thesis, University of Natal, Pietermaritzburg.

WINDELL, J T 1971. Food analysis and rate of digestion. In Methods for assessment of fish production in fresh waters, ed. W E Ricker. *IBP Handb.* 3: 1–345.

THE HIMALAYAN TAHR ON TABLE MOUNTAIN

R BIGALKE (Sen.)
185 Alexander St., Pretoria

Accepted: May 1977

It is seldom possible to state with any degree of accuracy when species of exotic animals were liberated or found their way as escapees into foreign environments. But in the case of the Himalayan tahrs on Table Mountain, the elimination of which is now being seriously tackled, it is possible to state where the animals came from. On 2 September 1935 a pair of Himalayan tahrs (*Hemitragus jemlaicus*) was sent to the Groote Schuur Zoo by me from the National Zoological Gardens in Pretoria. Either these animals, or some of their progeny, escaped from that zoo resulting in their rapid increase in Table Mountain at the cost of its flora. Although considerable damage has already been done to the montane vegetation, it is to be hoped that the steps now being taken to eradicate the tahrs will not be relaxed until the object has been attained.

Like the klipspringer, in earlier times a common little antelope on Table Mountain, the tahr is an agile climber and jumper in rocky terrain. At Groote Schuur the animals were obviously not so securely housed that they could not escape. Their rapid increase in numbers shows that they found Table Mountain at least as favourable an environment as their normal home in the Himalayan mountains.