Analysis of anglers' catch data from the Swartkops estuary

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An analysis of anglers' catch data from 1972–1978 revealed that the spotted grunter *Pomadasys commersonni* is the most abundant angling species in the Swartkops estuary (83% of mass and 87% of numbers). It is followed by *Lithognathus lithognathus, Argyrosomus hololepidotus* and *Lichia amia.* During the early part of this century *L. lithognathus* was the most abundant species in the estuary followed by *A. hololepidotus, P. commersonni* and *Pomatomus saltatrix.* Various factors such as food availability, reproduction and climatic conditions which could be responsible for seasonality of catches are discussed.
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Analise van hengelaarsdata vanaf 1972–1978 het aangetoon dat die spikkel-knorder *Pomadasys commersonni* die voorste hengelvis in die Swartkopsstrandmeer is (83% van massa en 87% van getalle). Die volgende was *Lithognathus lithognathus, Argyrosomus hololepidotus* en *Lichia amia.* Aan die begin van die eeu was *L. lithognathus* die volopste hengelvis gevolg deur *A. hololepidotus, P. commersonni* en *Pomatomus saltatrix.* Verskeie faktore soos beskikbaarheid van voedsel, reproduksie en klimatologiese toestande wat moontlik seisoenaliteit van vangste beïnvloed, word bespreek.
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The Swartkops estuary is situated in the immediate proximity of Port Elizabeth which makes it easily accessible to large numbers of people especially over weekends and during holidays. Grindley (1974) stated that this estuary is probably 'unique in South Africa as being the only well-preserved estuary within a city'. Because of the importance of this estuary, both from a recreational and aesthetical point of view, regular information on the occurrence and abundance of the resident animals is of the utmost importance to enable evaluation of the system if future fishing pressure is further increased or if the estuary is seriously polluted.

The only authoritative publication on the abundance of fish species in the Swartkops estuary was by Gilchrist (1918). Species lists have been published by Edwards (1971) and Grindley (1974). Based largely upon Gilchrist's data, Grindley (1974) estimated the relative abundance of fish species. The University of Port Elizabeth has initiated studies on the nekton of the estuary by means of analysis of anglers' catch data, regular gill and seine netting, and of the larval fish community by plankton tow netting. Base line data are thus being obtained by which the effect of adverse conditions such as over-exploitation and pollution in an increasingly industrialized area can be evaluated. In this paper anglers' catch data, obtained over a period of six years, are discussed. Information on climatic conditions, which could influence fish abundance and occurrence, are also presented.

Methods

Catch statistics (April 1972–March 1978) were obtained from the Hook and Reel and Rod clubs. The data are presented in terms of mass, numbers and mean mass per species on a monthly basis (Table 1). A unidirectional variance analysis test was performed on numbers of fish caught per month to determine if differences were statistically significant. The total monthly catch, as well as the contribution of the three most abundant species is given (Fig. 1). A comparison is made between the present data and those obtained by Gilchrist (1918) (Fig. 1). Although the data of Gilchrist (1918) are not strictly comparable to the present anglers' data, netting was performed on such an extended scale that information on all fishes, including angling fishes, was obtained. Grindley (1974) summarized Gilchrist's data to show the presence and abundance of fish species caught at that time (Table 2).

Table 1 Summary of fish caught in Swartkops estuary by members of Hook and Reel and Rod Clubs from April 1972 – March 1978

	January		February		March		April		May		June		July	
	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n
Pomadasys commersonni	144	93	740	497	856	633	1548	1024	1248	819	817	473	1186	68
Lithognathus lithognathus	41	20	48	24	50	12	138	39	99	27	67	20	93	25
Lichia amia	18	11	91	55	60	42	44	23	31	16	5	3		
Argyrosomus hololepidotus	51	23	51	22	61	34	89	44	45	14	47	18	38	14
Elops machnata	17	12	38	14	33	24	31	16	14	7	10	3	55	31
Platycephalus indicus	3	2	15	13	29	25	38	28	14	12	7	6	3	3
Pomatomus saltatrix	18	34	13	6	2	2	3	3	2	2	10	10	1	1
Skate?	9	2	24	4	44	3	9	2			3	1		
Rhabdosargus holubi	1	1			2	2	3	2	1	1	2	2	2	1
Myliobatus aquila							5	2					7	1
Shark?	3	1					4	1						
Diplodus sargus					1	1			1	1	1	1		
Rhabdosargus globiceps									3	2				
Chanos chanos														
Caryx spp.														
Total	304	199	1008	635	1138	778	1910	1184	1456	901	972	537	1386	752

Surface water temperatures, taken daily at Humewood beach from 1972–1978, were obtained from the City Engineer's department. Daily atmospheric pressure, wind distance and rainfall data were supplied by the weather station at the H.F. Verwoerd Airport and at the Swartkops township.

Results

The spotted grunter *Pomadasys commersonni* was the most important fish taken by anglers in the estuary, both in terms of mass (83% of all fish caught) and numbers (87%) (Table 1). *P. commersonni* was the dominant angling fish in all months of the year. Although more leervis *Lichia amia* than kob *Argyrosomus hololepidotus* were caught the total mass contribution of *A. hololepidotus* was greater. During the early part of this century, more white steenbras and kob were caught than spotted grunters and elf occurred about as frequently in the catches as the spotted grunter.

When the present angling catches are compared to Gilchrist's (1918) data (Fig. 1) the same overall seasonal trends are obtained. In both instances lowest numbers occurred during the winter and summer months and peak catches were made during March and April and the spring months August, September and October. The weather data indicate that peak catches were made in between the periods of lowest and highest water temperature (Fig. 3), lowest and highest barometric pressure (Fig. 2) and most and least wind distance (Fig. 2). Also largest catches coincided roughly with maximum rainfall (Fig. 3).

Discussion

The most important single characteristic of the angling statistics during the present survey is the complete dominance of *P. commersonni* throughout the year (Fig. 1). The other most abundant species were the white steenbras *Lithognathus lithognathus*, *A. hololepidotus*, *L. amia*, bartail flathead *Platycephalus indicus* and tenpounder *Elops machnata*. In Natal estuaries *P. commersonni* is also

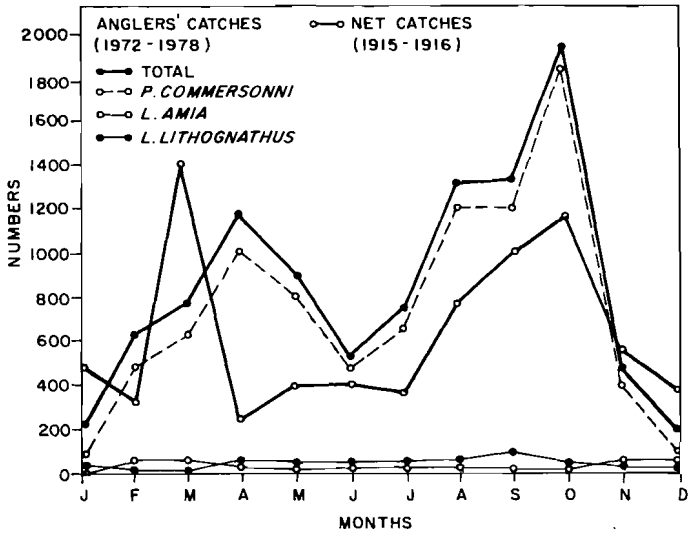

Fig. 1 Total number of fish caught as well as numbers of the three most abundant angling species caught monthly from April 1972–March 1978. Mean number of fish obtained monthly from June 1915–May 1916 by seine netting (Gilchrist 1916) are also included to show similar trends in seasonal distribution.

August		September		October		November		December		Total			
Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mass (kg)	n	Mean (kg)	
2325	1209	2005	1199	3058	1861	586	400	141	94	14652	8978	1,6	*Pomadasys commersonni*
91	28	287	85	122	34	30	13	35	12	1102	339	3,3	*Lithognathus lithognathus*
19	11	8	5	58	22	66	28	95	51	493	267	1,9	*Lichia amia*
27	17	104	18	22	12	32	13	60	18	527	247	2,5	*Argyrosomus hololepidotus*
58	40	26	14	21	12	12	8	17	9	321	190	1,7	*Elops machnata*
9	4	8	5	14	9	15	9	13	10	168	126	1,3	*Platycephalus indicus*
7	6	1	1	6	4	1	1	5	5	69	75	0,9	*Pomatomus saltatrix*
				20	2	42	3	55	6	206	23	8,9	Skate?
3	3			1	1	1	1	1	1	20	15	1,4	*Rhabdosargus holubi*
		23	2	11	1	13	2	4	1	63	9	7,0	*Myliobatus aquila*
				3	1					9	3	3,1	Shark?
										3	3	0,9	*Diplodus sargus*
										3	2	1,3	*Rhabdosargus globiceps*
7	1									7	1	6,5	*Chanos chanos*
1	1									1	1	1,4	*Caryx* spp.
2549	1320	2463	1329	3334	1959	799	478	424	207	17743	10279	1,7	Total

the most abundant angling species although *Rhabdosargus sarba* (Natal stumpnose) is caught in large numbers (Wallace 1974). Of the other locally important angling species, the kob is caught throughout the year in Natal while the white steenbras and leervis are caught seasonally (Wallace 1974). The distribution of *P. commersonni* extends to the vicinity of the Breë River mouth (T. Ratte pers. comm.). From Knysna southwards the relative abundance of *L. lithognathus* increases until it dominates in anglers' catches in South Western Cape estuaries (I. Gaigher pers. comm.). The relative abundance of *L. lithognathus* in South Western Cape estuaries is confirmed by gill net catches in the Bot River estuary and Breë River mouth (Ratte. 1977a, b). According to Gaigher *L. amia* and *A. hololepidotus* are also caught in fair numbers in this area. This is substantiated by the gill net catches of Ratte (1977a, b).

Whereas Wallace (1974) found that *P. commersonni* is caught from rocky and sandy beaches in Natal, it is very seldom caught from beaches in the Eastern Cape (G. Rossouw pers. comm.) although large numbers are caught in local estuaries.

Gilchrist's (1918) data are not strictly comparable to the present angling statistics because different catch methods were employed. Nevertheless, it provides the only source of data on relative abundance earlier this century and since netting was performed on such an extended scale broad generalizations are probably permissible. Netting was con-

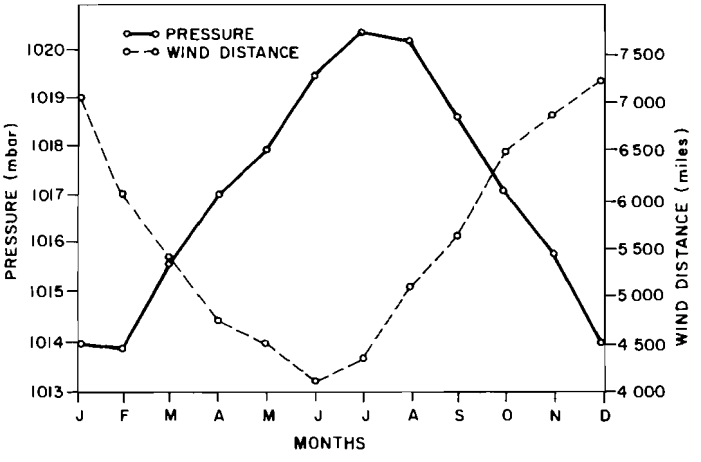

Fig. 2 Mean monthly atmosphere pressure (mbar) measured at Port Elizabeth Weather Office (1937–1978) and wind distance (miles) at Swartkops township (1973–1978).

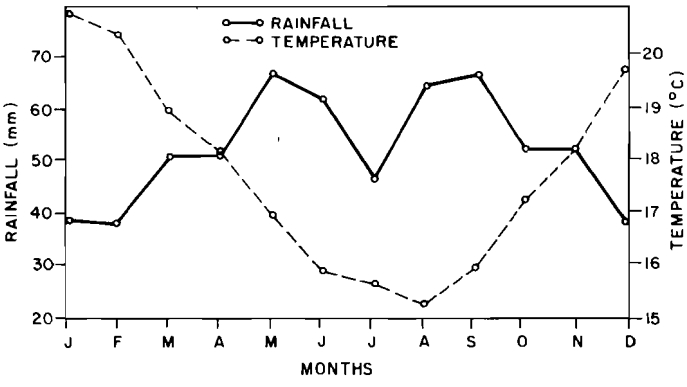

Fig. 3 Monthly rainfall (mm) at Port Elizabeth Weather Office (1937–1978) as well as mean sea-water temperature taken daily at Humewood beach (1972–1978).

Table 2 Summary of results of fish netting in the Swartkops estuary early this century (after Grindley 1974)

Scientific name	Common name	No. of fish and maximum mass/individual		
		Mean/ netting	Total	Maximum (kg)
Rhabdosargus holubi	Cape stumpnose	293	7910	1
Mugil cephalus	Flathead mullet	169	4568	3
Mugilidae	Mullet	51	1393	2,5
Lithognathus lithognathus	White steenbras	44	1304	16
Argyrosomus hololepidotus	Kob	23	622	32
Tachysurus feliceps	Sea-catfish	20	537	1
Pomadasys commersonni	Spotted grunter	15	408	1,5
Pomatomus saltatrix	Elf	14	393	1,5
Lichia amia	Leervis	6	152	1
Torpedo fuscomaculata	Blackspotted electric ray	1	39	7
Monodactylus falciformis	Cape moony	1	24	0,1
Diplodus cervinus	Zebra	—	22	—
Myliobatus aquila	Eagle ray	—	6	12
Rhinobatus annulatus	Lesser guitar fish	—	3	3
Platycephalus indicus	Bartail flathead	—	3	2,5
Diodon hystrix	Longspine porcupine fish	—	1	—
Raja alba	Spearnose skate	—	8	(2 m across)

ducted from June 1915 to July 1916 by F.W. Fitzsimons, Director of the Port Elizabeth Museum at that time. The procedure was to set a stop net across the mouth of a creek at high tide. At low tide another net was brought down from the head of the creek towards the stop net. According to Gilchrist most of the fish in the creek were captured in this way.

Major changes seem to have developed in the relative abundance of the fish species in the Swartkops estuary in the 60 years since the survey. The white steenbras was the most abundant species netted early this century and appeared twice as frequently as spotted grunters (Table 2). The elf occurred about as frequently in the nets as kob and three times as frequently in the nets as spotted grunters. Seventy-five elf were caught in the estuary from 1972–1978 by angling club members compared to 8 978 spotted grunters (Table 1). The elf was the most abundant angling fish caught off St Croix in Algoa Bay from 1975–1978 by anglers (Coetzee 1978). Whether the near disappearance of this species from Eastern Cape estuaries is due to overexploitation, as was found by Van der Elst (1974) to occur along the Natal coast, is impossible to say at present.

Seasonal trends in abundance indicate that the largest fish catches are made in the months after the equinox (Fig. 1). Differences between months were not statistically significant, because of the large variation in numbers of fish caught in different years. Wallace (1974) also mentions that more species enter Natal estuaries during spring months (with peak entrance in October) than at any other time of the year, because of migrations of juveniles into estuaries. In order to explain seasonal trends of Eastern Cape data, environmental factors which may influence the movement of spotted grunters (the dominant species) in and out of estuaries and along the shore will be discussed.

Availability of food is probably not responsible for the seasonality displayed in anglers' catches. Van der Westhuizen and Marais (1977) reported that the most important component of the natural diet of spotted grunters in the Swartkops is the mudprawn *Upogebia africana*. N. Hanekom (pers. comm.), who sampled macro-benthic animals in the Swartkops from 1976–1978 found no seasonality in abundance of *U. africana*.

Reproductive behaviour must influence migration patterns of spotted grunters. Wallace (1974) found that *P. commersonni* spawn from August to December in Natal waters. Smaller specimens (2–5 cm) are found in Natal estuaries (Wallace 1974) than in the Eastern Cape (seldom smaller than 5 cm). No larvae of spotted grunters were found by Melville-Smith (1978) in ichthyoplankton samples from the Swartkops estuary. It seems that spotted grunters spawn in Natal waters and that fish from the eastern Cape estuaries (near the southern limits of its distribution) migrate to Natal to spawn. The increase in abundance in the Swartkops from August to October could probably be accounted for by migrants from Cape estuaries further south en route to Natal for spawning. Wallace (1974) found that spotted grunter numbers in Natal remain high from September throughout the summer months both at St Lucia (gill nets) and on the sea shore near Durban (anglers' catches).

Climatic factors such as temperature, rainfall and salinity are known to influence migration behaviour and catch efficiency of fish (Higman 1966). Wallace (1974) found that

the majority of species in Natal spawn before the summer rainfall season. Juveniles migrate into estuaries before the period of strong river outflow (Wallace 1974). Mature *P. commersonni* are euryhaline and seasonal abundance in the Swartkops estuary roughly coincided with the months in which floods are the most likely to occur (Marais 1976) and during which rainfall is highest *viz.* autumn and spring (Fig. 3). In March 1974 when the Groendal Dam, situated in the catchment area of the Swartkops River, began to overflow resulting in a major flood, 349 spotted grunters were caught. During October 1974 when the dam was still overflowing strongly, resulting in salinities of <4‰ in the middle and upper reaches of the estuary, 533 were caught (Marais 1976). These figures present the largest numbers of any angling fish caught during these months in the Swartkops estuary from 1972–1978. It is possible that the prolonged reduced salinity conditions as well as silting of their burrows adversely affected the normal food source (*Upogebia*) of the spotted grunter. This could result in spotted grunters taking bait more readily during these conditions than usual. Angling data may not in reality reflect the abundance of spotted grunter but rather their catchability.

The number of fish caught of a particular species may reflect fishing pressure for that species. In a subsequent paper results of gill net catches will be presented which confirm the general trends found in abundance of angling fish.

The angling data show clearly that estuaries are not only important to juveniles which utilize the estuary as a nursery ground. Large numbers of adult fish of various species enter the estuary, most probably for feeding purposes.

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