Coastal anglers' catches at Terrace Bay during 1980

by

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ABSTRACT

An analysis of the catches of teleost fish by visitors to Terrace Bay is presented. The analysis is based on both a card census and a check of the total number of fish caught at Terrace Bay. Both daily catch rates (8,7 fish/day) and total catches (48 308) were high. Significant differences were apparent in the species of fish sought by local and visiting anglers, which in turn resulted in differential catch rates for the two categories of anglers.

CONTENTS

1 INTRODUCTION

In southern Africa angling is a major outdoor recreation, with one of the largest, if not the largest, number of participants of any sport. Of the two major divisions, marine and freshwater, marine angling undoubtedly attracts the greater number of participants, since many anglers fish only during vacations at the coast. In addition, many southern African anglers, or their wives, do not find freshwater fish attractive as a food source.

It is virtually impossible to estimate accurately the total number of coastal anglers, or what their total financial outlay and running expenses amount to annually. A recent survey of freshwater anglers in the Transvaal showed that a total of 117 093 licences was issued for the 1977–78 season (this includes licences for regular anglers and licences taken out for one or more days' angling). Capital equipment of the anglers totalled R130 million, while a further R32 million was spent on running expenses (Cadieux, 1980). In comparison, Van der Elst (1981) recorded 150 000 visitors per year at four isolated coastal resorts in northern Zululand, the majority of whom were anglers.

If a further factor is taken into account, namely the higher cost of sea angling equipment and greater distances which inland anglers must cover to reach the coast, it is clear that an estimated annual expenditure of R100 million on coastal angling is by no means an overestimate.

Until recently, however, there has been little research in southern Africa into any aspect of amateur sea angling. There are several reasons for this. Coastal anglers are not licensed or taxed; membership of an angling club is voluntary (club membership is only a prerequisite for angling in harbours); and the coast-line is long and often rocky.

There are a number of alternative methods for assessing angling impact: analysis of angling club or angling competition records, random sampling within an area, or a total sampling within a restricted area. The first has a major inbuilt error since only the more successful (or

competitive) anglers are being monitored. The method will, however, provide extremely useful indications of trends or changes in availability over the long term, since fishing effort in terms of man hours, fishing area and catch are all accurately known.

Direct examination of anglers' catches allows all levels of such catches to be monitored, but for logistic reasons is limited to restricted areas, usually sandy beaches, where movement between anglers is more practicable.

The only published surveys of amateur marine angling in southern Africa are those of Van der Elst (1976, 1981) and Coetzee and Baird (1981). However, only Van der Elst's investigations assessed coastal shore angling; Coetzee and Baird's data referred solely to inshore boat angling.

The survey discussed below, based on total catches by shore anglers at Terrace Bay during 1980 includes data collected over a one-year period on the species composition of the catch, variation in species composition and an assessment of total catches. This was made possible by the unique situation at Terrace Bay.

Terrace Bay (20°03'S, 13°03'E) is an isolated resort situated in the Skeleton Coast Park, under the control of the Directorate of Nature Conservation. There are a number of features that contribute to an accurate assessment of fishing effort and impact at Terrace Bay, the chief ones being:

(a) Entrance to the park is by permit only, and there are control gates situated at the two entrances.

(b) With the exception of Torra Bay (see below), all visitors must stay at the Terrace Bay resort, which is run as an hotel (i.e. cabins, but with a central dining room and lounge). All visitors are on full board.

(c) No camping or day visitors are allowed.

(d) Angling is allowed only over a restricted stretch of coast from 15 km south to 15 km north of Terrace Bay.

(e) The maximum number of visitors is restricted to 40.

(f) The provision of free freezer facilities, together with (b) above, ensure that almost all fish caught are removed from the park. Numbers can thus be checked at the entrance gates.

There is a second angling resort situated in the park, Torra Bay (20°25'S, 13°14'E). This is a camping resort, open only from mid-December to mid-January. It also has a restricted angling area, and Torra Bay campers may not fish at Terrace Bay. As it is open for only a short time each year, and since it is camping and self-catering, making control much more difficult, Torra Bay catches have not been included in the analysis.

2 ANGLING SPECIES

Angling at Terrace Bay primarily concerns four species. These are the west coast steenbras (witvis, weissfisch) *Lithognathus aureti,* the kob (kabeljou) *Argyrosomus hololepidotus,* the galjoen (schwarzfisch) *Coracinus capensis* and the dassie (kolstert) *Diplodus sargus.* Of these four species kob and galjoen are generally considered better table-fish, and many anglers, especially the more experienced, will actively seek to catch them. Although there are exceptions, kob and steenbras are mostly taken from the sandy (or pebble) beach areas, or from rocks into deeper water, whereas galjoen and dassies are caught in rocky areas with turbulent surf.

The only other fish taken in significant numbers was the barbel (sea catfish) *Tachysurus feliceps.* Catches of this species have not been analysed in detail, since many anglers consider them a pest and return them to the sea, possibly, but not always, recording the catch, while others, especially German-speaking anglers, actively fish for barbel and use them for producing smoked fish.

Other teleost species occasionally caught, in total less than 1% of catches, were redfingers (steenklipvis), *Cheilodactylus fasciatus*; klipfishes, *Clinus superciliosus*; mackerel, *Scomber japonicus*; white stumpnose, *Rhabdosargus globiceps*; strepie, *Sarpa salpa.* In addition some sharks, mainly *Triakis megalopterus* and *Mustelus mustelus,* were caught, but were seldom listed on census cards and never brought out of the park.

3 METHOD

Two methods were used to do the survey. Firstly, all visitors were requested to compile census cards, and secondly all departing visitors were questioned at the Ugab River control gate. (Very few visitors to Terrace Bay left by the second gate at Springbokwater, where control was sporadic).

The cards (Fig. 1) were handed to visitors on arrival at Terrace Bay and collected on their departure. Questions on the cards were kept as objective as possible; the only subjective question was the angler's own assessment of angling experience. It should be noted that Question 4

S.W.A. 1305

ADMINISTRASIE S.W.A. ADMINISTRATION
AFDELING NATUURBEWARING EN TOERISME
NATURE CONSERVATION AND TOURISM BRANCH
HENGELSUKSESKAART / ANGLING SUCCESS CARD

Vul asseblief een kaart in vir elke dag van hengel, al was daar geen vangste nie. / Please complete one card for each day spent angling, even if no catches were made.

1. Wanneer het u gehengel? : Datum: vm. ☐ nm. ☐ albei ☐
   When did you angle? : Date: ..... a.m. ☐ p.m. ☐ both ☐
2. Getal visse gevang/Number of fish caught:
   Steenbras ☐ Kabeljou / Cob ☐ Galjoen ☐ Dassie (Kolstert) ☐ Ander / Other ☐
3. Hengelervaring: Beginner ☐ Gemiddeld ☐ Ervare ☐
   Angling experience: Average Experienced
4. Is u 'n inwoner van S.W.A.? : Ja ☐ Nee ☐
   Are you an inhabitant of S.W.A.? : Yes No
5. Opmerkings:
   Remarks: .....

Deutsch umseitig.

FIGURE 1: The census card used at Terrace Bay during 1980.

made no provision for visitors who had previously lived in SWA. No comment was required regarding the weather or sea conditions, since these would be strongly influenced by experience in other areas. Many anglers did, however, make remarks concerning sea conditions, which confirmed that this was in fact the case ("a bit rough" and "very stormy" were recorded by two anglers on the same day).

Several problems were experienced with the cards. A whole party of anglers often filled in one card per day, or alternatively a single angler filled in one card for several days. Supplies of cards occasionally ran out and could not be replaced immediately; some of the cards were not fully completed, or were left blank; while a fair proportion was not returned.

The number of angling days per month, represented by the returned cards, ranged from 28 to 419. Only one month, November, with 32 days' angling, is not considered representative, as the 32 days reflect the activity of only two parties of four anglers each.

The control at the Ugab River gate and, when possible, Springbokwater, was of major importance in monitoring by species the total catch of fish at Terrace Bay. There were three exceptions, two of which were very minor percentages of the total catch. These were the small number of visitors who left through the Springbokwater gate when catches were not being checked, and the equally small number of anglers who visited Terrace Bay by light aircraft. The final, and most important, source of error in computing total catches was fish retained at Terrace Bay. Fish were used in the dining room, and fish were caught by the staff for private use. This was especially true of the lower rank staff, to whom fish is an important free source of protein and who not only fished on their own account after hours, but also obtained fish from visitors in exchange for assistance with the cleaning of anglers' catches. It is conservatively estimated that these factors combined account for an error of 5% in the total number of catches recorded.

Notwithstanding these errors, it is believed that the present study is an accurate assessment of coastal angling success on a restricted stretch of coast.

4 RESULTS

The card census data are based on cards returned by visitors relating to 1 845 days when fishing took place. Statistics obtained at the control gates, however, recorded a maximum total of 5 366 days. This implies that the card census covered only 34,4% of the total days fished.

The total catch removed from the park, as checked at the control gates, totalled 46 742 fish of the four major angling species, whereas the card census reflected a catch of 29 686 fish, or 63,5% of the total catch.

Two factors account for these anomalies. Firstly, the angling days, equal to rod days (R/D), as recorded at the control gate are based on the number of anglers times the number of days spent in the park, but visitors did not necessarily fish every day; and secondly, many of the anglers with poor or zero catches did not complete or return cards. Thus, results based on the card census will reflect a catch rate higher than the true one, whereas those based on the control gate figures, a lower rate than in fact was the case.

Catch rates for the year, based on both surveys, are shown in Table 1. Total catch rates for the year are 8,71 fish/RD (control gate) and 16,09 fish/RD (card census).

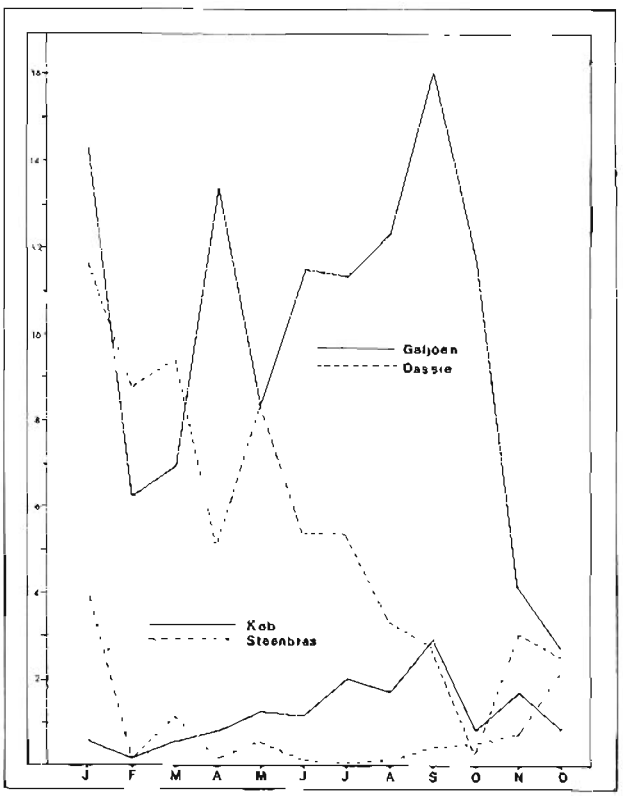

FIGURE 2: Catches per "rod day" (R/D) per month at Terrace Bay during 1980, based on census card returns.

While accepting that the results of the card census give an artificially high catch rate, it can be assumed that the cards are fairly representative of successful anglers. Table 2 is a summary, by month, of all anglers who returned cards. It is immediately obvious that the catch rates for successful anglers in terms of rod days were high, reaching 22,3 fish/RD in September. Catch/RD is shown graphically in Figure 2. One species, the galjoen, dominated the catch, especially during the winter months. Catches of dassie were, except in mid-summer, in inverse proportion to galjoen catches. Kob catches were in general very low; only in January and December were average catches higher than 2 fish/RD. Catches of steenbras were also low; only during July to September did they exceed 1,5 fish/RD.

TABLE 1: Total catch and catch rates (as catch per rod day) for Terrace Bay as reflected by the card census and the total number of fish removed from the resort through the Ugab and Springbokwater gates.

	Card census			Gate control		
Species	RD	Total catch	Catch/RD	RD	Total catch	Catch/RD
Steenbras	1845	2464	1,34	5366	3477	,65
Kob	1845	1495	,81	5366	1740	,32
Galjoen	1845	17746	9,62	5366	29467	5,49
Dassie	1845	7981	4,33	5366	12058	2,25
		29686	16,09		46742	8,71

The proportions of visiting and local anglers varied widely over the year (Fig. 3). In January and December local anglers fished on about 80% of the rod days, but during the rest of the year local anglers accounted for only 20–45% of the anglers. During the year, 44,1% of the anglers who returned cards were local, whereas 55,9% were visitors.

The catch rates (based on census cards) of local and visiting anglers were then analysed separately. A total of 1 784 rod days was analysed, slightly less than the total used above. This discrepancy was caused by a few parties of anglers, including both local anglers and visitors, who recorded their catches on the same card.

The difference in catch rates for each species by local and visiting anglers is shown in Figures 4 and 5. Figure 4 is a monthly plot of catches, as fish per R/D, for each species caught by the two categories of anglers, local and visitors. Although there are considerable monthly

TABLE 2: Catches of edible fish by anglers at Terrace Bay during 1980, based on census card returns. For each month the upper line is catch, the lower line catch/RD. The final column is the total catch per month of edible fish.

Month/RD	Steenbras	Kob	Galjoen	Dassie	Total
JAN.	16	111	400	326	853
28	,57	3,96	14,29	11,94	30,46
FEB.	16	15	550	777	1358
88	,18	,17	6,25	8,83	15,45
MARCH	24	49	297	406	776
43	,56	1,44	6,91	9,44	18,05
APRIL	121	27	2096	773	3017
115	,80	,18	13,88	5,12	19,98
MAY	127	59	846	848	1880
101	1,26	,58	8,36	8,40	18,61
JUNE	235	42	2344	1109	3735
204	1,15	,21	11,51	5,44	18,31
JULY	425	15	2392	1129	3961
210	2,02	,07	11,33	5,38	18,86
AUG.	419	32	2294	816	4120
243	1,72	,13	12,32	3,36	22,27
SEPT.	550	80	2973	517	4120
185	2,97	,43	16,07	2,79	22,27
OCT.	111	80	1546	88	1825
141	,79	,57	11,04	,63	12,94
NOV.	55	24	134	100	313
32	1,72	,75	4,19	3,13	9,78
DEC.	365	961	1169	1092	3587
419	,87	2,29	2,79	2,61	8,56
TOTALS	2464	1495	17746	7981	29686
1845	1,34	,81	9,62	4,33	16,09

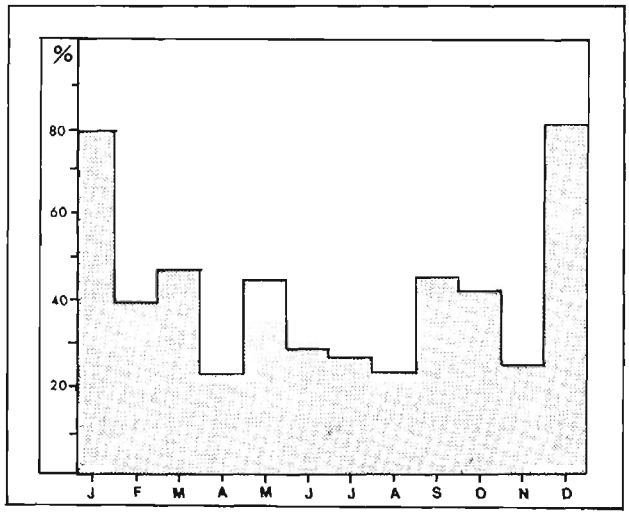

FIGURE 3: Percentages of local and visiting (i.e. outside SWA/Namibia and Walvis Bay) anglers per month. Local anglers stippled.

fluctuations in catch rates, the catch rates by visitors are in general higher than local anglers for all species with the exception of kob.

Figure 5 is an attempt to illustrate this tendency more clearly, while suppressing the effects of varied monthly catch rates and the changing proportions of anglers of the two categories. For each month the overall catch rate for each species was calculated. These catch rates were then separately multiplied by the number of anglers present in each category during the month. This gave an expected month's catch (or proportional share of the month's catch) for each species by each group of anglers, assuming there was no difference in angling methods or preference. Since Figure 5 shows percentage divergence from this expected catch, the expected catch, whatever its actual figure might be, can be shown as a horizontal line on the zero point of the y-axis.

A percentage divergence from the expected was calculated for each angler category, per species, per month by the following formula:

$$\frac{\text{Actual catch} - \text{Expected catch}}{\text{Actual catch} + \text{Expected catch}} \times 100$$

Thus the greater the difference between actual catch and expected catch, the larger the percentage divergence. Where actual catch was larger than expected, the percentage divergence is positive; where less, negative. In any case, where actual catch equals expected catch, the percentage divergence will be zero, whereas if either expected or actual catch is zero, percentage divergence is 100%.

It must be emphasised that although the expected catch is shown in Figure 5 as a straight line, this theoretical expected catch is individually calculated monthly for each species and category of angler. Thus a very high catch of a species in one month has no effect on any other month's expected catch.

It is clear from these graphs that local anglers catch a significantly higher proportion of the total kob catch than do visitors. Only in three months did they catch less than expected. The very high negative deviation in February can be ignored, the total catch for the month being five fish, as can that of August (total catch six kob). In the seven months when more than 40 kob were recorded on cards, a total of 1 397 kob was recorded. Of

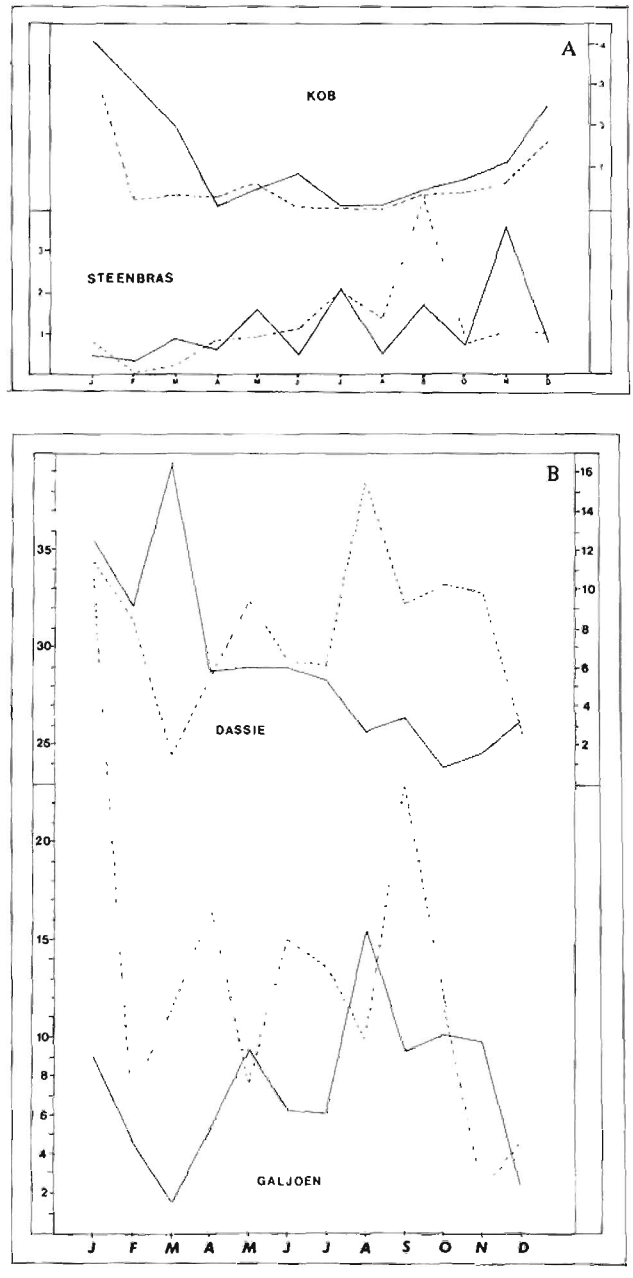

FIGURE 4: Catch per R/D per month. Local and visiting anglers' catches were recorded separately: local anglers, solid lines; visiting anglers, broken lines.

4A. Catches of kob and steenbras.
Left-hand column: catch rate per R/D of steenbras.
Right-hand column: catch rate per R/D of kob.

4B. Catches of dassie and galjoen.
Left-hand column: catch rate per R/D of galjoen.
Right-hand column: catch rate per R/D of dassie.

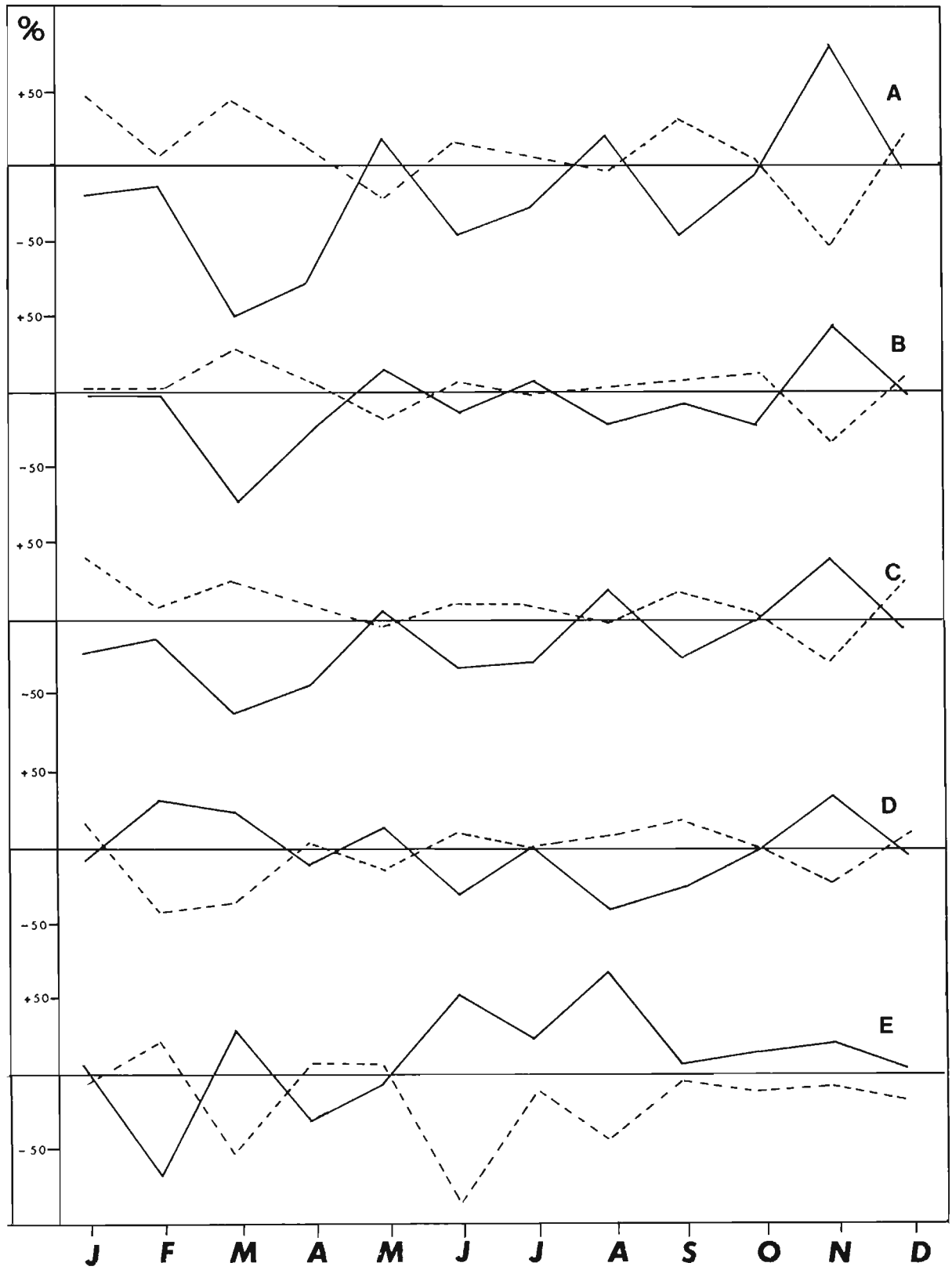

FIGURE 5: Divergence from expected catch per month and species for the two categories of anglers. Solid line: local anglers. Broken line: visiting anglers. Horizontal line: expected catch.

Percentage divergence calculated with the formula:

$$\frac{\text{actual catch} - \text{expected catch}}{\text{actual catch} + \text{expected catch}} \times 100$$

A. Total catch
B. Dassie
C. Galjoen
D. Steenbras
E. Kob

this total, local anglers (623 R/D) caught 1 116 (expected catch 793,4) and visitors (474 R/D) caught only 281 kob (expected catch 603,6) ($x^2 = 303,6$:$p<0,001$).

Also emerging from Figures 4 and 5, rather unexpectedly, was that for all three other species and for total catches the catch per R/D of visiting anglers and their share of the total catch were higher, and in some cases considerably higher, than those of local anglers. Only in three months of the year (in all cases including November, when returns were not representative), do local anglers record better results than expected for galjoen, dassies, and total catches. Although local anglers fared better than expected in six of the twelve months as regards steenbras catches, the catch over the year was still significantly lower than that of visitors ($x^2 = 181,5$: $p<0,001$). This was unexpected, since it could be anticipated that the local knowledge of angling conditions further south, which are similar to Terrace Bay, would favour local anglers considerably.

The level of experience of anglers fishing at Terrace Bay is shown in Figure 6. As has been stated, this question was highly subjective, but we assume that similar levels of error were present in both visiting and local angler assessments. In the total number of rod days there is no significant difference in the proportions of beginner, average and experienced anglers visiting Terrace Bay. The marked difference in catches by local and visiting anglers cannot therefore be the result of differences in angling experience. The difference in catches between local and visiting anglers and possible reasons will be further discussed in the following section.

The total catch recorded taken out of the park is 48 308 fish, including barbel. Using data based on catches both north and south of Terrace Bay (Penrith, unpublished data), the mass can be computed as shown in Table 3. The final column of Table 3 reflects the total estimated mass of fish caught during 1980 at Terrace Bay. The reason for the additional 5% is explained in section 2.

From Table 3 it can thus be seen that the total mass of edible fish caught from only a 30-kilometre stretch of coast by a maximum of 40 anglers daily (but in fact only 14,7 per day averaged over the year) totals no less than 50 metric tons.

TABLE 3: The numbers of edible fish recorded at the control gates, the average mass and the estimated total mass removed from Terrace Bay in 1980; the final column is an estimate of total catches at Terrace Bay.

Species	No.	Av. mass	Total mass (kg)	+ 5% (kg)
Steenbras	3477	1,44	5006	5257
Kob	1740	2,33	3880	4074
Galjoen	29467	0,95	27993	29393
Dassie	12058	0,85	10249	10761
	46742			49486
Barbel	1566	0,52	814	50341

5 DISCUSSION

The card census, although not completely successful, allowed the analysis of 1 845 rod days (34,4% of the maximum number of days fished) and 63,5% of the total number of fish caught. The census can therefore be accepted as a reasonable survey of successful anglers. The majority of the anglers were visitors from outside South West Africa (including Walvis Bay) (55,9% as opposed to 44,1%). Visiting anglers, being in the majority, would be expected to, and did, catch the greater proportion of the total catch, but also obtained, with the exception of one species, a greater share of the total catch than proportionally expected. There were, however, no significant differences in the levels of experience of visiting and local anglers. Reasons for the differences must therefore lie in the behaviour or the approach to angling of the two groups of anglers.

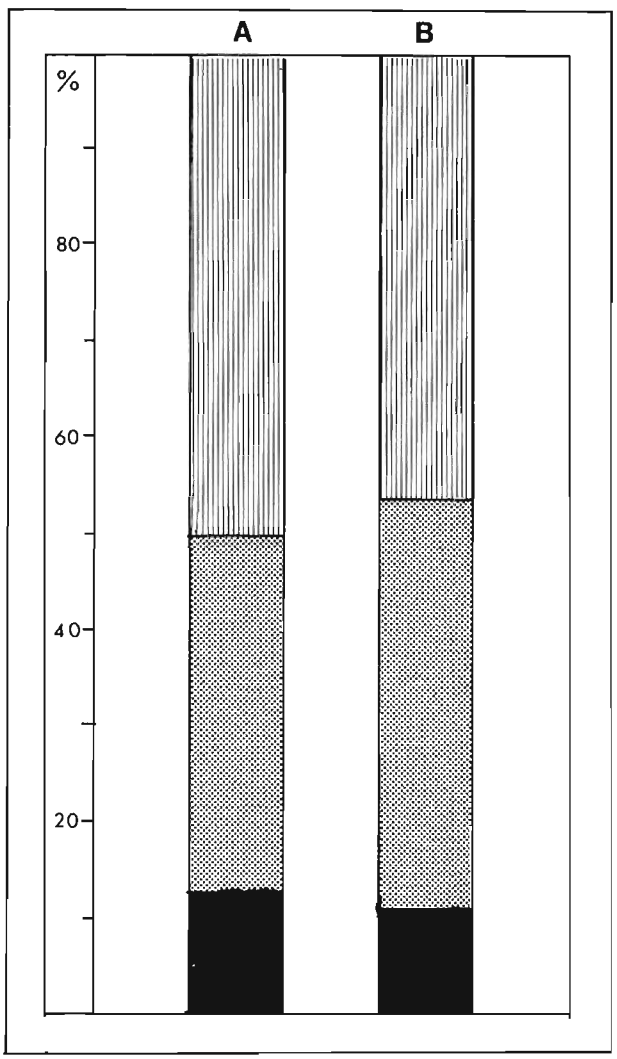

FIGURE 6: Levels of experience of anglers at Terrace Bay:
A. Local anglers
B. Visiting anglers
Solid colour: beginners
Stippled: average
Vertical lines: experienced

TABLE 4: Catch per 100 hours angling at Terrace Bay during 1980

Days	Total hours	Steenbras	Kob	Galjoen	Dassie	Total (1)	Total (2)
5366	32196	10,80	5,40	91,52	37,45	145,18	150.04

Total (1) 4 main edible species
Total (2) Edible fish catch including barbel

It is thought that the reasons, or at least some of the reasons, for this anomaly are the following:

Only kob are caught by local anglers at a catch rate significantly greater than that of visitors, the average for the year being 1,48/RD for local anglers and 0,34/RD for visitors. In December, the month when kob were most plentiful and the percentage of local anglers highest, the difference was still marked: 2,52/RD as opposed to 1,62/RD. Kob are the largest edible fish (in terms of average mass) at Terrace Bay, as well as being excellent table-fish. In addition, they occur in most areas of the South West African coast open to angling and where they are caught under conditions much the same as those at Terrace Bay.

Finally, there was a recurring tendency, on sets of cards returned by local anglers, for the first and/or last day of a stay to record a high galjoen catch and a low total catch, but with a catch including kob on other days. It seems fairly certain, therefore, that many local anglers at Terrace Bay actively fish for kob during at least part of their stay, whereas very few visiting anglers do so.

Galjoen, on the other hand, are actively fished for by both categories of anglers but, it would appear, more intensively by visitors. Visitors' catch rates over the year equalled 12,51 galjoen/RD, local anglers only 5,67/RD. These figures are possibly biased because local anglers were usually in the majority at times when galjoen were, or appeared to be, less plentiful. Even when galjoen catches for all anglers were at their minimum (December), visiting anglers returned markedly better catches: local anglers 2,44/RD, visitors 4,64/RD, whereas in January, a month of high galjoen catches, with a high proportion of local anglers, catch rates were: local anglers 9,05/RD, visitors 33,5/RD. Dassies and to a lesser extent steenbras showed a similar trend. Three factors are mainly responsible for the greater catches recorded by visiting anglers. Firstly, the trend, noted above, whereby local anglers normally spent at least part of their time angling for kob; secondly, angling conditions for galjoen (with dassie as an alternative catch) were similar to conditions under which galjoen were caught in the Cape, where many of the visitors had experience of angling; thirdly, and perhaps most important, a disturbing proportion of the visitors from the Republic of South Africa concerned themselves only with a large catch and therefore concentrated on the most easily caught species, galjoen. It was noted that very large numbers of galjoen (and dassie) were caught by a relatively small number of visiting anglers. These anglers visited Terrace Bay with four-wheel drive vehicles equipped with portable freezers. This may best be illustrated by statistics relating to anglers in the four-month period mid-January to mid-May. Inter alia there were 27 vehicles, each containing two to six persons, predominantly from the western Cape. Fishing for a total of 494 days or 24,8% of all rod days in this period, these accounted for 50,2% of the galjoen catch. Their catch of kob, conversely, was only 8% of the total catch for the four months (based on gate statistics).

The apparent inverse correlation between galjoen and dassie catches (as shown in Fig. 2) resulted from their presence in the same areas. Galjoen, however, are more vigorous and aggressive feeders, especially when conditions are turbulent. Thus, when galjoen are feeding they will, in the majority of cases, reach bait, and therefore be hooked before dassie. When galjoen are not feeding, however, dassies will be caught by anglers primarily seeking galjoen. In addition, on account of their aggressive feeding habits the rates of successfully hooked "bites" for galjoen are considerably higher than those of dassies, which have a more timid or circumspect approach to bait.

In an attempt to provide a comparison between the Terrace Bay catches and those of Natal, the only available published data on coastal angling catches from any area of southern Africa, catches have been converted to catch per 100 hours angling. We have been extremely conservative in this conversion, using the total catch and rod days as calculated from the control gate records, and assuming an average angling day to be six hours. (The card census suggested that only 65% of anglers fished all day. In addition, hotel-style meal hours further restricted angling time). Results are shown in Table 4. Catches per 100 hours were, as expected, extremely high. The average for the year was 150 fish/100 hours and for galjoen alone 91,5/100 hours, rising to over 250/100 hours in September. In comparison, elf (*Pomatomus saltator*) catches in Natal during the peak angling season have only reached ±50/100 hours twice since 1958, and in northern Zululand, where they are the major coastal angling fish, the peak month catch is only 20/100 hours (Van der Elst, 1976, 1981).

The high catch rates and high totals of fish caught at Terrace Bay at any time of the year are probably exceptional compared with almost any other angling area in southern Africa. This in turn is attracting visitors, but it is doubtful whether catches of this magnitude will continue for much longer unless some measure of control is instituted.

Recruitment to the population from the unfished areas north and south of Terrace Bay is possible, but the galjoen, at least, is not a migratory species. In addition, although there is no other significant angling within the borders of the Skeleton Coast Park (with the exception of angling during one month a year at Torra Bay), commercial handline boats fish close inshore along the park coast for kob and steenbras.

6 SUMMARY

The catch at Terrace Bay is very high, both in number of fish per angler and in total mass. The most conservative figure suggested an average catch rate over the year of 8,7 fish per angler per day. The total mass of edible fish caught at Terrace Bay during 1980 is estimated at slightly over 50 metric tons.

Anglers living in South West Africa (including Walvis Bay) spread their angling effort and actively fish for kob to a greater extent than visitors from other areas.

Visitors from the Republic of South Africa and elsewhere concentrate very largely on galjoen, and dassie when galjoen are not feeding. An unacceptably high proportion of the catch is accounted for by a fairly small proportion of these visitors.

It is not expected that these very high catch rates will continue if unrestricted angling continues at its present tempo.

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FINAL NOTE

The survey of anglers' catches in Natal (C. S. W. Joubert 1981. Invest. Rep. oceanogr. Res. Inst. (52):1–15), reached us after this paper had reached proof stage. This survey again emphasises the vast difference in catch/RD between Terrace Bay and Natal.

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