

# Recreational fishing surveys in the Northern Territory—1978 to 1993

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**R.K. Griffin**

Fisheries Division, Northern Territory Department of Primary Industry and Fisheries  
GPO Box 990  
Darwin NT 0801

## Abstract

*Surveys to assess levels of recreational fishing activity directed at barramundi in the Northern Territory have been conducted since 1978. Three survey methods have been used: roadside interviews, roving creel surveys and access point surveys. The roadside survey, which is essentially a large scale access point survey, has been used to estimate annual recreational catch and effort for the Mary River/Kakadu region in 1978/79 and in 1986, with repeat surveys on two long weekends each year. Roving creel surveys and access point surveys have been used in the Mary River from 1987 to 1994 and in the lower Daly River from 1987 to 1990. Results are presented for the Mary/Kakadu region and the utility of the various methods is discussed.*

## Introduction

Barramundi (*Lates calcarifer*) is a well known and very popular sport fishing target in northern Australia. It is also the subject of substantial commercial fisheries in Queensland and the Northern Territory. In the Northern Territory the commercial fishery has been dramatically reduced over the past fifteen years, both to reverse overexploitation of the stocks and in recent years to

provide a greater share of the available resource for the recreational sector. When management of the barramundi resource in the NT was upgraded in 1979 (Grey and Griffin 1979) the recreational sector was acknowledged but afforded little consideration in the management scheme. With the rapidly expanding population of the NT, and Darwin in particular, at the time the recreational sector was clearly important but no data were available on its extent or impacts. Surveys to assess the level of recreational catch and effort were initiated in 1978 to address this problem.

## Survey methods

Since 1978 three survey methods have been used to obtain data on recreational catch and effort, mainly in the popular fishing areas close to Darwin. All those surveys have focussed on barramundi fishing. They were:

- roadside interviews
- roving creel surveys
- access point surveys.

One general survey of households throughout the NT was conducted in 1986 to provide information on participation and expenditure related to recreational fishing.

## Roadside interviews

The most popular recreational barramundi fishing area in the NT has historically been the area east of Darwin between the Adelaide River and the East Alligator River. Much of that area is now known as Kakadu National Park. The total area, some 20 000 km<sup>2</sup>, is accessible from Darwin via only one road, the Arnhem Highway. An interview checkpoint was set up on the Arnhem Highway at the western end of the survey area. Effectively this was an access point survey on a very large scale. Angler parties returning from the survey area were informed by a series of roadside signs that a survey was in progress and were requested to stop for a short interview. Those parties which stopped were asked to provide details of fishing locations, fishing time, catch (retained and released), fishing methods, type of equipment used, value of tackle and other equipment, frequency of fishing trips and area of residence. Details of vehicles with boats or fishing tackle evident, but which did not stop, were recorded. The apparent cooperation rate was very consistent with approximately 50% of fishing parties responding. Interviews were conducted from approximately 0900 hrs to 2100 hrs. In most cases very little traffic was observed after nightfall at around 1900 hrs and surveys conducted after 1986 ceased at that time.

From August 1978 to August 1979 surveys were conducted on 40 days randomly selected to cover both wet and dry season conditions and weekdays and weekends. In addition the Sundays and Mondays of four long weekends were also surveyed. Expansion of data from those days resulted in estimates of annual catch and effort (Griffin 1982).

In 1986 a similar 12 month series of roadside surveys was conducted on 43 randomly selected days and four long weekends. Stratification was similar to the 1978/79 series with the exception that a third seasonal activity stratum was introduced, fitting between the dry season and the wet season, a time known as 'the buildup' or *guring* in the aboriginal seasonal scheme. Annual catch and effort for the survey area for 1986 was estimated (Griffin 1988).

Roadside surveys have been repeated on two of the long weekends, May Day (the first weekend in May) and Picnic Day (the first weekend in August), each year since 1987.

## Roving creel surveys

From 1986 research and management efforts were focussed on the highly exploited Mary and Daly Rivers to the east and south west of Darwin. To provide detailed information on recreational catch and effort without the uncertainty of the 'missing 50%' factor of the roadside survey, roving creel surveys were introduced. Creel surveys are also able to provide good data on the size of fish taken. Initially it was intended that these surveys would cover the Mary and Daly Rivers as well as the four rivers in Kakadu National Park. To survey all fishing locations in the huge area of Kakadu was not possible and diminishing resources were concentrated on the Mary River and Daly River. Since 1991 only the Mary River has been surveyed. Analysis of results has concentrated on the Mary River. In the Mary River four areas are studied over two days on each survey. A system of stratification similar to the more recent roadside survey was used with

22 weekdays and 11 weekends sampled over three seasons. Some areas are essentially inaccessible for much of the wet season and zero effort for those areas is assumed for those times. At each location a count of boats and anglers was made on the water and as many parties as possible were interviewed. At all locations except Shady Camp almost all fishing was conducted from boats.

### **Access point surveys**

One of the areas on the Mary River, Shady Camp, has essentially only one boat launching area, and surveys there were conducted as access point surveys only from 1992 onwards. As many as possible of the angler parties returning to the ramp between approximately 1030 hrs and 1900 hrs were interviewed. In most cases complete coverage was achieved.

### **Results and discussion**

Only a selection of results is presented in this paper with the intention of illustrating some of the difficulties encountered as well as the value of such survey data to management of the fishery and the resource. More complete results are available in Griffin 1982; 1988; 1993.

### **Roadside interviews**

The survey series in 1978/79 and 1986 produced estimates of annual catch and effort for the whole survey area and for major rivers within the area (Table 1). The earlier series was also used to estimate participation and to assess expenditure on recreational fishing for barramundi in the survey area.

In the climate of resource allocation controversy which prevailed in 1987 this kind of information was extremely valuable. It was shown that between 1979 and 1986 the proportion of the total barramundi harvest (commercial and recreational) taken by the recreational sector had risen from 29% to 34% by number or from 20% to 30% by weight. Thus it was clear that the recreational catch was a very significant and increasing proportion of the total harvest. As a result the Mary River was subjected to special management measures in 1988 (a two fish possession limit and a 50 cm minimum size) to restrain the impacts of recreational fishing in addition to the severe limitations imposed on the commercial sector.

The comparative surveys conducted on the May Day and Picnic Day Weekends have shown a considerable decline in the number of parties participating in fishing on those weekends since 1986 (Table 2). In 1978 and 1979 the total number of fishing parties observed at these weekend surveys was over 300. This decline is attributed to demographic changes and increased alternative recreational activities in Darwin in recent years.

### **Creel/access point surveys**

Creel surveys and access point surveys have provided valuable data on recreational catch, effort and size of barramundi taken in the Mary River. For Corroboree Billabong and Shady Camp, the two major areas which account for around 85% of effort and 90% of catch, estimates of annual catch and effort are available from 1989 to 1992. For the whole Mary River reliable estimates are available for 1991–1992. These estimates show that recreational effort in the Mary

River has declined since 1989, contrary to the general perception that recreational activity is increasing. Annual effort has declined at Corroboree and remained relatively stable at Shady Camp (Figure 1a). The perception that effort is increasing probably results from the intense seasonal concentration of anglers at Shady Camp in March–May in recent years. It could be concluded that barramundi anglers are becoming more selective in the timing of their fishing excursions. The number of barramundi harvested annually from each of the major areas (Figure 1b) has declined slightly, reflecting the decline in effort at Corroboree, variations in recruitment and an increase in the minimum legal length in 1991.

The effectiveness of the size limit and bag limit regulations introduced in 1988 can be seen in the trends in cpue for the Mary River (Figure 2). Prior to 1988 the harvest rate (hcpue—fish kept per hour) and the total catch rate (tcpue—fish caught per hour including releases) were almost identical suggesting that most anglers kept all barramundi caught. The new restrictions resulted in a slight decline in the hcpue and an increase in the tcpue. Much of the variability in observed catch rates can be related to observed variations in year class strengths. The current hcpue is 2 to 3 times higher than in 1978. While tcpue has increased substantially, the proportion of parties actually catching a fish has somewhat paradoxically declined from 85% to 45%. It is suggested that this is due to large numbers of novice anglers attracted by reports of good fishing being largely unsuccessful due to poor timing or inadequate equipment.

Improvement in the quality of recreational fishing is also demonstrated in the increase

in the size of barramundi taken. The proportion of barramundi of memorable size has increased steadily, almost 10% of the catch in 1992 being greater than 90 cm total length (or 9 kg).

Tourism is one of the NT's most important industries and barramundi fishing is an important component of that industry. Data on origin of anglers has provided information on the numbers and behaviour of tourist anglers in the Mary River. Participation by tourist and local parties has not changed appreciably since 1987 (Figure 3) but there have been increases in mixed groups (i.e. one or more visitors with one or more locals) and in parties using the services of a professional guide. Examination of catch rates of these groups shows that there is no difference between locals and tourists but the catch rate of mixed groups is significantly lower. This fact may in part explain the paradoxical fall in success rate observed.

### **Household survey**

During 1986 a total of 804 households in six NT population centres were surveyed to determine patterns of fishing activity over the preceding 12 months (Cam Rungie/Touche Ross 1986). That survey found that 35.3% of respondents had been fishing at least once in the past 12 months while 29% viewed fishing as of major importance. The survey failed to provide adequate coverage of tourist activity and based its conclusions in relation to tourists on the activities of only 43 people on specialised fishing tours. It concluded that the recreational sector took 58% of the total barramundi harvest. This figure is considered to be an extreme overestimate caused mainly by inappropriate extrapolations of the tour-

ist component. The requirement to recall activities undertaken up to 12 months ago also suggests that recall bias is likely to be significant. While the survey produced figures in relation to expenditure and economic value of recreational fishing in the NT these figures, like many others of this type, should be interpreted with care.

### Summary and conclusions

Surveys conducted by the various methods have provided valuable data on recreational fishing in the NT particularly in relation to barramundi which is the primary target species. Data on catch and effort have been useful in population modelling and in management of the resource as emphasis has changed from the commercial sector of the fishery to the recreational sector. Auxiliary data on angler origin are useful for planning of provision of facilities for tourists. The unbiased information provided is sometimes contrary to popular perceptions and in some instances has demonstrated that perceived declines in recreational catch rates were not real. In addition the detailed information from creel surveys has provided insight into changes in seasonal patterns of activity which can be related to changes in access, habitat changes and changing behaviour of participants.

### References

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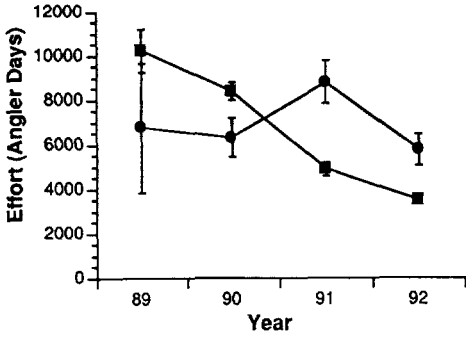
**Table 1.** Estimates of annual recreational barramundi catch (number of fish) and effort (angler hours) for the Mary/Kakadu region and for the Mary River.

Year	Mary/Kakadu region		Mary only	
	Catch (number)	Effort (angler hours)	Catch (number)	Effort (angler hours)
1978/79	26 000	173 333	11 700	78 000
1986	27 345	220 924	14 308	117 954

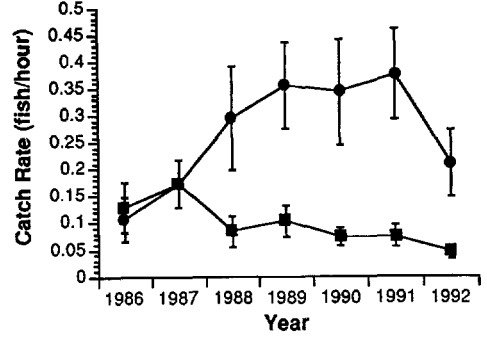
**Table 2.** Total number of fishing parties observed at Arnhem Highway roadside surveys—1986–1994.

Year	May Day weekend			Picnic Day weekend		
	Mary only	Total	% Stop	Mary Only	Total	% Stop
1986	141	235	61	98	145	63
1987	140	202	58	101	172	48
1988	69	103	52	76	148	50
1989	106	210	50	102	160	50
1990	104	162	50	114	160	49
1991	181	206	49	67	107	52
1992	83	110	57	73	99	56
1993*	60	69	54	47	56	45
1994*	38	97	45	33	48	33

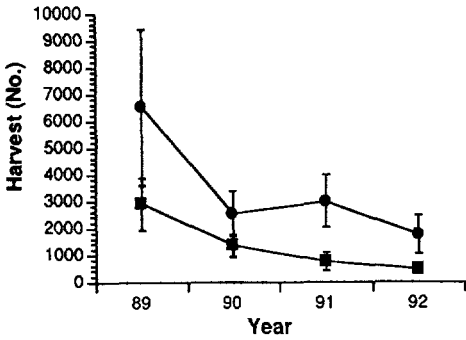
\* 1993 and 1994—long weekend Mondays only.



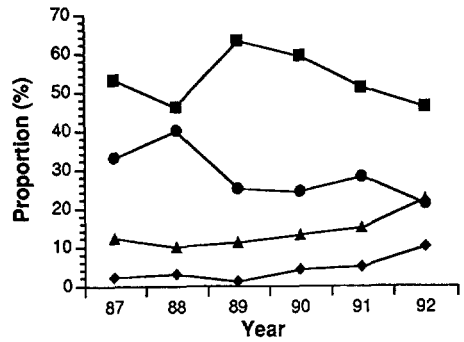
**Figure 1a.** Estimated recreational fishing effort at Corroboree Billabong (B) and Shady Camp (J). Error bar = one standard error.



**Figure 2.** Angler harvest rate (B) and total catch rate (J) for the Mary River, 1986 to 1992. Error bar = 95% confidence interval.



**Figure 1b.** Estimated recreational harvest of barramundi from Corroboree Billabong (B) and Shady Camp (J). Error bar = one standard error.



**Figure 3.** Proportion of fishing parties in the Mary River by angler origin. B—Local; J—Tourist; H—Mixed local and tourist; F—Guided.