The Moon and the Marlin

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A study aimed at measuring catch rates of black marlin off the Great Barrier Reef by analysing charter captains' log books and diaries had another fortuitous outcome. It was also possible to objectively look at the effects of the moon, and sea surface temperature, on catch rates over two decades. The results may surprise you.

If fishing was predictable, it probably wouldn't be pursued by as many devotees, and with such enthusiasm. Most would agree that it's the very unpredictability which makes it so interesting, and so frustrating. So it is ironic that we try to find patterns in environmental 'chaos' so that we might increase the chances of a fish, however slim that increased chance might be. Most serious gamefish anglers I've met over the years have thought long and hard about this unpredictability, and perhaps not surprisingly, have come up with theories and ideas about environmental cues which may be related to good (or bad) fishing. Regarding marlin fishing, pretty well all possible variables have been thought of at some stage or other as influencing fishing success. The list would include time of day, degree of cloud cover, direction of current, strength of current, stage of tide, turbidity (cloudiness or clarity) of water, colour of water, wind direction, swell direction, height of sea (I could go on), and of course, perhaps the two big ones — sea surface temperature and phase of the moon. We all know that any or all of these sorts of variables probably do affect fishing, but the problem is, we generally only have our own experiences to rely on. That doesn't usually stop people from being dogmatic, though. It's funny how one experienced charter captain will be adamant that a particular factor is critical, while another one at the other end of the marina — equally experienced — will hold exactly the opposite opinion. And I guess that's the crux of the matter; they tend to be opinions, rather than proven fact.

So how can we get around this dilemma and maybe take just some of the guesswork out of fishing? The answer, ideally, is to gather together as much fishing and environmental data as possible, preferably over a long period of time, and run the numbers through a computer to look for correlations and relationships between fishing success and environmental cues. Well, I am happy to report that just such an exercise has recently been completed, but before going into the results, some background information will help set the scene.

One of the biggest problems of determing recreational fishing success from year to year is lack of data on fishing 'effort', that is, the amount of time taken to catch an equivalent quantity of fish. We might have a fair idea of the actual catch, through weighstation records, or the tagging program, but without knowing how much 'time and effort' went into making the catch, how do we know if fishing (or availability of fish) is worse or better than it was in times past? Sure, many fishermen will swear blind that, in their experience, fishing is in decline, but without actual proof one way or another, it is very difficult for fisheries managers to act.

The one gamefish fishery for which very good catch records exist is the Cairns based charter fishery for black marlin. It has been in continuous existence since the late 1960s, and records of virtually all fish weighed and tagged are accessible (albeit, with a fair

amount of detective work). From about 1994, catches of black marlin appeared to have declined, at least according to many in the fishery. If it were possible to gain some measure of fishing effort in this fishery, then it would also be possible to determine if such a decline might be real, or 'imagined'. A joint study was therefore undertaken between Drs Robert Campbell and Tim Davis of CSIRO, and yours truly, to attempt to do just that.

The idea was to contact a cross section of charter captains who had fished the Cairns heavy tackle fishery for as long a period as possible, and ask if they had kept any personal records of their fishing activity. The minimum requirement would be to have recorded the number of days spent fishing for marlin, and the number of fish caught (captured, tagged, or free released). This task was not as easy as it might sound. One by one, I tracked down as many captains as possible who had fished Cairns over the years. The current crop were not to difficult to find, but some of the retired 'old salts' were not so easy. Some, who I thought would have kept meticulous records, had kept none, relying on their instinct and memory to keep finding the fish (which they invariably did). Conversely, I was pleasantly surprised at receiving some remarkably detailed records from unexpected quarters. Some had kept special logbooks for the purpose, recording every fish raised, struck, hooked and caught or lost, together with a lot of the environmental variables referred to above. Some had even entered the data onto a computer spreadsheet (God bless them) but most of the records took the form of battered notebooks and ship's logs, with one line per day's fished (still good enough for the purpose), or personal diaries of each day at sea, recording not only each fish, but also what was eaten for each meal, how the deckhand was getting on the nerves, and so on. I even managed to track down a couple of captains who had left Australia, and was very pleased to receive some old diaries in the mail, even from as far away as Madeira. The exercise was actually a lot of fun, and I would very much like to thank all the captains involved. They know who they are, and in every case, they were only too happy to help.

The next task was not quite so much fun. All of these rough notes, in their varying degrees of legibility, had to be deciphered and entered into the trusty computer, and then, analysed (thanks mainly to Rob Campbell of CSIRO). But the job was eventually done, and the statistics of the ensuing database make interesting reading. We ended up extracting usable data from 9 captains. The longest continuous record was 18 years, closely followed by another of 17 years. The earliest records were from 1970, and in all, 4022 days heavy tackle fishing were recorded. A total of 12,181 black marlin were recorded as being raised, 539 as being captured, and 3,121 as being tagged. Only 43 were recorded as 'free' releases. Recorded fishing activity covered all of the recognised black marlin grounds quite well, and bonus information was also recorded on water temperature, sea conditions and the like.

The Analysis

The main aim of this exercise, as noted, was to calculate catch per unit of fishing effort over the history of this consistent fishery, and this was indeed achieved. Even though we obviously didn't record all of the fishing effort in the fishery, any changes in fishing success would still be revealed by averaging the catch rates of a subset of captains. The results indicated that the number of black marlin caught per day had indeed declined in the latter half of the 1990s. Interestingly, the early years of the fishery showed the highest catch rates (up to 2 fish per day average for the 1973 season), but also the greatest variability in catch rates (1975 and 1976 were poor years, followed by the second best year on record in

1977). This was in the days of high Japanese activity in the area, and yet, after exclusion of the Japanese in 1980, and a further exclusion in 1991, the catch rate did not increase. The analysis of catch rates is quite complex, and is available in the report cited at the end of this article, but our main purpose here is to look at the secondary outcomes of this study, the effects of some environmental variables on catch rates.

There were three main sets of data that could be overlaid on the catch data: moon phase, sea surface temperature and current direction and strength. The latter two variables have been measured at Jewel Reef since 1987 by the Australian Institute of Marine Science (AIMS), which they kindly supplied.

Moon phase

Lets look firstly at the variable which I know interests most serious anglers — the effects of moon phase on catch rates of black marlin. Many will not be surprised that moon phase was indeed found to be a significant factor in influencing catch rate, but they may not have predicted how. Graph 1 shows a simplified plot of catch rate ('relative index') against moon phase. A full moon here is denoted as moon phase 15, while a new moon is 1. There is a very strong effect, therefore, at 'half moon', that is half way between either full and new or new and full. The one drawback of this analysis is that it assumed an equal effect on either side of the half moon, which explains the symmetry, but which may not be actually the case. In other words, there may be a stronger or weaker effect on either side of the half moon. (Dr Campbell intends to perform this analysis in due course). Nevertheless, this is a strong result which was arrived at completely objectively, using pooled data from many days fishing. It is also, I believe, the first time that such an effect has been clearly demonstrated for marlin. Not that it would necessarily hold for juvenile black marlin, or indeed, other species such as blues and stripes, but it might, and it would be well worth while attempting to determine if this is the case.

[CAPTION FOR GRAPH 1: The influence of daily moon phase on catch rates of black marlin off the Barrier Reef. 'Relative Index' is simply a measure of catch rate in relation to a base line. Moon phase '8' is half moon, either first quarter OR last quarter (see text)]

Surface Temperature

The other factor found to have a marked influence on catch rate was sea surface temperature. Graph 2 shows the relationship between the two, clearly indicating the peak catch rates when the average temperature is 26-26.5°C. The remarkable feature of this graph is that the effect is so strong, especially for warmer, rather than cooler water. Catch rates average about 30 to 40% lower with an average change of just one degree either side, but again I stress that the effect is more for increased temperatures.

[CAPTION FOR GRAPH 2; Relative effects of sea surface temperature on black marlin catch rates. This is an 'average' graph. See full report for details.]

Looking now at Graph 3, note that the average temperature for much of the 1990s was below 26-26.5°C, and lower than average catch rates were observed for that period. Even more interesting is the sudden increased average temperature in 1998, well above the

optimum temperature. As all marlin fishermen will know, that year was one of the worst on record! As a post-script to the study, which was completed before the 1999 season, that year bounced back to a much more 'normal' catch rate (see XXXX issue of ***Bluewater Boats & Sportfishing***) when water temperatures were also back to a more normal level (by the way, I wonder what happened to all the predictions from the previous year about the end of the coral reef due to temperature caused coral bleaching?).

[CAPTION FOR GRAPH 3: Mean monthly sea surface temperatures for September-November on the main black marlin grounds. The dashed line is the mean for all areas and all years.]

These are fascinating results for all those interested in fishing. It should be realised though, that these relationships between moon phase, sea surface temperature and catch rates are statistical, describing average events over long periods. It does not mean that fishing will **always** be better on a half moon, or when temperatures are exactly 26.5°C, because, as we all know, exceptions happen all to often too. Also, these influences may easily be over-ridden by other factors, such as the availability of baitfish. Nevertheless, the exercise should hopefully demonstrate the usefulness of keeping records of fishing activity, and especially of pooling such records to obtain truly objective measures of fishing success through time and space.

The report referred to in this article is titled: "Analysis of historic charter boat data to assess black marlin catch rates in the recreational fishery off northern Queensland, Australia" by R. Campbell, J. Pepperell and T. Davis. It will shortly be available so feel free to contact me for details via the magazine, or at pep@ozemail.com.au.