

THE NATIONAL ANGUILLA CLUB

BULLETIN

SPECIAL REPORT ISSUE

1979

Report on the Results of the 1979 Session Reporting Scheme

INTRODUCTION

As in past years, the session report forms submitted by members have all been analysed according to the usual format, although several tables have been amended in an effort to demonstrate new trends in effort Vs bait and to consider the combined effect of many of the other variables we take into account in our reporting.

Unfortunately, 1979 was a very poor year as far as overall effort and results are concerned. In view of this, and the great effort in time required for a satisfactory comprehensive analysis to be completed, I have decided to only perform a partial study. This should demonstrate the potential that can be achieved when members succeed in a greater effort and a larger number of eels.

This decision had to be based on the small numbers to be considered as by statistical assumptions, the larger the number considered, the more accurate the results. To do a full analysis of the present reports may lead to false trends. However, with the assistance of the computer for future years, the data from 1979 can be fed into it and accumulated results combined as a more accurate and positive indicator of trends for all variables on the report forms.

Also to be considered at this time, all our past records and analysis data is still in the hands of the past Club Analyst although steps are being taken to retrieve them. This has tended to prolong the time and effort required for the analysis work for 1979.

Enough of my apologies, what of 1979?

Table 1. Performance of Individual Members. 1979

Only 15 members submitted reports in 1979, although many more than this failed to partake in reporting in 1979. Their reasons were discussed at the AGM.

It is hoped that ALL members will participate to the full in 1980. The average effort for EACH member should be at least 20 sessions. The results from these sessions are open to optimism and speculation.

By studying Table 1. the numbers of sessions, eels captured and their weight range, together with the overall rod hours of effort can be seen. Only 6 members in fact achieved over 20 sessions. The actual effort in rod hours depends on how many rods are used. I used only 2, some members use up to 5. There is nothing wrong with this, it depends on restrictions in your area. The same restriction applies to close seasons. Some members may have difficulty in completing 20 sessions. I do feel however, all members should achieve at least this.

The total figures for table 1. are includes, together with the mean value (i.e., average value). The members with * are those who sent reports to K.Richmond who claims they were sent to me but were never received.

Table 2. represents the totals of performance of all members from 1967, when the reporting scheme was first begun. In the report for 1980, I hope that total numbers of eels and rod hours for all the years will be included.

By comparison of the results for 1979 with all others, it is seen that there are only a few years with worse results. The important item being the bottom row - RH/E. This shows that in 1979 the average rod hours required by members to produce an eel was 43. There are only 3 other years poorer than this.

We have to take into consideration other factors however, i.e., some members do fish waters with a very slow rate of catch but larger eel size.

Table 1. Performance of Individual Members. 1979

Member	S	E	RH	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
B. Crawford	23	14	584	7	4	3	-	-	-	-	-
P. Hamilton	16	34	474 $\frac{1}{2}$	15	12	4	2	-	1	-	-
A. Hollerbach	10	7	102	-	2	-	3	1	-	-	-
D. Holman	29	27	1836	8	5	8	4	2	-	-	-
S. Hope *	14	10	365	-	2	7	1	-	-	-	-
K. Layland	21	16	625	4	4	5	2	-	1	-	-
A. Lister	20	6	410	1	-	-	3	1	1	-	-
J. Martin	5	15	61 $\frac{1}{2}$	1	8	6	-	-	-	-	-
A. Mitchell	22	7	976	-	2	2	2	-	1	-	-
P. Nunn	2	4	45	-	3	1	-	-	-	-	-
E. Orme *	8	2	176	2	-	1	-	1	-	-	-
A. Smith	7	0	104	-	-	-	-	-	-	-	-
A. J. Sutton	25	11	656	-	1	4	1	3	1	-	1
D. Walker	5	1	231	-	-	-	1	-	-	-	-
M. Davies	6	4	172	1	1	-	2	-	-	-	-
(15 MEMBERS)											
TOTAL	220	158	6845	37	45	40	23	7	5	-	1
MEAN	14	10	456	2.5	3	2	1.5	0.5	0.3	-	-

(* = Reports not all received from Kevin Richmond)

Table 2. Performance of Total Members 1967 - 1979 (Excluding years 1977/78)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1979
No. Rep.	19	22	26	20	24	18	19	30	31	35	15
Med No of E	7	8	10	13	11	11	10	16	9	15	7
U $\frac{1}{2}$	12	18	24	24	20	29	35	26	13	23	15
L $\frac{1}{2}$	3	3	4	2	6	3	5	9	5	10	4
Med No of RH	329	266	288	255	479	425	525	486 $\frac{1}{2}$	604	542	365
U $\frac{1}{2}$	1184	442	662	357	742	650	1136	941 $\frac{1}{2}$	855 $\frac{1}{2}$	815	625
L $\frac{1}{2}$	214	108	126	153	281	186	335	261	414	351	104
Tot. E	204	294	423	334	363	322	418	596	336	639	158
Tot. RH	11300	10100	11600	8200	11970	7534	13160	21781	21531	22158	6845
RH/E	55	34	27	25	35	29	35	47 $\frac{1}{2}$	73 $\frac{1}{2}$	35	43

Years 1977/78 excluded from Table 2 due to Rod Hours not being used.

Table 3. The Overall Result. 1979

This table gives a full breakdown of overall results for 1979. It can be used to formulate comparable results of all previous years.

It demonstrates to eel weight totals in each weight range. Only 51% of the eels were under 2lb. This was quite good and indicates that only about 1 in 2 eels caught by members were below 2lb. Almost a quarter of the eels caught were over 3lb.

The table goes on to indicate that although we required an average of 43 rod hours to capture an eel, 99 rod hours were required to capture one over 2lb, 130 rod hours for an eel over 3lb and 526 rod hours for an eel over 4lb.

This effort is further analysed in later tables to consider the main variables of bait, time of day and month, going on then to study the effects of swim variations, tackle, etc. The idea being to achieve a combination of the variables that produce the biggest eels in the smallest number of rod hours.

Table 4. The Overall Result. 1979 - Bait Types Vs Day and Night

This is a totally new table, combining several variables in one in an attempt to indicate possible trends linking them together.

By inspection, the best results appear from deadbait used at night in terms of rod hours per eel, neglecting the figures for baits under 'other', these being mainly mussel, maggots and a 4lb+ eel caught on a worm/deadbait cocktail.

It is also observed that the bigger eels were caught at night on deadbait and overall, the rod hours required to capture the larger eels were very favourable at night on deadbait, being substantially less than the overall results in Table 3.

For example, to capture an eel on deadbait at night took on average $25\frac{1}{2}$ rod hours, compared with 92 rod hours with deadbait during the day, or $43\frac{1}{2}$ rod hours with worms at night. To capture an eel over 2lb took $56\frac{1}{2}$ rod hours on dead bait at night, 147 $\frac{1}{2}$ rod hours for an eel over 3lb and $295\frac{1}{2}$ rod hours only for an eel over 4lb. These figures can easily be compared with corresponding totals for rod hours/eels for worm bait and day/night over the full weight range.

We must be careful however not to generalise too much as much of course depends on the water being fished and the size or type of bait used. Our first aim must be to ensure we are fishing waters with the potential to yield eels in the 5lb+ class. We must then determine whether or not to use whole deadbaits or only portions, or to use one large lob worm, or portions or more than one.

There are also all the other variables of the water and tackle plus weather to be considered, but overall, a positive pattern should be obvious and it will be one that can be statistically demonstrated.

In the following analysis tables, the analysis has only been performed for eels and rod hours concerning worm and dead baits only as so little effort was put in for other baits and little achieved. This should not however, indicate to any members that they must restrict themselves to worms or deadbaits in the future. All data is statistically significant, especially where big eels are concerned.

Table 3. The Overall Result. 1979

WEIGHT RANGE	TOTAL 1979	
	N	CF%
0-1	37	23.4
1-2	45	51.9
2-3	40	77.2
3-4	23	91.7
4-5	7	96.2
5-6	5	99.4
6-7	-	-
7-8	1	100.0
Total Eels	158	
Total RH	6345	
Mean RH/E	43	
RH/2	90	
RH/3	190	
RH/4	526	
Median	2:1	
UQ	2:8	
LQ	1:0	
IQR	1:8	

Table 4. The Overall Result. 1979 - Bait Types Vs Day and Night

WEIGHT	E	E/DB	E/N	E/O	E/DB/D	E/DB/N	EW/D	EW/N	EO/D	EO/N
0-1	37	26	10	1	3	27	2	8	-	1
1-2	45	34	11	-	6	28	5	6	-	-
2-3	40	30	10	1	4	26	1	9	-	1
3-4	23	10	11	1	2	8	2	9	-	1
4-5	7	3	3	1	-	3	1	2	-	1
5-6	5	5	-	-	1	4	-	-	-	-
6-7	-	-	-	-	-	-	-	-	-	-
7-8	1	1	-	-	-	1	-	-	-	-
Total Eels	158	109	45	4	16	93	11	34	-	4
Total RH	6333	4103 $\frac{1}{2}$	2666 $\frac{1}{2}$	76	1470 $\frac{1}{2}$	2363	1196	1470 $\frac{1}{2}$	18	58
Mean RH/E	43	37 $\frac{1}{2}$	59 $\frac{1}{2}$	19	92	25 $\frac{1}{4}$	108 $\frac{1}{4}$	43 $\frac{1}{2}$	-	14 $\frac{1}{2}$
RH2	90	83 $\frac{1}{2}$	111	25	210	56 $\frac{1}{4}$	299	73 $\frac{1}{2}$	-	19
RH3	190	216	190	38	490	147 $\frac{1}{2}$	398 $\frac{1}{2}$	136 $\frac{1}{2}$	-	29
RH4	526	456	888	76	1470 $\frac{1}{2}$	295 $\frac{1}{2}$	1196	735	-	50
RH5	1140	634	-	-	1470 $\frac{1}{2}$	472	-	-	-	-
Median	2:1	1:12	2:0	-	1:13	1:10	1:9	2:1	-	-
UQ	2:8	2:6	3:1	-	2:2	2:6	2:8	3:2	-	-
LQ	1:0	1:0	1:3	-	1:6	1:0	1:2	1:3	-	-
IQR	1:8	1:5	1:14	-	0:12	1:6	1:6	1:15	-	-

Table 5. Monthly Analysis by Month and Bait Type.

This table carries on the investigation set up in Table 4. A breakdown of the results in terms of month of capture Vs bait and weight.

The rod hours for each month, together with this split into effort for each bait type is indicated.

A direct comparison to achieve the bait and month to give the best eels for the least effort can now be performed.

For example, if the month of July is considered, we see that a direct comparison of results for worms and deadbaits produces a positive indication of the usefulness of this method of analysis.

The figure of rod hours to capture an eel is 22 for worm and 23 for dead bait. Only May has a better total at 19 for eel/deadbait. In other months, the effort is very large, 177 rod hours/eel on deadbait in August.

Considering rod hours/eel by weight in July, we see that for eels over 2lb, 41 rod hours are required using deadbait, over 3lb takes 158 rod hours, over 4lb takes 276 rod hours and over 5lb takes 552 rod hours.

By comparison with the results indicated in Table 4. Day Vs Night, where a difference of up to 2 is apparent for rate of catch at night compared to day we could assume a similar figure corresponds to rate of catch at night per month.

This being so, it must be feasible to assume that the above rod hours/eel per bait type and month would be substantially reduced if night time only were to be considered. Only lack of time and space prevents the presentation of actual figures but it must be hoped that future analysis work may include such totals.

It is also clear to observe where the most effort by members was carried out. This is not unaturally during the months of May - September. It is significant however to see the rod hour figures for 2lb+ eels captured during July average about 42 which is lower than the total average rod hour/eel for all members and all eels captured.

I hope that members find time to study this table more closely at their leisure as they are sure to find more informative trends.

Table 5. Monthly Analysis by Weight and Bait Type. (Jorn and Deadbait only)

Bait Type	APRIL			MAY			JUNE			JULY			AUG			SEPT			OCT			
	W	DB	T	W	DB	T	W	DB	T	W	DB	T	W	DB	T	W	DB	T	W	DB	T	
0-1	-	-	-	2	14	16	-	2	2	2	5	10	15	-	2	-	2	-	1	-	1	-
1-2	1	1	2	1	13	14	4	4	3	2	2	12	14	-	1	1	3	3	2	-	2	-
2-3	-	1	1	1	2	3	1	5	6	2	2	20	22	-	2	2	3	1	4	2	-	2
3-4	-	-	-	2	2	4	2	3	3	2	3	5	5	-	1	1	3	1	4	-	-	-
4-5	-	-	-	-	-	-	-	1	1	2	2	4	4	-	-	1	-	1	-	-	-	-
5-6	-	-	-	-	-	-	-	1	1	-	2	2	2	-	1	1	-	1	1	-	-	-
6-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7-8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Total E	1	2	3	6	31	37	7	16	23	13	49	62	-	6	6	9	6	15	5	-	5	-
Total RH	123	151	274	172	593	765	930	959	139	235	1105	1390	242	106	1306	508	557	1065	264	37	361	-
Mean RH/E	123	75	91	29	19	20	133	35	55	22	23	22	-	177	218	56	93	71	53	-	60	-
RH2	-	151	274	57	148	189	309	56	114	48	41	42	-	213	261	72	106	106	132	-	150	-
RH3	-	-	-	86	296	191	465	112	213	71	158	126	-	355	436	127	278	178	-	-	-	-
RH4	-	-	-	-	-	-	-	280	74	142	276	251	-	532	603	508	57	532	-	-	-	-
RH5	-	-	-	-	-	-	-	559	149	-	552	695	-	532	603	-	557	1065	-	-	-	-
Median	-	-	-	1:8	1:0	1:0	1:14	2:4	2:2	1:12	2:0	2:0	-	3:0	3:0	2:6	2:0	2:5	-	-	-	-
U ₁	-	-	-	3:1	1:0	1:0	3:0	3:1	3:4	2:6	2:6	-	6:0	6:0	3:4	4:0	3:12	-	-	-	-	-
L ₁	-	-	-	0:10	0:12	0:11	1:9	1:12	1:11	1:1	1:1	-	2:6	2:6	2:0	1:2	1:2	-	-	-	-	-
IQR	-	-	-	2:7	0:13	0:15	1:7	1:5	1:7	1:5	1:5	-	3:10	3:10	1:4	2:10	-	-	-	-	-	-

Table 6. Analysis of Swim Features Vs Bait

This table is divided into eight sections, each investigating the effect of swim variables and bait type used. Some very interesting results are observed.

6:1. Bank fished. Using worm bait, the most successful bank was East in terms of numbers of eels captured, although the South bank gave eels in less time. Using deadbaits, the most successful bank was South, both in terms of numbers of eels and effort required to capture them. Therefore, South or South East banks appear to have the greater potential.
(Note the high eel weights for deadbaits on the South East bank)

6:2. Distance cast. Using worm bait, the most successful distance appears to be in the medium range. Using deadbaits, overall, the distance does not appear to make too much difference as far as effort per eel goes, although more eels were captured in the 10-20 yard range.

6:3. Depth fished. Using worm bait, the most successful depth is obviously in the 5-20 foot range both in numbers and effort, although no member apparently used worm bait in depths over 20 foot. Using deadbaits, again the medium depth range was the most successful, although the shallow depths resulted in better results for bigger eels.
(Note, included in the shallow range are baits fished sub-surface)

6:4. Snags in the swim. Using worm baits, these were most successful when there were no snags present. A similar result occurs for deadbaits. It must be stressed that only eels captured are counted. There must be many eels contacted but not landed in snaggy swims. In all, only 21 eels were captured near a snag against 130 in clear swims.

6:5. Weed concentration. Using worm baits, the more weed present, the lower the number of eels caught and in general, the more effort required. A similar situation exists for eels caught on deadbaits. The same points as for 6:4 apply.

6:6. Type of bottom. Using worm baits, the most successful bottom was one of mud or silt, both in numbers of eels and effort required. A similar result is apparent for deadbaits.

6:7. Clarity of water fished. Using worm baits, overall, a similar effort was needed regardless of water clarity, except for the larger eels where the very clear water produced bigger eels to the least effort. For deadbaits, clear water produced the best results in numbers of eels and effort required.

6:8. Surface disturbance of water in the swim by fish, wind or rain. Using worm baits, when there is a lot of surface activity, the results appear to be the best. With deadbaits, a slight disturbance improves results.

Overall impressions of this section, items 6:1 - 6:8 would appear to be that when using a worm bait, choose a south/south east bank, cast 10-20 yards into 5-20 foot of water in a clear swim with a muddy or silty bottom where the water is reasonably clear and there is a slight surface activity due to fish, wind or rain. When using deadbaits, similar choices would appear to be the most productive.

In future Report analysis, it is hoped to have a further statistical breakdown in terms of day or night as this may reveal further trends hidden in the overall rod hour totals.

Table 6. Analysis of Swim Features Vs Bait

Bait	Feature	J	2+E	RH	RH/E	RH2	MEDIAN	UQ	LQ	LOR
1.										
<u>BANK</u>										
<u>WORM</u>	NORTH	7	2	231	33	115½	1:12	2:14	0:12	2:2
	N. East	-	-	46	-	-	-	-	-	-
	EAST	19	14	1352½	72	97	2:4	3:2	1:14	1:4
	S. East	-	-	38	-	-	-	-	-	-
	SOUTH	7	3	293	42	97	1:14	2:1	1:4	0:13
	S. West	3	2	203	59	104	-	-	-	-
	WEST	6	1	318½	53	318½	0:8	1:4	0:7	0:13
	N. West	-	-	-	-	-	-	-	-	-
<u>DEAD</u>										
<u>BAIT</u>	NORTH	21	11	630	32	57	2:0	2:5	1:6	0:11
	N. East	2	1	240	120	240	-	-	-	-
	EAST	16	11	1071	63½	97	2:5	2:8	1:5	1:3
	S. East	3	3	398½	133	133	4:10	5:6	4:0	1:6
	SOUTH	35	15	494	14	33	1:8	2:6	0:12	1:10
	S. West	-	-	22	-	-	-	-	-	-
	WEST	26	8	1085	41	135	1:9	2:2	0:12	1:6
	N. West	5	-	22	4	-	1:0	1:6	0:12	0:10
2.										
<u>DISTANCE (yds)</u>										
<u>WORM</u>	0-5	1	-	290	290	-	-	-	-	-
	5-10	10	6	348	35	58	2:8	3:7	1:0	2:7
	10-20	3	2	327	41	163½	1:4	2:2	1:0	1:2
	20-50	12	6	509	42	85	2:0	3:1	0:9	2:8
	50+	11	10	1118	85	112	2:9	3:4	2:0	1:4
<u>DEAD</u>										
<u>BAIT</u>	0-5	11	3	366	33	46	2:3	4:0	1:13	2:3
	5-10	17	9	702	41	78	2:0	3:1	1:5	1:12
	10-20	58	15	1397	24	93	1:3	2:0	0:8	1:8
	20-50	21	13	1133	54	87	2:2	2:6	1:12	0:10
	50+	4	4	157½	40	40	2:8	3:8	2:7	1:1
3.										
<u>DEPTH (feet)</u>										
<u>WORM</u>	0-5 (shallow)	3	3	623	78	209	1:8	3:4	0:11	2:9
	5-20 (medium)	30	17	1976	66	116	2:4	3:2	1:3	1:15
	20+ (deep)	-	-	-	-	-	-	-	-	-
<u>DEAD</u>										
<u>BAIT</u>	0-5 (shallow)	20	14	646	42	60	2:2	3:0	1:12	1:4
	5-20 (medium)	82	32	3155	38½	98½	1:7	2:6	0:12	1:10
	20+ (deep)	2	2	130	55	65	2:1	-	-	-
4.										
<u>SIZE%</u>										
<u>WORM</u>	YES	2	1	552	276	552	-	-	-	-
	NO	40	27	2040	51	75	2:7	1:0	3:2	2:2
<u>DEAD</u>										
<u>BAIT</u>	YES	19	9	926	49	102	1:10	1:0	2:5	1:5
	NO	90	40	2986	33	74½	2:5	1:8	3:4	1:12

Table 6. Continued. Analysis of Swim Features Vs Bait

Bait	Feature	E	2+E	RH	RH/E	RH2	MEDIAN	UQ	LQ	IQR
<u>5.</u> <u>FORM</u>	<u>NEED</u>									
	MIL	18	17	1126	62	66	2:2	1:0	3:2	2:2
	SPARSE	16	5	583	36 $\frac{1}{2}$	116 $\frac{1}{2}$	1:4	0:9	2:8	1:15
	DENSE	8	6	883	110	147	2:5	1:12	3:2	1:6
<u>DEAD</u> <u>BAIT</u>	MIL	70	29	1289	18	44 $\frac{1}{2}$	2:2	1:4	3:0	1:12
	SPARSE	21	15	1524	75	105 $\frac{1}{2}$	3:1	1:8	3:13	2:5
	DENSE	15	5	882	59	176	1:0	0:8	2:0	1:8
<u>6.</u> <u>FORM</u>	<u>TYPE OF BOTTOM</u>									
	MUD/SILT	25	10	1124	43	112 $\frac{1}{2}$	1:4	0:9	2:8	1:15
	SAND/GRAVEL	16	10	1468	92	147	2:0	1:4	3:0	1:12
	ROCK/BOULDERS	-	-	25	-	-	-	-	-	-
<u>DEAD</u> <u>BAIT</u>	MUD/SILT	70	20	1877	27	94	1:4	0:12	1:14	1:2
	SAND/GRAVEL	30	20	1955	65	98	2:0	1:8	3:0	1:8
	ROCK/BOULDERS	1	1	80	80	80	-	-	-	-
<u>7.</u> <u>FORM</u>	<u>CLARITY OF WATER</u>									
	CLOUDY	18	11	1250	69 $\frac{1}{2}$	113 $\frac{1}{2}$	2:2	0:10	3:1	2:7
	CLEAR	15	7	916	61	130	1:4	0:9	2:5	1:12
	VERY CLEAR	7	6	426	61	71	3:4	3:2	4:4 $\frac{1}{2}$	1:2 $\frac{1}{2}$
<u>DEAD</u> <u>BAIT</u>	CLOUDY	31	18	1821	59	101	2:2	1:5	3:6	2:1
	CLEAR	52	24	1512	29	63	2:8	0:14	2:5	1:7
	VERY CLEAR	17	5	579	34	115	1:2	0:9	2:2	1:9
<u>8.</u> <u>FORM</u>	<u>SURFACE DISTURBANCE</u>									
	MIL	25	19	1657	66	87	2:0	1:0	2:7	1:7
	SLIGHT	9	2	555	69	276 $\frac{1}{2}$	1:11	0:9	2:10	2:1
	HEAVY	7	6	332	54 $\frac{1}{2}$	63 $\frac{1}{2}$	2:9	2:0	2:14	0:14
<u>DEAD</u> <u>BAIT</u>	MIL	50	21	2779	45	90	2:2	0:14	3:0	2:2
	SLIGHT	20	12	813	39	67	1:10	1:2	2:4	1:2
	HEAVY	5	2	220	35	160	1:7	0:11	2:0	1:5

APPENDIX ICONVENTIONS & ABBREVIATIONS

1. References are indicated by numbers in parenthesis, thus: (1), and are detailed in a collective list in Appendix V.
2. Weights are given in lb:oz, thus 4:7 (4lb 7oz.) and are rounded to the nearest half oz.
3. Rod hours are generally rounded to the nearest quarter.
4. Rates-of-catch are referred to rod-hours per eel. (the higher the number, the slower the rate-of-catch) and are rounded to two significant figures.
5. Ranges in weight etc., cover the range from the lower number to less than the upper number. Thus, for example, a 1:0 eel falls in the 1-2 lb range, a 2:0 eel in the 2-3 lb range, and so on.
6. Abbreviations used are:

E	eel(s)
N	number (usually, number of eels)
CF%	Cumulative frequency percent.
RH	rod-hours.
RH/E	rod-hours per eel, the rate-of-catch of all eels in all weight ranges.
RH2	rod-hours per 2lb plus eel, the rate-of-catch of eels weighing 2:0 and over; similarly for RH3, etc.
UQ	upper quartile.
LQ	lower quartile
IQR	Inter-quartile range. If, for example, a number of weights is listed in order of magnitude, the MEDIAN is the middle weight which divides the list in half, and the QUANTILES are the weights which divide each half into two equal parts. The medial is therefore a measure of the average and the interquartile range is a measure of spread.
S	Number of sessions fished.
No.Rep	Number of members reporting sessions fished.
E/DB	Eels captured on deadbait.
E/W	Eels captured on worm bait.
EDB/D	Eels captured on deadbait during the day.
EDB/N	Eels captured on deadbait during the night.
EW/D	Eels captured on wormbait during the day.
EW/N	Eels captured on wormbait during the night.
E/O	Eels captured on baits other than worm or deadbait.
EO/D	Eels captured on baits other than worm or deadbait during the day.
EO/N	Eels captured on baits other than worm or deadbait during the night.
RH/W	Rod-hours fished using worm bait.
RH/DB	Rod-hours fished using deadbaits.
T	Total
2+E	Number of eels of a weight over 2lb.
Mean	Average number.

APPENDIX II
SIGNIFICANCE TESTS

In the Bulletin article on the effects of moonlight (15), members were introduced to the application of tests of statistical significance to angling data, and some may have wondered why such tests have not been applied more widely to the data in these reports.

There are, in fact, several reasons for having deferred significance testing, one of the main ones being that a fair amount of calculation is involved and in the writer's view it has been worth waiting until there was some chance of the results of such tests being of real value. That time is now here.

For non-mathematical members who may not be familiar with the concept, the following introductory notes may help to explain the general idea.

It is necessary first to have a clear idea of the sense in which the word "probability" is used in statistics. Referring probability to a percentage scale, its meaning can be illustrated by saying that the probability of getting heads on the spin of an unbiased coin is 50%. That is, if we spin the coin a large number of times, the number of heads will tend towards half of the total spins. Obviously, the probability of spinning tails is also 50%. Similarly, the probability of getting a six on a single throw of an unbiased die is one sixth or approximately 17%. And so on.

An event which is certain to occur is said to have a probability of 100% and one which cannot possibly occur at all is said to have a probability of 0%. In the statistical sense, then, probability is a numerical scale of likelihood, ranging all the way from certainty to impossibility.

The idea of significance testing can again be illustrated by a coin-spinning example. Suppose we spin a real-life coin 100 times. We shall expect to get roughly - but not exactly - 50 heads and 50 tails. Suppose we actually get 45 heads and 55 tails. We may now ask the question: is the difference between what we expected and what we got significant? In other words, might the result have arisen by chance with a perfectly good coin, or are we justified in concluding that the coin was biased, with a small but real built-in predisposition towards coming down tails?

Surprising as it may seem, it is possible to calculate a factual answer to this question. It is possible to calculate how often a difference as large as 45-55 would occur with a truly unbiased coin in a long series of 100-spin trials. The calculation shows that differences as large as 45-55 would occur in about half of our long series of 100-spin trials. In other words, the result we actually observed has a 50% probability of occurring even with a truly unbiased coin, and most people would agree that this provides no good reason for doubting that the coin we actually tested was a "good" one. Or, putting it another way, the result of our test was statistically "not significant".

Obviously, the calculation referred to takes into account not merely the proportion 45-55, but also the actual number of spins on which the evidence is based. For example, if we got 270 heads and 330 tails in a 600-spin trial, the proportions are still 45-55, but the calculation shows that there is only about a 1% probability of such a result occurring with a "good" coin. Most people would agree that this gives reasonable grounds for entertaining serious doubts about the coin - i.e. the result is statistically "significant".

Taking the illustration a step further, if we carried out a 1,000-spin trial and got 450 heads and 550 tails, the proportions would still be 45-55 but the probability of this result occurring by chance is only about 0.1%. Statistically, this result is "highly significant". In a manner of speaking, we could declare the coin to be a dud and add that we were 99.9% sure of it.

A variety of such tests of significance is possible, all taking the basic

form of considering the difference between the actual results observed and the results which would have been expected, and calculating the probability of such a difference having arisen by chance. Members interested in the methods of doing such calculations may look them up in the statistical text-books but a few further comments are worth making here.

In the coin-spinning illustration above, we were testing the notion that a coin might be biased by considering how the result of spinning it differed from the result expected for an unbiased coin. In other words, we compare the result with what is called the "Null Hypothesis" and in the coin example, the consequence of the Null Hypothesis (namely, that the coin is not biased) is self-evident: obviously, the "expected" result on the Null Hypothesis is 50-50. In other cases, the expectation arising from the Null Hypothesis may require some thought. In an angling example, suppose 45 eels are caught on worms and 55 eels on dead-baits, and we want to know whether the result indicates a significant difference in prospects using these two baits. In this case, the "expected" result is no longer self-evident. At the very least, we shall have to take into account the amount of time spent fishing the two baits. If it was about equal, the expected result would be 50-50; but if we had spent about twice as long on dead-baits as on worms, other things being equal, we would "expect" twice as many eels on dead-baits i.e. about 17-33. In other words, we must take the time factor into account when we set up our "expected" results for the purpose of a significance test.

In general, we should beware jumping to conclusions about the angling meanings of our calculations. The point about a significance test is that, unless there are reasonable grounds for thinking that a real difference existed (and not a fortuitous difference which arose by chance) there is little point in looking for explanations. The time to look for explanations is when we are reasonably sure that there really is some effect to be explained! However, the explanation may not be the obvious one; for example, if we find a significant difference between some worm and dead-bait results, we shall be wise to consider whether they were obtained from the same waters, during the same times of day, in the same periods of the season, etc., and if not whether these other variables are likely to have cancelled one another out. A significance test will therefore often lead on to other investigations, as we try to trace the significance back to its source.

Finally, it is conventional in statistics to describe as "probably significant" a result which could have arisen by chance in only about 5% of cases; as "significant" a result at the 1% level; and as "highly significant" a result at the 0.1% level. These criteria have been developed from the long experience of statisticians in many fields, but it is acknowledged that significance does depend to some extent on the field of study. In the present Report, however, the conventional criteria are used, and results above the 5% level are regarded as "not significant". These are quite severe criteria, and it may well be that anglers would be content to base their tactics on conclusions at (say) 10% or even 20% significance. Indeed, it is quite unprecedented for an angler to be given the slightest notion of the significance of the advice they are offered. In any case, it will be appreciated that "not significant" in this context is equivalent to a verdict of "not proven" in many instances i.e. the significance test shows us that more evidence is needed to settle the matter. Equally, in cases where a great weight of evidence already exists, an effect might prove to be statistically significant yet of such small magnitude as to be of no practical angling significance. Like other statistical methods, significance testing is only a tool, and like all tools it needs to be used skilfully and thoughtfully.

APPENDIX IV

THE USE OF "ROD-HOURS" AS A MEASURE OF "ANGLING EFFORT"

Good anglers are necessarily practical men, accustomed to trying out ideas in practice before accepting or rejecting them. For instance, no angler would accept that such-and-such a bait is good for the fish he is after without knowing whether it had been tried and the fish duly caught. Moreover, knowing that something has happened once or a few times is not enough, because almost anything can happen on rare occasions. The angler is therefore interested not merely in strategies and tactics which give him a chance, he is interested in trying to choose the strategies and tactics which give him a better chance than others. In other words, anglers are accustomed to trying to compare the merits of different methods, etc., in practice before accepting or rejecting them.

It is common experiences that even the simplest and most straightforward attempts to assess the comparative merits of different methods, etc., can be extremely difficult to bring successfully to a convincing conclusion. One of the most common problems in these attempted comparisons lies in trying to give the various items of one's experience the right relative balance or "weight". To give an absurdly simple example, an angler who recalls that he has never caught any eels during the daytime should obviously give a very different weight to his observation if, on the one hand, he has fished for eels regularly during the day; or, on the other hand, has seldom started before dusk or carried on after dawn!

In short, it is necessary to try to take into account not only the results obtained, but the angling effort which went into obtaining them. All anglers try to do this, if only on a very rough and subjective basis; and the more successful they are at weighing off the element of effort, the more valid their conclusions are likely to be. Of course, angling effort is a complex thing, no doubt impossible to measure exactly. However, the writer suggested some years ago (see, for example, ref. (5,19) that even a very rough measure of angling effort would be a very valuable aid to making more objective comparisons, and that perhaps "rod-hours" might be useful units to employ. It seemed to the writer that rod-hours were likely to be more useful than, for example, fishing hours, number of sessions, number of members in the club, etc., and at least as likely to be useful as some of the measures of fishing effort (e.g. the horse-power of trawlers!) which have proved useful in zoological studies. A scheme was proposed in which, inter alia, the utility of rod-hours would be investigated in a wide variety of comparisons. The present series of Reports relate to that scheme and contain a multitude of comparisons based on rod-hours.

Since the original proposal, it has been suggested in the angling press (e.g. ref (20)) and elsewhere that the entire concept of using rod-hours in this way as measures of angling effort was absurd. However, in the writer's opinion, the matter is not one which can be settled like a political issue by argument, however forceful; nor yet like a geometry theorem by the application of pur logic. It is essentially a practical question and, like angling problems, it can only be settled by putting the method to the test and finding out whether it gives useful results, or not.

In any case, and apart from any outside controversy, the investigation has now reached a stage where it is appropriate to try to decide whether or not the comparisons made in these Reports on the rod-hour basis are valid. Some comparisons lead to conclusions which agree with our preconceptions, and we have no difficulty in accepting them; but other conclusions are more or less unexpected, and it is important to know whether these unexpected conclusions are to be taken seriously.

In fact, the present Report provides many convincing illustrations that

rod-hours do indeed provide a valid and useful measure. It is proposed to show the line of argument in one case; the reader will have no difficulty in finding many other parallel cases.

Let us start by adopting the "Null Hypothesis" that the critics are right and that rod-hours have no value for our purpose. That is to say that rod-hours are not related to results in any meaningful way; or we might say that the relation between rod-hours and results is random.

A consequence of this Null Hypothesis would be that when we convert results into rates-of-catch by dividing numbers of eels caught into the number of rod-hours involved, we are carrying out a meaningless exercise. We might equally well use a set of random numbers instead of the number of rod-hours recorded on the Session Reports. If this were so, then any patterns which seemed to emerge would be fortuitous; they would not be repeated consistently; and most important, they would generally fail strict tests of statistical significance.

It follows therefore that if we find more or less consistent patterns emerging repeatedly, and especially if these patterns differ sufficiently from the random expectation to be statistically significant, then we have excellent objective grounds for rejecting the Null Hypothesis and concluding that the critics were mistaken.

Consider first the case outlined in Section 3.1 of this Report, in which ratios of rates-of-catch between worms and dead-baits are taken. Rod-hours are well and truly compounded into these ratios, and it is improbable that any sort of rational result would emerge if the Null Hypothesis were true. In fact, we find firstly that worms catch eels between two and three times faster than dead-baits: a reasonable conclusion which accords well with common experience. We find, moreover, that we get about the same result in each of the four years taken separately. Even more strikingly, we find roughly the same rather complex pattern through the various weight ranges in each of the four years.

Doubtless, the unbiassed reader will have great difficulty in accepting the notion that rod-hours are meaningless and unrelated to results in the face of these consistently repeated patterns. It is difficult to imagine how these patterns could emerge unless (a) they existed in the records of members' angling experiences and (b) the analytical methods which revealed them are valid.

Taking the argument a stage further, all individual waters which had produced even one single eel on both worms and dead-baits were considered, and ratios calculated for all of them. There are no less than forty. We find that the average ratio for these 40 waters also lies between two and three, and we note in passing that there is no particular reason why this average should tally with the total pooled results, unless it represents a fundamental fact of angling life laid bare by a valid method of analysis.

We may now apply the most searching test of all. If the Null Hypothesis of the critics is correct, and the rates-of-catch are meaningless and random, then we are merely taking the ratios of pairs of random numbers which are as likely to be below 1 as above 1, and the fact that the average ratio is 2.81 instead of 1.00 is fortuitous. Knowing as we do how the 40 ratios vary above and below their average of 2.81, we can in fact calculate exactly what the chance is of the difference from the random result of 1.00 arising fortuitously. The calculation shows that the chance is almost immeasurably small, very much less than one chance in a thousand.

The reader will find many similar cases in other sections of the Report, and in the writer's view they demonstrate conclusively that the rod-hour has proved to be an entirely useful unit with which to take an approximate measure of angling effort for the purpose of the type of comparison made. It is therefore reasonable to conclude that, on the one hand, the suggestion that rod-hours are meaningless is wrong; and on the other, that we shall be wise to give due weight to unexpected results as well as expected ones.

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