Experiment 1

This experiment was conducted in Jervis Bay on 8 April 1979 with three divers, two of whom (M.C., D.P.,) were experienced in estimating fish lengths underwater and one (J.M.) who was less experienced. Only one of the experienced observers (D.P.) knew the actual length distribution. In this test sticks were held up by another diver and were classified into five size classes on two occasions.

In all cases there was overestimation of the number of sticks in the smallest size groups and underestimation of the numbers in the larger size groups (Appendix 2, Table 1). Examining the test statistics for the Kolmogorov-Smirnov tests shows that only one observer showed much improvement between the first and second trials. None of the distributions is significantly different from the expected distribution.

Experiment 2

This experiment was conducted on 19 April 1979 in Botany Bay with three different divers one of whom was 'experienced' ($J.B.^1$) one moderately experienced ($J.B.^2$) and one naive (P.M.). The sticks were held up by another diver and classified into five size classes in each of two attempts.

Again all divers classified too many sticks in the smaller size classes and too few in the larger size classes. All observers deteriorated between the first and second trials (Appendix 2, Table 2). None of the distributions is significantly different from the expected distribution.

For the remaining experiments, the Kolmogorov-Smirnov test statistics are presented together in Appendix 2, Table 28.

Experiment 3

This experiment was conducted on 22 April 1979 in the boat harbour at Heron Island with two divers, one of whom was moderately experienced (B.R.) and one naive (W.C.). The sticks were held by a third diver. Both divers showed the same trend as previously observed, i.e. recording too many sticks in the smaller size classes and too few in the larger size classes (Appendix 2, Table 3). Both divers showed considerable improvements from the first to the second trial (Table 28).

Experiment 4

The above experiment was repeated on 22 April 1979 at Heron Island with four observers, three of whom (W.C., S.R., D.P.) were aware of the expected distribution and one of whom was completely naive (K.W.). Each observer participated in two trials except one (B.R.) who undertook four trials. Improvement over the previous trials was shown by all non-naive observers, who also showed considerably better performances than the naive observer (Appendix 2, Tables 4 and 28). The observer undertaking four trials showed improvement between the first and second two pairs of trials.

Experiment 5

The above experiment was repeated on 22 April 1979 on land at Heron Island with the same four observers, with the sticks held against the marked standard. The results (Appendix 2, Tables 5 and 28) showed considerable further improvement. The differences between Dmax and Dcrit increased

generally to greater than 0.2.

Experiment 6

In this experiment on land at Heron Island on 22 April 1979, the three practised observers estimated the actual stick lengths (to the nearest centimetre). The results (Appendix 2. Table 6) show that all observers still had a strong tendency towards underestimation of stick lengths.

Experiment 7

The above experiment (estimating actual stick lengths) was repeated on 22 April 1979 underwater, in the boat harbour at Heron Island with the three practised observers. Underestimation underwater was greater than on land with all observers recording increased mean negative deviations (Appendix 2, Table 7).

Experiment 8

In this experiment on 22 April 1979 in the boat harbour at Heron Island, the sticks were held by another diver against a marked standard and the same three observers showed reasonable results (Appendix 2, Tables 8 and 28) although one observer showed a tendency to overestimate.

Experiment 9

In this experiment, on 22 April 1979, in the boat harbour at Heron Island, the same three observers classified the sticks held by another diver into five size classes without the assistance of a standard.

All three observers showed considerable accuracy (Appendix 2, Tables 9 and 28) in classifying sticks, the observed distributions coming close to the expected distribution.

Experiment 10

In this experiment on 23 April 1979 on Northwest Wistari Reef, four divers, the three practised and one naive (J.H.), swam over the stick transect and estimated the actual length of the sticks. All practised observers showed an improvement in length estimation and a reduction in the number of length underestimations (Appendix 2, Table 10). The naive observer demonstrated a surprising degree of accuracy, although the tendency to underestimate was evident.

Experiment 11

In this experiment on 23 April at Northwest Wistari Reef, the same four divers swam over the stick transect twice each (except for one observer, J.H.) and classified the sticks into five size classes. All observers shows good ability to correctly classify the sticks; the differences between Dcrit and Dmax were all 0.2 or greater (Appendix 2, Tables 11 and 28).

Experiment 12

In this experiment on 24 April 1979, the same four divers swam over the stick transect on Northwest Wistari Reef and estimated actual stick lengths. The mean deviations were again quite low. The least practised observer (J.H.) still demonstrated the greatest tendency to underestimate

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and one of the practised observers (B.R.) had overcompensated to show many more overestimations than underestimations (Appendix 2, Table 12).

Experiment 13

In this experiment on 24 April 1979 at Northwest Wistari Reef the same four divers swam over the stick transect and classified the sticks into five size classes. The lowest differences between Dcrit and Dmax was 0.19 for the least practised observer (Appendix 2. Tables 13 and 28).

Experiment 14

This experiment, on 25 April 1979, was carried out on the north side of Heron Island Reef in an area to the east of the 'no fishing' area and referred to as the 'fished' area. The same four observers swam over the stick transect, estimating actual stick lengths.

Apart from one observer who appeared to be deteriorating with practice and considerably underestimated lengths, there appeared to be something of a stabilisation in estimating fish lengths for the other two practised observers with mean deviations of about 3-4 cm and only a slight tendency to underestimate (Appendix 2, Table 15).

Experiment 15

In this experiment on 25 April 1979 in the 'fished' area on the north of Heron Island, the same four observers swam over the stick transect and classified the sticks into five size classes. Three practised observers (including the observer worst at length estimation) showed extremely

good results and the least practised observer again showed reasonable results (Appendix 2, Tables 16 and 28), showing reasonable approximations to the expected distribution.

Preliminary coral trout counts, made swimming in transects perpendicular to the stick transect from the reef crest to the sand area at the bommie zone, for the length of the stick transect had been made at Northwest Wistari Reef on 24 April (Appendix 2, Table 14) and to the east of the 'no fishing' area at Heron on 25 April (Appendix 2, Table 17). It was evident from these counts that coral trout fell primarily into three size classes. Because the power of the Kolmogorov-Smirnov test increases with a greater number of size classes, and three size classes give a rather gross population size structure, it was decided to examine the population in 10 cm rather than 20 cm size classes. Prior to this however it was necessary to determine diver accuracy and between diver variability in placing sticks into a greater number of smaller size classes. As an initial test, the actual length estimates from 25 April from the Heron 'fished' area were put into both 20 cm and 10 cm size classes (Appendix 2, Tables 20 and 21) and the distributions tested to see if they were significantly different from the expected distributions. None was significantly different from the expected distribution (Appendix 2, Table 22).

All further experiments involving sticks involved classifying sticks with ten 10 cm size classes.

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