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PRELIMINARY REPORT OF AN EXAMINATION OF A FAILED MOORING LINE FROM FIJI: A SUSPECTED CASE OF FISH BITE

by

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The following is an abbreviated report of results from an examination of two short lengths of three strand, twisted polyethylene rope submitted by Lt. Richard L. Boy of the National Data Buoy Center. Origin and history of the samples are given in his letter of 20 May 1983, reference CC: 83-0521.

The line was of three strand twisted construction. It measured 58.7 mm (3.31 in.) circumference as received. No marker was found.

As received, each piece of rope had two places where yarns had been damaged and a number of yarns parted by cutting or some other means. Sample number BP-IX-110A was asssigned to the longer piece and BP-IX-110B to the shorter. Damaged fiber areas on piece 110A were 90 mm (3.54 in.) apart. At one site on 110A, it was estimated that about 20% of the fibers in the cross section had been parted. At the other location, only a few yarns were damaged. On the smaller sample, 110B, there were two areas of relatively light damage. They were 60 mm (2.36 in.) apart. Looking at the damaged areas without magnification it was difficult to say what the cause of damage might have been.

Under the microscope, it was found that in all four of the damaged areas noted above the great majority of fibers appeared to have been parted by cutting. A high proportion had sharply truncated ends which indicated that the cutting instrument had a very keen edge. Table I below shows the percentage of fiber ends which appeared to have been cut in comparison with the percentage which appeared to have been damaged in some other ways such as abrasion or tensile over stress.

TABLE I

% Various Types Damaged Fiber Ends

Rope Samples - BP-IY-110A&B

Sample	Sharp Cut	Shear Cut	Other
Longer length of rope			
A_2 Square cut end	25	50	25
A_3 Damaged area	65	26	9
A_4 Damaged area	73	22	5
Shorter length of rope			
B_3 Damaged area	63	33	4
B_4 Damaged area	73	23	4

Data from the square cut end of Sample A_2 have been included in Table I for comparisan with data from the damaged areas mentioned above. Sample A_2 is assumed to be where a knife was used to cut off a piece of the rope. It is therefor characteristic of a cut with a reasonably sharp knife blade, and the figures are characteristic: 25% "sharp cut" ends, 50% "shear cut" ends and 25% others. Comparison with data from fiber ends in the damaged areas reveals that the latter contain a much higher percentage of "sharp cut" ends and almost no "other" types. Such a result is characteristic of cuts made with a very keen edge, such as a razor blade or fish teeth.

Microscopic examination of the damaged areas as a whole resulted in the discovery of several places where fibers were cut well inside the line between strands. In some places, the poly - ethylene fibers were cut only part way through leaving no doubt that damage was due to cutting not abrasion. There was no separation of fibrils or mashing of fibers. The shape and location of cuts indicate a stabbing into the line between strands unlikely to happen with a knife but quite possible for a tooth. It appears

quite certain therefor that the line was bitten but there is still a question as to whether biting played a major role in its failure.

To ascertain the underlying cause of line failure, the parted ends of all 63 yarns were examined for the predominant type of fiber damage present. They were placed into two categories: "sharp cut" or "other". Results indicated that 37 out of 63, or 59%, of the yarns had been cut by a very sharp edge. There was very little evidence of torn fiber ends which would indicate abrasion or cutting by an edge that was less than razor sharp. The results support a conclusion that significant cutting had occurred at the point of failure and that the cuts were likely due to fishbite.

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This is a preliminary report and will be replaced in due course with a complete report containing applicable procedures and data.

B.P.