the breeding of the Greater Flamingo *Phoenicopterus ruber* Linneaus in the Bredasdorp District, South Africa. Ostrich 34:129–154.

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Wildlife mortality and entanglement by discarded hip chain string.—The assessment and quantification of an organism's habitat is essential in accomplishing many research and management goals. A component of this is the measurement of linear distances, occasionally over many kilometers (Gysel, L. W. and L. J. Lyon. 1980. Habitat analysis and evaluation. Pp. 305–327 *in* Wildlife management techniques manual [S. D. Schemnitz, ed.]. Fourth ed. The Wildl. Soc., Washington, D.C.; Orth, D. J. 1983. Aquatic habitat measurements. Pp. 61–84 *in* Fisheries techniques [L. A. Nielsen, and D. L. Johnson, eds.]. Am. Fish. Soc., Bethesda, Maryland). Hip chains (also called string boxes) are a valuable tool used by biologists to measure long distances where using a tape measure would be difficult, if not prohibitive. Hip chains meter a polyester or cotton string that is pulled from a spool inside the unit. The observer ties the string to a stationary object and walks away as the hip chain tallies the distance traveled on an odometer. Hip chains have the advantages of allowing the observer to measure distances while both hands are free to complete other tasks and the string is advertised as disposable (e.g., 1996 Ben Meadows Company catalog). However, the string left behind can be an eyesore or a source of mortality for wildlife as this article demonstrates.

In May, 1994, I used a hip chain to measure linear stream distances in the Oregon Coast Range, Lincoln Co. I used cotton (biodegradable) string and walked within the stream's wetted channel. Nine days later, I walked the same stream and found a dead American Dipper (*Cinclus mexicanus*) tangled in the residual string (Fig. 1). The string left behind was still in long (>100 m) segments, had floated downstream, and had accumulated on the upstream side of rocks and woody debris. The dipper's legs were greatly entangled in the many loops formed in one of these accumulations. These loops appeared to have tightened as the bird struggled or was swept downstream and the bird was unable to escape.

Discarded hip chain string also has killed other wildlife. I informally surveyed colleagues locally and queried subscribers to electronic bulletin boards dedicated to wildlife topics. Nineteen respondents reported ≥13 species of which >24 individuals were dead and 9 individuals were released alive. Animals killed were 4 bats, 5 Western Screech-Owls (*Otus kennicotti*), 4 Northern Spotted Owls (*Strix occidentalis caurina*), >3 unidentified songbirds, 2 thrushes, 2 American Robins (*Turdus migratorius*), 2 Varied Thrushes (*Ixoreus naevius*), a Wood Thrush (*Hylocichla mustelina*), Belted Kingfisher (*Ceryle alcyon*), and a Steller's Jay (*Cyanocitta stelleri*). Two robins, and a Red-tailed Hawk (*Buteo jamaicensis*), Long-eared Owl (*Asio otus*), Northern Saw-whet Owl (*Aegolius acadicus*), Spotted Owl, Western Screech-Owl, Flammulated Owl (*Otus flammeolus*), and Northern Pygmy-Owl (*Glaucidium gnoma*) were found entangled and released alive. Most animals (>93%, N = 32) were caught in flight, 1–1.5 m above the ground or water. Few (25%) were snared only by the tip of one wing with two to five wraps of string; however, the rest were completely tangled, indicating they struggled to free themselves following capture. The Spotted Owls were all caught in thicker cruising string whereas all others were tangled in hip chain string. Animals

FIG. 1. Adult American Dipper found dead entangled in discarded hip chain string in the South Fork of Drift Creek, central Oregon Coast Range, May 1994.

were captured over a stream (47%) and in the upland (53%, n = 32). Hip chain string is potentially lethal immediately and remains so for a considerable time period. Animals were found <2 h to 5 years following string deployment (median = 11.5 days, N = 22). Marketing of new "stronger, long-lasting polyester thread!" may extend the potential for mortality to wildlife, although five respondents reported no qualitative reduction of the strength of the "biodegradable" cotton string after >1–2 years of exposure. Animals were captured throughout the U.S. (Alaska, Arizona, California, Idaho, Massachusetts, North Carolina, Oregon, Vermont, and Washington) and Canada (British Columbia, New Brunswick, and Nova Scotia).

Discarded string from hip chains pose an added risk of entanglement and mortality to terrestrial and aquatic organisms, regardless of the string's biodegradability. Nocturnal flyers (owls and bats) appear to be particularly susceptible. It is possible that this string could entangle fish and amphibians as well. Therefore, I recommend that biologists and foresters use hip chains with caution. Alternatives to reduce this hazard include recovering the string

immediately after use (≤24 h), using a visual estimation technique that corrects for bias (e.g., Hankin, D. G. and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Can. J. Fish. Aquat. Sci. 45:834–844), deploying string at ground level (<0.1 m), or in aquatic systems, walking on the stream bank where it is unlikely that a large volume of discarded string will be accumulated by the stream. Hip chains are a valuable tool; however, their widespread use and persistent threat necessitate additional precautions to reduce incidental wildlife mortality.

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