A MODIFIED ROPE-CLIMBING TECHNIQUE FOR REACHING CANOPIES OF FOREST TREES IN REMOTE AREAS

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ABSTRACT

A method is described for gaining access to canopies of mature deciduous trees in remote areas. This rope-climbing technique, modified from those used in caving, provided a light-weight, portable, non-destructive alternative to pole climbers, and an inexpensive alternative to scaffolding, ladders, towers, and hydraulic lifts. The method has been successfully applied in an investigation of canopy arthropods for three years in the Nantahala Mountains, North Carolina. Attention is given to equipment, cost, necessary skills, and safety.

Key Words: Rope-climbing technique, canopy arthropods, forest canopies

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INTRODUCTION

Forest canopies have been notoriously difficult to approach for scientific study and, as a result, there exists a paucity of detailed information on this important component of forest systems. Vehicles equipped with hydraulic lifts have been used for sampling in accessible areas while other more novel techniques have been employed to reach forest canopies in inaccessible areas. Muul and Liat (1970) constructed over 200 m of aerial walkways in a Malaysian forest canopy from aluminum ladders. Towers constructed from wood or metal scaffolding have been used in canopies of small to medium-sized trees (Reichle and Crossley 1967, Coulson *et al.* 1971, Burns 1973, Schowalter *et al.* 1981, Heichel and Turner 1983). Gist and Risley (1982) used pole climbers in inaccessible areas of the Okefenokee Swamp. Denison *et al.* (1972) were among the first in this country to employ rope-climbing techniques for efficient canopy access although potentially harmful lag screws were driven into Douglas-fir trees to anchor rope-holding steel plates. Perry (1978) and Perry and Williams (1981) described non-destructive rope techniques which allowed them to climb into emergent tropical trees and also move aerially between trees. A very small body of literature reports of rope-climbing techniques employed in forest canopies in the United States. Included are examinations of canopy epiphyte biomass (Pike *et al.* 1972), the role of rain forest canopy roots (Nadkarni 1981), leaf-miner populations on oaks (Faeth *et al.* 1981), and caterpillar feeding behavior (Jack Schultz, personal communication).

This paper reports on the use of a rope-climbing technique modified for a study of canopy arthropods in a mature temperate deciduous forest canopy. Modifications to previously described methods included two mechanical ascenders operated above the chest and as a safety precaution a mechanical ascender located at the waist, adoption of a horse cinch strap as a shoulder harness, construction of an inexpensive wrap-around seat, and equipping a number of trees with nylon line with which to raise climbing rope. The described method represents one of few related applications of rope-climbing techniques in the United States and continues to be one effective solution to the logistical problem of reaching the crowns of trees in relatively inaccessible areas.

The rope-climbing technique was employed at the Coweeta Hydrologic Laboratory, U.S. Forest Service, near Franklin, North Carolina. Elevation ranges from 700 m to 900 m in the study area which is dominated by chestnut oak, red maple, mixed hickory species, and tulip poplar (Day and Monk 1974). Tree crowns exceed 40 m and vehicular access is limited.

METHOD

The following materials were utilized: 50 m of 1.7 cm diameter dacron rope, 6 m of 2 cm wide tubular nylon, 1.5 m of 7.5 cm wide nylon webbing, one pair of hand-held mechanical ascenders (similar to European jumars), one Gibbs® ascender, two D-ring carabiners, two D-ring locking carabiners, and a woven cotton horse cinch strap (Figure 1). A simple seat was made from the length of nylon webbing by first forming a loop and tying the ends together in a water knot (Mendenhall and Mendenhall 1969). From behind, sections of the loop were brought forward on both sides and between the legs then clasped in front with a locking carabiner. The Gibbs® ascender was also hung on this carabiner and functioned to prevent uncontrolled descents and also to maintain the climber at a stationary position anywhere on the rope. I obtained a cinch strap with attached pieces of nylon webbing which permitted it to be worn as a vest and on which the second locking carabiner was used to join ends of the strap across the chest. The climbing rope was guided through the cinch carabiner and through the Gibbs® ascender. Movement up and down the rope was made possible by a pair of hand-held mechanical ascenders. Each of the pair of ascenders was attached by a separate length of tubular nylon to a loop around one foot. Foot loops were secured by additional tubular nylon tied around the ankles. Ascender-to-foot lengths of nylon were run through separate carabiners attached to the cinch strap. The completed set-up for climbing is shown in Figure 2.

Prior to budbreak in the spring braided nylon cord weighted on one end was cast over branches and both ends tied off at the bases of selected climbing trees. These loops remained in place during the sampling season and served to hoist the climbing rope into individual trees. The actual process of climbing was slow and similar to walking up a ladder yet the most difficult aspect of tree climbing was initially getting a rope into the canopy. Generally, the time required to set-up, ascend 25 m, descend, and dismantle was approximately 30 minutes per tree. All of the sampling and climbing equipment was

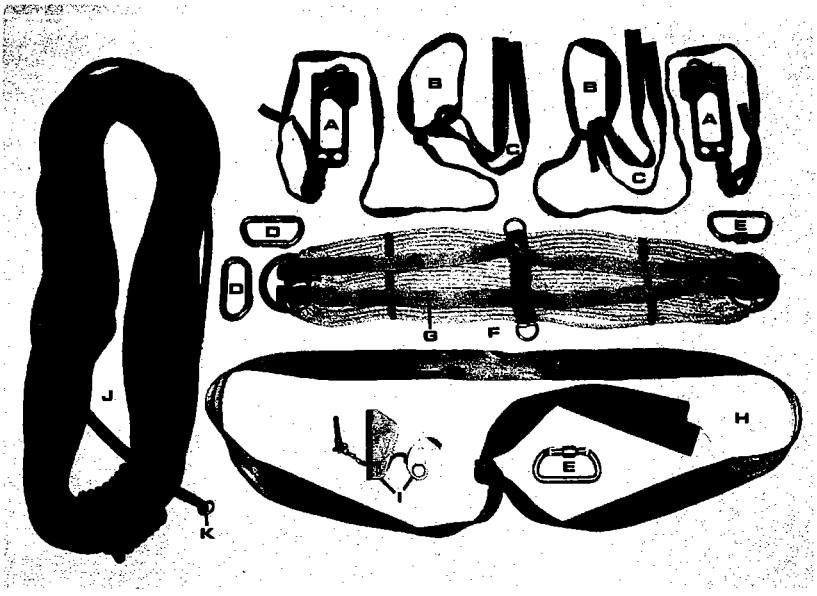

Fig. 1. – Rope and climbing equipment utilized to reach canopies of mature deciduous forest trees. A = hand-held mechanical ascender, B = foot loop, C = ankle straps, D = carabiner, E = locking carabiner, F = woven cinch strap, G = nylon strap, H = seat loop, I = Gibbs® ascender, J = synthetic climbing rope, K = metal ring for attaching rope to nylon tree-lines.

carried in a backpack across the steep slopes of the study area.

Backpacking suppliers usually have or can obtain suitable rope and rope-climbing equipment. Cost of equipment varies considerably. The equipment described here was obtained for approximately 200 dollars and rope was the single most expensive item. Manufactured harnesses and chest blocks, if chosen over inexpensive alternatives in this paper, would increase expenditures. Knowledge of proper equipment use is important and valuable sources of information and potential instruction are local climbing and/or caving (spelunking) clubs. The similarity between extended periods on a vertical free-hanging rope in a cave and on a rope in a mature forest tree attracted me to the use of caving techniques and to climbing instruction from an experienced caver.

DISCUSSION

The described method has permitted the author to make direct, detailed analyses of canopy arthropods in a mature deciduous forest. Careful preparation for each climb has been insurance against mishaps which have not occurred in three years of tree climbing. However, the ease with which these techniques can be learned and applied may lead to unjustified confidence for the beginner. Safety consciousness cannot be overstated (Whitacre 1981). The climber must become familiar and thoroughly test his equipment before

Fig. 2. – Assembled rope-climbing rig on author.

climbing higher than a few meters. One unique threat to climbing in temperate forests, not addressed in reports from the tropics, is the sudden appearance of intense thunderstorms. Since lightning strikes are common and ideal climbing trees are among the largest, climbing should be suspended at the approach of storms.

Disadvantages of the method include specialized training and confinement to a stationary lifeline. Canopy vegetation consists of multiple layers of different tree species and varying age classes within those species. The climbing rope provides a very narrow sampling path which is also restricted by the supportive capacity and height of selected climbing trees. Also, at least where canopy vertebrates are prevalent, ropes are subject to occasional damage by those species which are attracted to the salt from a climber's perspiring hands (Perry and Williams 1981).

After initially weighing advantages and disadvantages of using a rope-climbing technique at Coweeta, one was adapted in 1981 as the primary method for reaching mature forest canopies. None of the original materials have required replacement although additional carabiners have been purchased to carry equipment aloft. The method has worked well and continues to be invaluable for investigations of canopy arthropods.

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