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A NEW TECHNIQUE FOR THE EFFICIENT USE OF MACRO-MISTNETS

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Abstract — A cheap and simple method of adapting yacht masts to allow quick and efficient stringing and versatile manipulation of a 6,0 x 30,0 metre macro-mistnet, is described.

Introduction

Although use of mistnets to acquire flying animals alive was pioneered by ornithologists, mammalogists studying bats soon adapted nets for their own particular requirements. Meaningful research on bats sooner or later necessitates garnering adequate numbers of specimens. In most instances it is imperative that some proportion of the catch must be acquired alive and unhurt for subsequent release and observation. Because they are cheap, light, compact and thus easily transportable, mistnets are efficient tools for this purpose. Other devices such as the Constantine trap (Constantine 1969), from which the Tuttle trap was developed (Tuttle 1974; Kunz & Anthony 1977), as well as a variety of other methods (Nyholm 1965; Humphrey, Bridge & Lovejoy 1968; and Youngson & McKenzie 1977) have proven useful in certain situations.

A variety of mistnets of *ca* two metres high and up to 12 metres long are most commonly employed to net bats. However, it was found that macronets, 30 metres long and either six or nine metres high, yielded significantly higher netting results than the equivalent net surface area obtained by serially strung two-metre high nets. The relatively higher effectiveness of macronets is attributed to their height.

Field trials with a 6,0 x 30,0 m macronet showed that only 15 % of the total bats netted were taken in the bottom four shelves that correspond in height with standard-sized nets. The remaining 85 % of specimens were netted in shelves five to 12, with maximum yields in shelves seven, eight and nine. It was also found that upon being netted, individuals of by far the majority of species reacted violently, attempting to escape by continuous struggling and chewing of the net. If the animals are not immediately removed, the net is severely damaged and one risks losing specimens.

The majority of bats netted in macronets are therefore out of reach for the net operators. Macronets strung in the regular fashion, with the net loops slipped over a length of pole matched to the height of the net, are unwieldy when it is necessary to lower the nets fast and remove bats in the higher shelves to

prevent net damage or specimen loss. This paper describes a system designed to allow progressive lowering and raising of the net, quickly and effortlessly, by not less than two people. The system also allows quick and efficient stringing of an otherwise unwieldy net with a minimum risk of entangling the net in grass or underbrush in the process. Once familiar with the system, people with no previous netting experience, can operate a macronet.

Materials and Methods

The materials and methods described offer an efficient method of handling a 50-T 50/2 1½ inch Terylene 12 shelf macronet of 6,0 x 30,0 m (20 x 100 ft) marketed by Bleitz Wildlife Foundation. However, the system can be adapted for any other macronet, *viz.* Bleitz's 51-T of 9,0 x 30,0 m (30 x 100 ft).

The key to the system is yacht masts and trimmings, particularly the masts of catamaran freshwater sailcraft models 14 and 16. One reason yacht masts and trimmings are preferred is that they are highly rust resistant and designed for rigorous treatment. The masts are constructed from lightweight anodised aluminium-alloy and are elliptical in cross section, which minimizes flexing

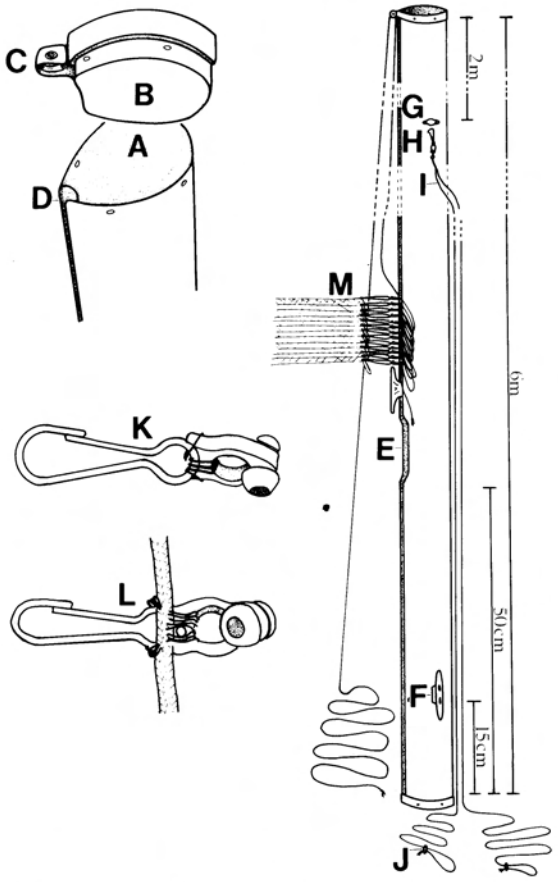

Fig. 1. Schematic diagram illustrating various components used in adapting yacht masts for stringing a macronet.

(Fig. 1A). It is essential that the chosen mastpoles have sailtracks (Fig. 1D). Since the mast length required for the 50-T macronet (=6,0 m; 20 ft) is less than the standard mast lengths of both the models 14 and 16 catamarans, storm-damaged masts can be purchased at minimal cost and the damaged section eliminated when trimming the mast to the required length. It is also possible to have mast subsections welded together by engineering firms equipped to weld aluminium. Welded masts are, however, subject to breakage along welds with excessively rough treatment.

For the 50-T 6,0 x 30,0 m macronet, two anodized aluminium-alloy masts are cut to six-metre lengths. Although this particular net is catalogued as being 6,0 m (20 ft) in height, when strung it measures slightly less. It is essential that the masts be slightly longer than the height of the net, so that it can be hoisted high enough for the bottom string to be *ca* 50 cm off the ground against the masts, to allow for sag towards the middle of the net.

Four plugs are shaped from soft wood to seal off each end of both masts (Fig. 1B). The plugs are then inserted into the open ends of the masts and screwed fast *via* four holes drilled into the mast ends. The plugs are painted a reflective signal red to render the masts more visible to pedestrians and motorists when transported on top of a vehicle. At the upper end of each mast, a stainless steel pulley of appropriate size is screwed onto the plug in line with the sail track (Fig. 1C). If the sail track has no insertion slot, one is machined about 50 cm from the bottom of each mast (Fig. 1E). *Via* this slot, a cleat is later inserted into the sailtrack and tightened in the desired position (described later) by means of its two recessed bolts and nuts. Two further cleats are screwed onto each mast, one on either side, and 15 cm from the bottom (Fig. 1F). These three cleats at the bottom of each mast are useful for winding cord around when transporting the masts.

Two stainless steel eyelets are popriveted to the sides two metres from the top of each mast (Fig. 1G). A set of guy-ropes can be attached to each eyelet, with stainless steel swivel-clips for upright support of the mast (Fig. 1H). Each set of guy-ropes consists of two 7 m long and 3 mm diameter lengths of 150 kg breaking strain nylon cord (Fig. 1I). One end of each length is joined to the swivel-clip and the free ends are fitted with metal slides (Fig. 1J) for adjusting the tension when the mast is erected.

To facilitate supporting the net between two masts, the following has been found to work best. Curtainrail-runners of the type manufactured in plastic are freely available commercially. The soft plastic frame of the unit has to be ground down to 5 mm width to allow it to slide freely between the lips of the sailtrack. The wheels and axle of the unit are manufactured from hard plastic and clip in and out of the frame. Of all the types of curtainrail runners available, the product described and illustrated is found to have the least friction when running in the sail track. Two sets of 13 of these curtainrail-runners are each wired onto an ordinary metal trigger clip as illustrated in Fig. 1K.

Starting *ca* 30 cm from one end of a 16 m long and 3 mm diameter nylon cord, 13 roller-clips are stitched onto the cord at 41 cm intervals (Fig. 1L). The 30 cm short free-end of the cord is then tied onto the cleat, which at this stage of

the assembling process is screwed into the sail track *below* the insertion slot. The tip of the long free-end of the cord is subsequently passed through the inside of the pulley at the top of the mast, and then brought back towards the lower end of the mast. The clip-runners are slipped into the sail-track one at a time as the cord is progressively brought back, until all 13 clip-runners are in the sail track with the leading one against the pulley. The cleat in the sail track is then re-adjusted and tightened just *above* the insertion slot to prevent the clip-runners from falling out of the sail track at any time. With the short free-end of the cord tied down to the lower cleat, the cord is tightened and the long free-end of the cord is wound around the three cleats at the bottom of each mast. The mast is now ready for use, and is normally transported in this condition on the roof carrier of a vehicle. The guy-ropes are unclipped and are transported separately, together with the tentpegs. Since about a metre of the masts extends beyond the front and rear of an average-sized vehicle, it is mandatory to tie a red flag at the rear end of the masts to alert traffic. If rough terrain is to be negotiated, the mast ends should also be tied down to the front and rear bumpers of the vehicle for additional stability.

The masts and net are erected in the following sequence and manner. An area in which to erect the net is selected, for example in riparian forest, with the net close but perpendicular to the streambed. The masts are placed horizontally on the ground roughly in position, *ca* 30 paces apart. At this stage it is essential to ascertain that sufficient space is available under the canopy to raise the net to its full height. One mast is then erected with its sailtrack and clip-runners facing the other mast. The mast is supported in the upright position by means of the four guy-ropes anchored at right angles to each other by large tentpegs. Having at the time of unpacking the net ascertained its exact length when stretched moderately tight (Bleitz 1984), that exact distance is measured with a 30 m measuring tape from the upright mast towards the other one in order to establish the latter's exact location. The second mast is erected on this spot, with the sailtrack and clip-runners facing the first mast. Tall grass and underbrush are subsequently removed along a two metre wide strip between the masts to prevent the net from becoming entangled.

The long free-ends of the mastcords are unwound from the cleats, and their tips are tied to the guy-ropes to prevent the cords from slipping back through the pulleys. The clip-runners are then all lowered against the cleat positioned at the lower end of the sailtrack above the insertion slot. The 13 loops at one end of the net are sequentially clipped onto the clip-runners by two operators, taking care that the premarked loop attached to the double cross-support cord of the net is clipped to the top clip-runner. While the first operator moves towards the second mast progressively paying the net out of the bag, the second operator moves with him but concentrates on keeping the net tight enough to keep it off the ground. Once the entire net is paid out, the first operator slips the 13 suspension loops in sequence over his finger while the second retains the tension on the net. With the first operator then taking the strain, the second person returns to the other end of the net and, by progressively shaking the top cross support free from the bundle of net, moves back towards the first to assess in which direction the net has to be untwisted. Now the net can be clipped onto the second mast. Again the

premarked loop representing the double cross support cord at the top of the net is clipped onto the top clip-runner, and the remaining loops are clipped to their corresponding clip-runners. Provided the distance between the masts was correctly determined for adequate tension on the net, there should now be very little sag towards the middle. The net can now be raised by pulling the clip-runners upwards by means of the long free ends of the mast cords. Lowering the net is achieved by pulling down on the clip-runners.

Results and discussion

Intensive netting over the past three years has consistently proven the superiority of macronets over conventional nets. Six by 20,0 m macronets (with a total surface area of 120 square metres) yielded up to 300 % better returns than serially strung conventional 2,0 m high nets of comparable net surface area. Eighty-five per cent of all bats netted in macronets were above two metres, and consequently would not have been taken with conventional-height nets.

The system described here allows quick and easy stringing and manipulation of a macronet. Erecting and manning such a net requires only two people, depending on their skill and the likelihood of low netting results (*viz.* deserts), two operators can at times erect and man two nets in close proximity during the same trapping period. Since time is often at a premium during field operations, the efficiency of the system has proved itself a valuable time saver in that two experienced netters can erect a macronet in 15 minutes.

The masts used are durable and are light enough for one person to carry for considerable distances, yet they are rigid and extremely tough, capable of withstanding excessively rough treatment. The length of the masts is a disadvantage in terms of storage, handling and transportation. With special arrangements, however, this drawback counts for little when weighed up against the advantages of a high-yield, ready-to-use and versatile system that can be erected in a relatively short time.

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