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A modified pull-net for catching Great Knot at roost sites

Dmitry Dorofeev[1,2], Alexander Matsyna[3], Anton Ivanov[4] & Ekaterina Khudyakova[5,6]

[1]*All-Russian Research Institute for Environmental Protection, 36 km MKAD 1 str 4, Moscow 117628, Russia*
dmitrdorofeev@gmail.com
[2]*Moscow State University, Biological Department, Leninskiye Gory, 1 str 112, Moscow 119991, Russia*
[3]*Ecological Centre DRONT, P.B. 631, Nizhny Novgorod 603001, Russia*
[4]*Timiryazev State Biological Museum, Malaya Gruzinskaya 15, Moscow 123242, Russia*
[5]*Ivanovo State University, Yermak St. 39, Ivanovo Region, Ivanovo 153025, Russia*
[6]*Ivanovo State Agricultural Academy named after D.K. Belyaev, Sovetskaya Str. 45, Ivanovo Region, Ivanovo 153012, Russia*

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Trapping Great Knots *Calidris tenuirostris* at the Khairusova-Belogolovaya river estuary in 2016 using mist nets was not very efficient, with only 14 birds being caught in 13 days. We therefore had to find another capture method. We could not use cannon nets (Minton 2003) as gunpowder is difficult to acquire in Russia and even harder to transport to the research site. In addition, the equipment required is heavy (Standen *et al.* 2014) and therefore difficult to transport to our site. We decided to try to use a pull net (called a Taynik in Russia) and based our design on Bub (1991) and Noskov *et al.* (1984), adapted for Great Knot trapping at roost sites. Our pull net is very light, no more than 7 kg ready-assembled, and uses two elastic pulls, which make it very fast. It is silent and easy to install and can be operated by just two people.

Net construction

Our pull net (Fig. 1) measures 4 x 5.8 m, with netting which is 5 x 6 m, but we would recommend using a larger piece of netting to give more 'bag'. The mesh size is 12 mm each side and the netting thread is 0.8 mm thick. A 7 mm diameter rope which does not have any give (we used a halyard) is tied to the front of the net (Fig. 1, A & B), with about 6–7 m of rope beyond the net on both sides. This is called the main rope (#1 in Fig. 1). A thin rope (3–4 mm in diameter) goes around the edge of the net and is attached in several places. Two rope loops are attached to the back of the net (D & E).

The pull net also includes two 'elastics' (#2 in Fig. 1; we use latex resistance bands that are designed for fitness

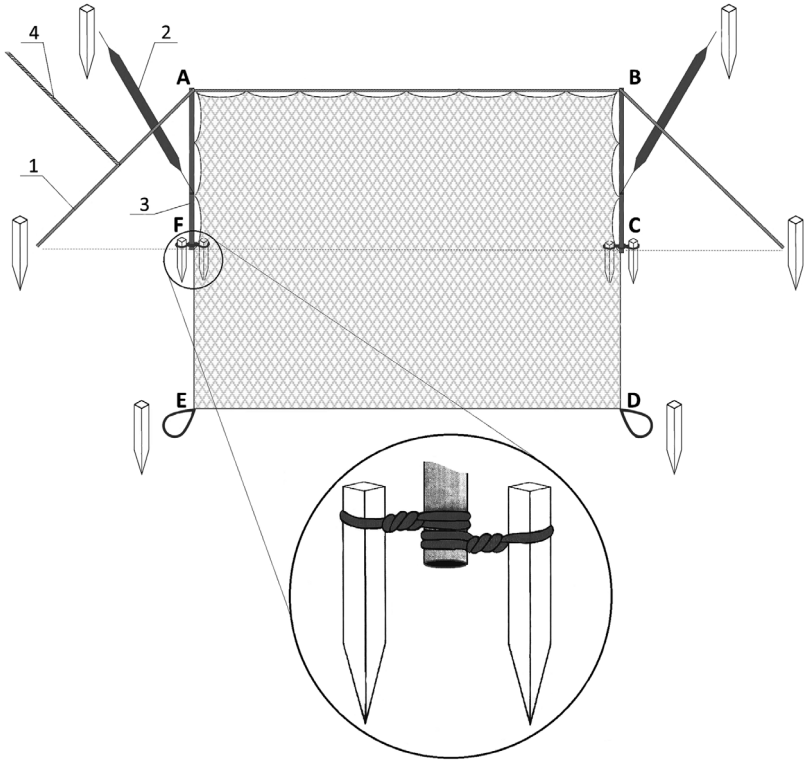

Fig. 1. Diagram of components and assembly of pull-net.

and boxing training), which increase the speed of the net when triggered, and a release rope (#4). Our release 'rope' is thin steel cable 0.6 mm in diameter or braided marine fishing line with a breaking strain of 100 kg. The poles (#3) can be sectional; ours are 2 m long aluminum tube with a diameter of 20 mm and 3 mm walls. The hinge is formed of two pairs of stakes which are driven into the ground about 70–80 mm apart at points C and F. The pole is attached to each stake with two ropes 4 mm in diameter, which are interwoven and are taut when set, forming a hinge on which the pole rotates freely. We use 10 stakes to set the net.

Setting the net

When setting the net, we first spread it out on the ground, then peg the back to the ground with stakes. We then tie the main rope to the poles using clove-hitches (builder's knot) so that the distance between the ends of the poles is equal to the distance between the loops at the back of the net. The result is a rectangle-shaped frame. Next we put stakes in about 2 m away from the net directly out from the hinges and tie the ends of the main rope to them, at equal distances on each side. When attaching the main rope to the stakes, we recommend positioning the poles as if the trap were set. The poles should be slightly angled towards the stake and the main rope should be taut when attached to the second stake so that it is parallel to the back of the net. Two parallel straight lines pass through the pull net: one through the two stakes at the back of the net, and the second through the stakes to which the trap is attached and stakes on which the poles rotate, allowing the trap to rotate on a rigid frame formed by the main rope and two poles.

We use the last two stakes to attach the elastics, which are tied to ropes, to the poles about 70 cm from the hinges (Fig. 2). We check that the elastics will pull when the net is lifting and before it passes the upright position. We attach the release rope (#4) to one side of the main rope, preferably to the middle of the rope.

Once we have set the net, we carry out a test 'fire'. If the trap is constructed correctly, then pulling about 1–1.2 meters of the release rope fires it. Once the net fires correctly, then we set the net and hold the back and sides down with small stones placed along the rope to which the net is attached. The net itself should be furled at the back. Setting the trap takes one person about 1.5 hours; a second person's help speeds it up significantly. We did not camouflage the trap, but we tried to ensure that the poles of the pull net and the stones, with which the trap is held down, were as low as possible and did not prevent Great Knots from going into the catching area (Fig. 2).

We have found that the most common installation error is incorrect mounting of the poles, so that they rotate poorly or skew the trap to one side.

Operating the net

The flocks that we were catching were roosting on the shore of an estuary, on a pebble beach. We normally operate with three or more people; two are on the shore on either side of the net to push the birds towards it and the third person operates the release rope, with radios allowing communication between team members. We found that a flock of Great Knots rarely settles fully in the catching area, but the flock can be carefully moved by approaching it very slowly. Great Knots move away from a person approaching them and can be gently pushed into the catching area. To prevent the birds from missing the trap, we used flotsam (logs, boards, etc.) to construct guide

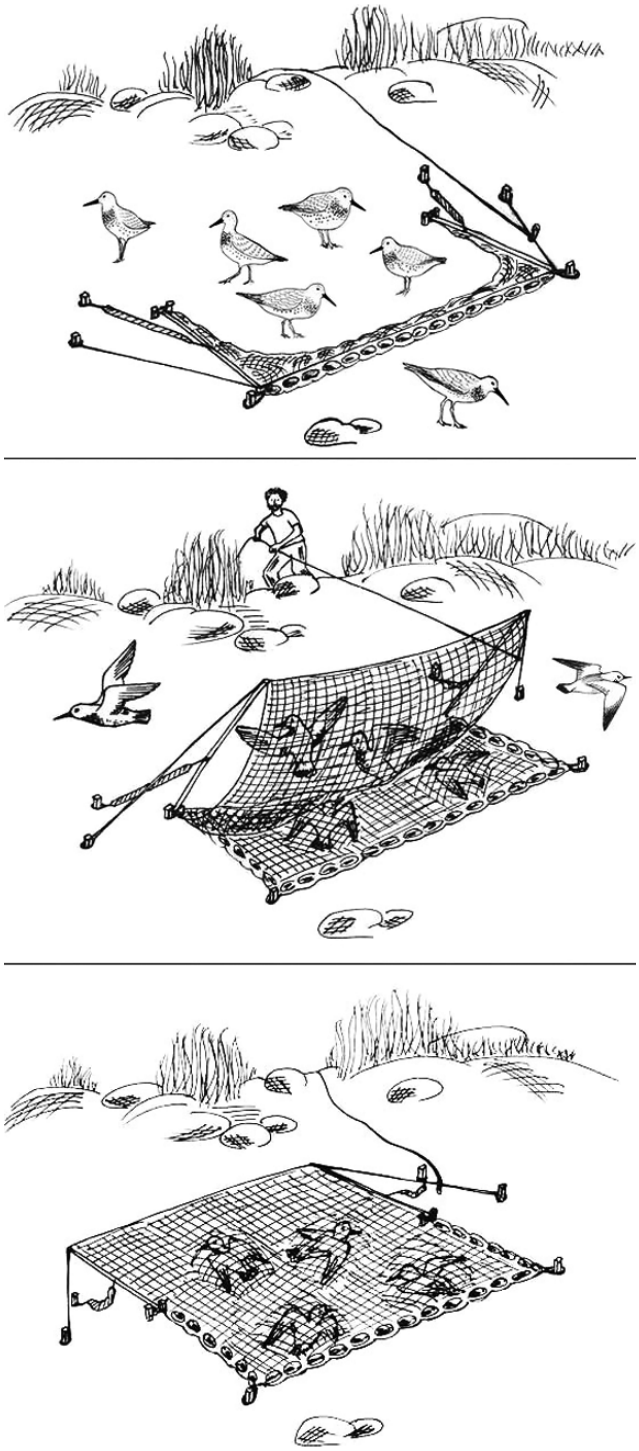

Fig. 2. Recommended set-up and operation of pull-net.

lines, along which the birds go into the trap. It is also possible to use fences, as in walk-in-traps. We found that flocks of Great Knots and Red Knots *C. canutus* can be carefully guided into the trap, but godwits usually fly away.

The pull net is very safe but the area covered by the trap must be free of medium- and large-sized stones, which may otherwise potentially cause injury to the carpals. In addition, it is important to use small mesh (we use 12 mm) so that the birds do not get tangled in the net and are easy to extract.

The pull net is not a substitute for cannon nets. However, two or three people can use it efficiently to catch waders at roost sites. The advantages of this trap are ease of manufacture and installation, simplicity of construction, and that it makes little noise when fired. It is possible to use this trap to catch medium-sized bird species such as terns, passerines, and possibly small waterfowl where they occur in high densities.

During four years of expeditions, we caught and tagged 929 Great Knots and 19 Red Knots. On average, 50–60 birds were caught with each pull, with a maximum of 136. We normally measured, flagged and took blood samples from each bird but, in bigger catches, we only metal-ringed them to speed up the process. Bycatch included Grey-tailed Tattler *Tringa brevipes*, Dunlin *C. alpina*, Red-necked Stint *C. ruficollis* and Lesser Sand Plover *Charadrius mongolus*.

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