Home-made fish traps reduce the capture of small shannies (*Lipophrys pholis*) compared to using hand-nets in the UK.

Chris J. Barrett[1]*, Magnus L. Johnson[2], Susan L. Hull[2]
[1]Cefas, Pakefield Road, Lowestoft, Suffolk, NR33 0HT, England
[2]University of Hull, Cottingham Road, Hull, HU6 7RX, England

Summary
A replicated, controlled study in 2011-2012 found that using home-made fish traps reduced the capture of unwanted, small shannies *Lipophrys pholis* compared to using conventional hand-nets in intertidal habitats.

Background

The common blenny/shanny *Lipophrys pholis* (shanny hereafter) is a cosmopolitan resident of intertidal rocky shores (Barrett *et al.* 2015) and acts as biomonitors of ecosystem health (Horn *et al.* 1999), such as for the detection of organic contaminants, namely polycyclic aromatic hydrocarbons (PAHs), (Lima *et al.* 2008). Shannies mature at ~70 mm total length (before one year of age) and breed and lay eggs in 'nests' within intertidal pools (Martins *et al.* 2017). Various reasons exist for the capture of shannies; fascination by tourists, the need/desire for up-close observations, to monitor population dynamics, etc. (Horn *et al.* 1999). Trapping via hand net is considered the conventional method of capture (described in Gibson 1999 and used as recently as Estekani *et al.* 2020) though net-capture is documented to cause distress and damage to fish if not done with care, which affects their condition and, potentially, their future survival (Gibson, 1999). It is therefore likely that the more stress-prone juveniles might not survive to reach reproductive size and contribute to the adult stock population (Vinagre *et al.* 2018). Owing to the 'pool load capability' hypothesis (Monteiro *et al.* 2005), as a fish grows, the degree of protection and/or food available in a pool is reduced and it is therefore more profitable for such fish to utilise bigger, often deeper pools. If the reverse is true, it is likely that small, juvenile specimens utilise smaller, shallower pools and, as such, might be more easily observed without the need for fish capture. It is likely however that cross-over will occur (i.e. mid-sized pools being occupied by small and large-sized shannies). In this study, we investigated whether the capture of unwanted, small, juvenile specimens could be avoided using home-made bottle traps, instead of other traditional methods of intertidal fish capture such as hand nets.

Action

We selected two rocky shore sites for the study; one on the Isle of Anglesey, Wales (53°13'03.5"N 4°30'31.8"W), and the other in north Yorkshire, England (54°12'58.1"N 0°15'49.8"W).

*corresponding author: christopher.barrett@cefas.co.uk

Between April 2011 and June 2012, in spring, summer, autumn and winter, we tested the use of home-made bottle traps in capturing large shannies, compared to using hand nets. Bottle traps, adapted from those used to capture terrestrial newts (Smith & Sutherland, 2014), were made from two-litre drinking bottles. The capped end was cut off to create a larger opening, then the top, narrower part of the bottle, was cut off, turned around, and placed back inside the bottle, forming an inward-facing funnel (Figure 1). Holes were made into each side of the top end and a long loop of string was attached. Bait (out-of-date minced beef; approximately 15 g) was placed into the end of the bottle and stones were added to create negative trap buoyancy in the pools. Within each of the six seasons at both sites, 10 traps were deployed per site; five in medium (average 40 cm depth, 120 cm length, 98 cm width), and five in large-size pools (average 64 cm depth, 286 cm length, 148 cm width). Traps were laid on the bottom of a rock pool with the string trailing out of the water. A diagram is given in Figure 1, along with a photograph of captured shannies.

Figure 1. A graphic of a bottle trap (top) and photograph of captured, large shannies (bottom). Based on observations, the graphic shows how larger fish tended to enter the trap and take bait first, whilst smallest fish were last. Once inside the trap, fish had difficulty relocating the entrance and no escapes were observed.

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Traps were left for 45-60 minutes following their deployment (which usually took up to five minutes to ensure the traps were negatively buoyant and to ensure the traps were staying horizontal on the bottom of the pool, without rolling or rising) then retrieved using the string. Furthermore, hand nets (8" square nets comprising 0.3mm diameter mesh) were used in ten pools; in five small pools (average 26 cm depth, 63 cm length, 46 cm width) and in five medium-size pools (dimensions aforementioned), to capture fish under rocks and within algae. Nets were used for ~10 minutes per pool unless there was reason to believe fish remained in a pool, in which case, netting continued for another five minutes per pool. In total, 20 (five small, upper shore; ten medium, mid shore; five large, lower shore) pools per site per season were sampled. Captured fish from each pool were placed onto a tray containing pool water. The trays had laminated graph paper fixed to their base; fish in the trays were photographed for total length to be calculated later. All fish were returned to their original pools.

Consequences and discussion

From the ten mid shore pools that were sampled, where both traps and nets were utilised, 21 shannies were caught using traps in five pools (three in Anglesey, two in Yorkshire) and 54 were caught using nets in nine pools (four in Anglesey, five in Yorkshire). Those caught in traps were significantly larger (median = 82.7 mm, range = 70-100.5 mm) than those caught in nets (median = 28.3 mm, range = 18-73.6 mm): (Mann Whitney U-test, W = 1489, d.f. = 20,53, $p < 0.001$). In all cases (Figure 2), trap-caught fish were at or above their size of maturity (70 mm on average; Faria *et al.* 1996)). No other species were caught in traps, though a small number of long-spined scorpion fish *Taurulus bubalis* were incidentally caught in nets.

We propose that capture of large shannies using traps is an effective alternative to using hand nets and avoids the capture of small shannies, which might become stressed or damaged if net-caught. The evidence we have demonstrated would be beneficial for conservation and scientific practitioners, to help minimise the potential impact of capturing intertidal fishes.

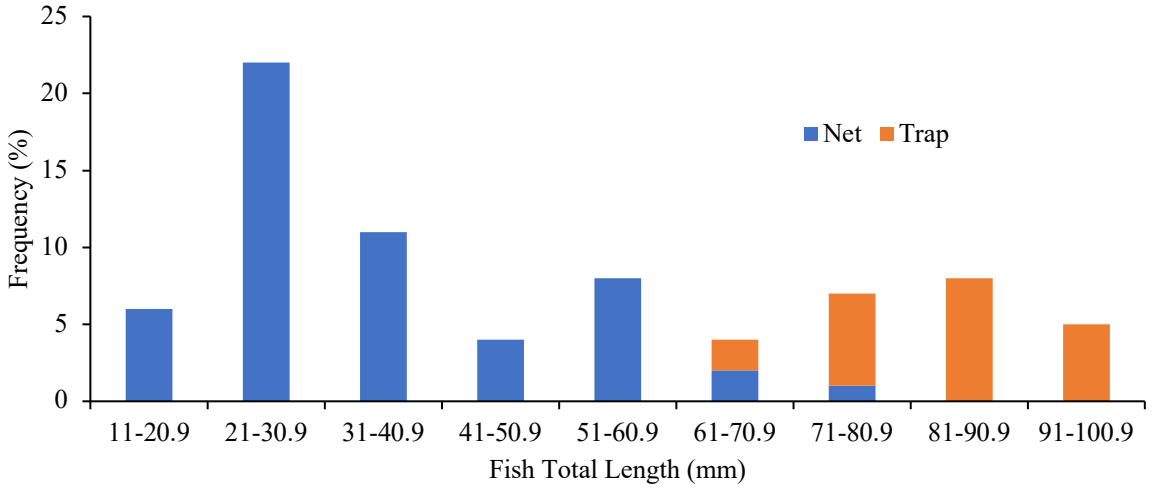

Figure 2. Size histogram of shannies caught using nets and traps from mid-size pools in relation to their average size of maturity (vertical dashed line).

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