Provision of nesting boxes for Dippers *Cinclus cinclus hibernicus* - Monitoring Report

Action C9

LIFE09 NAT/IE/000220 BLACKWATER SAMOK

June 2015

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I.R.D. Duhallow Ltd.

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Executive Summary

The River Allow was surveyed at the onset of the LIFE project to determine the distribution of Dipper and their nest sites. Dippers will often nest in crevices or on ledges. Such habitat is available underneath or along the sides of old bridges. However, where concrete reinforcement has been undertaken, these crevices are often infilled. In addition, new bridges constructed from cast concrete do not provide suitable habitat to support dipper nests. Therefore, particular survey attention was paid to all road bridge sites, to determine if Dipper were using them for nesting or the suitability of such sites for nesting. Where nests were not found, an assessment was made to determine if a suitable nesting platform could be installed in the form of an artificial nest box or ledge.

The distribution of Dipper nests was mapped on GIS and potential locations for the installation of artificial nest platforms identified.

Available Dipper nest box designs were researched. Two designs were selected (a wooden ledge and a circular corrugated pipe). Most bridges along the River Allow Catchment are relatively low, so the wooden ledge design was customised to adapt it for local conditions and make it less vulnerable to vandalism.

One of each design were installed under 10 bridges within the River Allow catchment (i.e. along the Rivers Allow, Dalua and Brogeen).

On the first year of installation (2012), there was a 40% uptake. Birds showed a preference for the wooden shelf design over the circular pipe. The latter offered little protection against the wind as due to the curvature of the underside of the bridges, it was only possible to install them parallel to the river flow making them exposed to the prevailing wind blowing under the bridge.

In the second year (2013), the design of the pipe was modified, on advice from the Duhallow Birdwatch Group, by placing a wooden baffle in the centre of the pipe offering protection against the prevailing winds. In 2012 birds showed a complete preference for the modified pipe design and no new nests were recorded on the wooden shelf.

In year three (2014) the nest platforms were cleared of all nests prior to the nesting season. This time nesting was noted under six bridges.

In (2015) nests were installed along another 10 bridges, bringing the number of bridges up to 20.

The nest box designs were featured on the Birdwatch Ireland eWings Magazine and have been subsequently placed in a number of other areas (e.g., MulkearLIFE, National Roads Authority projects).

Background

Cinclus cinclus hibernicus is a sub-species of dipper endemic to Ireland (O'Halloran, *et al.*, 1992). It is a strictly riverine passerine found throughout the country (Smiddy, *et al.*, 1995). The most suitable habitat for dippers is fast flowing well oxygenated riffle areas of rivers and streams (Sorace, *et al.*, 2002; Arizaga, *et al*, 2009). Here they feed on invertebrates found in the substrate of the channel (Taylor & O'Halloran, 1997; Sorace, *et al.*, 2002). Dippers have the ability to swim under water and walk along the riverbed looking for prey items (Shaw, 1978; D'Amico, 2010). Because they are dependent on the availability of invertebrates (Sorace, *et al.* 2002; D'Amico, 2010), they are equally susceptible to changes in water quality. Sorace *et al* (2002) describes them as an indicator species, as an abundance of dippers in a river system suggests high numbers of invertebrates due to good water quality.

Dippers will nest in crevices of large rocks, disused drainage pipes, ledges and bridges (Copland, 2007; Smiddy, *et al.*, 1995). A study of nesting dippers in Southwest Ireland (Smiddy, *et al.* 1995) found that bridges are a favoured nesting site for dipper (86% of the nests monitored were under bridges). Bridge repair and renovation is important to maintain and improve infrastructure in the area but many modifications can reduce the availability of nesting sites for dippers (Copland, 2007). By installing artificial nesting units, dipper numbers in an area can increase (Copland, 2007; Du Feu, 2005).

Action C9 of the Blackwater SAMOK LIFE project (DuhallowLIFE) involved inspecting the bridges that span the Allow River for dipper nest site suitability. Ten bridges were deemed unsuitable for nesting without the provision of nesting supports or boxes. Two designs (ledge and pipe (*See appendix*) were developed and installed. Each bridge was subsequently monitored for dipper nest uptake during each breeding season.

This report shows the results of monitoring artificial nest units for dipper nests at all 10 sites.

Site Description

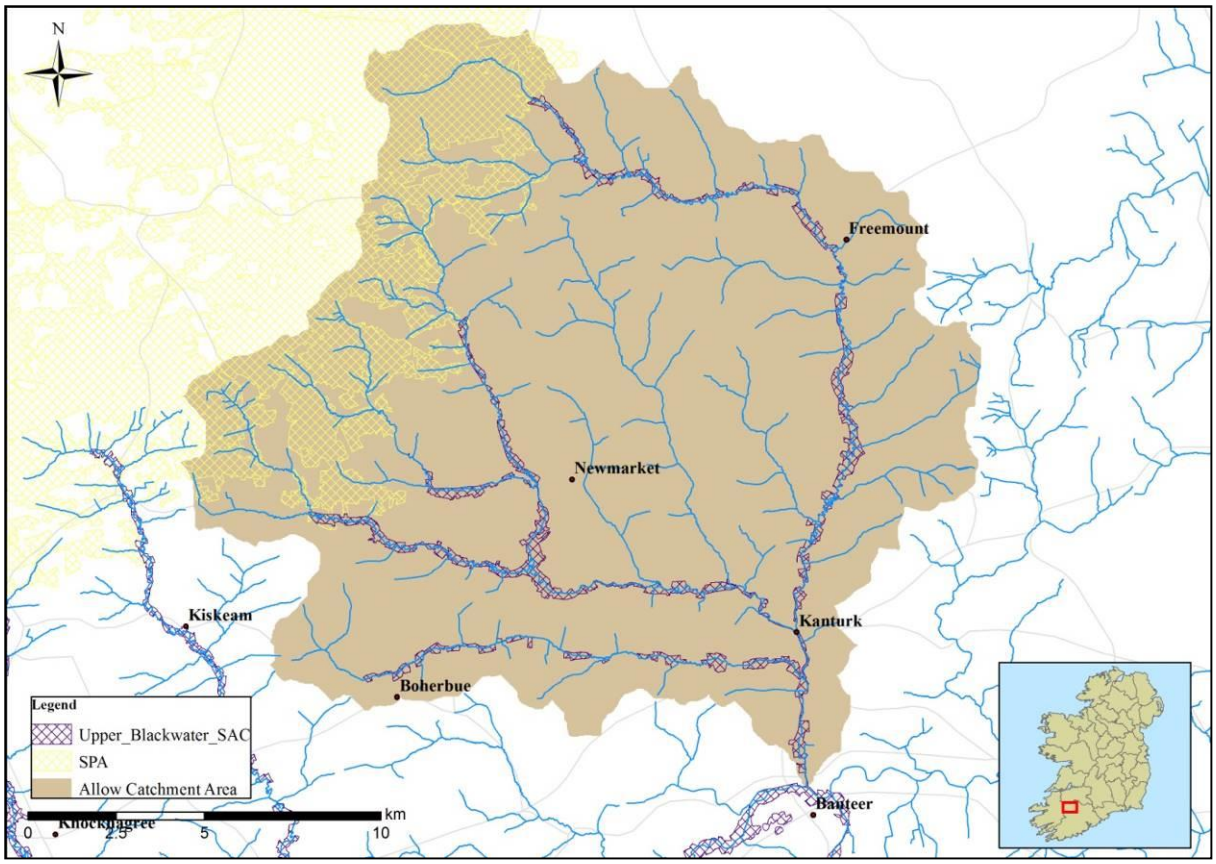

Figure 1 River Allow catchment area targeted by the DuhallowLIFE Project (LIFE09 NAT/IE/000220 Blackwater SAMOK)

The River Allow catchment is 310km^2 (*Figure 1*). The three major rivers that drain the catchment are the Allow, Dalua and Brogeen. The main agricultural land use in the catchment is pasture with dairying and sucklers forming the majority of farming practices.

The majority (70%) of the soils in the Allow catchment are deep, poorly drained mineral soils. Blanket peat covers approximately 5% of the catchment, mostly in upland reaches. Mineral alluvium is associated with the river channels, while shallow well drained mineral soils make up the remaining soil type in the catchment (EPA/Teagasc, 2006; Tedd, 2014).

The River Allow catchment rivers (Allow, Dalua, Brogeen, Glenlara and Owenkeale) form part of the Blackwater River (Cork/Waterford) Special Area of Conservation (Natura 2000 site code: 002170). These tributaries provide important habitat for Freshwater pearl mussel *Margaritifera margaritifera*, Atlantic salmon *Salmo salar* and European otter *Lutra lutra*, all of which are listed in the Annex II of EU Habitats Directive.

The upper reaches of the Allow catchment contain the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle Special Protection Area, which was designated as such for Hen Harrier *Circus cyaneus* (listed in Annex I of the EU Bird's Directive).

Methodology

- In April 2011, the bridges that span the Allow River (n=16), one bridge over the Dalua and one crossing the Brogeen were inspected for dipper nests and potential nesting suitability (e.g. crevices, ledges, etc.).
- Where nesting opportunities were deemed insufficient, suitable habitat was assessed to determine whether artificial nest boxes would increase the likelihood of dippers nesting under the inspected bridge.
- Ten bridges in total were chosen to have nest boxes installed underneath them (Figure 2).
- Two types of nesting unit were designed: ledge and pipe (*see* Appendix). The ledge type (made from marine plywood) is based on the design outlined by Copland (2007) but was modified to suit the low bridges found in the Allow catchment. The pipe (corrugated plastic) was inspired by Hobson (2014). Both types were used under each of the ten bridges.
- In January 2012, the nesting units were assembled in a workshop on the grounds where IRD Duhallow is based. Rural Social Scheme (RSS) participants manually constructed the units before they were brought on site to be installed under the chosen bridges. A strip of galvanised fixing band was attached to each unit and then secured in place under the bridge.
- Bridge type was determined, as was height, width and immediate habitat.
- During each nesting season following the installation of the nesting units, each bridge was inspected for dipper nests and the aspect of nest entrance was recorded.
- A paired t –test was used to determine whether there was any significant difference between nesting years. Pearson Correlation Coefficient tests were conducted to determine a) whether or not there was any correlation between the type of nest unit and the direction in which the entrance to the nest was positioned and b) whether there was any correlation between total volume of the nests and the volume of the interior nesting cavity.
- After the breeding season in 2014, all nests were removed. The volume of the interior cavity of each nests was measured by inserting a plastic bag into the nesting chamber and pouring water from a 2l bottle into the bag. At the point where the water was about to spill from the cavity the remaining water was measured, thus determining how much

water filled the cavity. This was done to ascertain if there was any correlation between nest size and cavity volume and to investigate whether nest box design influenced the size of the nest cavity.

- In 2015, ten more bridges in the catchment (specifically the Dalua and Brogeen) had the two types of nesting unit installed under them. Due to persistent high water levels it was not possible to install these nest boxes until after the nesting season had finished, when water levels had dropped to a level commensurate with health and safety requirements.

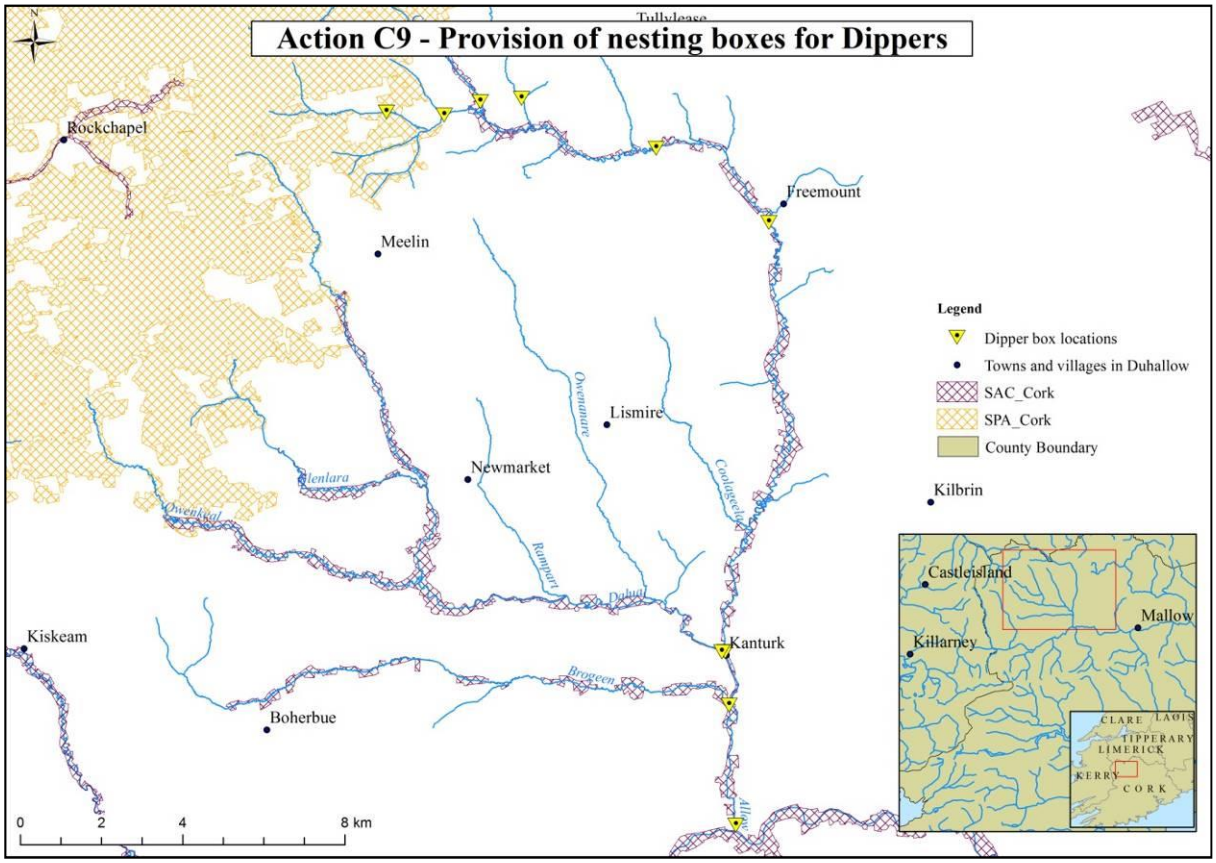

Figure 2 Location of nesting units for dippers.

Results and Conclusions

The majority of failed nests and chick mortality among dippers in mainly due to human interference (Asadi, et. al., 2015). This was certainly evident during the intial bridge survey. A dipper nest that was observed at Rowls Langford South was discarded by an unknown person after the tree in which the nest was built was cut down. The nest was subsequently examined upon discovery and dead dipper chicks were found within (Appendix 1). This put an empashise on the requirement for nest units, modified to suit the bridges of the Allow, for dippers in the area.

During the first year of installation (2012), there was a 40% uptake of bridge sites. Birds showed a preference for the wooden shelf design over the circular pipe (Table 3). The latter offered little protection against the wind and there was no uptake recorded. Due to the curvature of the underside of the majority of the bridges in the catchment, it was only possible to install the nest pipes parallel to the river flow, increasing exposure of the cavity to the prevailing wind blowing under the bridge.

Table 1 Results of annual monitoring of artificial dipper boxes in the Allow Catchment

Location	2012		2013		2014		2015	
	Ledge	Pipe	Ledge	Pipe	Ledge	Pipe	Ledge	Pipe
Leader's Bridge	0	0	0	0	0	0	0	0
Paal East	**1**	0	0	0	**1**	0	**1**	0
Greenane Bridge	0	0	0	**1**	0	**1**	0	0
Kanturk Bridge	0	0	0	0	0	0	0	0
Allow Bridge	**1**	0	0	0	**1**	0	0	**1**
Raheen Bridge	0	0	0	0	0	0	0	0
Knocktoosh	**1**	0	0	**1**	0	**1**	0	**1**
Rowls Langford North	**1**	0	0	0	**1**	0	**1**	0
Rowls Aldworth	0	0	0	**1**	0	**1**	0	**1**
Rowls Langford South	0	0	0	**1**	0	**1**	0	**1**

In the second year (2013), the design of the pipe was modified on advice by the Duhallow Birdwatch Group by placing a wooden baffle in the centre of the pipe to offer protection against the prevailing winds. In 2013 birds showed a complete preference for the modified pipe design and no new nests were recorded on the wooden shelf.

In year three (2014) the nest platforms were cleared of all nests prior to the nesting season. This time nesting was noted under 7 bridges (i.e. 70%) of sites occupied (pair of boxes per

site). A statistically significant increase in nests was recorded between 2013 and 2014 (p = 0.04, paired t-test). This is due to the addition of wooden baffles and the removal of old nesting material.

In 2015, dipper nests were found at six bridges; two ledges and four pipes.

There was a significant correlation (*r=0.6331*) between the type of nest unit and the direction in which the entrance to the nest was positioned. Dippers building nests in the pipe design tended to prefer having the entrance to the nest facing downstream (Table 6).

Table 2 Aspect (upstream; u/s, or downstream; d/s) of entrances to dipper nests recorded in the artificial nest units of the duration of the LIFE Project.

	2012	Aspect of Nest entrance	**2013**	Aspect of Nest entrance	**2014**	Aspect of Nest entrance	**2015**	Aspect of Nest entrance
	Type		Type		Type		Type	
Paal East	Ledge	u/s			Ledge	u/s	Ledge	u/s
Greenane Bridge			Pipe	d/s	Pipe	d/s		
Allow Bridge	Ledge	u/s			Ledge	u/s	Pipe	u/s
Raheen Bridge								
Knocktoosh	Ledge	u/s	Pipe	d/s	Pipe	d/s	Pipe	u/s
Rowls Langford North	Ledge	u/s			Ledge	u/s	Ledge	d/s
Rowls Aldworth			Pipe	d/s	Pipe	d/s	Pipe	u/s
Rowls Langford South			Pipe	d/s	Pipe	d/s	Pipe	d/s

Nest volume varied depending on nest unit utilised and where the nest was constructed (Table 7). However, there was no significant correlation (*r = 0.1273*) between the total volume of the nests and the volume of the interior nesting cavity.

Table 3 Dry weight, total volume and cavity volume of each of the nests examined in 2014

Nest Type	Dry Weight (g)	Nest Volume (cm^3)	Cavity Volume (ml, H_2O)
Pipe	189.5	12813.03	1526.25
Pipe	386.2	23142	1159.55
Pipe	259.9	7743.84	1306.93
Pipe	421.7	16492	1433.55
Ledge	924.75	38102.4	1539.7
Ledge	399.4	16144.59	425.5
Ledge	428.2	10577.49	1458.7

All of the bridges that had positive results over the four-year period (i.e. a dipper nest was built in an artificial nest unit) were located near suitable conditions for dippers. These include shallow fast flowing water, riffles and rocky outcrops (Smiddy, *et al*, 1995; Sorace, *et al.*, 2002; Taylor & O'Halloran, 1997). The three bridges that failed to have any uptake in dipper nests

are Leader's Bridge and Kanturk Bridge and Raheen Bridge. It is unclear why these bridges were not selected, although two had the highest arches of all ten bridges.

The percentage uptake for the artificial nest units on the Allow and Brogeen Rivers is comparable to similar programmes in Ireland, the UK and USA. Artificial nest boxes, made from recycled material from old car seats, installed in Co. Wicklow had a 72.7% success rate (Burns, 2014). Cross and Smith (2013) reported that of the 141 dipper pairs recorded in their study, 85 (60.3%) were nesting in boxes installed in the River Teme catchment. Only 25% of the 12 nest boxes installed by Hawthorne (1979) were utilised by American dippers (*Cinclus* mexicanus). The study did show however that only the boxes secured to vertical, permanent structures (e.g. bridges and walls) had nests built in them.

The renovation of many bridges along the Allow River may have resulted in the lack of suitable nesting sites for dippers. The provision of artificial nest units under these bridges has resulted in a significant increase in nesting opportunities along the River Allow. The average uptake of nests over the four years is 50.25%. This was increased to 65% through the placement of the wooden baffles to the pipe design and cleaning and removal of old nests from the units. This high nesting success indicates the Allow River provides suitable habitat for *Cinclus cinclus hibernicus*. Artificial nest units, be they box, ledge or pipe, provide secure nest sites and can be the preferred option for dippers (Cross & Smith, 2013).

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Appendix 1 Details of bridge sites

Table 4 Locations and grid references (ITM) of where the artificial nest units were installed

Bridge	Grid Reference (ITM)
Leader's Br.	538459, 598948
Paal East	538290, 601911
Greenane Br.	538188, 603228
Kanturk Br.	538106, 603226
Allow Br.	539266, 613824
Raheen	536493, 615656
Knocktoosh	533162, 616888
Rowls Langford N	532156, 616809
RowlsAldworth	531263, 616471
Rowls Langford S	529844, 616554

Table 5 Characteristics of bridge site (n = 10) where nest units were installed

Bridge	**Elevation (m)**	**River Width (m)**	**River Depth (m)**	**Bridge Width (m)**	**Arch Height (m)**
Leader's Br.	78	35	0.8	8	6
Paal East	80	7.5	0.4	8.5	2.75
Greenane Br.	87	22	0.15	10	6
Kanturk Br.	87	17	0.3	8	3
Allow Br.	138	10	0.7	6	5.5
Raheen	157	8	0.25	6	3.5
Knocktoosh	223	2	0.25	4	2.1
Rowls Langford N	189	6.5	0.4	5	4
Rowls Aldworth	203	6.5	0.4	5	4
Rowls Langford S	217	4	0.3	4	2.5

Table 6 Summary of artificial dipper nest unit uptake over a four year period

Year	**Ledge**	**Pipe**	**Total**
2012	4	0	4
2013	0	4	4
2014	3	4	7
2015	2	4	6

Table 7 Frequency of total uptake of nest units installed in the Allow Catchment

Year	**Bridges examined**	**Total**	**Frequency (%)**
2012	10	4	40
2013	10	4	40
2014	10	7	70
2015	10	6	60

Appendix 2 Human Interference

Figure 3 Rowls Langford South. (Inset: Dipper Nest in tree branch. The branch was cut down in July 2011 and the nest, with chicks, was discarded (Figures 4 & 5). It is unknown who did this. Nesting units were installed after this event with uptake in 2013, 2014 and 2015.

Figure 4 Dipper nest discarded after it was cut down with an overhanging branch (Rowls Langford South)

Figure 5 The discarded nest was opened and the remains of dipper chicks were found inside. Note: skull of chick (circled)

Appendix 3 Construction of artificial nests

Figure 6 Artificial nest unit designs (pipe on left, ledge on right) developed and tested at 10 bridges.

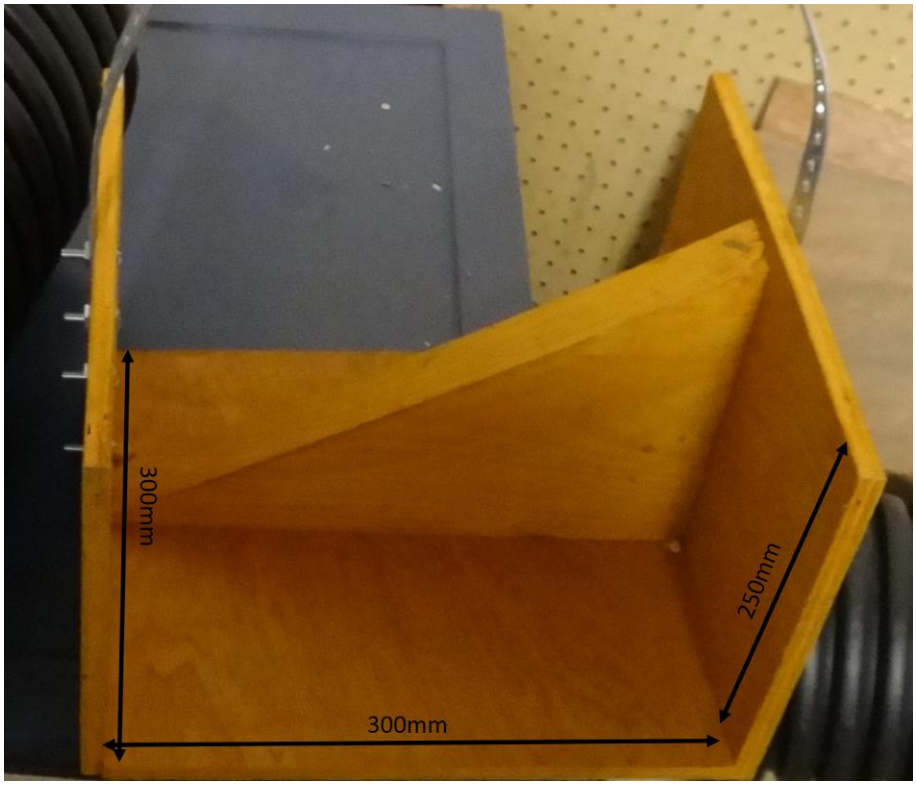

Figure 7 Details of the timber ledge design.

Figure 8 Dimensions of Pipe design. A disc shaped wooden baffle is inserted midway along the inside of the pipe.

Figure 9 Pipe style unit with dipper nest at Rowls Aldworth

Figure 10 Ledge style unit being used by dippers in Knocktoosh (note the pipe style unit in the background)

Figure 11 School pupil inspecting an old dipper nest during one of the school visits (Action D2)

Appendix 4 Artificial nests in situ

Figure 12 Leader's Bridge. No nests were built in the units provided throughout the duration of the project.

Figure 13 Paal East (Bridge near Kanturk Castle). Inset: Occupied ledge type nest unit (2015).

Figure 14 Greenane Bridge (RSS participants installing ledge type unit. Inset Dipper nest in pipe type nest unit (2013)

Figure 15 Kanturk Bridge. No nests were built in the units provided throughout the duration of the project.

Figure 16 Allow Bridge. Inset: Dipper nest in ledge nest unit (2012)

Figure 17 Raheen Bridge No nests were built in the units provided throughout the duration of the project.

Figure 18 Knocktoosh (Dipper nest in ledge unit in foreground (2012). Inset: dipper (*C. cinclus hibernicus*) near its near in Knocktoosh.

Figure 19 Rowls Langford North. Inset: Dipper nest in ledge type unit (2012)

Figure 20 Rowls Aldworth. Inset: Dipper nest in pipe unit (2015).