THE ARCHAEOLOGY OF ORNITHOLOGY; THE RITUALS OF RINGING - LUNDY'S HELIGOLAND TRAPS IN CONTEXT

By

JOHN SCHOFIELD
English Heritage, National Monuments Records Centre,
Kemble Drive, Swindon SN2 2GZ
e-mail: john.schofield@english-heritage.org.uk

ABSTRACT

Lundy's two existing Heligoland traps – Quarter Wall and the Terrace Trap – are closely associated with the Lundy Field Society, with its formative years, its central role and purpose in conservation and research, and with the conflicts of interest the Society has occasionally run into with the island's leasees and managers. This gives the traps significance as 'monuments' to the Field Society's existence and its achievements thus far, perhaps more so than with any other single place, excepting the Old Light where early Field Society meetings were held. Beyond this local interest is a move within heritage management circles and within the practice of archaeology to recognise that modern changes to the landscape, and recent buildings and monuments, are just as much a part of the cultural heritage as those of earlier date. Thus the Heligoland traps have a wider interest, being representative of the growth of ornithology as a largely twentieth-century pursuit, as well as being an unusual and curious monument type of this period. As this type of structure has never before been assessed or even considered in these terms, rather as a functional structure for trapping and ringing birds, they are here examined in the same way as any other class of archaeological site. The questions are put: how significant are Lundy's two Heligoland traps? Why do they matter, and to whom?

THE RISE AND RISE OF ORNITHOLOGY

Although its origins are earlier and complex, bird watching as a social and leisure pursuit is essentially a twentieth-century phenomenon. The Royal Society for the Protection of Birds for example began life in 1889, and by 1899 had over 150 branches and 20,000 members, mostly women (Moss, 2005, p. 72). It continued to grow exponentially through the twentieth century as more leisure time was available, coincident with the growth of other leisure pursuits including archaeology. In North America interest in bird watching and bird protection developed in parallel. And, as Moss, (2005, p. 85) explains, the gradual change in attitudes both here and in the 'States, from an era where collecting birds was normal practice, to one where protection was paramount, came just in time. The sweeping urbanization and industrialization of the twentieth century would bring unprecedented habitat loss leading to many species coming under threat.

Table 1. Some classes of bird trap (after Bub, 1991)

Fall traps
Small and medium-sized funnel traps
Large funnel traps and sets with long leads
Installations for catching ducks and other water birds
Cage traps
Pit traps
Traps for catching Grouse
Stationary nets
Drop nets
Aerial clap nets
Traps for bats and flying foxes
Bow nets
Dip nets
Hedge net
Tent net
Pull nets
Cannon netting

In line with an emerging interest in contemporary archaeology and heritage (e.g. Bradley *et al.*, 2004 & www.changeandcreation.org), the material evidence for this activity constitutes a fascinating and significant record; a wonderfully eclectic and obscure 'archaeology of ornithology'. Here the focus is on Heligoland traps, but a wide range of artefacts and sites exists within this field, the sites displaying a broad and diverse range, and the artefacts a typology that reflects emerging technological development and refinement. To give an example of the diversity of categories, classes or types of monument, or areas with distinctive landscape character, we can recognise for example: reserves and habitats (e.g. Axel & Hosking, 1977), altered specifically to attract wildlife, and within these reserves can be artificial islands, scrapes, artificially created woods, paths, visitor centres with car parks, and bird hides; bird observatories (of which eighteen exist now in the UK); decoys for trapping birds; and some classes of traps for ringing. Bub's excellent and comprehensive *Bird Trapping & Bird Banding* (1991) is effectively a handbook of bird trap types, a field guide by which traps can be designed and constructed, but also – for archaeologists – a guide to their identification in the field, even where the traps are ruined or the main infrastructure removed. Bub identifies 'large funnel traps and sets with long leads' as one of at least seventeen classes of bird trap (see Table 1 for details), within which are seven separate types, the Heligoland trap being only one (Table 2) of which there are various sub-types (see below). Some of these classes and types of trap are fixed installations, though most are portable. The diversity of trap types is considerable therefore, with the type of trap selected for each situation depending principally on terrain and the species of bird being targeted. Of the artefacts, rings (see below) and ringing equipment predominate, including as we have seen portable traps such as mist nets, while binoculars have developed in terms of their reduced size and weight and increased sophistication largely due to their use in watching wildlife. Field identification guides are another part of this assemblage, representing amongst other things changes in our understanding of bird distribution, habitat preference and behaviour, and the different ways information is presented to an increasingly enthusiastic and informed public.

Table 2. Types within the class 'Large funnel traps and sets with long leads'

Heligoland trap (for sub-types see text)
Simple funnel nets
Portable funnel traps
Slit funnel traps
Orchard trap
Drop curtain trap for geese
Ladder entrance trap for crows, raptors and Collared Doves

Within this wider context attention now turns to the specific activity of bird ringing, and the use and significance of Heligoland traps.

RINGING

Moss (2005, p. 95-6) associates the growth of interest in bird-watching through the twentieth century with developments in the more serious side of ornithology, such as migration studies and bird ringing (or banding, in American usage). Birds had been marked as early as 1740 when Johann Leonard Frisch proved that swallows did not hibernate under ground by tying coloured threads to their feet. When the birds returned the following year, he showed that the threads had not lost their colour. In 1890 a private landowner in Northumberland was the first to use aluminium rings, placing them around the legs of young woodcocks to study their movements. Kear (1990, p. 126) notes how wildfowl figures prominently in the early days of ringing, while H.C.C. Mortensen (1950) was the first ornithologist to mark birds extensively for science. He began large scale migration research in 1899 with starlings, fitting their legs with strips of aluminium stamped with numbers and letters and bent to the required shape. But of 1500 starlings ringed, he heard news of only three. The practice of ringing birds grew rapidly between the two world wars, developing into the national scheme now run by the British Trust for Ornithology. There are currently 2000 ringers in the UK, ringing between 800,000 and 850,000 birds a year (Richard Castle, pers. comm.). In the 'States, bird 'banding' began in 1909. By 1933 there were 2000 licensed ringers banding an annual total of 1.5 million birds.

A major advance in the long-term study of larger birds came with the production and use in 1967 by The Wildfowl Trust of plastic rings that could be deciphered at a distance on the living animal. They are made of 'Darvic', a coloured laminated PVC with individual letter and number codes engraved so they can be read in the field (Kear, 1990, p. 128). Other techniques now available (and which together contribute to an increasingly sophisticated assemblage of ringing–related artefacts) include: wing tags (brightly coloured plastic tags attached to the birds' feathers); false feathers, the process known as 'imping', or replacing a real feather with a brightly coloured alternative; and the use of harmless colour dyes. Radio transmitters can be attached to birds, for satellite tracking, while head and neck markers can be used in addition to the field-readable rings described above. These can include nasal discs and nasal saddles, and neck collars for larger birds such as geese.

Much can be learnt from ringing. Most significant is information on migratory behaviour and mortality rates, information that is vital for bird conservation. As in most other fields of research, including archaeology, knowledge and understanding continue to improve and develop. After over ninety years of bird ringing in Britain and Ireland, new information on migration routes and wintering areas continues to be discovered. Ringing also provides details of how many young birds leave the nest and survive to become adults, and how many survive the stresses of breeding, migration and severe weather (www.bto.org/ringing/ringinfo). In an earlier review, Williamson (1957) noted that a detailed history of the moulting sequence in any particular species also requires the collection and arrangement of a number of individual records, while equally the study of ectoparasites and their relationship to the host required its capture (Williamson, 1957, p. 218). As Kear (1990, p.130) has said, the breeding success of any bird and the chances of it dying change with age, but only by studying individuals, marked as juveniles, over their whole life-span can we discover at what age they are most likely to breed well or die. We can explore aspects of natural selection using ringed birds because individual differences in lifetime breeding success are the most important components of evolutionary change.

HELIGOLAND TRAPS

As we have seen, Heligoland traps are one of many ways to trap birds. But Heligoland traps have a certain scientific and historic status, and a romantic appeal, given their place of origin, their name, their evolution from traps used for hunting, and their success in trapping particular species of bird. These traps are fixed ('monumental') and distinctive structures; they were the first permanent form of bird trap to be used to monitor bird populations and migration, and they originate in the unlikeliest of places: Heligoland. But what of the traps themselves, as places, as monuments to the growth of ornithology?

Although every trap is different, there are some distinct sub-types, as described by Williamson (1957, p. 215-6). The basic and classic Heligoland trap (the 'model', shown in Figures 1 and 2) is the first, with its wide entrance commanding open ground or natural cover. Brownlow (1952, p. 387) describes the classic trap thus:

> "A tapering wire netting enclosure open at the wide end, and closed at the narrow end by a collecting box with a transparent back, which appears to birds driven into the trap as a way of escape, and enduces [sic] them to enter the box. Traps are set up over places where birds collect to feed, rest and roost. They are designed to catch larger numbers of birds than are obtained in smaller portable traps. They involve considerable outlay of effort, materials and expense, and are, therefore, only worth erecting at places where information of genuine scientific value may be obtained from the results of trapping."

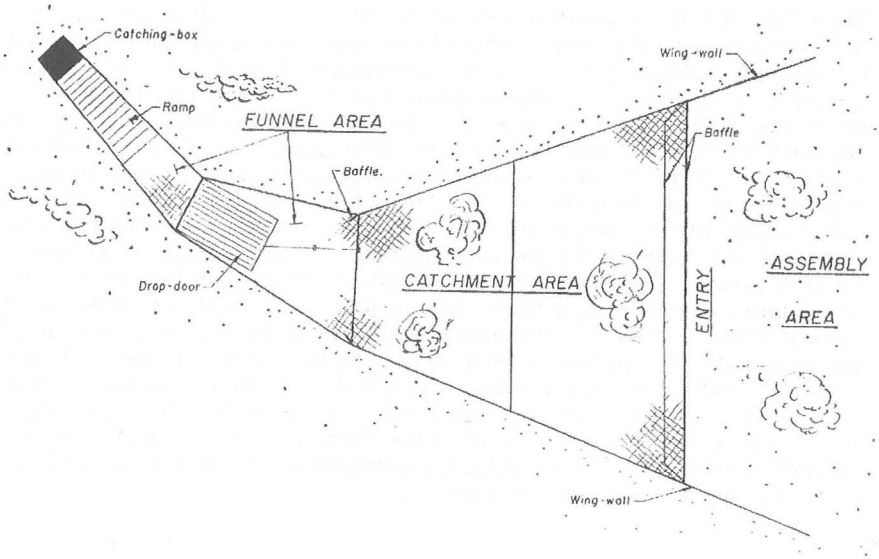

Figure 1. Plan of a classic Heligoland trap, after Woodford & Hussell (1961).

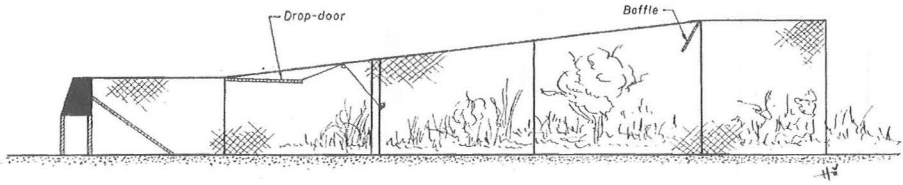

Figure 2. Section of classic Heligoland trap, after Woodford & Hussell (1961)

Second is the Gully or Vaadal trap which consists of a wire-netting roof carried on girders or cables across the upper ends of steep-sided and narrow gullies, the upper end of which is closed by a funnel and a catching-box. The Double or Double-dyke traps (used at Spurn and Fair Isle) were designed to catch birds including wheatear, which move along stone walls. These were first built with two entries facing opposite directions but sharing a common funnel and catching-box. This proved unsatisfactory however, and they were later equipped with separate funnels, properly angled to ensure a point of no return for the birds that entered them. Ditch traps have been built in places where a natural hollow or ditch runs alongside a wall, while portable Heligoland and 'Minogoland' traps were developed for use prior to the emergence of the more portable mist nets (Bub, 1991, p. 136-40). Finally, the Rybachy trap (the largest trap in the world, at Rybachy, formerly Rositten on the Baltic) works on the same principles, with the only permanent parts being the telegraph poles used to pull netting up when the trap is in use. Here the catching box is a walk-in room as the trap can catch hundreds of birds at a time - once 2764 on a single day (cited in Bub, 1991, p. 80-81). Whichever type was chosen, and excepting the mobile traps, materials were much the same: mainly timber framing and wire netting, along with the tools needed for construction. Also, the landscape around the trap was adjusted, to create an environment attractive to the birds.

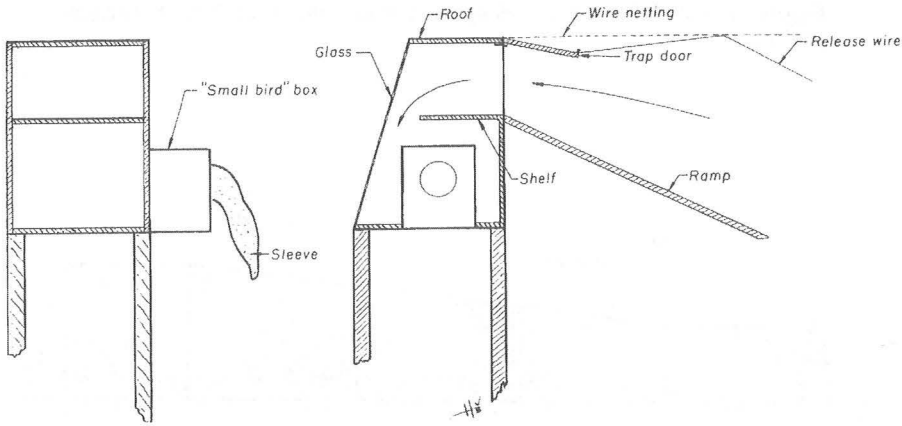

Figure 3. Details of a Catching Box, after Woodford & Hussell (1961)

All of the fixed Heligoland traps have four distinct areas (Figures 1 and 2), as described by Woodford & Hussell (1961, p. 127-31). First is the assembly area, the area immediately in front of the trap, including that within the wing walls. There should be adequate cover here (trees and bushes) leading into the trap, but lower than the entry, to prevent birds flying up and over the trap, rather than into it. Second is the catchment area, the main body of the trap which narrows and reduces in height from the entrance towards the funnel. Baffles are generally included here to prevent birds breaking back along the walls or roof towards the entrance. Third is the funnel area or lock-up, a narrow, sharply converging passage leading from the catchment area to the catching box. On some traps this area can be closed off, with a drop-door, controlled from a point in the catchment area. Once this door has been dropped the birds are confined to a small area, and there is no risk of them flying out. The principal changes in direction, presenting the birds with a point of no return, are made in the funnel area. In most traps there are two bends, so that the catching box is at a 35-50 degree angle from the point of entry. Finally is the catching box itself (Figure 3), with a transparent back, shelves to divide the box into compartments, an opening to the funnel, and a means of removing the birds. There are several different types of catching box, described by Brownlow (1952), Lockley & Russell (1953) and Woodford & Hussell (1961).

The Heligoland trap was developed originally by Hugo Weigold from the 'Thrush-bushes' used by Heligoland islanders to catch migrant thrushes for food. Gätke (1895) described these thrush-bushes, while Weigold (1956) describes the first trap, built on Heligoland in 1919. Writing some forty years later, his enthusiasm for his trap is clear:

> "[W]e constructed our first trap which proved excellent. We were able now to trap all the birds. And how exciting it was, to keep in our hands many birds of various species even the smallest and most delicate ones, to examine them in detail, to measure them, weigh, ring, and eventually set them free. My funnel trap has since been in every detail considerably improved and in this way a mere idea of 1919 became a real blessing for the study of bird migration (Weigold, 1956, p. 161)."

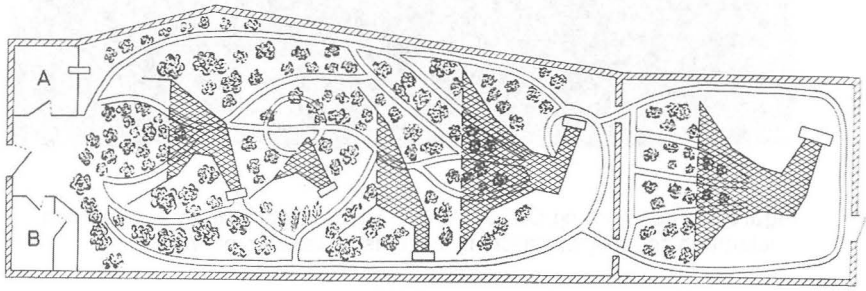

Figure 4. Plan of the 'Fanggarten' showing the traps as they were in 1944. (A) and (B) are banding huts. (After Bub, 1991, adapted from Lockley & Russell 1953).

Figure 5. The Catching Box of the first UK Heligoland trap, at Skokholm. Photograph courtesy of National Museums & Galleries of Wales

This, then was the first Heligoland trap, which led to the founding of the 'Fanggarten', or ringing garden, which on the barren island of Heligoland gave shelter to migrating birds. As Woodford & Hussell (1961, p. 126), describe it, this was a simple planted area surrounded by a cat and human proof fence, containing three small and one large funnel or Heligoland traps to which a further large trap was added later (Lockley, 1953) (Figure 4). Nothing of the original Fanggarten survives, the area having been completely destroyed by bombing during the Second World War (Ommo Hueppop pers. comm.). In the British Isles, the first trap was erected at Skokholm in 1933 (Figure 5), and on the Isle of May in 1934. The first of the original Lundy traps was built in 1946 (see below, and Webster 1997, 19-21).

How many Heligoland traps exist, or have existed in the past, is not known, though we can estimate numbers from web sources (and Peter Howlett, pers. comm.). In the UK, 31 examples are known from observatories, additional to the few that existed elsewhere, including on Lundy. Of these observatory traps, 23 survive today, nine of which are on Fair Isle. Only six of these observatory traps are in England. We can be certain therefore that in a UK context, Lundy's traps are rare examples of an unusual site type. The number of examples that can be closely inspected by visitors may be smaller still. In addition to their accessibility, there is also a degree of social significance attached to the Lundy traps, with their origins closely associated with the formative years of the Field Society (Webster, 1997), now in its sixtieth year. I shall return to this point about significance in the final section.

THE RITUALS OF RINGING

Archaeology today is as much about social practices as the places where these practices were conducted. For the archaeology of the contemporary world this is especially so, given that we can still observe people's interaction with place and question them about it. For Heligoland traps, both Brownlow's (1952, p. 398-9) and Woodford & Hussell's (1961, p. 137-8) descriptions help us to understand the social practice of operating the traps: the 'rituals of ringing'. Woodford & Hussell (1961) note for example how driving techniques will vary between traps and with the species of bird being caught, but there are some general principles. They note how the trappers (two to six) first take up positions some distance from the trap, in a straight line. They then walk forward slowly, 'beating' the vegetation with sticks, but remaining in formation. As the trappers approach the entry, they should move in quickly to move the birds into the trap. The trappers then move through the catchment area driving the birds before them. If the trap has a drop door, one of the trappers should close this when most birds are in the funnel area. One trapper remains in the funnel area gently driving birds into the catching box. And once all birds are in the box, trappers move to the back of the trap and remove the birds. These were the rituals as described in 1961, and some practices have changed somewhat since that time. Vegetation isn't generally 'beaten' anymore; rather, ringers make themselves sufficiently conspicuous to disturb the birds ahead of them (Tony Taylor, pers. comm.). Nevertheless, these are distinct and unique practices associated only with Heligoland traps, and they have changed little over the years. The physical remains of the trap allow these rituals to be understood and reconstructed where the traps are no longer, or infrequently, in use.

BIRDS AND THE LFS

Tony Taylor has described the Lundy Field Society's involvement with birds and ornithology (Taylor, 1997). He describes the significance of the strategic position of Lundy for attracting large numbers of migrants, and its high quotas of rare, vagrant species from Europe and Asia. He notes also how the main objectives of the ornithological work of the Lundy Field Society have been: to monitor the population sizes of the island's breeding species; to record the numbers and species of birds migrating via Lundy, the timing of these movements and any significant changes in numbers; to investigate, through ringing the migration routes, longevity, causes of mortality and other aspects of the biology of Lundy's breeding and migrant birds; and to encourage field studies into other aspects of Lundy's birds, such as breeding biology, behaviour and ecology (Taylor, 1997, p. 96).

Taylor goes on to outline two phases in the work of the Lundy Field Society. From its foundation in 1946 until 1973 the Field Society was closely involved with the status of Lundy as a national Bird Observatory and had resident ornithological wardens to carry out its work. From 1973 the wardens' tasks became more diverse, including responsibilities related to the marine environment; ornithology was no longer their only role. Indeed from this time none of the wardens had a ringing licence, so this work was now undertaken entirely by visitors and volunteers. The results from bird ringing reflect this change. Prior to 1973 the ornithological wardens ringed many seabirds and comparatively few migrants, despite the presence of Heligoland traps from 1946. These figures could be misleading however, as in terms of actual numbers more passerines were ringed during this period, and the wardens used the Heligoland traps several times a day, every day. After 1973 portable mist nets revolutionised the catching of passerines, so migrants have become the main species targeted. Before 1973 for example, 2700 guillemots were ringed, while only one has been ringed since. Equivalent numbers for willow warblers are 2859 and 6474 (Taylor, 1997).

The LFS is not exclusively concerned with ornithology. As the pages of the Annual Report (Webster 1997, p. 23) and the *Island Studies* volume (Irving *et al.*, 1997) demonstrate, the range of its work and interests is diverse. But birds do represent a clear focus of attention, and significant research and recording work has been undertaken by members over the years (see LFS Annual Report Index for examples).

LUNDY'S TRAPS

Lundy's two current Heligoland traps (the 'Terrace Trap' and 'Quarter Wall Trap') are classic traps, in the descriptions of Brownlow (1952) and Woodford & Hussell (1961), with clear reference to Weigold's (1956) original design of 1919, and the thrush-bushes of Heligoland. But they are not the originals. The idea of a Heligoland trap on Lundy is first mentioned in a letter from Leslie Harvey to Martin Coles Harman of March 1946 (Webster, 1997, p. 16), prior to a summer spent organising the construction of the first trap between the 'Hotel and House' (as Webster, 1997 says, not easy given wartime restrictions on materials). Webster goes on to describe the construction (after LFS 1946) in September and October 1946, prior to the trap being severely damaged over the winter, and destroyed twice during the first half of 1947.

By June 1947 other locations were under consideration, with the trap eventually relocated to St John's Valley, and a second trap constructed in the Quarries. A trap also once existed at the Old Light. These locations proved difficult and eventually current trap locations were selected: the original Terrace Trap was built in 1951, and the Quarter Wall Trap sometime during the wardenship of Peter Davies (1951-4) (Figure 6). The Terrace Trap was rebuilt in 1972 and the following spring a new Quarter Wall Trap was constructed (Webster, 1997, p. 24). This was built as a Double-dyke design but later the part with its opening facing east was removed because the bulky appearance of the construction seemed to discourage birds from entering. Figure 6 shows that the trap's present form is closer to the original. These are the two traps that survive today. The Terrace Trap exists within the area of a Scheduled Monument, however the documentation makes clear the fact that the trap is excluded from the scheduling.

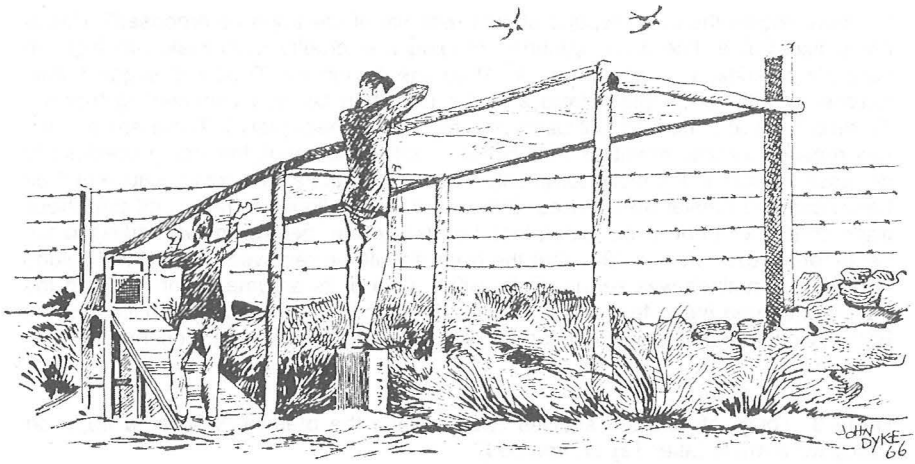

Figure 6. Lundy's Quarter Wall Trap in 1966, drawn by John Dyke (taken from Irving *et al.*, 1997).

There is a concern about the condition and state of the Lundy traps. Woodford & Hussell (1961) for example discuss the need for adequate cover in the lead up to and in the mouths of traps. In the case of the Terrace Trap this has been lacking since Rhododendron were cleared from this area some years ago. The willow in the mouth of the trap also now needs replanting. That said, both traps are used when ringers are on Lundy. Although most catching on Lundy is now done with mist-nets, the Heligoland traps are used when it is too windy for the portable nets, or when ringers are passing. The Quarter Wall Trap is good for birds that use the wall for shelter or a perch. During their use, ringers are often asked about the Heligoland traps by visitors, leading to a discussion about ringing and birds on the island.

THE SIGNIFICANCE OF LUNDY'S TRAPS

The two Heligoland traps on Lundy present a fascinating dilemma. The present traps are comparatively robust and well maintained examples of a particular aspect of a distinct twentieth-century phenomenon – bird ringing, which emerged in the context of a growing awareness of and interest in conservation, the natural world and ornithology (Moss, 2005). But the dilemma concerns the significance of these Lundy traps. The traps that survive today are not the original traps, these having been in different locations, and the present traps rebuilt and repaired. The traps were frequently used for ringing in the past, though less so today, partly for lack of suitable vegetation in the Terrace Trap, and problems with livestock damaging Quarter Wall Trap. They still have great potential value for ringing (Tony Taylor, pers. comm.). Neither are the Lundy traps the earliest examples, or necessarily the 'best', however that is defined.

So, how should the LFS respond should removal of the traps be proposed? This is not unlikely at a time when hunting, trapping and cruelty to animals are high on people's agenda, and given that in 1990 the Landmark Trust did suggest this, apparently after a complaint from a visitor (the then Director commenting that the Terrace Trap at least was 'obtrusive and possibly unnecessary'). There are at least four reasons for their retention. First is the scientific argument, that some species are not easily caught in the more commonly used and portable mist nets because of their behaviour and habitat preferences, but will go into Heligoland traps, and that these traps continued to be used, albeit less frequently than before. In responding to the Landmark Trust's view in 1990 that the traps should be removed, an LFS Heligoland Trap sub-committee was set up (Cole 1990). One of its arguments for retaining the traps concerned the potential loss of data regarding target species identified by the British Trust for Ornithology at that time. The following figures were presented:

Table 3. Totals of selected species caught since the present Heligoland traps on Lundy were made (after Taylor, undated).

Target species	No. in traps	No. in mist-nets
Sparrowhawk	9	0
Kestrel	2	3
Snipe	5	9
Woodcock	4	1
Black Redstart	3	1
Redstart	83	88
Whinchat	15	26
Stonechat	27	12
Spotted flycatcher	271	289

In each case, significant loss of important data would have occurred without the presence of the Heligoland traps. As the following figures suggest, rarities have also been caught in Heligoland traps, and these two would have gone unrecorded without them.

Table 4. Selected rarities caught in Lundy's traps (after Taylor, undated).

	Heligoland traps	**Mist-nets**
Dartford Warbler	1	0
Subalpine Warbler	1	1
Ruppell's Warbler	1	0
Greenish Warbler	1	0
Great Grey Shrike	1	0
Woodchat Shrike	4	2
Red-eyed Vireo	2	1

Second is the educational role these traps perform, even though – and perhaps especially because – they are now rarely used. In a sense they are now monuments to an activity, a pursuit, with which many visitors to Lundy will be unfamiliar. And just like the many other monuments on Lundy – the Quarries, the Old Light – these particular traps can be explored by visitors. As we have seen already, visitors do talk to ringers while the traps are in operation so there are opportunities to learn about the traps, about the reasons for ringing, and the trapping process itself.

These two reasons were given by Taylor (undated) in the LFS's response to the Landmark Trust in 1990. Two further reasons were not considered, and arguably clinch the case for the traps' retention.

The third reason then is that these traps are a rare type of structure that reflect a social trend that contributes to twentieth-century landscape character, and the activities that have shaped it, certainly in places like Lundy. Lundys' traps comprise two of what are likely to be less than ten examples of their type in England, and less than 30 in the UK. They are also the only structures surviving on Lundy that represent its former status as a national Bird Observatory, although other examples continue to be used at observatories elsewhere in the UK, at Spurn for example where three of the original five traps survive, or Fair Isle where there are nine.

And fourth is the local – and social – significance of the traps, representing the island's former status as a national Bird Observatory, and more importantly for us in the early formative years and development of the Lundy Field Society. Even though they are not 'original', the traps that exist today represent the enthusiasm, the commitment and the struggle that early members endured.

For these four reasons alone, the traps should be kept, partly as curiosities, but largely for their social, scientific and historical meaning.

Moss (2005, p. 343) concludes that, "during the past century birding has grown from humble and uncertain beginnings into a mass participation leisure activity, which now brings pleasure and satisfaction to millions of people throughout the world." In a small way, Lundys' Heligoland traps contribute to this story. More to the point, they are a significant part of the Field Society's own heritage and represent its only physical legacy, a monument to continued and continuing achievement, on the occasion of its sixtieth anniversary.

ACKNOWLEDGEMENTS

The idea for this essay came during a splendid midsummer's night, ringing shearwaters with Steve Wing and Simon Griffiths (amongst others) during the LFS's fiftieth anniversary celebrations on Lundy in 1996. It seems fitting to publish it ten years later, on the occasion of the sixtieth. But I needed some help. I am grateful to Ommo Hueppop, Head of the Heligoland Station for information on the fate of the earliest traps there, and Chris Redfern (Editor of *Ringing and Migration*), Peter Howlett (Bird Observatories Council), Myra Tolan Smith (English Heritage) and Jez Blackburn (British Trust for Ornithology) for providing contacts and some key references. Richard Castle (LFS) has provided some useful information about the continuing use of the Lundy traps, and brought the Rybachy trap to my attention. Tony Taylor commented on the paper and provided information on the LFS Heligoland Trap Sub-committee, which I vaguely recall from my first years on the LFS Committee. Otherwise all the information included here is from published or internet sources, as cited in the text.

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