The Attitudes of Housing Occupants to Integral Bird and Bat boxes

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DECLARATIONS

This dissertation is a product of my own work and does not infringe the ethical principles set out in the University's Handbook for Research Ethics. I agree that it may be made available for reference via any and all media by any and all means now known or developed in the future at the discretion of the University.

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ABSTRACT

This study aims to explore what home occupants attitudes are to integral bird and bat boxes and why by examining influencing factors. A preliminary investigation took place with housing developers to assess current perceptions, followed by site visits to housing estates where integral boxes were installed. This was to undertake opinion surveys where people were asked to complete 15-20 minute questionnaires conducted as small interviews. Where this could not take place, short surveys were used. Questions included aimed to collect demographic details, assess nature connectivity, individual home preferences and gauge a number of reactions regarding box satisfaction. The aim was to compare these against the latter to predict potential factors influencing their acceptance. A key finding from the study revealed that the significant majority of people thought integral boxes were a good idea and were happy or indifferent to having them in their home. There were no strong correlating factors that predicted whom was more likely to be accepting of boxes, although the least satisfied were people who owned their own home and were unaware of the presence of boxes.

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1. INTRODUCTION

I. Background

In the House of Lords 1st Report of Session 2016-2017, it was stated that the Government's target of one million new homes by 2020 was not appropriate. To address the housing crisis, the target needed to be closer to 300,000 new homes built annually for the foreseeable future; in short, 'one million homes by 2020 will not be enough' (House of Lords, 2016). However, biodiversity is undergoing significant global decline and the UK's most recent State of Nature Report (2016) issued a warning that 'nature is faring worse in the UK than in most other countries' (British Partnership of 50 organisations, 2016).

The impact of Urbanisation is just one of the 10 factors listed within this report where the predicted negative effects of development far outweigh positive outcomes. Although urban areas take up just 7% of UK land, they are home to 80% of the human population, leaving very little room for people and wildlife to coexist (British Partnership of 50 organisations, 2016). With multiple studies exalting the benefits for mental health of living with nature but there being an increasingly lack of access to it, the suggestion is that there is more at stake for society than just wildlife population loss (Cox & al, 2017).

Where species have exploited the niche of the urban environment to their success, it is these synanthropes that are most threatened when a change in practice occurs. Building infrastructure represents a significant resource for roosting bats and nesting birds, such as the House Sparrow (*passer domesticus*), Common Starling (*sturnus vulgaris*) and the Common Swift (*apus apus*) (Town & Country Planning Association; The Wildlife Trusts, 2012). In the aim to maximise space and reduce greenhouse gas emissions, the renovation, thermal insulation and design alteration of buildings can result in the loss or absence of accessible cavities used by the above (Schaub, et al., 2015). Yet, the Swift has become something of a poster-bird to this problem, as this amber-listed species is almost completely dependent on man-made structures and has declined by 25% in the past decade due to lack of nesting sites (BTO, n.d.).

In response to this, built-in 'integral' boxes are being designed as a possible option for refurbishments and new builds constructed by councils, individuals and private bodies. In particular it is the latter that groups such as the RSPB have pursued, as housing developments represent a major opportunity for mass installation (RSPB, 2016). However, whilst there have been some studies conducted on the success of integral boxes

internationally, the reception to their presence in people's homes has not been officially recorded. (Schaub, et al., 2015) There is a current divide in perception which exists; what people think and what relevant interest groups think they think. The acceptance of integral boxes by home occupants is advertised as the foremost barrier to their inclusion by housing developers. Without thorough and unbiased research into this area, claims for and against this approach cannot be substantiated.

This research aims to explore and summarise the various responses to box presence and use. The synanthropic space is a precarious balance of cohabitation between human and animal and it is these factors influencing people's acceptance, which will be investigated.

II. Research Objective

The primary research objective is to explore the opinions of homeowners and occupants to integral bird and bat boxes. The aim is to also attempt to uncover and predict what factors may influence their responses in identified context. The secondary research objectives are to record box success regarding their use and evaluate their potential as realistic mitigation techniques in the face of biodiversity decline.

III. Structure of Research

This research will begin with a review to find related literature, particularly interpretations of the synanthropic space as a way of defining the relationship between people in closer proximity to wildlife. It will also contextualise this study by exploring wider attitudes to biodiversity.

Due to its niche nature, this review will also make use of non-peer reviewed research, which is being conducted nationwide by special interest groups in the practical application of box installation. This was aided by interviewing those involved in current housing industry practice and their perception for later comparison.

The Research Methodology chapter explains choice of approach via questionnaires and interview techniques and the reasons for factor selections.

The Results and Discussion chapter presents the results quantitatively followed by qualitative case studies and a discussion which explores the results in more depth by debating the correlations and themes from the data. The Concluding Remarks chapter presents a conclusion of the research including limitations, dedicating significant time to recommendations for future studies.

2. LITERATURE REVIEW

I. Introduction

In 2015, 54% of the world's population was identified to be living in a city with that number projected to increase to 5 billion by 2030 (United Nations, n.d.). This is having a huge impact on biodiversity and although 15% of land is currently under protection, it does not cover all important areas with more animals making use of the city (United Nations, n.d.)**.** But how prepared are people to live in such close proximity to other species, that they will let them exist in the fabric of their own home (RSPB, 2013)**?** The suggestion from housing developers is that people may object to boxes because of undesirable side effects – but this implies dissociation with how the natural world functions. We are in danger of losing our connection and knowledge of the natural world as biodiversity declines and this can impact our treatment of them and acceptance of their presence (Gunawan, 2016)**.**

II. Synanthropy

Synanthrope: 'An undomesticated organism and especially an animal (such as a mouse, pigeon or raccoon) that lives in close association with people and benefits from their surroundings and activities' – (Merriam Webster, n.d.)

Synanthrope is not a particularly well-known word; however, it should be conceptually recognisable to most. In contrast to other species, humans have survived and reproduced at an unprecedented rate, primarily because of our ability to manipulate the world around us without the reliance on biological adaptations (Orland, n.d.). This technological evolution sustaining our population growth is at the root cause of the modern environmental crisis and directly impacts the numerous species around us (Orland, n.d.)**.** It is in response to these cultural adaptations, that our relationship with animals has shifted, creating a niche in which the synanthrope has found its precarious place.

Although urban development destroys natural habitats, it also creates new ones in a synurbization process as wildlife responds to urbanisation (Luniak, 2004)**.** George Monbiot argues in *Feral* that the best eco-systems are the ones that are 'self-willed' and governed only by their own processes (Monbiot, 2013)**.** Whilst this might be the case in an ideal world, the realism of this remains unlikely for human-shaped landscapes. However, Phillip Hunter says that like natural habitats, urban environments still offers opportunity and despite anticipated perils, has the potential for adaptation to reap these rewards (Hunter, 2007) To demonstrate, he calls attention to the differences between forest and city-living songbirds that have learned to cope in noisier surroundings by amplifying their song (Hunter, 2007) Another article summarising a study on Blackbirds *(Turdus merula)*, revealed that artificial lighting offered them increased foraging time in comparison to their countryside cousins

(Helmholtz Centre for Environmental Research , 2014). However, whereas other species have exploited city resources for their gain, some are not always as welcome. Red foxes *(Vulpes vulpes)* have sparked debate in the media before, as the tricky topic of feeding wild animals crops into conversation:

> 'Admitting you feed foxes is a bit like admitting you feed pigeons. You may as well stop speaking to your neighbours, because you have chosen to live among the animals instead.' (Cocozza, 2015)

The article suggests that popular opinion dictates that feeding wildlife is seen as 'sad and antisocial' (Cocozza, 2015)**.** Of course, no reference has been provided to back up this statement, but the piece in general does highlight commonly reoccurring issues of synanthropic interactions. It offers contrasting views between those who see as an opportunity to be close to nature and those who can see it as an invasion or something abnormal. A pest control consultant asserts that it is a 'natural respect of humans,' which is an essential component of happy human / animal cohabitation (Cocozza, 2015). Conflict between people and animals exist globally, but it is these tensions that reveal social and cultural dimensions behind them.

However, respect does not necessarily need to feature if it is advantageous to have a species in proximity. Swiftlets (*Collocaliini*) in Indonesia are actively being encouraged to nest inside buildings in Kumai where their nests, once abandoned, are sold at a high price to the Chinese market as a medicinal delicacy (Boyle, 2011)**.** With this practice supposedly taking place accidentally at first as far back as the 17th century, now new concrete birdhouses have been erected at sites in multiple cities across South East Asia, giving the architecture a very unique style with a multitude of holes offered up for nest potential (Boyle, 2011)

This practice of welcoming animals into the human environment is a concept that has been increasing in popularity amongst people in various professions – from artists to zoologists. Ned Doddington, author of *How to Design with the Animal*, deals completely on this topic on his site *The Expanded Environment* and proposes synanthropic habitats, which designs liveable space for wildlife (Dodington, 2014).

> "The basic modis-operandi of Synanthropic Habitats is humans making concerted efforts to design for, improve, and invite alternate species into human environments." – (Dodington, 2014)

It is proposed that a significant proportion of synanthropic architecture created is a cultural response to the increased societal awareness of biodiversity and habitat loss. It is growing through architectural and artistic design, to something increasingly functional and widely

practical in application. Unlike such examples as farms, menageries, zoos and stables, these structures are built to *contain*, but not *restrain* animals from going about their daily lives. Merritt's *African Sun Swift Tower* has over 221 bird boxes within it and was commissioned as a conservation piece for Logan's Meadow Nature Reserve, financed through an urban art fund (Newell, 2014)**.** The artist was hired to visualise this idea and worked with local swift researcher, Dick Newell, to ensure it had the best chance of use – something which was confirmed on a field visit during this research. It is now being used to study swift recognition of nest boxes. Ecologists are also working with the construction industry to create guidance within technical material; *Designing for Biodiversity* is a book examining ways to practically incorporate features into new and existing buildings (Murphy, et al., 2013)**.** In turn, bodies such as The Wildlife Trusts are appealing to the public to re-envision housing developments and embrace a more holistic way of living, one that minimises damage and enhances the natural surroundings (The Wildlife Trusts, n.d.)**.**

In her thesis on *Synanthropic Suburbia*, Sarah Gunawan deftly defines and discusses the nature of the synanthrope and its relationship to architectural design. Although deserved, her work is too extensive to go into detail, but her exploration of *Animals & Architecture* provides cultural context to the challenge of accepting integral boxes in domestic dwellings. She clarifies the synanthrope as something that exists somewhere on the gradient between a domesticated pet and a wild animal and just as it exists differently physically, so it does conceptually (Gunawan, 2015)**.** She argues that interspecies relationships are intertwined by multiple factors, asserting that how humans perceive an animal informs the level of control they desire over it, which in turn impacts human tolerance of its proximity (Gunawan, 2015)**.** She simplifies this by breaking it down into four scenarios of reception, demonstrating the perceived differences between a bird as a neighbour, intruder, pet and synanthrope (Gunawan, 2016). This is supported by the different scenarios of the Foxes and Swiftlets referenced earlier.

Two questions leap out from this exploration in relevance to this study: Does the installation of integral boxes en masse into domestic dwellings generate a positive enough ecological impact to make it worthwhile and is it realistic to suppose that occupants would be willing to share this space with animals? Gunawan asks – 'how close is too close?' (Gunawan, 2015).

III. Bird and Bats

This investigation of integral boxes in domestic housing was inspired by work being conducted by the Swift Local Network (SLN), a group which are active in raising awareness about the Common Swift's decline and associated habitat loss. These birds have adapted to using man-made structures in place of cliffs, crags and trees, but they are not the only type of bird – or even species that is happy to exploit artificial opportunities. The below information introduces and contextualises the synanthropes that do this and have been chosen for observation.

Common Swift (Apus apus)

The Swift is a summer migrant to the UK that arrives in early May and leaves in August to winter in southern and central Africa. They can spend almost 10 months of the year without landing and when they do decide to, are likely to return to the same nest sites year after year (Yong, 2016). This makes it all the more important for them to have locations that are dependable. However, as they are experts at exploiting the cracks and gaps associated with older buildings, renovations are making this increasingly more difficult (Schaub, et al., 2015). Although the BTO indicates a 25% decline in population numbers over a decade, precise data is trickier to find and they currently only have an Amber listed status for Conservation Concern (BTO, n.d.). Anecdotal comments from the SLN and broader material to be found on the *Swift Conservation* website, suggests they believe this trend will continue without direct intervention (Mayer, 2017). At the rate in which modernisation is occurring in Europe to improve the energy efficiency of buildings, it is certainly possible that this will result in a strong decline of building dependent species (Schaub, et al., 2015). It is for this reason that integral boxes are being explored as a mitigation opportunity.

The 'enigmatic' Swift has become something of a poster-bird to promote their use, not just with members of the public, but also housing developments like Barratt Homes (RSPB, 2016).

> "The swift is an iconic species, its appearance announces the start of summer as they swoop and soar above our gardens… Our partnership with Barratt Homes has allowed us to share ideas and look at how we can bring this practice back in a way that works for builders, home owners and the swifts." – Darren Moorcroft, RSPB (RSPB, 2016)

However, studies to the efficacy of installing these boxes remain sparse and although some international research recommends certain conditions to ensure maximum success, there is a lack of peer-reviewed submissions (Schaub, et al., 2015) It should also be considered

that while habitat loss may be a large driver of swift decline, the suspected drop of insect numbers for this insectivorous species would also be a huge concern (Pickerell, 2005).

House Sparrow (Passer domesticus)

The House Sparrow is one of the most widespread and abundant birds in the world but despite its commonality, it is now declining dramatically in the UK and little is known about these causes (Vincent, 2005)**.** Characteristically noisy and gregarious, they are an urban opportunist which exploits available food sources and nesting sites in human habitats. House Sparrows, as their name dictates, have been known to nest in housing, particularly in holes and gaps in soffit boards and under tiles (Vincent, 2005)**.** As was explored with the Swift, there is reason to suggest that lack of suitable nesting sites may be a direct cause for their population decrease. However, Kate Vincent's study of House Sparrows in Leicester urges caution with this interpretation as access to roof spaces did not deter colonisation of a new estate in Guisborough and sparrows readily nested in hedges of conifers (Vincent, 2005)**.** Contrastingly, she also offers instances of females fully capable of breeding that were not occupying nest sites, which may have been down to suitable nest sites as a limiting factor. Regardless of this, House Sparrows are likely to benefit from integral boxes and will be an interesting to observe en situ to see if their tendency to be noisier impacts home occupant opinion.

Common Starling (Sturnus Vulgaris)

The Common Starling is another resourceful and gregarious bird, which may be one of the commonest garden visitors in the UK, but its decline elsewhere of the UK has made it a Red listed species (RSPB, n.d.)**.** They show adaptability when it comes to food and feeding – actively pursuing insects in the air as well as probing the ground for invertebrates, but also not refusing large food scraps or bird table offerings (BTO, n.d.). As a cavity-nesting bird, their decline has also been linked to the lack of available opportunities within buildings (BTO, n.d.). A joint survey by the RSPB and BBC Radio 4 'Today' programme, investigated the use of houses for nesting of the aforementioned bird species (and House Martin *Delichon urbica*) in 2002 and revealed that houses built before 1919 were particularly important (Wotton, et al., 2002)**.** Most Starlings, and indeed House Sparrows as well nested in the roof space, with chimneys and walls the next most frequent sites. There was therefore a large amount of concern vocalised in the summary of findings for renovations taking place to older buildings.

However, their primary breeding habitat is arable farmland, so much so that they can be considered an incredibly invasive pest to crops in areas such as North America and South

Africa to name a few (Department of Primary Industries and Regional Development, 2017). As with the House sparrow, however, they are likely to make good use of integral boxes but due to their tendency to produce more faecal mess, it will interesting to learn if this impacts people's opinions.

British Bats

There are 17 species of breeding bats in the UK, most of which evolved to live in trees and caves but have now adapted to roost in buildings. Strict legal protection exists on the conservation of bats within the built environment, depending on the provision of roosting, availability of foraging and appropriate management of existing roosts (Bat Conservation Trust, 2017). Integral mitigating features are considered standard practice and although the indicator of widespread bat species has increased by 23%, threats such as new housing populations on natural habitats may still impact bat populations (British Partnership of 50 organisations, 2016). BTO researchers working with Norfolk County Council revealed concerns that a local level, loss of some species could be as high as 40% (BTO, 2017).

However, bats can pose challenges in close proximity to humans with conflict arising over issues of mess and health fears recorded in churches (Bat Conservation Trust, n.d.). In addition to this, cultural associations depending on perceived versus actual knowledge can influence integral bat box acceptance in domestic dwellings. The western world has tended to regard bats with superstition and fear, often carrying misconceptions around disease and blood-sucking (Smithsonian, n.d.). Although more work has been done to correct this information by such groups as The Bat Conservation, it is probable that some fallacies or fears still exist (Bat Conservation Trust, n.d.). Paul Barnes argues that values in opposition to this would impact species protection policy; in this case it may impact practice in housing developments (Barnes, 2013).

IV. Nature Connectivity

The section on synanthropy touched upon perceptions and attitudes to animals that benefit from close proximity to human habitats. Depending on how specific species are viewed could impact how they are treated and to what extent they are tolerated. But what are the wider implications from this that we can derive about our attitude to biodiversity, our connectivity with nature and its value within a 21st century society? The accusation is that people, particularly those in towns and cities, are losing touch with the natural environment and this is putting the future of the planet at risk – us included (Guardian, Press Association, 2011).

In his September article *Badger or Baulbasaur*, author Robert Macfarlane discusses this by framing it against a piece of Cambridge research, revealing that children (8+) were more capable of identifying Pokémon than real species (Macfarlane, 2017). The point was not to chastise modern culture, but to point out the worrying trend in young people showing a loss of knowledge about the natural world in correlation with a growing isolation from it (Macfarlane, 2017). This may be particularly noticeable in certain socio-economic groups where less than 1% living in social housing used green spaces on their own estates due to a lack of facilities (Groundwork, 2017).

Shifting baseline syndrome (SBS) has been used in reference to conservation issues where an extinction of knowledge occurs as a redefinition of what is "normal" according to experience (Vera, n.d.). This has been interpreted as either generational or personal amnesia that adjusts people's perceptions; it is also warned as a real problem for those informing policy and management (Papworth, et al., 2009). Lincoln Larson (et al) also argues that these perceptions have the potential to emerge as emotional drivers that can impact wildlife stewardship, referencing the responses to a study of invasive House Sparrows and people's reactions (ref 9). (Larson, et al., 2015) The suggestion is if that people know more about nature, they are more likely to care about it.

The above deals with the loss of knowledge, but the isolation concerns are more complex. Richard Louv coined the term Nature Deficit Disorder in his book *The Last Child in the Woods* and details the costs of this alienation as something which impacts us on a physical and emotional scale (RSPB, 2013). Stefan Slater expands on this in *The New Wilderness* arguing that we do not exist in a void and actually our interaction with nature forms the building blocks of civilization, affecting people directly (Slater, 2017). The RSPB's Connecting with Nature report recognises this as complex problem with a multitude of issues including, health, education and social wellbeing (RSPB, 2013).

The link here originates from the hypothesis on Biophilia, a term that has come to mean a genetic drive or need to interact with nature (Ulrich, 1993). Although this can be interpreted in numerous ways, the message being promoted is that people are healthiest and happiest when able to engage with the natural environment on a regular basis. The economic costs of anxiety and mood disorders are estimated at €187.4 billion and an increasing number of health professionals and biologists are promoting the mental health benefits of nature (Cox & al, 2017). It is thought that the correlation between these issues would impact willingness to include integral boxes within home occupant's houses.

V. Housing in the 21st Century

Since the revelation that the UK voted to leave the European Union in 2016, Great Britain has been left in a shroud of uncertainty. Most of the UK's wildlife and environmental legislation is based on EU legislation and there is little evidence to suggest there is a plan for how these will be replaced (CIEEM, 2017). Some point the finger of blame for Brexit in the direction of the governments whom have failed to provide adequate housing for over 30 years (Tilford, 2016). In the last decade homeownership has fallen for the first time since Census records began in 1951, with private rented accommodation rocketing by 69% and many young people struggling to find stable and affordable homes (Shelter, 2017). First-time buyers are in a precarious position as while UK house prices are predicted to dip in 2018, with banks poised to tighten their lending criteria coupled with a chronic lack of supply in the housing market, competition may be too high for most (Colson, 2017).

Construction companies are also being hit by challenges as some shares have fallen by as much as 37% (Rhodes & Wilson, 2016). The suggestion from some housing development companies is that because the immediate outlook for the industry is unclear, it may have to rethink its building and land-buying programmes (Monaghan, 2016). If their response is to tighten their monetary belts, persuading them to include integral boxes (despite the new Manthorpe products at a reduced cost) may not prove viable (Manthorpe, 2017). However, housing developers are not unaware of the environmental impact their builds are perceived to have (Knapton, 2017). The recent Kingsbrook development in Aylesbury is described as 'Britain's most wildlife-friendly housing development' and was a collaborative effort between Barratt Homes and the RSPB (Knapton, 2017). The suggestion is that housing developers recognise a perceived responsibility in the eye of the public and are using this to their advantage to market their housing.

Owning a home can represent stability in what can otherwise be an unpredictable world – a microcosm that can be controlled (Dupuis & Thomas, 1998). The three choices open to most people include renting, owning and shared ownership of a property. The latter may represent the first step-up for those struggling to afford a deposit alone, but unlike full owners, people in shared cannot exercises the "right to manage" their building as it will be run by the housing association (Lunn & Collinson, 2016). The presence of integral boxes may be considered just another feature of a house for some, but may also represent an invasion and dictation of space for others (Dupuis & Thomas, 1998). It is thought that this sense of ownership and responsibility for a home will influence acceptance of integral boxes.

VI. Concluding remarks

From the various studies and preliminary investigation work that has been researched, it has been identified that a number of synanthropic species stand to benefit from a close relationship to humans. Swifts, House Sparrows, Starlings and some British Bats have been known to use man-made structure and integral boxes have been advised as an effective means of mitigation for loss of nesting and roosting space. It is suggested that they have the potential to be most effective, especially with Swifts, when they are created en masse as part of housing developments to allow for colonies to establish. Synanthropic architecture is becoming less theoretical and more practically applicable with The Wildlife Trust and other bodies making use of features integrated for the benefit of wild animals. This is accompanied by a growing expectation that there is a responsibility with housing developers to do this in their new builds.

However, the acceptance of integral boxes appears to depend on the occupant's relationship with the synanthrope, which can vary between species. This can be linked to the person's individual connection to nature, which also varies widely and may do so particularly between socio-economic groups. Other secondary factors may also influence attitudes to integral boxes, which could be subsidiary or independent of nature connectivity. These can include housing availability, contractual agreement (rented, owned, shared ownership) and education.

In order to compare box satisfaction to these factors, questions should be developed which can test for possible correlations with the questionnaire aimed at occupants. Housing developers are particularly interested in home ownership, so socio-demographic questions should be employed. It would also be worth investigating to what extent the public feel that housing developers have a responsibility to the natural environment. The RSPB's Nature Relativity Scale (NR-6) can be used to compare nature connectivity and in reference to developer concerns of mess and noise, questions can be formulated around home standards and comforts. As it is suggested that there is a mutual benefit between proximity to nature and the effects on health and wellbeing, special awareness should be paid to responses that might indicate this as an argument for their inclusion.

The need to find a modern solution for the displacement of synanthropic species is growing in urgency as the human population expands. In order for integral boxes to be accepted in domestic housing, the importance of their inclusion should be highlighted to occupants to raise awareness and breed support.

3. PRIMARY INVESTIGATIONS AND CONTEXT

I. House Developer Interviews

Prior to writing the home occupant questionnaires, four telephone interviews with employees of a housing development company (henceforth known as HDC) took place and another with an RSPB representative. This was to achieve two primary goals, a) establish developer opinion of integral boxes initially based on anecdotal Swift Local Network (SLN) feedback b) ascertain what developers expect homeowners' attitudes to be towards integral boxes. Only one company was interviewed and although opinions may differ across the sector, it was considered likely that typical concerns or assumptions could be identified. It was also likely that opinions differ between various divisions, so employees selected were chosen for interview from different departments that might have involvement in integral box installation.

The interviews were staged in a semi-structured format with interviewees provided a set of questions and participation agreement sheet to sign beforehand; see *Confidentiality*. Although the questions differed for each person, they roughly followed the same pattern. The first sets aimed to confirm job role and potential involvement and then investigate the working relationships between departments. Then, some more specific questions regarding the work their company was doing relating to integral boxes and how much they personally knew about them. Finally, they were asked about what they wanted to know that would impact their decision regarding installation:

> "What do you think would affect opinion in the company regarding the use of installation of integral bird and bat boxes? / What does _____ want to know about the use of boxes?"

The overall responses reviewed from the transcripts demonstrated several key points. Firstly, developers did not know what the results would be of integrating boxes into developments in relation to consumer opinion and also what the success rate would be regarding inhabitation. It was suggested that the integral box concept had been sold to developers on the back of their use by Swifts and they did not have other birds in mind. Homeowners are their biggest audience and are therefore of most interest to them. It was accepted that they didn't know enough to be certain but the assertion was that consumers are very varied and so they would anticipate a mixture of responses. Cost was certainly a prominent factor and how many that would be installed depended on evidence that they had a good chance of being used. However, planning was beginning to drive increased mitigation requirements and developers needed a response. Developer actions and perceptions were based on RSPB information and also some reports of consumer

complaints, their origin was difficult to place. Several factors of concern were listed and they could be largely summarised under consumer perception of boxes, including the potential for noise, increased maintenance and excrement. Aesthetics were a concern for developers and the driver seemed to be for something that was discreet. There was a school of thought that believed the vast majority of people will be neutral with a select few who would be delighted with boxes and then a very small amount who would be vocally unhappy. However, this perception may not have been widespread as the general response from developers was that integral boxes were too much of an unknown. In order to establish if integral boxes were worth pursuing, an official investigation into what homeowners (as their main audience) thought would need to be made.

II. Third party involvement

Those involved in this research include the unnamed housing development company whom provided essential contextual information about developer attitudes. This was aided by the RSPB who helped set-up these contacts and offered other support. The Swift Local Network is an active group nationwide taking part in Swift conservation projects and member Stephen Fitt was responsible for suggesting the main objectives of this research. Arc Ecology is a local ecological company in the Isle of Wight who assisted with the Freshwater development and offered contextual information. The Isle of Wight Housing Association also provided a tour plus context of Freshwater and sent a letter out making people aware of the research visit taking place in May. A local bat expert was contacted for Ryde who was able to talk more about bat activity in the Isle of Wight.

The Cambridge visit was spent with Dick Newell who offered a great deal of assistance and contextual information about the Fulbourn mitigation site He demonstrated the research that was taking place with box design and gave a tour to other projects in Cambridge, including the art installation of the Sun Swift Tower mentioned in the literature review and Haddenham. Dr Thais Martins from Truro College offered time and her information about recent developments in Cornwall. Newquay Community Orchard was also visited and contacts there provided key contextual information about Tregunnel Hill and Nansledan, the latter which has been gaining global attention but could not be fully explored during this survey as it represented too big of a project. This was the same with the Kingsbrook, Aylesbury development.

4. RESEARCH METHODOLOGY

I. Approach

The research objective is largely explorative and descriptive in nature as there is a specific question being investigated to a very little-known field. However, it also attempts to predict responses based on anticipated correlations between box satisfaction and other influencing factors. A mixed quantitative and qualitative approach was chosen to address the 'what do people think and why' aspect of integral boxes respectively. Numerical data was reasoned to be able to portray the large data-set anticipated and could also be easily circulated to interested parties. Oral and written responses were valuable because they could it could explore this in greater detail, as well as explaining any unusual results. The data collection methods included were interviews, questionnaires, case studies and anecdotal reports.

II. Confidentiality

Research participation was confidential for all interviews and questionnaires, including names and other identifying information. All participants were given the *Participant information, question sheet and consent form* to read through and sign before being conducted and had the option to withdraw their data until September 2017.Telephone interviews were recorded and after the transcript had been made, were deleted within 1 month. Questions posed would deviate from the list as, it was preferred that the interviews would only be semi-structured to allow for a free-flow of information.

The home occupants were made aware that their responses would be made publicly available for research after being given and left the information sheet for future contact if desired, as well as correspondence for University supervisors.

III. Long Questionnaires

The long questionnaire was to be conducted as part of a 15 – 20 minutes interview divided into relevant sections and split into closed and open-ended questions. To keep consistency and collect as much information as possible, the sheet was filled out by the interviewer. Questions were asked both for independent interpretation and also correlation against box satisfaction to assess if it was an influencing factor. As all sites had different demographics and received different levels of information, data has been divided by site for comparison. Other questions were included because it was hoped they would elicit responses that would prove interesting for discussion in case studies. Like with the telephone interviews, the aim was to have a semi-structured format that would allow for a free-flow of conversation.

Questionnaires for bird and bat boxes were identical aside from a change in reference to the specific species.

IV. House Details

This section was intended for private note-taking about each property visited. This helped to keep a record of the visit although it was not always possible to complete all details. Due to developer concerns regarding specific negative side effects, special attention was paid to box condition, faecal presence, non-target species nesting and noise.

V. Demographic

Not all the demographic questions were included in this section and instead were split between here and the following *Home Occupant details*. This was to separate information about the person to that which related more to the house. The first question was designed to confirm that the interview was being conducted with a person who considered themselves a main decision-maker. This was because they would have a say about the maintenance of the house and therefore presence of integral boxes. Job position was queried to see if anyone from the construction or conservation industry was interviewed as they may have pre-existing opinions about boxes relating to their work.

Questions that were designed to compare for correlation against box satisfaction were gender, age and education. Gender was asked because it is suggested there is a gender divide between interest in conservation and sustainability with females rumoured to be more involved (Meinzen-Dick, et al., 2014). The literature review suggested that more young people are having fewer opportunities to engage with nature; therefore there could be an identifiable generational difference between younger and older adults (Groundwork, n.d.)**.** Additionally, people who have spent more time in education may be more aware of the effects of climate change and biodiversity decline as the education of sustainable development (ESD) is increasing in higher education institutions (UNESCO, 2017)**.**

VI. Home occupant details

Questions asked relating to the occupant's house were considered in this section. Those intended to compare for correlation against box satisfaction included ownership of property, presence of children and number of bedrooms.

Homeowners were of particular interest to housing developers because these were their biggest target audience. It was reasoned that due the large monetary investments, suspected negative side effects to integral boxes might carry higher risk to impact housing ratings used by developer sales team. Asking how many bedrooms there were in a house

was devised as another way of establishing wealth as houses with more rooms tend to be more expensive. This was asked due to associated links between people in poorer communities having less connectivity to nature, which may impact Box Satisfaction (Groundwork, n.d.). It was also hypothesised that parents might have more connectivity to nature because children (<16) are more likely to involved in wildlife activities than adults (The Wildlife Trusts, 2017).

How long the interviewee had lived at the property and intended to live there was asked as it was speculated that long-term commitment might make people think more about the potential maintenance of integral boxes. Due to cost and availability of homes, first-time buyers were a group considered less likely to be put off by integral boxes (Shelter, 2017). Asking if people had access to a garden or green space was included to try and encourage conversation about connectivity to nature. The question on pets was added at a later date in response to a number of references to the relationships between cats and bird; see *Challenges and Changes* section.

Asking if people had experienced any problems with their home since moving in would invite the participant to name issues that they were most concerned with. If they had experienced problems with integral boxes, they would most likely be mentioned here. Asking what their level of satisfaction was with their home comfort was used to invite comment on any disturbances that would disrupt this. It was also useful context to understand contextual information about the site if there were commonly occurring problems.

VII. Awareness

Questions in this section were created for context about the sides and case studies. Prior knowledge about the concept of integral boxes was queried because it was reasoned that the more people knew about integral boxes and why they were needed, the more likely they were to accept them. Following this, it was also asked about how effective nest and roosting boxes were in general as people may be less happy with the in-built concept if they didn't think they would work or help species breeding.

Prompting participants to talk about when they had seen birds or where they had seen bats, aimed to ascertain their personal interest by the attention paid to these species, as well as contextual information about the site. Asking if they had allergies, phobias or strong dislikes would establish if there were existing personal issues around birds, bats or possible non-target species e.g. wasps/bees that might impact box opinion.

VIII. Box presence

This section asked people about their knowledge of integral boxes and was largely for independent assessment. Two questions were introduced in Cambridge about any previous involvement or motivation in the swift mitigation project as there may have been potential for bias towards the boxes. It was important to ask people about the presence of a box within their home in order to discuss it, as well as gauge what level of communication people had received. When they were made aware of it i.e. before or after purchase/rental agreement was also relevant. It was hypothesised that people who knew about the boxes were more likely to be happier about them because they had taken ownership and responsibility for them being there (Dupuis & Thomas, 1998)**.** If they knew about them, it was asked if it impacted their decision to buy and why. Enquiring if any wildlife activity had been noticed around the house would generate further context about the site and also prompt people to talk about their feelings towards this. This could be linked back to their overall feelings of nature connectivity.

IX. Reaction and Feedback

The Reaction and Feedback section directly deals with participants' opinions and experiences of the integral boxes. The interviewees were asked directly what their opinion of the box was and notes taken on whether they thought it was a good idea and how happy they were. This was turned into a numeric value to compare quantitatively by designing a Likert scorecard of values from 5-1 respectively with A-E representing the conceptual idea and F-J the level of happiness. This was split into two as it was interpreted that people could think something was a good idea, but not necessarily be happy with how it functioned i.e. box location. People were queried about whether they had any problems with the box and particular attention was paid to any concerns the developers had raised. They were also asked whether these issues actually bothered them as it was reasoned that although people may mention these issues, they may not personally consider them problematic.

A key question was whether people though integral boxes should be pursued and was kept open-ended as there may be provisos voiced on their use. This was then followed up with what people might like or dislike about having one in their home to see if any concerns raised correlated with what the developers assumed; *see Challenges and Changes*. After the visit to the Isle of Wight, a question was included on whether the participant would recommend a house with one built-in to a friend. This was based on late information from a housing developer interview that indicated this was important for their marketing and sales team. Participants were also given the chance to ask any questions or make any further comments.

X. Nature and Development

This section was dedicated to the influencing factors to box opinion regarding nature, developer responsibility and future impact in relation to climate change. The NR-6 (Nature Relatedness) is a Likert scale used by the RSPB employed to gauge attitudes to the natural environment. It can be interpreted by valuing the answers 1-5 with Agree Strongly as the highest mark; it is then divided by 6 to give the NR-6 score. This is valuable because it numerically summarises people's connectivity to nature and can be tracked against other factors using a correlation graph. It was hypothesised that people with a higher NR-6 score would have a higher Box Satisfaction score.

Due to the recognised impact of building developments on natural habitats, people who recognised this problem were predicted to give a higher Box Satisfaction score. Conflicting statements (to prevent bias) relating to developments were created on a Likert Scale (2 to -2) to give a Responsibility Score. Statements 1, 2 5 and 6 were considered ideal answers to agree with and 2, 3 and 7 ideal to disagree with. These statements were categorised on learned knowledge during the literature review. This data needed to be normalised before it could be used in a correlation graph; the best possible score was a 4.0/14.

The next Likert scale was used in the same method as described above and aimed to judge reactions to thoughts about the next 50 years and the associated changes to the natural environment. This was to assess people's ability to think sustainably beyond their own lifetime and test their knowledge. Statement 2 & 3 were considered most ideal to agree with and 1 most ideal to disagree with. Although Statement 3's assertion about wildlife behaviour is debatable as there are wildlife 'climate change winners,' it is minimal in comparison to the negative impacts (British Partnership of 50 organisations, 2016)**.** The best result could be 4.0/6.

XI. Factors

This is the final Likert scale used within the questionnaire and is based on the occupant's personal preferences about their home. It was written in response to specific developer concerns about mess, maintenance and noise to establish if these House Preferences are likely to influence Box Satisfaction. A-E were awarded marks 1-5 respectively with higher results supposedly meaning a more positive Box Satisfaction result. It was hypothesised that people who were happier to put in extra effort into maintaining their home and didn't mind an untidier home, would be less likely to be concerned about having an integral box. It was also reasoned that people who preferred some kind of background noise to complete silence and liked a house in proximity to nature, would also be content with integral boxes.

Results were divided 4 to give the House Factor Score with average results considered to be 2.8 and above. Issues were raised after the Isle of Wight; please see *Challenges and Changes*.

The subsequent questions were asked to assess occupant priorities to choosing their house. These were included after the telephone interview with an RSPB representative that suggested although people think wildlife conservation is important, it does not feature strongly enough to be a top priority when it comes to buying a house. This portrays access to nature as something which is most at risk in development planning because it is seen as something that is nice to have, but is ultimately undervalued.

To formally summarise their level of satisfaction, participants were asked how happy they were with an integral box and, depending on what type they had, whether they would theoretically be happy with an integral bird or bat box. This was because there was very little information on the location of integral bat boxes. The question style was initially designed so that satisfaction indicated a preference for a box. However, this was split into two questions after the Isle of Wight as it was felt that it mixed two responses in one question; see *Challenges and Changes*.

XII. Images

Images were included to aid discussion; a variety of different types of integral boxes were chosen to illustrate the product concept. Pictures of British birds and bats that might make use of them were also added to help identification as the might be known by sight but not by name.

XIII. Short Questionnaires

In response to the difficulty of getting people to commit to a long survey, a short survey method was devised that made use of the alphabetical coding to give a Box Satisfaction rating. Unlike the long surveys, people both with and without integral boxes were interviewed to try and collect as many responses as possible. The latter have value for recording receptibility as potential buyers and former for personal experiences. Common reactions discovered from the Isle of Wight were assigned a number 1-10 to make it quicker and easier to record. Easy demographic questions were chosen, as well as some on pets, gardens and standard box reaction questions. This was because they would help give the widest context of why they think the way they do about boxes – without being able to test influencing factors. They would therefore mainly be useful as case studies for box success.

XIV. Challenges and Changes

There were various challenges that presented themselves during this research. Additionally, some problems manifested themselves within the survey discovered after the Isle of Wight and resulted in changes taking place to the questionnaire. This was undesirable but necessary and proved an interesting way of testing the methodology. Challenges and changes have been listed below.

Challenges

Integral box locations and plans	Finding addresses for integral boxes was challenging and it took a lot of searching to find locations, check plans then confirm them on site. Bat boxes were extremely difficult to locate and seemed to be because of laws protecting the species. Some bat boxes were found but this was mostly luck or due to nearby bird boxes.
Uncontrolled communication	The Isle of Wight Housing Association distributed a letter to residents before arrival. This was unproblematic but the letter should have been written by the researcher.
Engagement	People were not always willing to engage with a door-to-door survey. Timing when people were in was challenging as there was a small time between people getting in, dinner and it too late to call. Most were conducted during the day.
Activity	It was difficult to assess whether a box had any activity so confirmation of inhabitancy was split between visual signs and hearsay.
Weather	Some weather conditions made in very unfavourable to conduct surveys in, particularly with paper questionnaires.
Survey completion	Some people wanted to take surveys away and complete them. To get the maximum number of people, this was occasionally approved but dissuaded. One person did not complete all sides but this did not prove too problematic overall.
Safety & Travel	Safety was controlled by ensuring someone was always expecting the researcher back at the end of the day. Travel was limited to taxis, trains and lifts by known 3rd parties.

Changes

Pets

Asking if people had any pets was a question added during the Isle of Wight visit when it became apparent than people linked owning cats to bird deaths.

Short vs Long Questionnaires

Some people were unwilling to engage in a long questionnaire that took 15-20 minutes and so a short questionnaire was devised. It was effective in that in took people's responses but many factors were unable to be tested this way.

House Preferences

Two statement/questions were adjusted in the House Preferences;

1. 'I like my home to be' was changed to 'I would describe my home as' to ascertain actual cleanliness over what was desired.
2. Personal value and monetary value was clarified in the nature proximity statement as it was identified that they these were different definitions.

Formal Satisfaction

The summarisation of satisfaction was changed from

1. Satisfied 2. Preference for box 3. Indifferent/Neutral 4. Preference against box 5. Dissatisfied.

Afterwards, it split into two questions as it was felt that the question asked two different things, current satisfaction and future satisfaction.

a) How happy are you with an integral bird / bat box in your house?
b) If when buying your next house you were given the choice, would you have a preference for, against or be indifferent to an integral box?

Future Impact

A mistake was realised in the wording of the 3rd Statement in this section.
'Climate change will have a minor impact on wildlife behaviour' was changed to 'Climate change will have a negative impact on wildlife behaviour'.
People interpreted this in different ways with some disagreeing because they felt it caused a major impact and others because they disagreed it caused an impact at all etc..

Format

The questionnaires were made more compact to reduce the number of pages.

Mitigation

As it was unknown if anyone at Cambridge was involved in the box mitigation process, questions were inserted that asked this to ensure no bias went unrecorded.

Recommendation

After a late interview with a Housing Developer, the question was inserted as to whether the occupant would recommend a house with one built-in to a friend. This was included because this was one of the ways in which developers assess their ratings and any negative side effects from boxes had the potential to impact these.

Positive / Negative

Rather than asking people about positive or negative side effects of boxes they could think about, it was instead asked what they liked or what would concern them about having an integral box. This proved to better as these were more personal responses.

5. RESULTS AND DISCUSSION

I. Approach

In accordance with the method described, this section tests the hypotheses around *what* people think about integral bird and/or bat boxes in their house and the factors that influence their response. The first section looks at the quantitative results. Data which has been collected is presented in this section according to its subject.

II. Quantitative analysis

Table 1

Overall			**%**				**%**
A	A really good idea	41	29	**F**	Very happy	30	21
B	A good idea	65	46	**G**	Happy	57	40
C	No opinion	35	25	**H**	Indifferent	51	36
D	Not a good idea	1	0.7	**I**	Unhappy	3	2.1
E	A really bad idea	0	0	**J**	Very unhappy	1	0.7
	Total	142				142	

Table 2

People with integral bird boxes			**%**				**%**
A	A really good idea	22	31	**F**	Very happy	16	23
B	A good idea	34	48	**G**	Happy	33	46
C	No opinion	15	21	**H**	Indifferent	21	30
D	Not a good idea	0	0	**I**	Unhappy	0	0
E	A really bad idea	0	0	**J**	Very unhappy	1	1.4
	Total	71				71	

Table 3

People with used integral bird boxes			**%**				**%**
A	A really good idea	9	31	**F**	Very happy	6	21
B	A good idea	15	52	**G**	Happy	16	55
C	No opinion	5	17	**H**	Indifferent	6	21
D	Not a good idea	0	0	**I**	Unhappy	0	0
E	A really bad idea	0	0	**J**	Very unhappy	1	3.4
	Total	29				29	

Table 4

People with integral bat boxes			**%**				**%**
A	A really good idea	3	23	**F**	Very happy	1	7.7
B	A good idea	6	46	**G**	Happy	5	38
C	No opinion	4	31	**H**	Indifferent	6	46
D	Not a good idea	0	0	**I**	Unhappy	0	0
E	A really bad idea	0	0	**J**	Very unhappy	1	7.7
	Total	13				13	

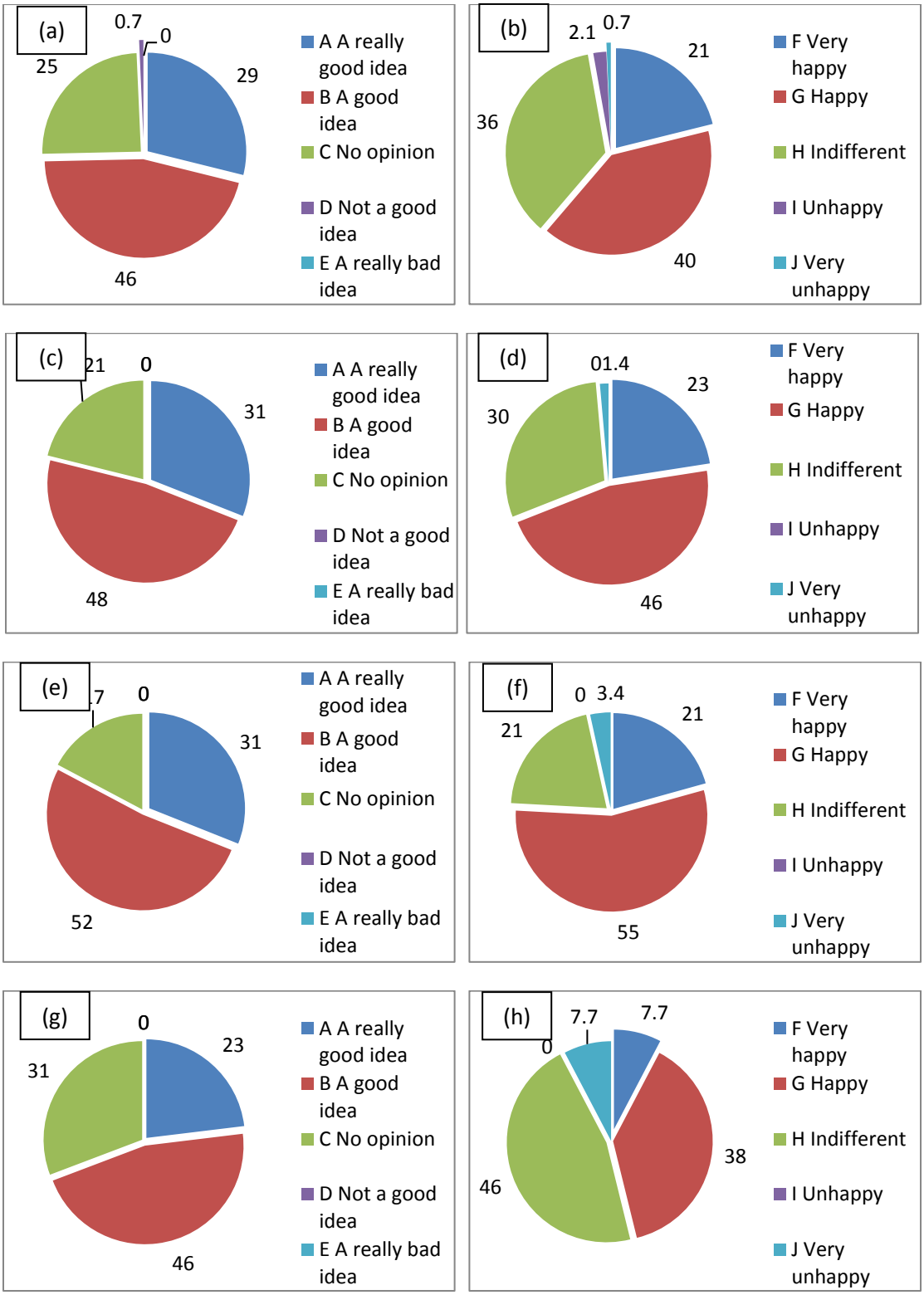


Figure 1: Representation of summarised results; (a + b) = Table 1; (c + d) = Table 2; (e + f) = Table 3; (g + h) = Table 4.

III. Summarised results

The tables and pie charts illustrated on the previous page are an overall summary of what people think about having an integral bird or bat box in their home. As detailed in the Research Methodology, responses were split into whether people would be happy with a box and if they thought it was a good idea. The tables present the number of individuals and the charts represents this visually as a percent. They were then divided into the following subsections;

- People with integral bird boxes
- People with used integral bird boxes
- People with integral bat boxes

Table 1 and corresponding charts show the overall results of a mixture of people with and without integral bird and bat boxes. Those without were asked to speculate how they might feel with one in their home. The results show that of the 142 people interviewed, 75% thought integral boxes in general were a good idea and 61% were or would be happy. Individuals with negative results have been represented fully for qualitative discussion; please see *Case Studies*.

Table 2 and corresponding charts splits this into people who only have integral bird boxes. This is more valuable for ascertaining opinions based on box presence. Of the 71 people interviewed, there was a small increase of people with outright positive opinion, resulting in 79% thinking it was a good idea and 69% saying they were happy. The sole individual who had an unhappy experience is represented within aforementioned case study section.

Table 3 and corresponding charts divides this further into suspected use of integral bird boxes, either by visual confirmation or hearsay from the occupants. These responses have increased value because they detail actual experience of how the box would function. Of the 29 people interviewed, there was another small increase of people with positive experiences. 83% thought it was a good idea and 76% said they were happy. The individual who had an unhappy experience is duplicated in this table as seen in Table 2.

Finally, Table 4 and corresponding charts address the number of people with integral bat boxes. As the number of people interviewed totals only 13 and there were no recordings of bat box use (aside from 2 used by birds) the ability to judge opinion to integral bat boxes is severely diminished. However, 69% of people with bat boxes thought they were a good idea and 46% said they were happy. The latter result is a direct split between those who were indifferent to their presence at 46% again with 31% who had no opinion. Although these scores are lower, negative responses expected due to cultural associations and fears of

bats were not present. The individual who had an unhappy experience with a bird box is duplicated in this table as they also had a bat box, but had no comments regarding it.

Overall, the results at face-value are very positive and there is an indication that people with boxes being used are happier and more confident in the box working than people without boxes. Although neutrality is challenging to assess, it indicates there would not be any actionable objection to the boxes and therefore would not impact developer ratings.

IV. Site comparison

The method was to divide it by site for easiest consumption to ensure contextual awareness of geographical differences. Table 5 shows the alphabetical coding and associated marks to give the Box Satisfaction score; the highest total 10 and lowest 2.

Table 5

				Marks
A	A really good idea	**F**	Very happy	**5**
B	A good idea	**G**	Happy	**4**
C	No opinion	**H**	Indifferent	**3**
D	Not a good idea	**I**	Unhappy	**2**
E	A really bad idea	**J**	Very unhappy	**1**

Table 6 - 9 and the corresponding charts in Figure 2 represent the different sites visited to assess the difference between the satisfaction and site location. The locations are:

- Tregunnel Hill and Trevenson Meadows, Cornwall
- Fulbourn, Cambridge
- Haddenham, Cambridge
- Freshwater, Newport and Ryde, Isle of Wight

Table 6

Cornwall		
Lower Scores (15)	**4**	1
	5	1
	6	7
	7	6
Higher Scores (26)	**8**	15
	9	3
	10	8

Table 7

Isle of Wight		
Lower Scores (15)	**6**	12
	7	3
Higher Scores (29)	**8**	22
	9	1
	10	6

Table 8

Fulbourn		
Lower Scores (18)	**6**	12
	7	6
Higher Scores (28)	**8**	10
	9	3
	10	15

Table 9

Haddenham		
Lower Scores (5)	**6**	3
	7	2
Higher Scores (6)	**8**	3
	9	3

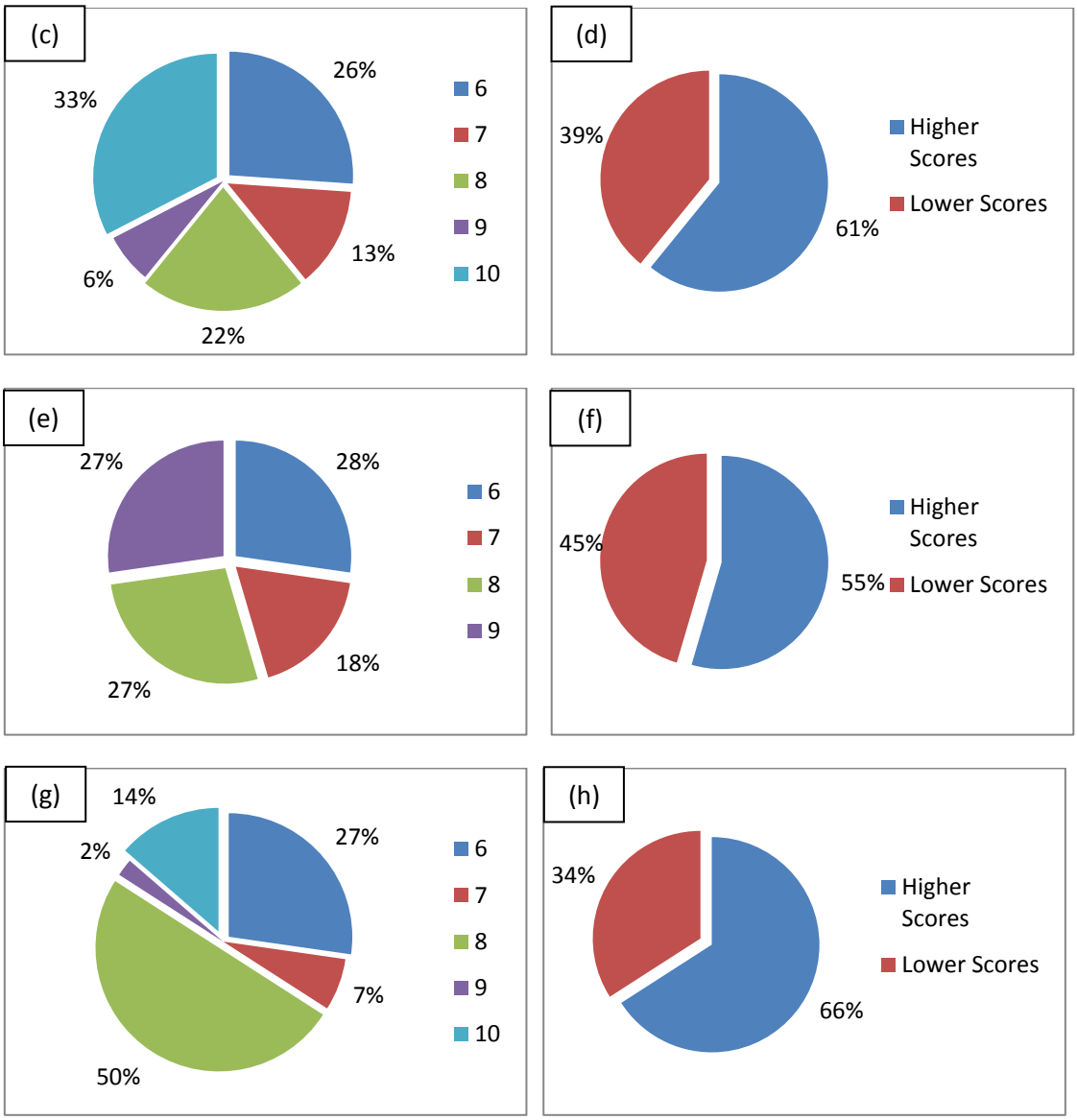


Figure 2: Representation of individual site results;

A + B Cornwall
C + D Fulbourn
E + F Haddenham
G + H Isle of Wight

In order to visually assess sites which gave a more positive response to the boxes, the Box Satisfaction Scoring on the left was grouped into higher and lower scores on the right. This does not mean there is a divide between satisfaction and dissatisfaction as the marks awarded between idea concept and happiness cannot be distinguished, but it does give an overall impression of which site is likely to be more positive.

In order of satisfaction:

- Isle of Wight 66%
- Cornwall 63%

- Fulbourn 61%
- Haddenham 55%

Based on these results, it appears that occupants in the Isle of Wight were most likely to give positive results with Haddenham the least likely. These differences are marginal but the latter stands out. This small council development had the poorest quality boxes and knew the least amount about them (results from short surveys); this is discussed more in the following section. The majority of residents there also rented their home and from discussions in the literature review, may not have had been as engaged or concerned because they did not own the property. However, there were no negative responses from the development and anecdotal feedback was indifferent to positive.

V. Formal Satisfaction Rating

The results of the formal satisfaction rating for the Long Questionnaires show no outright negative responses for either bird or bat boxes. People asked typically felt less strongly about integral bat boxes than they did bird boxes, although this is difficult to judge as these responses were mainly theoretical due to lack of bat box participants. 77% of people asked (exc Isle of Wight) preferred to have an integral bird box in their next home, supporting the hypothesis that people assign personal value to being in closer proximity to nature.

Table 10

Cambridge

Actual	Bird	Bat
Very Satisfied	7	0
Satisfied	1	1
Indifferent	1	0
Strongly for box	2	0
Preference for	5	1
Neutral	2	0

Theoretical	Bird	Bat
Very Satisfied	0	3
Satisfied	0	0
Indifferent	0	6
Strongly for box	0	0
Preference for	0	0
Neutral	0	0

Table 11

Isle of Wight

Actual	Bird	Bat
Satisfied	14	2
Preference for box	0	0
Indifferent	1	0

Theoretical	Bird	Bat
Satisfied	1	5
Preference for box	1	1
Indifferent	0	2

Table 12

Cornwall

Actual	Bird	Bat
Very Satisfied	7	0
Satisfied	3	0
Indifferent	2	0
Strongly for box	4	0
Preference for	6	0
Neutral	2	0

Theoretical	Bird	Bat
Very Satisfied	0	4
Satisfied	0	1
Indifferent	0	6
Strongly for box	0	2
Preference for	0	1
Neutral	0	2

Table 10 -12: Representation of formal satisfaction and preferences of box presence

VI. Awareness and Presence

The awareness of integral boxes and their presence is outlined in this section. Figure 3 charts A – G represents the data collected from the Long Questionnaires with some additional information from the Short Questionnaires. They reveal the extent in which people knew about the concept of integral boxes and if they were aware of them in their own home.

Unsurprisingly due to the amount of communication and publicity about the site, Cambridge was revealed to know the most about integral boxes and also much more likely to know about boxes in their homes before moving in. Most people had heard about boxes because of their house, but people from Cornwall quoted seeing them during the *Countryfile* episode. Due to the quality and cost of Tregunnel Hill, it was surprisingly that they did not know about the boxes before moving in and most only found out about them during this survey. Yet this did not appear to impact Box Satisfaction at first examination.

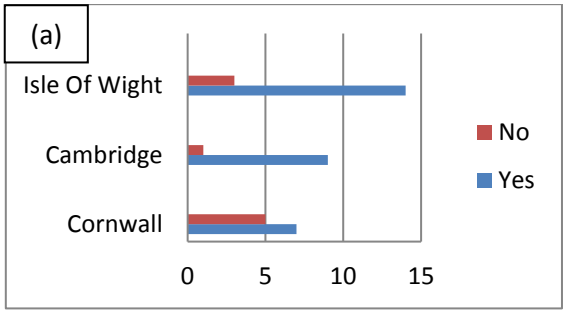
However, when divided between ownership groups and awareness of integral boxes in the home compared with Box Satisfaction, there was a noticeable difference. The suggestion was that people who knew about integral boxes before they moved in would be more likely to be happy with the boxes. This is partially reflected in Chart G that indicates that those who were least satisfied were people who owned their own homes and did not know about the integral box in their house. Incidentally, there was no difference between ownership and Box Satisfaction overall. Statements collected during the qualitative questions expand on this further.

Of the 51% who knew beforehand, 85% suggested it had no impact on their decision to buy, but 15% stated it impacted their decision positively with no negative results. Although this is not a huge sample size, it supports the hypothesis that the presence of an integral box is

not of enough importance to influence the decision to buy a property and may even add value.

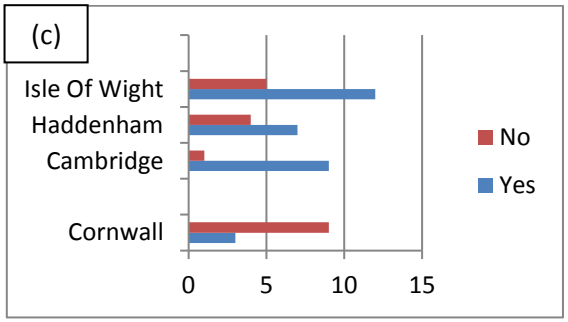
Figure 3 representative of long questionnaire awareness questions.

A Have you heard about boxes being built into house before I spoke to you today?
B Where?
C Are you aware you have an integral box in your home?
D Did you know it was there before moving in?
E When did you first notice the hole?
F Did it impact your decision to buy?
G Correlation between Awareness / Ownership / Box Satisfaction

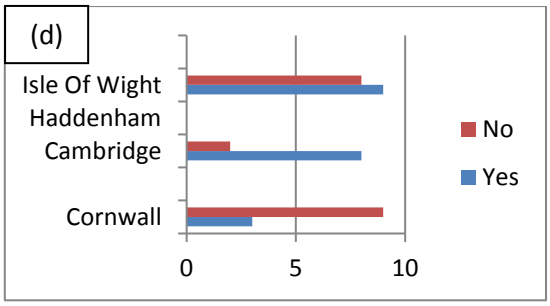


%	YES	NO
Cornwall	58	42
Cambridge	90	10
Isle of Wight	82	18
Total	**77**	**23**

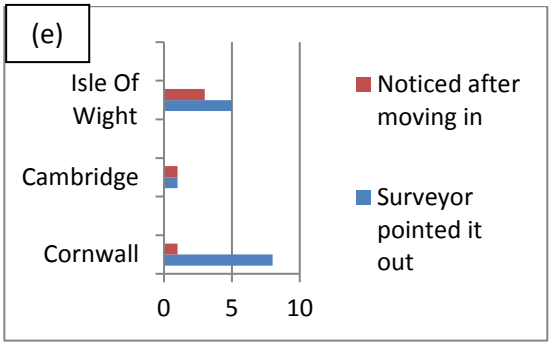
%	TV	Work	House	AD	Other
Cornwall	71	14	0	0	14
Cambridge	11	11	67	11	0
Isle of Wight	7	0	71	0	21
Total	**23**	**7**	**54**	**3**	**13**



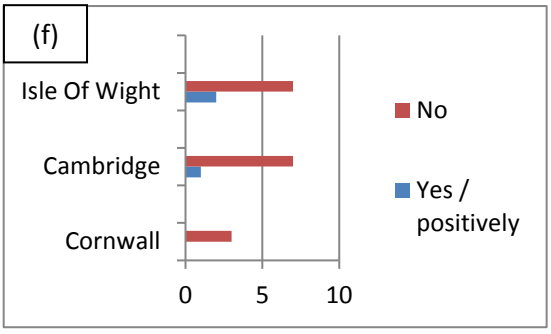
%	YES	NO
Cornwall	25	75
Cambridge	90	10
Haddenham	64	36
Isle of Wight	71	29
Total	**62**	**38**



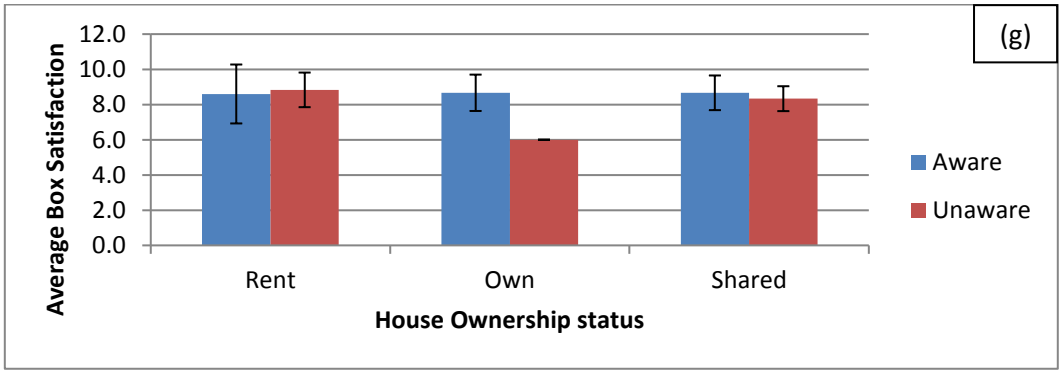
%	YES	NO
Cornwall	25	75
Cambridge	80	20
Isle of Wight	53	47
Total	**51**	**49**



%	Surveyor..	Noticed after
Cornwall	89	11
Cambridge	50	50
Isle of Wight	63	38
Total	**74**	**26**



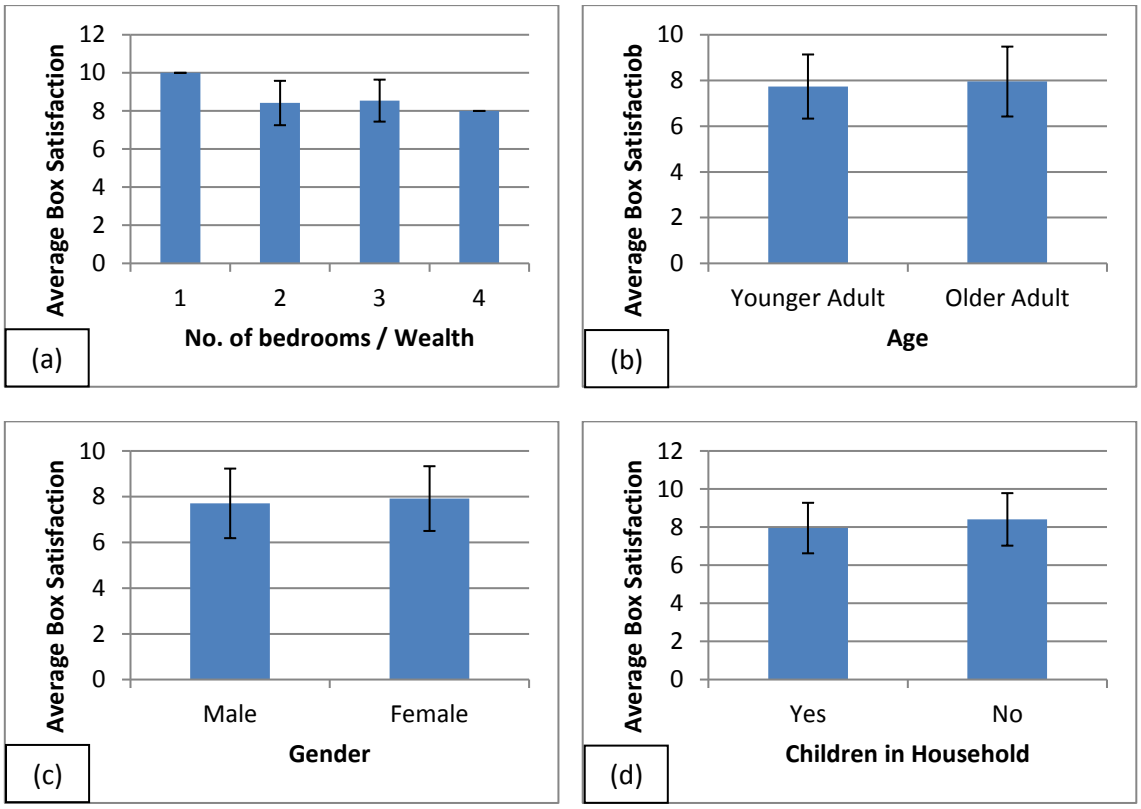
%	NO	YES – Positively
Cornwall	100	0
Cambridge	88	13
Isle of Wight	78	22
Total	**85**	**15**



VII. Demographics

There were several hypotheses around potential demographic factors that might influence Box Satisfaction. These were regarding wealth, age, children and gender. From the results collected, no significant difference can be seen between any of the information collected to suggest that one group is more likely to accept boxes than the other.

Figure 4: Representation of demographic results; (a) = Bedrooms / wealth; (b) = Age; (c) = Gender; (d) = Children in Household



There was no difference between those who were potentially wealthier because of the number of bedrooms within their house, or between male and female participants. However, a conflict was identified between the statements made between having children and the age of the participants. The hypotheses are;

1) *Younger adults* have less connectivity to nature
2) People *with children* have more connectivity to nature

This means there is an overlap between *younger adults with children*, which might explain why there is no discernible difference in Box Satisfaction.

VIII. Problems and perception

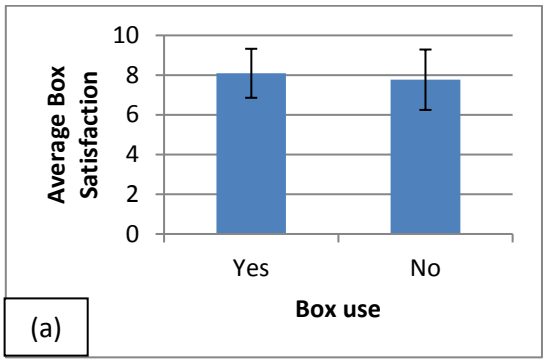
This section looks at box use, problems and responses to questions on box perception. People who gave negative responses or had problems were more difficult to engage and persuade to complete Long Questionnaires, so a full evaluation of why they thought the way they did could not always take place in correlation with influencing factors. However, information was collected and analysed as best as possible from Short and Long versions.

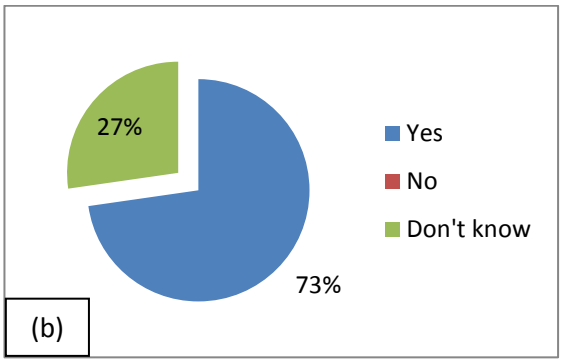
It was suspected that the more boxes were being used, the higher the likelihood was of there being problems, complaints or issues that would result in a lower Box Satisfaction. Cambridge had the highest box uptake of any of the sites and did have recorded problems, but they also had the most confidence the nest boxes in general were effective in promoting species breeding.

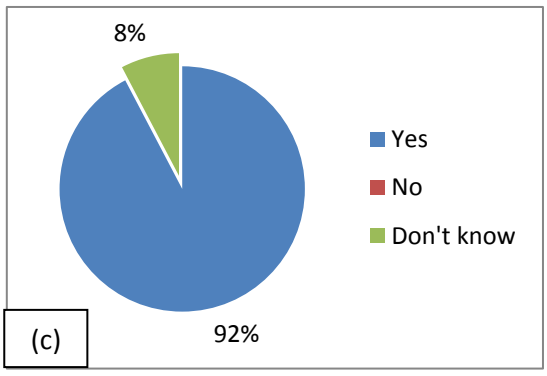
However Figure 5 Chart A compares suspected box use with Box Satisfaction to show no discernible difference between the two.

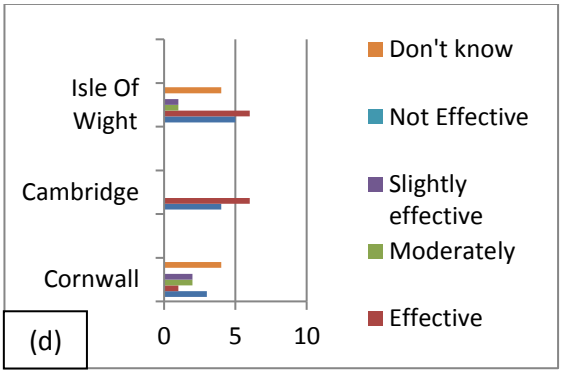
Figure 5: Representation of long questionnaire perception questions.

A Correlation between Box use / Box Satisfaction
B Would you recommend a house with one built-in to a friend? (Exc. IoW)
C Should integral boxes be pursued?
D + E How effective do you believe nest boxes are for supporting species breeding?
F + G Have you experienced any problems and do these problems bother you?



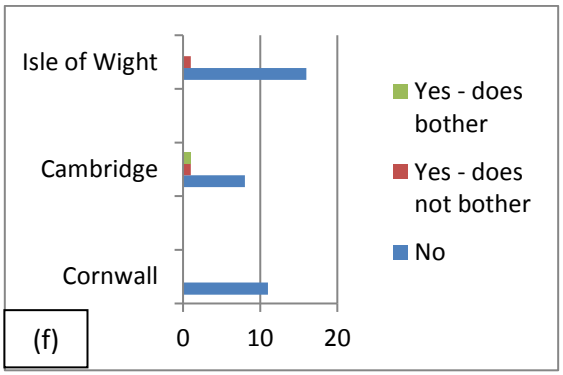


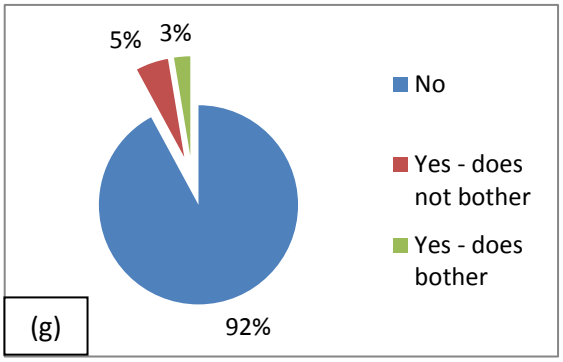




(e)

%	Very Effective	Effective	Moderately	Slightly Effective	Not Effective	Don't Know
Cornwall	25	8	17	17	0	33
Cambridge	40	60	0	0	0	0
Isle of Wight	29	35	6	6	0	24
Total	31	33	8	8	0	20





The only Long Questionnaire recorded problems were in the Isle of Wight and Cambridge. This was where defining problem became problematic as the two results who weren't concerned referred to seeing some excrement on walls, but it didn't bother them at all. The only result that was concerned with the problem in Cambridge is discussed in *Case Studies (Person 7).*

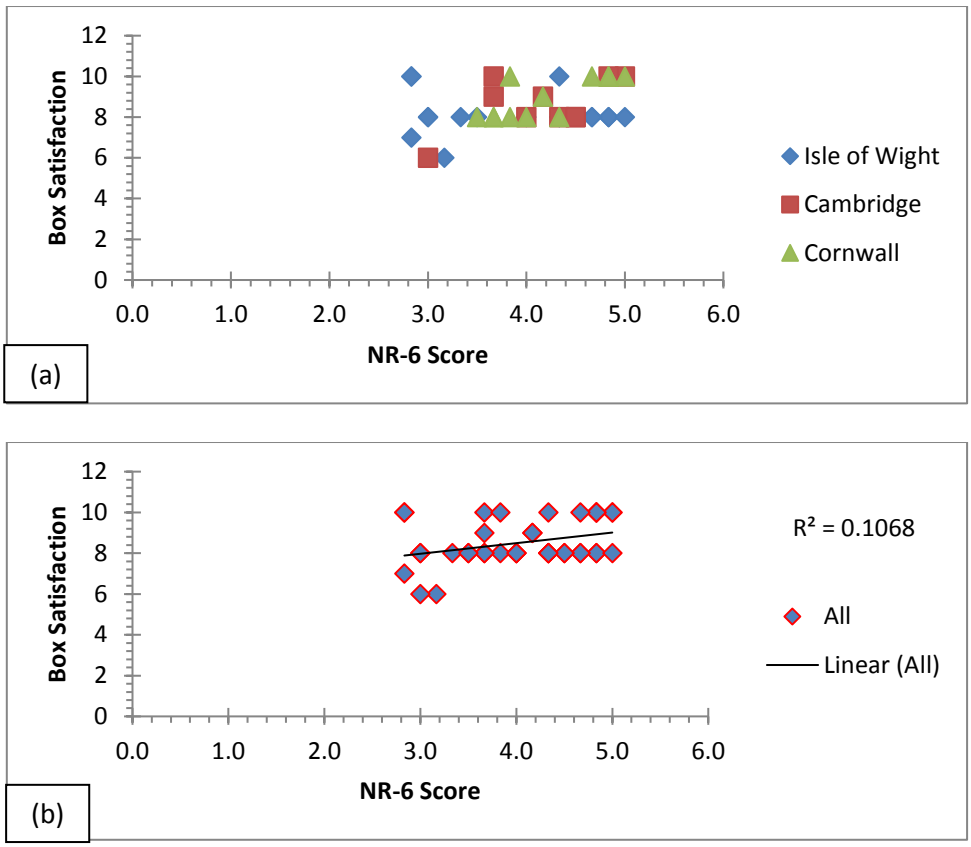
Chart C reveals that 92% of people believe that integral boxes should be pursued with the remainder unsure. Chart B was a question added after a late interview with the Housing Development Company (excluding Isle of Wight) and reveals that 73% of people would recommend a house with one built-in to a friend. This indicates that there may be added value or no impact on their house satisfaction ratings they would give to developers.

IX. Satisfaction Factors

This section examines the following factors that may influence or predict occupant satisfaction with integral boxes in their home;

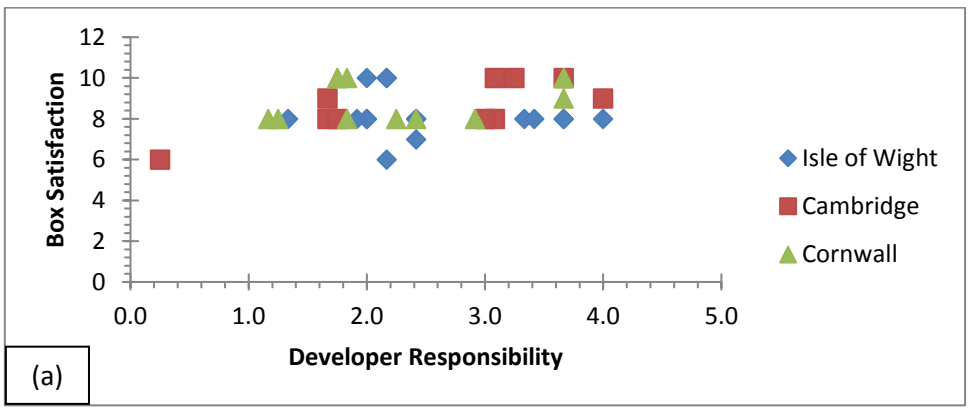
- Nature connectivity as presented via the NR-6 score
- Developer Responsibility
- Future Impact Versus Box Satisfaction
- House Preferences

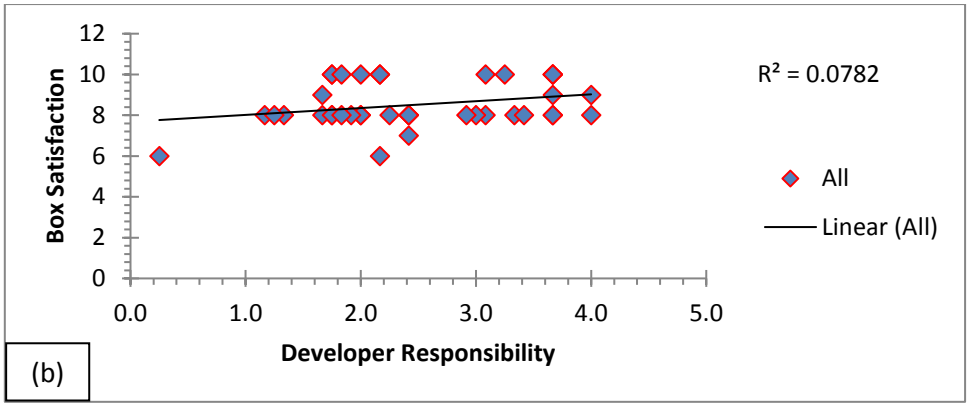
Figure 6: (a + b) Representation of Nature Connectivity against Box Satisfaction



The hypothesis was that people with higher connectivity to nature would be happier with integral boxes in their home, a potential reason being that they would want to be in closer proximity to nature. The result is a slight positive correlation overall but no discernible difference by location.

Figure 7: (a +b) Representation of Developer Responsibility against Box Satisfaction





Another hypothesis was that people who are aware of the impacts of housing developments will believe developers have a greater responsibility to wildlife; they will be more accepting of integral boxes. Again, there is only a *very* slight correlation in Figure 7 and no discernible difference by location – more noticeable is the outlier result highlighted further in Figure 8.

Figure 8: (a) Representation of Developer Responsibility against Nature Connectivity

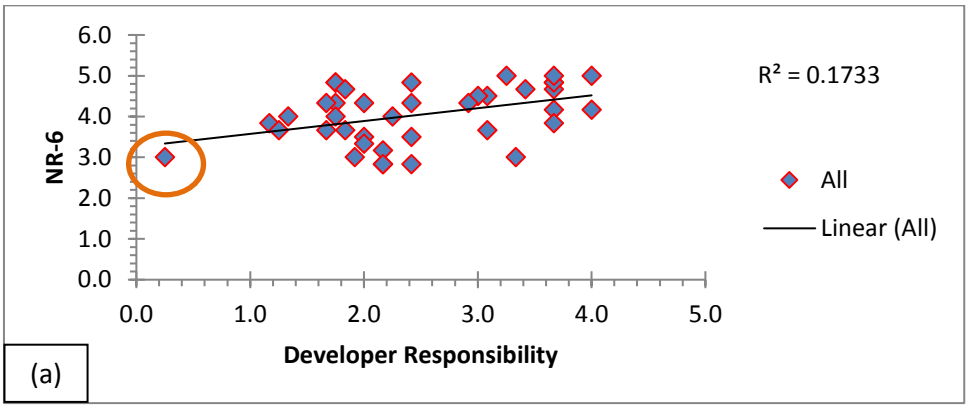
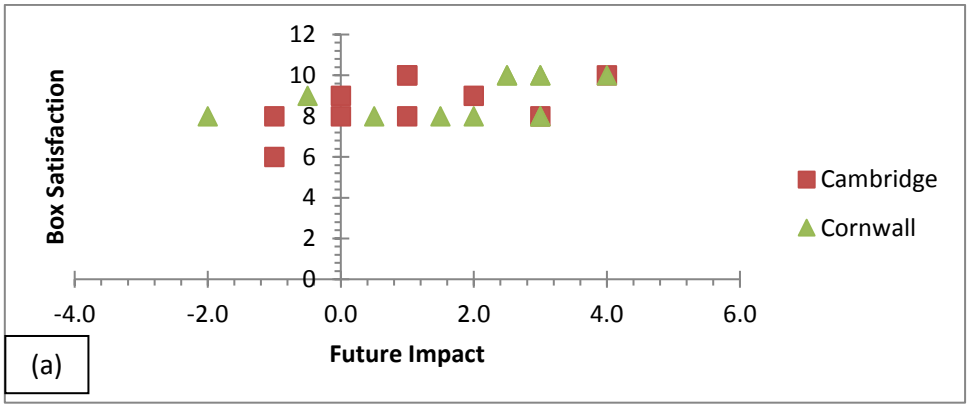
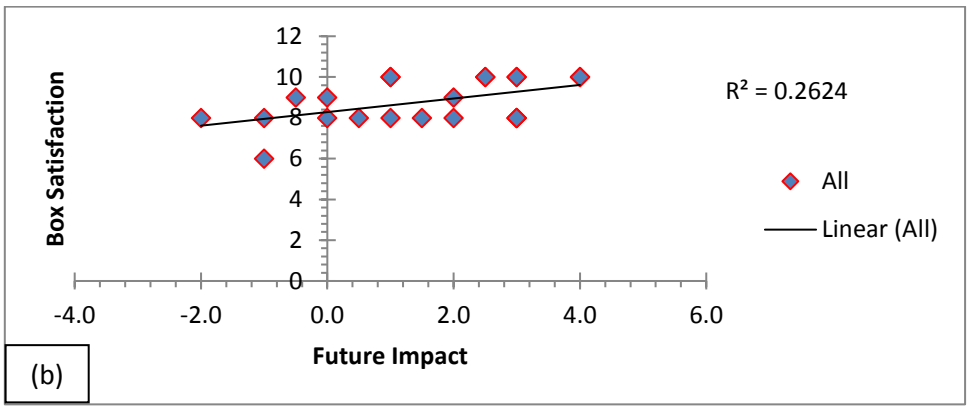


Figure 8 replaces Box Satisfaction with the NR-6 Nature Connectivity Factor. Although the correlation is small, it emphasises the individual who indicated they had a problem with the boxes, which also bothered them. Although other people have had a low NR-6 or Developer Responsibility Score, this person stands out and is discussed further in the section on *Case Studies*.

Figure 9: (a + b) Representation of Future Impact against Box Satisfaction (Exc. Isle of Wight)

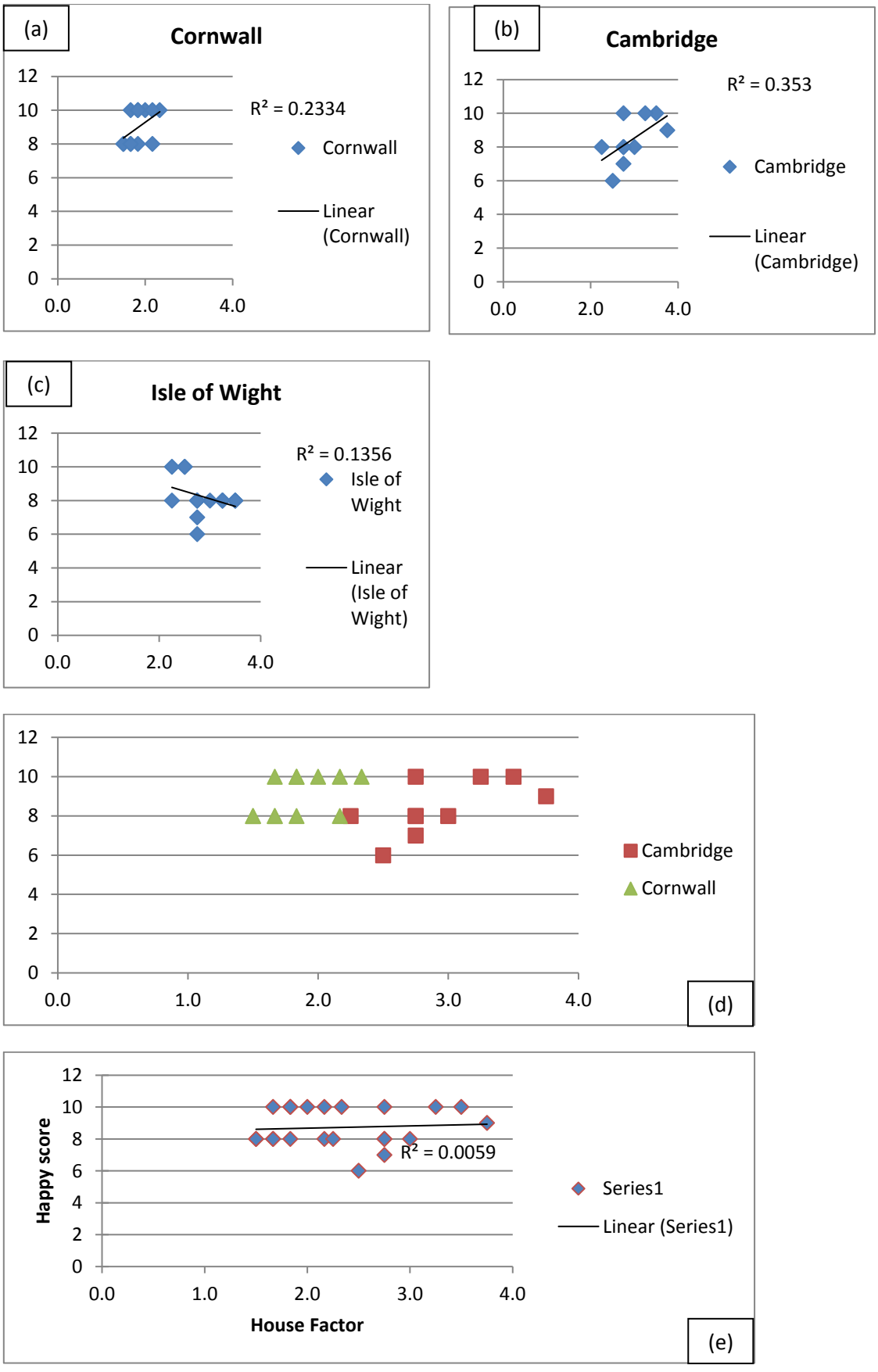




It was suspected that people who were more aware of environmental issues affecting wildlife in the long-term would have a higher Box Satisfaction Score. There is a slightly stronger, though still slight positive correlation and no significant difference between locations. However, the Isle of Wight could not be included because of the issue mentioned in *Challenges and Changes*.

The last correlation graph in Figure 10 was employed to test the final hypothesis in this section regarding House Preferences. The latter represents people's feelings towards maintenance, proximity to nature, cleanliness and noise. The hypothesis was that if people were more tolerant of these factors, this would be more accepting of an integral box that might impact them.

Figure 10: Representation of House Preferences against Box Satisfaction; (a) = Cornwall; (b) = Cambridge; (c) =Isle of Wight; (d + e) = Overall (Exc. Isle of Wight)



Overall, there is no discernible correlation or difference by location. However, individually there is a slight positive correlation, apart from the Isle of Wight in Chart C. As mentioned in *Challenges and Changes*, the wording had to be changed for the Isle of Wight and it was disrupting the results. It was included to demonstrate the impact this had on the methodology and therefore had to be removed from the overall results. Further investigation is needed and may improve by refining the questions or treating them separately instead of summarising them into one score.

X. Key Observations

Key observations to take away from this information presented in the Quantitative analysis section is that overall people are satisfied to have an integral bird box in their home and even express a preference to have one. There was little to no impact on the presence of an integral box that influenced people's purchasing decision. Where asked, people were generally satisfied or indifferent to bat boxes, but this was based largely on theoretical responses due to lack of locations. Recorded problems through Long Questionnaires were negligible in context; see *Case Studies*.

Swifts were only recorded in Cambridge, which was not surprising as it is a mitigation area, with Starlings and House Sparrows recorded at the other sites using boxes. As long-term monitoring could not take place, identifying activity was limited.

Overall it is difficult to assess a correlation between most of the factors defined with only very slight positive correlations being identified and demographics appeared to have no influence. However, an outlier result to be expanded on in the qualitative section was recognisable immediately as one of the least supportive of integral boxes who filled out a Long Questionnaire. Their nature and development related scores were lower across the board and therefore the methodology may have some use showing extreme responses. As there are very few of these, it is difficult to tell.

Haddenham was the least likely to feel strongly about integral boxes in comparison to the other sites, which was linked to lack of communication, poor quality of boxes and lack of care regarding ownership. Although there was no discernible difference between ownership groups, there was a noticeable dip in satisfaction for people who owned their own home and were unaware of the integral box. This suggests communication prior to purchase may be an influencing factor to Box Satisfaction for homeowners. Owners accepting integral boxes as their responsibility by being made aware of them before purchase may be a defining factor that prevents negative impact on developer ratings.

6. QUALITATIVE ANALYSIS

I. Approach

This section deals with *why* people think the way they do about integral boxes via qualitative interpretation. This has been achieved by writing case studies of the people whom have either demonstrated potentially typical, unusual or poignant results. It is a mixture of both positive and negative responses from Short and Long Questionnaires.

II. Case studies

I. Isle of Wight

Freshwater Persons 13

A male and female residing together were interviewed via a short survey and were notable because they suggested that – whilst they believed integral bird boxes to be a good idea, they should not have one in their house. This was because they had cats and would be concerned about the safety of any birds in the garden. This explains their 'B-I' rating.

Short survey	**P13**
Gender	Female & Male
Age	50s+
Children	No
Garden	Yes
Ownership	Unknown
Box type	None
Pets	Cats
Aware of	Yes
Box opinion	BI - 6
Other reactions	1 2

Their statement was the first instance in which pets became a factor of interest as it followed that many home occupants also voiced apprehension of cats predating birds. However, in the same conversation, this couple also stated that they fed birds and therefore were actually encouraging them to the garden. Although they may have been demonstrating an understanding of fledgling vulnerability to cat predation, this conflicting response undermines their reasoning and casts doubt over whether this was the real reason for their preference.

It was difficult to assess the strength of their feeling and whether they would have felt the same way if they did have box, but an interpretation at face value shows good awareness of the challenges of a synanthropic relationship.

Freshwater, Person 3

A female was interviewed via a long survey and was chosen as a case study because there were various relevant factors of interest. Firstly, there was evidence of nesting material poking out from the box [Illustration 1] showing that it had been used; the box appeared in good condition and no other comments were recorded regarding its use.

The occupant was aware of the box before purchase (shared ownership) and when asked about her opinion, stated that it was really nice that wildlife could be given a home. Variations on this statement were extremely common and were often one of the first comments people made when asked about their opinion. She indicated that she couldn't imagine integral boxes impacting the decision to buy, saying "beggars can't be choosers." This was a reoccurring attitude amongst interviewees and supports the hypothesis that presence of an integral box would not inhibit purchase for the majority of buyers.

Long survey	**P3**
Gender	Female
Age	35-44
Children	Yes
Ownership	SO
Box type	Bird
No.	2
Pets	Dogs
Aware of	Yes
Box use	Yes
Box opinion	BG - 8
NR-6 Score	4.3
Res Score	2.4
Other reactions	1 2 9

Both pets and children were present in the house and the latter were revealed to be allergic to wasps and bees. When it was enquired what reaction there would be to non-species nesting, the response was that it would not be a huge concern and she would call a pest-control company. Here, the owner indicates that she considers it her responsibility and not that of the Housing Association to fix this problem, although there are no instances of pests to judge whether this would be a standard response.

Newport, Person 5

This male occupant was selected because he had two integral bird boxes being used that had noticeable faecal matter around the exterior [Illustration 2]. It is thought that Starlings may have chosen to inhabit this box due to the trajectory and amount of faeces, although this cannot be confirmed. Incidentally, it was curious to observe there were Starlings nesting in eaves within the estate as modern builds are expected to exclude these gaps, suggesting poor quality construction. His responses to the House Preferences indicated that he preferred a low maintenance property and a very clean home – the latter was visually confirmed during interview.

Long survey	**P2**
Gender	Male
Age	45-54
Children	No
Ownership	SO
Box type	Bird
No.	2
Pets	No
Aware of	No
Box use	Yes
Box opinion	B G - 8
NR – 6 Score	2.8
Res Score	2.2
House Score	2.5*
Other reactions	1 2 9

The prediction was that the existence of faeces would be more likely to result in occupant dissatisfaction, impacting his box opinion. Although he was surprised to discover the box, he stated was not concerned and thought it was a good idea because, as it did not "impact his day to day living," he couldn't see any problems with it. Whilst his NR-6 Score was low-average, his responses in House Preferences offered an explanation for this as he suggested that a

property in close proximity to nature and wildlife had increased personal and monetary value to him.

While this reason well logically, it demonstrates the complexity of predicting opinion based on assumed knowledge of personality traits and the challenges quantifying received information.

Please note the House Score here was before questionnaire changes and was not included in quantitative results

Ryde, Person 6

Short survey	**P6**
Gender	Female
Age	20s+
Children	Yes
Garden	Yes
Ownership	Rent
Box type	None
Pets	Dog
Aware of	No
Box opinion	AF - 10
Other reactions	4

Two long questionnaire responses were taken from people in the Ryde area and they responded positively to the presence of integral bat boxes in their home. These boxes had small traces of bird faecal matter in them [Illustration 3 & 4] but no signs of bat roosting.

Person 6, however, indicated a very strong response to the *absence* of a bat box in her property and expressed ridicule at common misconceptions based around bats flying into people's hair. She questioned why she did not have a bat box and mentioned a memory of watching them where she used to live. Previous areas of residence have been a commonly reoccurring theme during conversations about wildlife sightings and offer an interesting line of questioning into the correlation to nature connectivity that could not fully be explored during this study.

Person 6 was interesting as a case study as it reflected an extreme response, which was also completely unanticipated because it was strongly *for* an integral bat box. Although the literature review suggested cultural associations around bats may be generally less negative towards them, she was surprisingly hostile against outdated misconceptions.

II. Cornwall

Tregunnel Hill, Stret Caradoc Person 8

Person 8 was notable because the male interviewed stated that he hadn't heard of the boxes before and wouldn't want an integral box in his house, voicing concerns about the possibility of noise disturbance from birds inside the wall. Although satisfactory evidence could not be found to disprove or uphold this, it was clarified that a recommended location for boxes were in the gable ends of houses to try and pre-empt any problems –

advice not followed at this site. This was his main concern, but otherwise he demonstrated no discernible feelings about them as a concept.

Short survey	P8
Gender	Male
Age	40s+
Garden	Yes
Ownership	Own
Box type	None
Aware of	No
Box opinion	C I - 5
Other reactions	4 5

During this conversation, he commented that it would have been “annoying” if he had discovered an integral bird box in the property after it had been purchased. Aside from speculating what action may or may not have been taken, a number of people across all sites that were unaware they had boxes, expressed a preference to have this communicated to them beforehand. Awareness and education of boxes has therefore been viewed as a variable factor impacting people’s attitudes to them and the sites vary in this respect.

Tregunnel Hill, Stret Morgan Le Fay Person 5

An older male questioned via short survey was used for a case study because he was the only person to respond that he felt the boxes to be a bad idea. As was the scenario with Person 13 in Freshwater, this was an example of conflicting interests.

Short survey	P5
Gender	Male
Age	60s+
Children	No
Garden	Yes
Ownership	Own
Box type	None
Aware of	No
Box opinion	D I - 4
Other reactions	4

He stated that although he rarely saw anything other than seagulls in the area, he “loved birds” and used to see a lot more on Bodmin Moor near where he used to live. However, he believed that birds should not be reliant on man-made boxes and feeders because they will “live better lives” in natural habitats. He also expanded that he wouldn’t particularly want one in his house as he has experienced sparrows living in a previous house attic roof-space before and they “made a mess.” Box specifications were clarified at this point.

Person 5 demonstrated an awareness of depleting habitat loss but did not link housing infrastructure as a method that could help counteract this. His past experiences of his interaction with House Sparrows as a pest, appear to have influenced his opinion and as he had received no information about the boxes previous to this, his response was not considered altogether surprising.

Trevenson Meadow, Person 1

Person 1 was an older male who gave a positive response overall to the presence of an integral bird box, but stated that he would probably have to block up the entrance if he experienced any problems with poo because his walls were difficult to clean.

Long survey	**P1**
Gender	Male
Age	55-64
Children	No
Ownership	Own
Box type	Bird
No.	1
Pets	No
Aware of	No
Box use	No
Box opinion	A H - 8
NR-6 Score	3.7
Res Score	1.3
Future Score	1.5
House Score	1.5
Other reactions	5

The integral box overlooked his back garden and cobwebs at the entrance suggested that it is likely it hadn't been used. He answered in his survey that he enjoyed seeing birds in the garden and typically saw them most in the morning, though hadn't seen any activity around the box. Although he supported the idea that integral boxes should be pursued by developers, he also indicated that he thought nest boxes in general were only slightly effective for supporting species breeding.

Blocking up the hole was an option that would occasionally emerge as a response when people were questioned about solutions to possible box problems. Although responsibility for this was only ever self-assigned to the occupant, it cannot be said for certain whether this would be the case in practice. There were not enough examples of integral box problems that people cared about to make a judgement, but the assumption became that people who owned their own homes were more likely to take responsibility for any maintenance issues. This could be referred back to the sense of ownership discussed within the initial literature review.

Trevenson Meadows, Person 6 + Person 9

Person 6 had one bat box present in his property and although thought it was a good idea, expressed that he had "major reservations" over whether they worked. His comments included that there were "too many too close together" and revealed concerns over the competency of housing developers to employ wildlife infrastructure effectively. This isn't unfounded as one House Martin nest box was noticed upside-down at this site [Illustration 5].

Short survey	**P1**
Gender	Female
Age	20s+
Garden	Yes
Ownership	Rent
Box type	None*
Aware of	Yes
Box opinion	B H - 7
Other reactions	1 2 8

Person 9 indicated that the presence of a house with a bird box was actually *more* valuable to them as they had lived in a village before with lots of birds present. It was not clarified

whether this was monetary or inherent value, but this claims support the hypothesis that people would actually prefer being in closer proximity to nature.

III. Cambridge

Swifts Corner Person 1

A female whose property overlooked a house containing a bird box was interviewed over a dead fledgling present in the connecting refuse area between their houses [Illustration 6]. When asked about her opinion, she stated that it didn't particularly bother her and compared it to seeing roadkill.

Short survey	**P6**	**P9**
Gender	Male	Male
Age	40s+	30s+
Children	Yes	Yes
Garden	Yes	Yes
Ownership	Rent	Own
Box type	Bat	None
No.	1	--
Pets	Cats	Unknown
Aware of	Yes	No
Box use	No	--
Box opinion	A G - 9	A G - 9
Other reactions	1 2 9	4 6

The language used here was worth consideration as it expressed acceptance of wildlife deaths because it could be in some way predicted or anticipated. Although unpleasant, a dead fledgling was a comprehensible side effect of the increased proximity between humans and wildlife.

Swifts Corner Person 7

Person 7 was a male identified as the outlier result mentioned in the Quantitative Analysis section. His response was revealed among the lowest scored relating to nature and development and was anticipated to give a low Box Satisfaction Score.

Long survey	**P7**
Gender	Male
Age	25-34
Children	Yes
Ownership	Rent
Box type	Bird
No.	3
Pets	Dog
Aware of	Yes
Box use	Yes
Box opinion	C H - 6
Other reactions	2
NR-6 Score	3
Res Score	0.3
Future Score	-1.0
House Score	2.5

This was a confusing case study because he inferred that he associated the integral box with rat problems and was therefore the only person to say he had a problem with the box and that this problem bothered him. This is considered unlikely due to the location and enclosed style of an integral bird box, but no evidence exists either way to corroborate or deny his statement.

However, his overall result was a 'C-H' – neutral response and checking his Formal Satisfaction rating stated he was indifferent to integral boxes. Typically, his approach was non-committal and apathetic, which made it surprisingly he actually completed the questionnaire.

This highlights the issue of those who either refused to engage by not taking the survey or giving very little time or energy to the topic during questioning.This neutrality represents the most unknown and potentially most variable group as without long-term trials of box inhabitation, it is uncertain whether the initial response of the occupant would be affected once the box was in use.

Windmill Lane Person 1

This case study is of particular interest because there were two problems noted, but only one was considered to be linked to box presence. A dead swift was recorded hanging from behind a white fascia board on the side of a house where there was a gap between the brick wall [Illustration 7 & 8]. Only the wing was visible and when this was pointed out to the female owner, she expressed surprise and unhappiness at its presence. It transpired that his had happened once before but a member of the local swift group had been able to dislodge the bird alive without issue.

Short survey	**P1**
Gender	Female
Age	40s+
Children	Yes
Garden	Yes
Ownership	Own
Box type	Bat & In. Bird
No.	2
Pets	Dog
Aware of	Yes
Box use	No/Yes
Box opinion	A J – 6
Other reactions	1 2 10

This incident can most likely be attributed to the swift's recognition of the fascia boards as potential nesting sites from the demolished 1960s housing. Swifts are thought to prefer nesting in the same area as other swifts and the house in question was in very close proximity to the remaining old style houses (Mayer, 2017) Conversation with Dick Newell revealed his own findings that birds could find it challenging to distinguish between theirs and their neighbours nest holes. In this situation, the presence of the dead swift should be considered a construction issue and also an indication of the type of problem that could have been encountered en masse had box mitigation not taken place.

Its reoccurrence appeared to be distressing for the owner and she showed concern for her property's appearance as well as the welfare of the birds. She went on to say that she also had integral bird boxes installed over her garden and she would sometimes find faeces on her outdoor furniture. The owner repeated the commonly voiced opinion that it would have been nice to have known about the boxes first but responded warmly to communication, summarising by saying she thought they were a good idea – but they had to work alongside the homeowner.

Overall, this case study illustrates the potential value of mitigation as well as the accompanying challenges. It has appeared that making the occupant aware of the boxes

before purchase, equates to them taking responsibility for the boxes and any side effects, whereas without them knowing, there seems to be an element of blame that can be assigned elsewhere.

III. Key Observations

Conversations with participants have been extremely valuable and these have brought up factors of influence that have been under investigation. People have talked about their own experiences with nature and although these were not always positive, many expressed pleasure at being able to give wildlife a home. Noise and excrement were sometimes brought up as questions or statements of experiences, which demonstrated home preferences were a factor of interest. However, very few problems were recorded and those that were did not always represent a concern for the occupant. Many people found it difficult to think 50 years into the future when discussing impact but were able to recognise the impact of housing on the environment. It is suspected that because of this, more people reacted positively to integral boxes and not just indifferently to their presence.

Reoccurring comments included that people wished to know about the boxes before they made an agreement on the property and that box location was also an important aspect to get right. Issues could be avoided if the right steps were taken early on to ensure full awareness, a suitable location and good quality box.

7. CONCLUDING REMARKS

This research was conducted to explore the attitudes of home occupants to integral bird and bat boxes as well as the influencing factors behind their opinion. Human adaptation of the environment has changed to the extent that cities and towns have become a unique habitat for a variety of wildlife species and these synanthropes are under threat as the population continues to grow. In the eyes of an increasing number of professionals, integral boxes are viable mitigation technique as a man-made alternative for building dependent species. The avenue for the biggest impact has been identified as the housing market.

Following a preliminary investigation with housing developers, it was found that it was not officially known what home occupants thought about integral boxes and opinion was divided between interested parties. Potential problems were suggested but these were hearsay and without solid foundation. After conducting a literature review, several factors of influence became clearer to be explored, including:

- Nature Connectivity

- Demographic circumstances
- Home preferences
- Communication and awareness
- Housing development and environmental impact

Links and overlaps between these factors were expected and it was difficult to identify one prevailing factor for people. It was thought there would be a stronger correlation between Box Satisfaction and people's connectivity to nature and opinion of developer responsibility.

However, it was demonstrated in the results that people who owned their own homes preferred to know about the boxes before purchase. Awareness can therefore be identified as the first step to box acceptance. The second step is ensuring that people know why it has been included and be reassured that it has been researched and been shown to work. Confidence in the product and correct use by developers will breed confidence. It is likely that will always be some people who do not want an integral box in their home, but the overall responses were more positive than the neutrality expected. People were very conscious of the need or at least a desire to provide a home for wildlife species, demonstrating the ties expressed earlier in the literature review about the synanthropic relationship.

Overall, integral boxes have the potential to be successful as a mitigation technique for certain building-dependent species and their increased proximity to people offers increased personal value. It would be unlikely that integral boxes would impact housing sales, but caution should always be taken to ensure a good standard is maintained.

I. Limitations

There were a number of limitations to the research process that provided lessons to take forward to future projects. A lack of access to bat box locations severely impeded any ability to get worthwhile opinion data of people with them built into their property and this would need to be rectified before continuing. Limited resources meant that the typical length of time that a site could be surveyed was 1-2 days but this was only once during the entire year. This made it very difficult to check for activity and also meant people who were away or out could not be interviewed.

Potential buyers were a group of interest that could also not be fully explored in this research as it would have involved trying to coordinate a time to adequately inform people of integral boxes and gauge their reaction. This could not easily be designated to other volunteers as the possibility for bias to influence responses may occur without careful standardisation.

Lastly, opinions are subject to change and it would have been useful to have housing case studies that were engaged in long-term monitoring and surveying. This would not need to involve great effort of the part of the participant, but they would simply record any activity noticed or concerns felt as and when this occurred naturally.

II. Recommendations

There is ample opportunity for future study to explore this area of research but it would be challenging to revisit any of the sites for participant surveys within a close proximity of time. Two sites of interest are instead recommended:

- Nansledan, Cornwall
- Kingsbrook, Aylesbury

Nansledan is a significant development which advertises holistic sustainable living and integrates wildlife features directly into the site. It will continue to be built over the next 30 years and represents a blank canvas for study which should be exploited. As mentioned previously, Kingsbrook is touted as something to which all housing developments could aspire to regarding wildlife integration and should be investigated fully.

Integral boxes have the potential to become standard practice as part of planning mitigations and may become a common feature in newly built British homes. However, they may still be installed incorrectly, poorly or redundantly and so standardisation should occur to prevent unnecessary damage to occupant opinion,

8. Illustrations

Illustration 1

Illustration 2

Illustration 3

Illustration 4

Illustration 5

Illustration 6

Illustration 7

Illustration 8

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10. APPENDIX

i. Site summaries

Fulbourn, Cambridge			
Total number of houses in area	**270**	Responses of houses with boxes	**27**
Total number of houses with boxes	**Unknown**	Responses of houses without boxes	**3**
Total number of boxes	**159**	Responses from outlier or unknown addresses	**16**

Overall (With external)

A	19	**F**	16
B	15	**G**	10
C	12	**H**	19
D	0	**I**	0
E	0	**J**	1

People with integral boxes

A	8	**F**	7
B	3	**G**	4
C	8	**H**	7
D	0	**I**	0
E	0	**J**	1

Without only external

A	17	**F**	14
B	13	**G**	8
C	10	**H**	17
D	0	**I**	0
E	0	**J**	1

People with bat boxes

A	2	**F**	1
B	1	**G**	0
C	1	**H**	2
D	0	**I**	0
E	0	**J**	1

People with used integral boxes

A	5	**F**	4
B	2	**G**	3
C	4	**H**	3
D	0	**I**	0
E	0	**J**	1

**External boxes have been included in the 'responses of houses with boxes', as they have more similarity*

Tregunnel Hill, Cornwall			
Total number of houses in area	**174**	Responses of houses with boxes	**21**
Total number of houses with boxes	**26**	Responses of houses without boxes	**9**
Total number of boxes	**58**	Responses from outlier or unknown addresses	**0**
Trevenson Meadows, Cornwall			
Total number of houses in area	**130+**	Responses of houses with boxes	**5**
Total number of houses with integral boxes	**13**	Responses of houses without boxes	**4**
Total number of houses with external boxes	**2**	Responses from outlier or unknown addresses	**2**
Total number of boxes	**28**		

Overall

A	12	**F**	8
B	20	**G**	17
C	8	**H**	14
D	1	**I**	2
E	0	**J**	0

People with integral boxes

A	8	**F**	6
B	13	**G**	11
C	1	**H**	5
D	0	**I**	0
E	0	**J**	0

*Sparrow terraces have been counted as one box

People with used integral boxes

A	1	**F**	1
B	4	**G**	4
C	0	**H**	0
D	0	**I**	0
E	0	**J**	0

People with bat boxes 4

A	1	**F**	0
B	2	**G**	2
C	1	**H**	2
D	0	**I**	0
E	0	**J**	0

Freshwater, Isle of Wight			
Total number of houses in area	**60+**	Responses of houses with boxes	**12**
Total number of houses with boxes	**21**	Responses of houses without boxes	**5**
Total number of boxes	**56**	Responses from outlier/unknown addresses	**3**
Newport, Isle of Wight			
Total number of houses in area	**20**	Responses of houses with boxes	**9**
Total number of houses with boxes	**12**	Responses of houses without boxes	**5**
Total number of boxes	**18**	Responses from outlier/unknown addresses	**2**
Ryde, Isle of Wight			
Total number of houses in area	**7**	Responses of houses with boxes	**4**
Total number of houses with boxes	**4**	Responses of houses without boxes	**3**
Total number of boxes	**4**	Responses from outlier/unknown addresses	**1**

Overall

A	7	**F**	6
B	25	**G**	24
C	12	**H**	13
D	0	**I**	1
E	0	**J**	0

People with integral boxes

A	3	**F**	3
B	13	**G**	12
C	5	**H**	6
D	0	**I**	0
E	0	**J**	0

People with used integral boxes

A	1	**F**	1
B	7	**G**	6
C	1	**H**	2
D	0	**I**	0
E	0	**J**	0

People with bat boxes 5

A	0	**F**	0
B	3	**G**	3
C	2	**H**	2
D	0	**I**	0
E	0	**J**	0

ii. Homeowner Anecdotal Report

A	A really good idea	**F**	Very happy
B	A good idea	**G**	Happy
C	No opinion	**H**	Indifferent
D	Not a good idea	**I**	Unhappy
E	A really bad idea	**J**	Very unhappy

1	Know what it is	**6**	Children like animals
2	Knew it was there	**7**	Have pets so bad idea
3	Thought it was something else	**8**	Not bothered by it
4	Didn't know it was there	**9**	No problems
5	Didn't know what it was	**10**	**It has caused problems**

Person:	**1**	**Notes**	**2**	**Notes**	**3**	**Notes**	**4**	**Notes**	**5**	**Notes**	**6**	**Notes**	**7**	**Notes**
Gender *Male / Female / Other*														
Age														
Children *Yes / No*														
Garden *Yes / No / Other*														
Ownership *Own / Rent / Other*														
Box type *Bird / Bat / NA*														
Pets *Cat / Dog / Other*														
Aware of? *Yes / No/ Not recognised*														
Activity? *Bird / Bat / Non species*														
Do you think boxes are a: *Good / Bad A B C D E* *Happy / Unhappy F G H I J*														
Other Reactions? 2 *1 2 3 4 5* *6 7 8 9 10*														
Address:														

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iii. Participation Information and consent

Ownership: This interview is being conducted by Sarah Roberts of the University of Gloucestershire as part of the Applied Ecology MSc. It is taking place with full knowledge and support of the University and supervisor Daniel Keech.

Purpose: This research seeks to discover the perceptions of home owners and potential purchasers to the presence of integral bird and bat boxes within domestic dwellings. The professional opinion of housing development companies represents valuable data to provide wider background context to this conservation method. However, it will be acknowledged that the sample size of interviewees cannot be representative of the entire industry.

Style: The following questions are *for guidance only* and will differ depending on the nature of the interview. The style aims to be conversational with a semi-structured element to make full use of the available time.

Involvement: This survey will aim to be completed in 30 minutes but you may terminate the interview at any time or refuse to answer individual questions. Participation is entirely voluntary and you have the right to withdraw your data from the study at any time until September 2017 when the data collection period is complete. Withdrawal after the study has been written up and published will not be possible.

Confidentiality: All information you provide will be anonymous, including your name and other identifying information. Please be aware that senior level endorsement has been received to carry out these interviews and departments/ names have been recommended, although not confirmed, for interview. You will be asked permission before any quotes are used within the research during the write-up period. The Company will not be referred to by name.

Recording: Recording the interview via audio device is a common method of ensuring detailed note-taking. This recording will be *deleted within 1 month* of recording and after a transcript has been taken. Any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be kept anonymous so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed. The transcript will be kept between the interviewer and interviewee and you may request to review the information. Only the questions posed during the interview will be included in the Appendix.

Contact details: May I contact you in the future regarding your interview whilst this research is taking place?

PLEASE DELETE AS APPROPRIATE

A) Yes
B) No

Researcher details:	Sarah Roberts s.blanche@hotmail.co.uk 07769030829
Other contacts	If you should have any concerns, please email or call any of the details below: University supervisor: Daniel Keech dkeech@glos.ac.uk 01373 451402 (T, W,F) 01242 714131 (M,Th) University Tutor: Anne Goodenough aegoodenough@glos.ac.uk RSPB supervisor: Joelene Hughes Joelene.Hughes@rspb.org.uk 01767 693166 or mobile 07789764460

Consent

All or part of the content of your interview may be used;

- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations
- On other feedback events
- In an archive of the project as noted above

By signing this form I agree that;

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read and agree to the Information sheet;
4. I don't expect to receive any benefit or payment for my participation;
5. I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future

I, (please print name) …… consent to participate in the above outlined study.

Thank you for your time

iv. Example of Housing Developer Questions

1. Please could you tell me a little bit about your job role?
2. How involved are you with the biodiversity side of sustainability?
3. How many people work within your team?
4. What departments do you work most closely with?
5. What policies are in place within [redacted] that deal with sustainability and the natural environment?
6. What company targets do you have to meet, if any? How do you set these? e.g. relative to government policy
7. What is your knowledge of the partnership between [redacted]
8. How was this partnership established?
9. In comparison with other housing companies, how typical would you describe [redacted] in its approach to sustainable development?
10. What image does [redacted] want to communicate to house buyers?
11. How is 'homebuyer want' ascertained?
12. Thinking about homebuyer priorities when buying a house, how important do you think it is for public opinion to see [redacted] as a conscientious and responsible housing developer?
13. Do you know how these house buyer priorities are ascertained?
14. What do you know about the use of integral bird and bat boxes, either inside [redacted] or out?
15. What do you believe public opinion is towards the thought of living in close proximity to bats and birds?
16. What do you think would affect opinion in the company regarding the installation of integral bird and bat boxes? / What does [redacted] want to know about the use of boxes that would impact their decision either way?
17. What do you think (if any) are possible positive outcomes of wildlife features such as bird and bat boxes included in housing developments?
18. What do you think (if any) are possible negative outcomes of wildlife features such as bird and bat boxes included in housing developments?
19. Please take this opportunity to ask me any questions you might have. Is there anything you would like to add?
20. Is there anyone who you would recommend I speak to?

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v. Participant information and consent

……..Participant's copy……..

Ownership:	This survey is being conducted by Sarah Roberts of the University of Gloucestershire as part of the Applied Ecology MSc. It is taking place with full knowledge and support of the University and supervisor Daniel Keech.
Purpose:	This research seeks to discover the perceptions of home occupants and potential purchasers to the presence of integral bird and bat boxes within domestic dwellings.
Involvement:	This survey will aim to be completed in 20 minutes but you may terminate the survey at any time or refuse to answer individual questions. Participation is entirely voluntary and you have the right to withdraw your data from the study at any time until September 2017 when the data collection period is complete. Withdrawal after the study has been written up and published will not be possible.
Confidentiality:	All information you provide will be anonymous, including your name and other identifying information. The research will be made publicly available and communicated to interested parties and funders.
Researcher contact details:	Sarah Roberts s.blanche@hotmail.co.uk
Other contacts:	If you should have any concerns, please email or call any of the details below: University supervisor: Daniel Keech dkeech@glos.ac.uk 01373 451402 (T, W,F) 01242 714131 (M,Th) University Tutor: Anne Goodenough aegoodenough@glos.ac.uk RSPB supervisor: Joelene Hughes Joelene.Hughes@rspb.org.uk 01767 693166 or mobile 07789764460

Consent

All or part of the information you provide may be used;

1. In academic papers, policy papers or news articles
2. On our website and in other media that we may produce such as spoken presentations
3. On other feedback events
4. In an archive of the project as noted above

By signing this form I agree that;

1. I am 16 years or older;
2. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the survey at any time;
3. I have read and agree to the Information sheet;
4. I can request my data to be withdrawn before the agreed date of September 2017 and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
5. Any contact details I provide may be used to contact me regarding my answers during the study and I may withdraw this consent at any time;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future

(If applicable)

Sorry I missed you! Your opinion is very valuable to my research and if you are interested in taking part, please feel free to get in touch on the above email address and I will respond to you promptly.

……Researcher copy……

Consent

All or part of the information you provide may be used;

- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations
- On other feedback events
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5. Any contact details I provide may be used to contact me regarding my answers during the study and I may withdraw this consent at any time;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future

I, …… consent to participate in the above outlined study.

Please sign here:

……

If you wish to be contacted in the future about these results, please fill in your email address or telephone number

Email address: [optional]	**Postal Address:**
Telephone number: [optional]	

Thank you very much for your participation

vi. HOUSE DETAILS: To be completed by Researcher

Date:	

Address			
House type	Maisonette		Terrace
	Detached		Other
	Apartment block		
	Semi-detached		
Box type	Bird		Bat
Number of boxes			
Wildlife Activity?	Yes	No	
Poo stains?	Yes	No	
Box condition?	Good	Poor	
Non species nesting?	Present	Absent	
Noise?	Heard	Not heard	

vii. SECTION 1: Demographic

1. Are you a main decision-holder in your household?

Yes	No

2. What is your age?

18-24 years old
25-34 years old
35-44 years old
45-54 years old
55-64 years old
65-74 years old
75 years or older

3. Do you identify as:

Female
Male
Prefer not to answer
Other

4. What is the highest level of education you have achieved?

PhD	Diploma
Masters degree or higher	City & Guilds
Senior business or technical qualification	A levels /advanced GNVQ
University degree	BTEC
HND/HNC	GCSE /GNVQ /O Levels
None of these	

5. What is your occupation / job role?

viii. SECTION 2: Home occupant details

6. How long have you lived here?

7. Do you:

Own
Rent
Other

8. Do you have a garden?

Yes, my own private garden
Yes, access to a communal garden
Yes, allotment in a different location
No
Other

9. Do you have any pets?

Cats
Dogs
None
Other

10. How many people live in your home?

16 and Over	
Under 16	

11. How many bedrooms do you have?

1
2
3
4
5 or more

12. Is this the first home you have purchased here?
/ rented?

Yes
No
N/A

13. How long do you anticipate living

Don't know

14. Have you experienced any problems with your home since you moved in?

Yes major
Yes minor
No
Notes:

15. Overall, how satisfied are you with your home comfort?

Very satisfied
Satisfied
Neither
Dissatisfied
Very dissatisfied

ix. SECTION 3: Awareness

16. Have you heard of bird and bat boxes built into buildings before I spoke to you today?

Yes	TV	Events
	Internet	Work related
	Magazines	Other
	Approached directly	
No (explain)		
Notes:		

17. How effective do you believe artificial nest boxes are for supporting species breeding?

Very effective
Effective
Moderately effective
Slightly effective
Not effective
Don't know

18. When do you notice birds where you live and / or work? [multiple choice]

Morning
Lunchtime
Afternoon
Evening
Night
All the time
I don't really notice birds

19. In the UK, what habitats have you seen wild bats in? [multiple choice]

Built-up and urban areas
Parkland areas
Wetland or water areas
Rural areas
Forested areas
I don't know
I've never seen a bat
Other

20. Do you have any: a) allergies b) phobias or c) strong dislikes to any wildlife species?

Yes	a) Allergies
	b) Phobias / fears
	c) Strong dislikes
No	

x. SECTION 4: Box presence

This area of Cambridge is a swift mitigation site and integrated boxes were installed because the construction of new house would have impacted the nest sites of breeding birds.

21. Were you in any way involved in the swift mitigation project?

Yes *How?*	
No (go to Q23)	

22. What was your motivation for becoming involved?

23. Are you aware that you have a bird / bat box built into your house?

Yes (go to Q24)
No (go to Q25)
Notes: *Thought it was something else?* *Didn't know what it was?*

24. Did you know it was there before moving in?

Yes (go to Q26)
No (go to Q25)

25. When did you first notice the hole? [if app]

26. Did presence of an integral box impact your decision to purchase/rent at all? If so, how?

Yes *How?* ++ / --	
No	

27. Have you noticed any wildlife activity near your house?

Yes	Bird
	Bat
	Other
No	

END OF SECTION 4

xi. SECTION 5: Reaction and Feedback

28. What is your opinion on having an integral box in your home?

A)	B)	Notes:
A really good idea	Very happy	
A good idea	Happy	
No opinion	Indifferent	
A bad idea	Unhappy	
A really bad idea	Very unhappy	

29. Have you experienced any problems with the box being there?

Yes (Go to Q30) *e.g. Poo stains?* *Noise?* *Non species breeding?* *Box condition?*	
No	

30. Do these problems bother you?

31. Do you think integral boxes in housing developments should be pursued?

32. Is there anything you like about having an integral box?

33. Is there anything that concerns you about having an integral box?

34. Would you recommend a house with one built-in to a friend?

Yes	No	Don't know

35. Do you have any further questions or comments you would like to make?

xii. SECTION 6: Nature & Development

36. Nature Relatedness Scale (NR-6)

The NR-6 is a brief measure of nature relatedness and used widely to gauge attitudes to biodiversity. By filling in this section, you will be informing nationwide date sets. Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think "most people" feel.

	Disagree strongly	Disagree a little	Neither	Agree a little	Agree strongly
My ideal vacation spot would be a remote, wilderness area					
I always think about how my actions affect the environment					
My connection to nature and the environment is a part of my spirituality					
I take notice of wildlife wherever I am					
My relationship to nature is an important part of who I am					
I feel very connected to all living things and the earth					

37. I would now like you to think about the relationship of building developments and birds.
Please could you state the extent to which you agree with the following statements.

	Disagree strongly	Disagree a little	Neither	Agree a little	Agree strongly
The increase in housing developments in the UK will reduce bird nesting opportunities					
There are enough natural nesting sites for birds in housing developments					
Birds can adapt to urban developments by moving into nearby countryside					
Having birds in the area you live makes a home a more enjoyable place					
New housing development should include more features specifically for birds in the houses and gardens					
New housing developments should protect nature spaces for birds near to the development					
Birds cause problems around housing developments					

38. Thinking about the next 50 years, to what extent do you agree with the following statements?

	Disagree strongly	Disagree a little	Neither	Agree a little	Agree strongly
There will be an increased variety of wildlife in the UK					
The landscape in the UK will become increasingly unnatural					
Climate change will have a negative impact on wildlife behaviour					

END OF SECTION 5

xiii. SECTION 7: Factors

39. I would now like you to think about your personal preferences within your home. Please choose the statement you most identify with.

My ideal property would be:	a) No maintenance and hassle free
	b) Low maintenance and minimal effort
	c) Not too much work but I enjoy small jobs
	d) More maintenance, I like to have projects
	e) Something that could always keep me occupied
I am usually at my most comfortable when I can hear:	a) Complete silence
	b) Inside background noise from my house
	c) Outside sounds of nature and wildlife
	d) Outside noise of human activity
	e) Loud activity from wherever its source
A house in close proximity to nature and wildlife:	a) Is less desirable and worth less money
	b) Has no added personal or monetary value
	c) Has increased personal value but I wouldn't pay more for
	d) Is something I'd consider paying more for but isn't a priority
	e) A top priority and I would definitely pay more for
I would describe my home as:	a) Always clean, neat and organised
	b) Clean fairly often and visibly tidy
	c) Clean when I have time but I don't mind the mess
	d) Recognisably lived in
	e) My own comfortable mess – I've got better things to do

40. What were your top three criteria / priorities when it came to deciding upon this property?

1.
2.
3.
Notes:

41. Have your priorities changed since moving in?

42. To summarise

a) How happy are you with an integral bird / box in your house?
b) How happy would you be with an integral bird / bat box in your house?

	Very Dissatisfied Would discourage inhabitancy	Dissatisfied	Indifferent/ Neutral	Satisfied	Very satisfied Would encourage inhabitancy
An integral bird box					
An integral bat box					

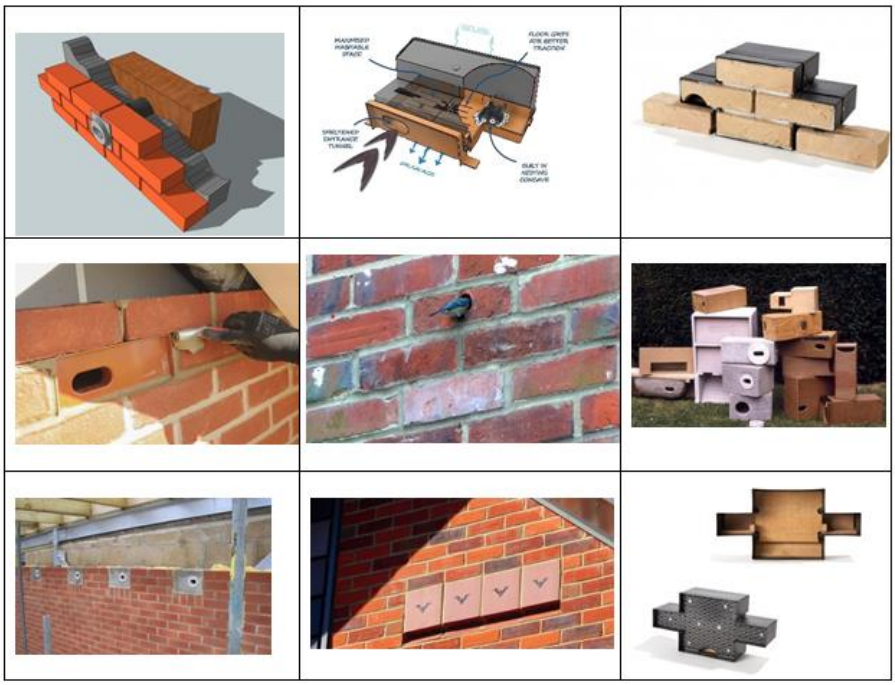
43. If when buying your next house you were given the choice, would you have a preference; for, against or be indifferent to having an integral box.

	Strongly against box	Preference against box	Indifferent/ Neutral	Preference for box	Strongly for box
An integral bird box					
An integral bat box					

Thank you for taking part- if you have time please see other sheets

It's really important to hear what you think and just as important to understand why? If you have 5 more minutes, please help me complete the following.

xiv. Images



European Starling	*Common Swift*	*Blue Tit*
		
House Sparrow	*Pied Wagtail*	*Great Tit*
		

Daubenton's bat	*Common Pipistrelle*	*Long-eared bat*