

***Common Lizard, Zootoca vivipara (Lichtenstein, 1823),  
Survey of Howth 2019***



**Final Report to Fingal County Council**



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## ***Summary:***

Common lizards, *Zootoca vivipara*, were surveyed on the Howth peninsula from April to September 2019. This survey was conducted to aid Fingal County Council in mapping the known distribution of this species in five main survey areas and to inform habitat management strategies that will be of benefit to the lizard populations on the peninsula.

A total of 89 lizard encounters were made over the duration of this study. Common lizards were detected in three of the five main survey areas. *Z. vivipara* have a widespread distribution throughout the southern and eastern coastal areas of Howth peninsula with the highest densities found along the cliff walks at East Mountain. Unexpectedly, lizards were not detected north of the Carrickbrack Road in the Summit and Shielfmartin areas. This is likely a result of unsuitable habitat.

East Mountain is identified as the area of highest ecological importance for common lizards in terms of availability of appropriate habitats along the ecotone of heathland and clifftop grassland. Red Rock and Bellingham's Farm are also sites of ecological significance but to a lesser degree. We also highlight the importance of the network of dry-stone walls to *Z. vivipara*. Overall, the highest abundances of common lizards were found associated with heathland, dry-stone walls, and clifftop grassland respectively.

This study has generated a baseline dataset upon which a long-term monitoring framework can be based. It is likely that the expansion of unfavourable scrub habitat and frequent uncontrolled fires on Howth are affecting lizard occupancy, population size, and the capacity for outwards dispersal from core zones. Therefore, we make recommendations for an appropriate habitat management and restoration regime that is critical for the continued presence of *Z. vivipara* on Howth peninsula.

### ***Acknowledgements:***

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### ***Cover image:***

The cover image is of an adult male common lizard, *Zootoca vivipara*, basking on the remnants of an old wall overlooking the Baily Lighthouse, Howth. Photo by R.Gandola.

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## ***1. Scope and Aims:***

The scope of this study is to determine the status and distribution of the common lizard, *Zootoca vivipara*, within five main areas of Howth. This study aims to assess the distribution, demographics, and habitat use of the local common lizard population(s) via a presence/absence surveys within the study areas. We aim to compare our findings to available historical data and Identify ecologically significant areas to guide future habitat management plans sympathetic to common lizards. This study will also form the baseline for future monitoring programs for *Z. vivipara* in Howth.

## ***2. Introduction:***

The common lizard, *Zootoca vivipara*, is Ireland's only native terrestrial reptile and is protected under the Wildlife Act (1976 and amendments). It has a broad global distributional, spanning from Ireland in the west to Hokkaido, Japan in the east (Inns, 2009). Notable features of this species include - the record for being the most northerly occurring reptile in the world capable of withstanding sub-zero temperatures for short periods of time; in the more southern parts of its range it switches from being a viviparous (live-bearing) to an egg laying species (Beebee, 2013).

At up to 20cm long common lizards have a remarkable natural history with complex behavioural and morphological strategies to ensure survival and persistence in an environment that appears to be less than inviting for a reptile. Their ability to survive the Irish climate is multifaceted. To cope with our cold, wet winters they brumate, a torpor like hibernation, in ice-free hibernacula (subterranean burrows, tree root systems, and other refugia) typically from November to March. As conditions improve, adult male lizards emerge first, followed by younger animals, and finally by adult females. In early Spring, lizards can be seen out basking on clear sunny days with air temperatures as low as 5°C. They manage to obtain optimal body temperatures through their colour patterns, which also aid in camouflage, and by exploiting local microclimates. Sheltered areas in lee of the wind and exposed to at least partial sunlight can easily attain temperatures 10°C warmer than surrounding air temperatures. Coupled with “mosaic basking” (basking while keeping most of the body hidden at any given time) such behaviours provide lizards with a way to gain the energy required to feed and thermoregulate (regulate their body temperature) in safety. Basking in sunlight also has the added benefit of

aiding with the production of Vitamin D3 via exposure to ultraviolet-B waves. Common lizards, like many other species, can also drop their tails (autotomy) as a defensive strategy. They will regrow them eventually but how quickly will depend on a variety of factors including prey availability.

The mating season usually begins in earnest from April and during this time males will fight over small territories with access to females. Victorious male lizards may flash their characteristic orange-red bellies at receptive females as part of their courtship ritual before engaging in aggressive mating whereby the male bites and holds onto the female to ensure she can't escape. The numbers of offspring that a female lizard will produce is directly related to her size, with bigger females giving birth to between 6 and 12 young encased in a translucent sac. Once pregnant or "gravid", female common lizards will spend increasing amounts of time basking to facilitate embryo development. "Birthing" usually takes place in a quiet sheltered place from mid- July to September where the female may also partially burrow herself to deposit her young for added safety. Common lizards do not provide parental care to their young. To off-set this, the juveniles tend to engage in "crèching" behaviour to offset their susceptibility to a variety of terrestrial and avian predators when newly born. Interestingly, the individuals in a crèche may not all be related to one another and it's not uncommon for an adult or two to bask beside a "crèche". Autumn signals a peak time for lizard activity with adults and juveniles alike foraging for invertebrate food items (spiders, caterpillars, flies, grasshoppers etc.), so that they will have attained optimum condition, and returning to hibernation sites.

In Ireland, *Z. vivipara*, has a broad distribution and occupies a variety of habitats from the Burren, to bog-land and rural gardens, with coastal dune and heathland systems deemed to be strongholds for the species (Marnell, 2002). In coastal heathland systems, common lizards tend to occupy a mosaic of east to south facing subtle micro-habitats of high structural complexity e.g. along the ecotone of dry heath and cliff grassland (Edgar et. al, 2010). Occupying such habitats also exposes lizards to the threat of fire. While burning is part of the management prescription to maintain a structurally diverse heathland vegetation, there is an inherent risk that frequent and uncontrolled events may make localized lizard populations more prone to local extinction.

Approximately 200ha of heathland is present on the Howth peninsula intermixed with a matrix of bracken (*Pteridium aquilinum*), gorses (*Ulex spp*), heathers (*Calluna vulgaris* and *Erica cinerea*), scrub habitats and small mixed woodland copses. This heathland covers a

significant part of the 547ha Howth Special Amenity Area (SAAO,1994), the largest of the three national and international designations on Howth. The newly designated UNESCO Dublin Bay Biosphere also includes the entire peninsula of Howth within its core and buffer zones. The heathland and its management on the summit of Howth has changed dramatically over the last 100yrs with a shift from primarily grazing and agriculture to the development of golf courses and houses. This land “improvement” has resulted in a corresponding loss of most of the bog and wetland habitats and a dramatic change to the heathland itself. Large areas have been eroded of their peaty soil and the “best” quality heathland is now confined to private lands and those used for horse grazing (Tubridy 2015).

The known distribution of *Z. vivipara* on the Howth peninsula is unusual in that no recent records exist even though “Howth lizards” have been featured in at least two recent tv series focused on Irish wildlife (Living the Wildlife, 2013 GMTV); Wild Cities (2016 CTL Films). Their presence on the headland also appears to be relatively common knowledge and used in publicity materials. The most recent nationwide survey (IWT) failed to produce records for this species in Howth. Although this is more likely a reflection of the inherent pitfalls of projects focused purely on collating submitted opportunistic data. Even so, the cryptic nature, colouration and behaviour of *Z. vivipara* contribute to making this species difficult to detect with any regularity for all but experienced surveyors.

With increasing pressures on Howth from tourism, climate change, and development it is essential that the distribution and landscape features of importance to *Zootoca vivipara* are mapped in order to facilitate appropriate habitat management of the peninsula.



**Structurally complex heathland habitat at East Mountain (Photo R Gandola)**

### **3. Methodology:**

#### **3.1 Desktop Study**

A thorough search of all relevant and publicly accessible databases (NBDC, GBIF, iNaturalist, Biology.ie), grey literature, and other sources of potential information on local lizard presence for Howth peninsula was conducted prior to the onset of surveys. The Herpetological Society of Ireland (HSI) database of native reptiles and amphibian sightings was also mined for lizard sightings from within the proposed survey areas in Howth.

#### **3.2 Survey Areas**

Five areas on Howth, Red Rock, Bellingham's Farm, Shielmartin, Summit, and East Mountain were identified by Fingal County Council as those with the greatest amount of heathland and other habitats which lizards may occupy for this study (Figure 1. F) All of these sites, except for private lands at 'Bellingham's Farm', are designated as public access amenity areas.

#### **3.3 Survey Methodology**

Three to four survey routes were selected per site (Table 1). Survey routes were chosen at each site based on the availability of existing tracks and trails, including the marked looped walks. Tracks that navigate a variety of habitat types and with likelihood of lizards being present and/or are already known where given priority. Each route was surveyed four times between April and early September 2019. This number of surveys per survey route is deemed appropriate to determine presence/absence and is in line with a recognised recording scheme (NARRS; see <http://narrs.org.uk/widespread.php>). The survey season was broadened due to prolonged inclement weather, less optimal for lizard detection, in June and August. This broadening of the survey period also allowed for better identification of high-density basking areas prior to and after the natural lull in sightings from late June – mid-July. This lull coincides with higher temperatures and the “birthing season”. The extension also facilitates documentation of breeding success, locating of juvenile “crèche-ing” areas and dispersal, and identification of hibernacula.

Visual encounter surveys (VES) were conducted along each survey route. The starting point for each survey on any given route was determined by time of day in order to maximise the chances of lizard detection. This flexible methodology therefore allowed for routes to be surveyed in “reverse”. Opportunistic observations in locations off the survey routes were also recorded when possible and associated with the nearest survey route. Weather conditions were also given priority over standardising a start time for each survey.





**Figure 1.** Maps of the five main survey areas with survey routes (red), opportunistic search areas (yellow), and a supplementary route (pink). Blue points signify route start/end points. A= Red Rock; B= Bellingham's Farm; C= Shielmartin; D=Summit; E= East mountain; F= Howth peninsula with five main areas surveyed for *Z. vivipara*.

**Table1: Survey sites with number of routes required to adequately survey each site. (\*denotes the length of the supplementary survey route, see Fig. 2 F)**

Site code	Site Name	No. of Survey Routes (# of surveys)	Total Length of survey routes (m)
S1	Red Rock	4 (16)	1080; 670; 470; 350
S2	Bellingham's Farm	4 (10)	700; 350; 250; 1120*
S3	Shielfarm	3 (12)	700; 600; 525; 200
S4	Summit	4 (16)	1050; 720; 510; 715
S5	East Mountain	4 (16)	1660; 2130; 410; 1520
		<b>19 (70)</b>	

### 3.4 Data Collection, Visualisation and Analysis

Detailed demographic, spatial, and habitat data was recorded for each lizard sighting. These data were collected using a custom-made app with spatial data collected either from the built in GPS chip on the data collection tablet or from a Garmin 60csx unit, whichever had the highest accuracy at the time of encounter. The Corine 2018 land-use data for Howth was not used in this study as the resolution (100x100m) was deemed to be too coarse to be of any use in making very general inferences on habitat type.

Data collected during the study was visualised with QGIS 3.8.3-Zanzibar. Statistical analyses and some data visualisations were performed in R 2019.

Heatmaps were generated in QGIS for both the lizard encounter data in 2019 and for the historical data collated during the desktop element of this study. Heat mapping is an interpolation technique that is useful in determining and visualising density and a zone of influence thereby identifying ecologically significant areas based on spatial data and known habitat preferences. As common lizards are a mobile species in which the juveniles disperse away from their natal site, we set the zone of influence for each record to be 500m. This value was arbitrarily determined to be the maximum distance travelled and is likely to be influenced by availability and connectivity of nearby habitats and barriers to dispersal.

### 3.5 Appropriate licensing by National Parks and Wildlife Service

Valid licences for 2019 "To capture protected wild animals for educational, and scientific or other purposes" on Common lizard, *Zootoca vivipara*, are held by R. Gandola (Licence no: C37/2019) and C. Hendry (Licence no: C33/2019).

## **4. Results:**

### **4.1 Desktop Study**

Just two historical records of *Z. vivipara* were found for Howth in IBRC records: 1908, 1971 in the Windgate road area and Glenlion, respectively. There is some confusion over accuracy for both records as Glenlion is a property situated south of the Carrickbrack Road close to the cliff walks. The earlier observation from 1908 is only accurate to within 1km<sup>2</sup> and therefore no specific location exists for this record however we assume it to have originated in the general Summit-Shielmartin areas. A total 47 records from 2010 -2018 were retrieved from the HSI's own database (Appendix 1).

### **4.2 General Results of Presence/ Absence Surveys**

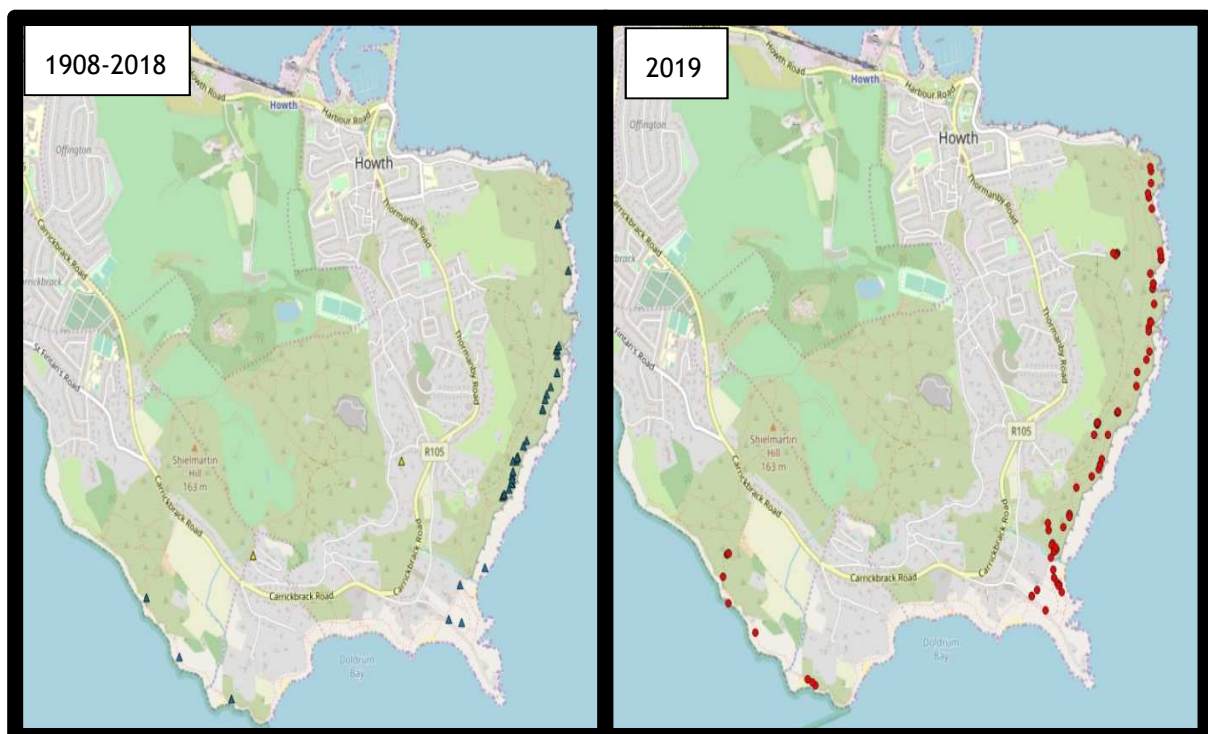
A total of 70 surveys were conducted between April and September 2019. This fewer (n = -2) number of surveys was due to our inability to gain access to the private land on Bellingham's Farm after the first survey. However, in order to ensure a thorough survey of all potential lizard habitat we added a supplementary route 'Bellingham's Farm R4' to this site. This new route followed the cliff walks for approx.1.12km from Red Rock beach to the intersection with Canchor Road (53.364286, -6.072187, see Figure 1.F). This new route also ensured that all areas with blocks of south facing heathland along the cliff walks were adequately surveyed.

In total, 89 lizards were detected by visual encounter survey. A breakdown of the total number of lizards encountered at each survey site, the route they were seen on and accompanying demographic and habitat information can be seen in Table 2.

In general, common lizards show a strong preference to heathland habitats with south or east aspects. 71% of all lizard sightings were associated with heathland, 15% with dry-stone walls, and 14% associated with cliff grassland. However, when surrounding and adjacent habitat is associated with dry-stone walls is considered then the association with heathland habitat rises to 83% (Figure 2.)

**Table 2.** Common lizard sightings by site, survey route, sex, life stage, and major habitat type. M=Male; F = Female; U= sex unknown

Site Name	Route	Adult Male	Adult Female	Adult unknown	Subadult/Yearling			2019 Juvenile	Total	Habitat Type
					M	F	U			
Red Rock	R2	1	1				3	0	5	Heathland
Bellingham's Farm	R1, R4		1				3	1	5	Heathland, cliff grassland
Shielmartin									0	
Summit									0	
East Mountain	R1, R2, R4	21	30	4	1	3	8	12	79	Heathland, Cliff grassland, Dry-stone wall
<b>Total</b>									<b>89</b>	



**Figure 2.** Maps of Howth showing locations of common lizard sightings from 1908-2018 and from this study. Blue triangles denote H.S.I records. Yellow triangles denote pre-1972 IBRC records. Red dots signify *Z. vivipara* sightings from 2019

### **4.3 Red Rock**

A total of five individuals were encountered at Red Rock. All individuals were encountered in southward facing heath/bracken dominated areas close to the concrete steps at Red Rock mountain. This is likely a result of the habitat being in better condition at the top of Red Rock mountain after the large and intense fire in 2018. The heath covered top is also likely to have a hibernaculum as four of the five individuals were seen in areas with suitable habitat features (open margins of structurally complex rocky heath with low gorse and a deep layer of dead gorse and bracken substrate). This is also supported by the time of year observed (early April) and presence of overwintered juveniles and an adult female (adult males are usually first to emerge and disperse from hibernacula).

While other pockets of heathland exist at Red Rock, they are fragmented within the matrix of tall bracken dominated meadow habitats and need management. We estimate that five fragments of heathland with a southerly aspect, comprising approx. 3.4ha of potentially suitable lizard habitat, exists at Red Rock (Figure 3). This is in addition to the 3.57ha regenerating habitat available at Red Rock mountain where the only known lizard population in the area resides. The newly cut fire breaks in the northwest of the site might be utilised by lizards if linkage corridors were created. The four pockets of heath running parallel to the coast and adjacent to the 'Bog of Frogs' trail may have provided suitable habitat for the lizards in the past and could again with management. Linkage corridors to the known lizard population at Red Rock mountain will need to be created as the interjoining habitat is unsuitable for dispersal in its current bracken dominated condition in the east. The dry-stone wall running north to south, separating the Red Rock site from Bellingham's Farm is likely to have provided refuge for lizard in the past. However, the extensive fire in 2018 and subsequent erosion of the topsoil has eliminated any suitable habitat on its eastern side with only marginal habitat remaining on the west. The western side of the wall is already showing limited signs of recovery. Management of this relatively small amount of land for common lizards would still allow for other management regimes to maintain the interjoining habitat for meadows and grassland much of which is north facing and unsuitable for common lizards. Common lizards are known to use margins of forests, but no lizards were detected along the boundary of the forested area to the west of the site.



**Figure 3.** A map of Red Rock highlighting the approx. 7ha of habitat potentially available for common lizards.

#### **4.4 Bellingham's Farm**

A total of five individuals were encountered at Bellingham's Farm. All individuals were encountered in southward facing heath/bracken dominated areas close to the cliffs and ecotone with cliff grassland. Very little of the heathland that dominated the western portion of this site and the adjoining Red Rock mountain remains after large and intense fire there in 2018. The remaining heath is in bad condition and in need of remediation. Good areas of heath still exist toward the middle of the site and continue onto the private horse grazed fields near the southern boundary of the property where it meets the cliff walks. It is likely that these areas support more common lizards than the small number of sightings (n=2) suggest.

The addition of the supplementary survey route along the cliffs walks to the east of Bellingham's Farm proved worthwhile as there are other pockets of good quality heathland to

the east of Red Rock beach and continuous with Bellingham's Farm along the cliff walks (Figure 4). We estimate that 0.7ha of suitable habitat remains on the private lands of Bellingham's Farm with another 35ha potentially available depending on natural regeneration of the former large area of heathland to the west of the site. To the east along the cliff walks, a further 2.2ha of derelict land (53.365393, -6.069374) has potential to be remediated into suitable lizard habitat if the bracken and tall gorse is managed to permit regrowth of the heathland on the landward side. Another 6.4ha of cliff top on the seaward side, stretching towards the Bailey also has the potential to be rehabilitated.



**Figure 4.** A map of Bellingham's Farm highlighting the habitat potentially available for common lizards. Red asterix denotes a bracken and gorse dominated derelict area of approx. 2.2ha with public access from Carrickbrack Road to the cliff walks via a dirt trail.

#### 4.5 Shielmartin

Common lizards were not encountered in this survey area. In general, most of the area is of poor quality, marginal habitat for lizards. The majority of the Shielmartin survey area is very exposed and dominated by low (<30cm), dense tufts of ling and bell heathers, and gorse on top of eroded soil and protruding bedrock. Two old dry-stone walls- one that following a southeast to northeast direction and the other forming the site boundary along 'Bog of Frogs' walking trail provide the most suitable habitats for *Z. vivipara* within this survey site (Figure 5). Recently cut fire breaks in the tall gorse may provide suitable edge habitat in the future however this area is current separated by 600m and the Carrickbrack Road from the nearest known lizard population at Red Rock mountain. Very little of the 23ha comprising this survey area is suitable for common lizards and is need of major rehabilitation and management.

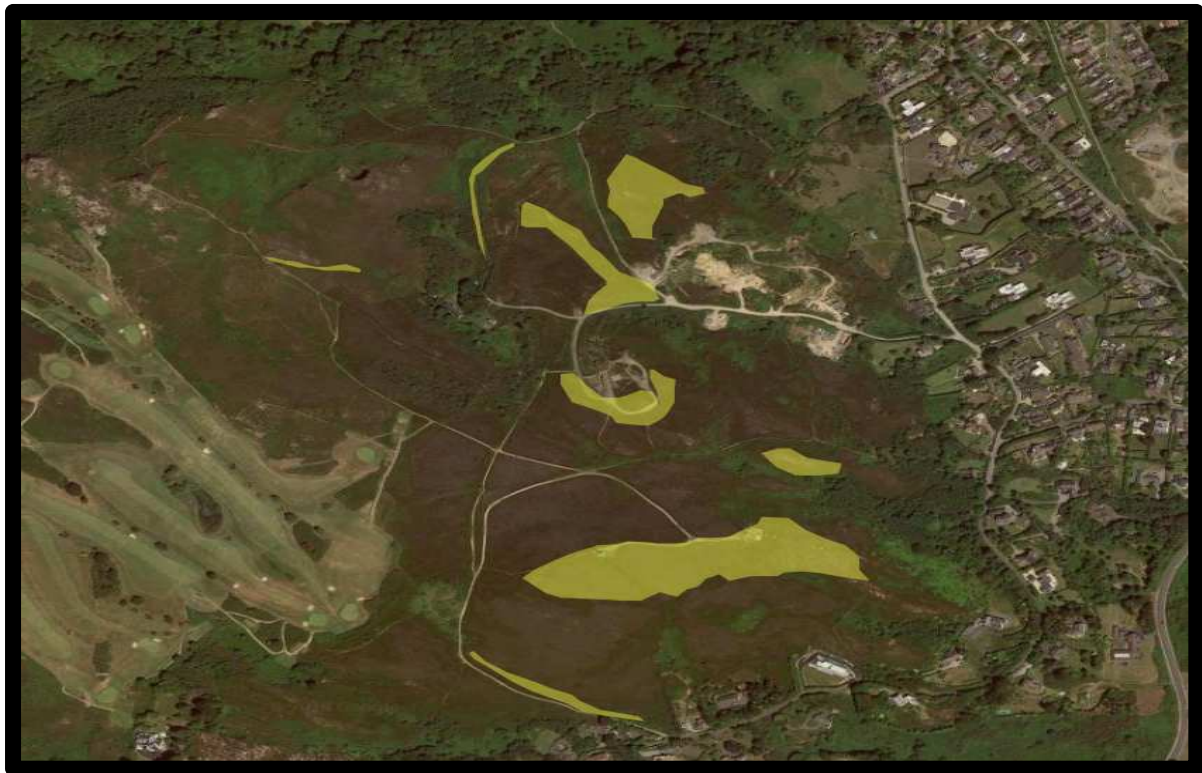


**Figure 5.** A map of Sheilmartin survey are highlighting the small areas of currently suitable habitat associated with the two dry-stone wall features at this site.



#### 4.6 Summit

No lizards were detected in the Summit survey area. The top of the headland between Shielfmartin and Summit, respectively. In general, most of the area is unsuitable for lizards. Much of the Summit survey area, like Shielfmartin is very exposed and dominated by low (<30cm), non-structurally complex, dense tufts of ling, bell heather, and gorse on top of eroded rocky soil. The eastern boundary of this 46ha site is also heavily influenced by Howth golf course. Some areas of potentially suitable habitat are present in the areas immediately surrounding the Ben of Howth, the aerials, to the north of the Greenhollows quarry, and an old dry-stone wall running from west to northeast via Blacklynn (Figure 6). However, like most of the dry-stone walls in Howth, they quickly become overgrown with bracken and fireweed, *Chamerion angustifolium*, (in damper places) in late Spring and early Summer. A survey of private lands backing onto the upper headland areas is needed to determine true absence of common lizards, they may still be resident in private gardens. In a scenario where common lizards are proven absent from the upper parts of Howth, and even if the habitat can be restored and better managed into the future, there is no guarantee that common lizards have the ability to colonise without the assistance of translocations.



**Figure.6** A map of the Summit survey area highlighting the small areas of potentially suitable habitat associated with the two dry-stones wall and small areas of structurally complex heathland habitat.

## 4.7 East Mountain

A total of 79 lizard observations were made at East Mountain. All individuals were encountered in south or east facing habitats dominated by structurally complex heathland and cliff grassland micro-habitats. The network of dry-stone walls that run along the cliff walks in a southwest to northeast direction from the Bailey lighthouse and adjacent private property boundary wall and access road to just below the summit car park; the short Upper Cliff Road wall that runs from west to east towards the ruins are important landscape features for lizards. These walls act as refugia and hibernacula as 13 individuals were encountered using the walls over the course of this study. Lizards were not detected in the old Kilrock Quarry section of the survey area. The habitat here is sub-optimal sparse heath on top of exposed rocky substrate. However, there are some suitable habitats available in the form of a dry-stone wall along the southern boundary of the quarry with small pockets of heathland.

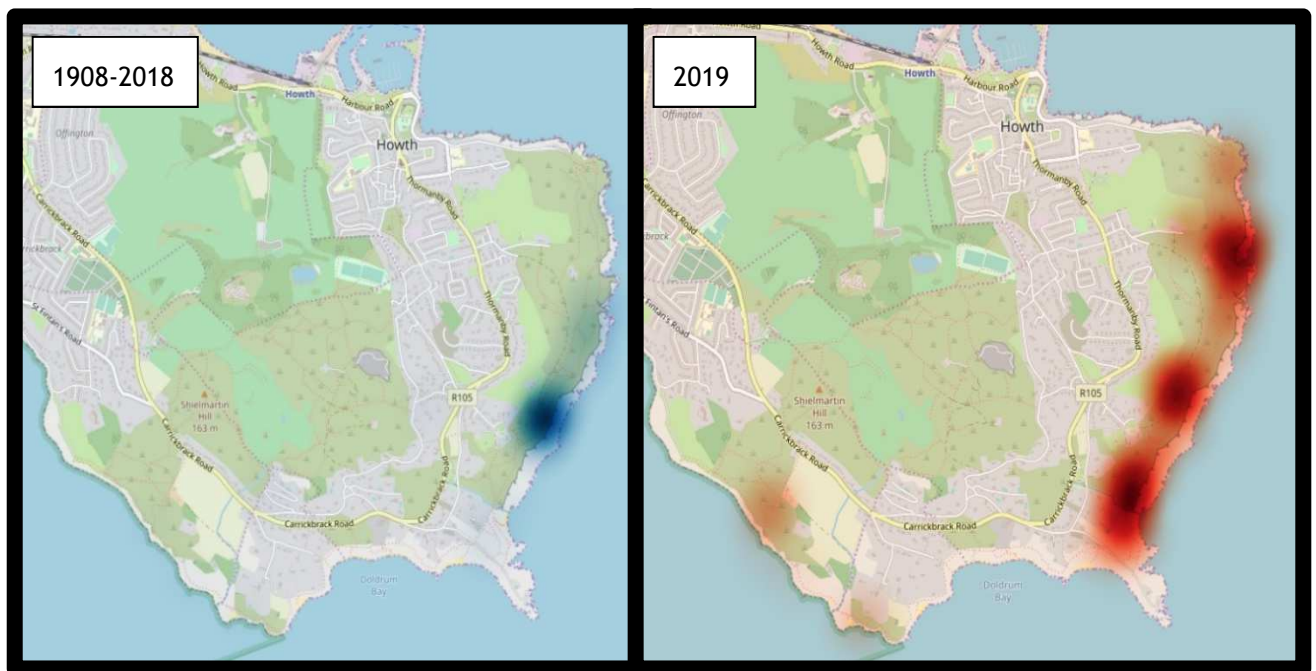
East mountain currently provides approximately 50ha of suitable habitat for common lizards with another approx. 15ha of marginal habitat (dominated by tall bracken and scrub) with the potential to become suitable habitat depending on the creation of habitat corridors and natural regrowth (Figure 7). Sympathetic management could rapidly create connectivity through this marginal habitat between the heathland and cliff grassland to the east and the quality heathland present in private lands the west.



**Figure 7.** Map of East Mountain highlighting areas of known suitability for *Zootoca vivipara* (yellow) and the large areas of marginal habitat (orange) that could be managed to create corridors of linkage between the coast and suitable habitat in private ownership in the north of the site.

#### 4.8 Heatmap analysis and identification of ecologically significant sites for lizards

All pre-2019 records were used to generate a heatmap for comparison with a heatmap created with 89 records from this study. The aim for this comparison was to determine the utility of historical data to determine areas of ecological significance for *Z. vivipara* on Howth and thereby also informing current management policy for an area that can experience erratic and largescale habitat alteration and disturbance due to fire (Figure 8).



**Figure 8.** Heatmaps showing interpolated areas of common lizard densities and influence with a 500m area of influence around each cluster on Howth. Darker colours indicate areas high density zones or ‘hot-spots’ for lizards at East Mountain in both pre- and in 2019. Specific management for these 'hot-spots' is likely to be the most reliable way of ensuring continued existence of common lizards at Howth.

Both datasets agree that East Mountain is the most ecologically significant site in Howth for *Z. vivipara* in terms of density and influence. The 2019 survey results display three high density and five lower density sites at East Mountain, Red Rock and east of Bellingham’s Farm compared to just one high density and one low density site at East Mountain from the historical dataset. These results highlight the importance of conducting regular and multiple repeat surveys, even over the course of one season.

## ***5. Discussion and Conclusion:***

Our study shows that East Mountain is the most ecologically significant area in Howth for *Z. vivipara* in terms of abundance, with the highest densities found in the heathland adjacent to the cliff walks. Most lizards encountered were adults with a near even ratio of males to females. This suggests that the population at East mountain is stable and viable breeding population. While numbers at Red Rock and Bellingham's Farm were comparatively low, there is connectivity between these sites and the detection of this year's juveniles confirm that a breeding population is still present. Common lizards appear to have some resilience to major fire events, as evidenced by their persistence after major events in the last five years, although more data is required to determine how the population is affected by the timing of fires, their size, and their location. The creation of new fire breaks may also provide basking opportunities for lizards over time. The habitat on the upper part of the headlands is mostly unsuitable for common lizards and this explains the lack of any sightings. Nevertheless, it is likely that the numbers of common lizards detected over the course of this study is an underestimate of the true common lizard population size given the scale of the area they could potentially inhabit.

Based on our field observations and desktop calculations there is approximately 121.3ha. (190ha if you include large portions of the Summit and Shielmartin areas) potentially available to lizards on Howth peninsula if the heathland can be restored and managed appropriately. Naturally, managing the heathland for lizards will also benefit other species and encourage higher levels of diversity. This diversity in turn will also buffer Howth from the worst extremes of climate change.

## ***6. Recommendations:***

We recommend the existing mosaic of heath and grassland habitats on Howth are maintained in a manner which is likely to have the least impact on resident wildlife and lead to an overall improvement in the amount of structurally complex, heather dominated, habitats available in areas known to- or adjacent to areas known to harbour resident population of lizards. To achieve this outcome in a cost-effective manner, manual bracken removal and selective cutting of heather and tall gorse to create a structurally complex mix of bushes between 30-100cm in height will be required in the areas mentioned above. These works should also apply to the preservation of important landscape features such as drystone walls and exposed earthen mounds, and the control of natural succession of the heathland habitat. In general, any habitat management regime that benefits common lizards is likely to benefit other resident species e.g. ground nesting birds like stonechat (*Saxicola torquata*), the common frog (*Rana temporaria*), and the small heath butterfly (*Coenonympha pamphilus*). It is also prudent to realise that complete removal of undesirable species or the implementation of heavy-duty management or clearance works may exacerbate any underlying problem(s) and or lead to unforeseen negative outcomes e.g. increased erosion following removal of bracken growth after a large fire. It is therefore recommended that habitat interventions are done on a small scale to avoid any large-scale impacts. In relation to the specific control of bracken, when left unmanaged bracken can often “shade out” favourable habitats or landscape features thereby forcing lizards to look for appropriate habitats elsewhere making them more susceptible to predators or by reducing the suitability of the site or feature for lizard occupancy e.g. abandonment of a hibernaculum or refugia. It is important that interventions are continued over multi-year timescales due to the ability of this plant to persist even after apparently severe control measures have been implemented. Bracken and gorse stands can also serve an important conservation purpose when correctly managed by increasing habitat complexity, structure and microhabitats while also providing protection. This is especially true for edge habitats.

Three broad techniques, potentially in combination with heather reseedling, are available to Fingal County Council to achieve the desired habitat management results at Howth: chemical, mechanical, and grazing. It is likely that a combination of techniques, determined on a site-by-site basis, will provide the desired outcome of regeneration of heathland and, in some cases, the cessation of natural succession.

### ***Chemical control (Bracken only):***

Asulam/Asulox® is a highly selective herbicide that attacks the dormant buds within the rhizome. It is the most effective and only real method for rapid control of bracken with a capability of killing up to 95% of plants (Heather Trust UK). Asulam/Asulox® is usually applied by spraying from vehicles or backpack sprayers. However, it is currently banned for use in the EU and requires Emergency Authorisation from the Department of Agriculture to be used. A derogation license is also required for its use in protected areas. As an herbicide, its use over large areas may also raise concerns about pollution and exposure to members of the public. It is also expensive intervention. Asulam/Asulox® is ineffective against non-fern species. The effects of Asulox® exposure on common lizards is unknown.

### ***Mechanical control:***

Mechanical control is labour intensive however given the terrain on Howth, it is likely the only method available for use at all survey sites. Bracken can be cut, rolled (heavy cylinders rolled by hand or horses), pulled up by hand, or scraped out (removal of top layer of soil by digger or shovel). However, given mode in which bracken regrows from dormant buds means that the process usually had to be carried out multiple times each year and for many years afterwards, except in the case of scraping. Gorse can be cut by hand. Scraping should ideally be followed by seeding using seeds collected at adjacent sites from resident *Calluna* and *Erica* species.

Advantages of mechanical control are that the cut bracken and gorse can usually be immediately removed or burnt on-site. Even though this a labour-intensive method it does have an added advantage in that any remaining litter covering the soil can be broken down into tiny pieces via trampling or crushing from footfall and or the rolling process. Breaking down of the bracken and gorse litter layer facilitates desiccation thereby making the site more suitable for colonisation by heather. Mechanical control in the form of manual labour also provides opportunities for local community and volunteer involvement which may also be an important part of outreach, education, and project ownership.

Burning is ineffective at controlling bracken but can be beneficial in the control of gorse. However, given the difficult terrain of Howth, and the legacy of uncontrolled fires at multiple sites the use of fire would only be a recommended control at sites where fires have not recently occurred. Inappropriate use of fire or the escape of a fire from a controlled burn may also hasten the spread of bracken.

### ***Grazing and trampling:***

Pigs, cows and horses can be used in a variety of ways to control bracken and gorse. Grazing of bracken by pigs needs a strict rotation of the group of pigs to ensure they don't succumb to a thiamine deficiency. Heavy stocking of cattle or horses to trample and break up of stems and brash of bracken and gorse may also be used to good effect when combined with mechanical control measures.

### ***Site Specific Recommendations***

#### **Red Rock**

The habitats at Red Rock should be managed to primarily control the bracken and to open-up dispersal and migration routes between the pockets of heathland for common lizards where they may still occur. Ideally, clearance should be done sympathetically in order to leave some marginal habitats, comprised of short bracken, rank grass, and gorse, in place. This marginal habitat should provide ample cover and shelter for any dispersing lizards. These habitat linkages can be achieved through a combination of cutting, removal and rolling of bracken in the larger more open areas may prove effective to return the site to a more natural mosaic of heathland and open grassland (Figure 9). Some of these pockets of heathland may also benefit from exclusion fencing to facilitate growth and or regeneration of heather and gorse. The firebreaks cut in the gorse at the north of the site should be monitored for any indications of heathland regrowth and or bracken incursion. Strimming out of lowering the height of some of this gorse may prove beneficial by providing a more complex structure than the current situation where much of the gorse is of a uniform height.

#### Recommendations for Red Rock:

- The creation of non-linear fire breaks which will also provide structurally diverse and open edge habitats that may attract lizards.



- Large areas of gorse at the north of the site could be “mob grazed” via high intensity, short term rotation by cattle or goats in order to retain structural complexity and reduce fire risk.
- Cutting, strimming and otherwise clearing of the dense bracken stands growing and covering the eastern boundary dry-stone wall and concrete steps and areas north of Red Rock mountain. Some bracken should be left in-situ at the top and south aspect of Red Rock mountain as there is little else providing cover and habitat structure for the lizards apart from a small area of gorse at the summit of Red Rock mountain near the steps. The south facing aspect of this gorse stand should be maintained as open habitat as it is likely the site of a hibernaculum for common lizards at Red Rock.



**Figure 9.** A map showing areas at Red Rock where mechanical control of bracken and gorse could be best placed to increase connectivity and habitat linkage for common lizards. Solid red blocks indicate where rolling or cutting of large areas of bracken may prove beneficial. Open red ovals indicate where only small patches of gorse and bracken should be removed in order to reduce erosion and provide cover for resident wildlife. The large oval indicates the likely area of a lizard hibernaculum Yellow blocks indicate areas of heathland favourable for common lizards available at this site.

## **Bellingham's Farm**

Bracken, scrub, and exotic plants need to be managed along the cliff walks from Bellingham's Farm towards Ceanchor Road and the Bailey. These species are creating large areas of shade and encroaching the areas of heathland still available there. The terrain between Red Rock beach towards Ceanchor Road and the Bailey is particularly difficult, close to private gardens and may prove very difficult to manage.

Recommendations (all to be conducted in accordance with owners input and permission):

- A structural survey to determine the status of regrowth and the health of the heather seed bank post fire. Re-seeding or transplants of heather may be necessary.
- Create non-linear fire breaks which also will also provide structurally diverse and open edge habitats for basking and feeding opportunities for lizards
- Maintain an extra wide fire break along the western boundary with Red Rock so as to avoid the spread of any fire as was seen in 2018.
- Deploy artificial refugia in fields where ample heath habitat remains and is maintained by horse grazing to determine status of the lizard population on these lands.



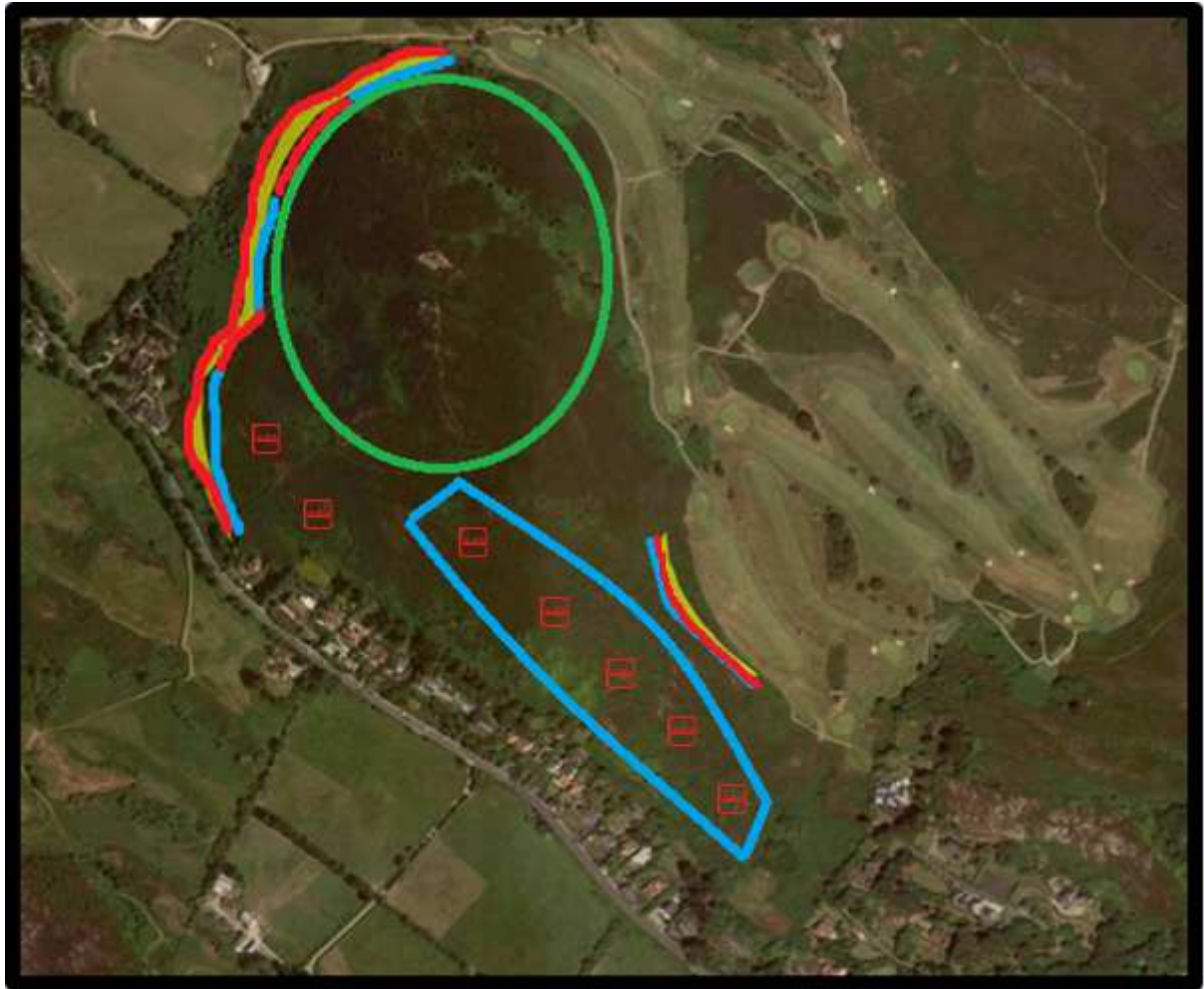
**Figure 10.** A map of Bellingham's Farm site where mechanical control of bracken and gorse could be best placed to increase connectivity and habitat linkage for common lizards. Solid red lines indicate where cutting or strimming of shade causing species are best placed. These areas should be cut to a maximum to between 30-100cm. Open red blocks indicate where only small patches of bracken and gorse should be removed in order to reduce erosion and provide cover for resident wildlife. Yellow blocks indicate areas of potentially favourable heathland for common lizards. The open blue block is an area that may need to be rehabilitated via reseeding with *Calluna* and *Erica* species after a large fire in 2018.

## Shielmartin

Major rehabilitation and management works are required here. Reseeding of *Calluna* and *Erica* species along the old walls and eastern boundary will be necessary. Vegetation removal along the southern aspects of these walls should be conducted in a fashion that to permit maximal exposure to the sun while also providing cover from prevailing winds. Bracken needs to be cut and removed along the looped trails as it is currently shading out the marginal edge habitats that currently exist there while also providing large amounts of fuel material for fires after dying back. The top of Shielmartin is very exposed however the heather is likely to regrow over time. The dense stands of gorse on the south facing slopes should also be monitored for heather regrowth and or bracken incursion. A thorough site evaluation confirming the return of a heather dominated habitat, at least 30cm tall, at Shielmartin would be required before a decision could be made about re-introducing lizards to the site. Succession of rhododendron and scrub from the southern margins adjoining private gardens also needs to be monitored.

Recommendations for Shielmartin are as follows:

- Cutting, strimming and clearing of the bracken and grass growing and covering the southern face of the dry-stone wall forming a boundary with Howth golf course. In areas where the wall now constitutes a mound wall (either partially or almost completely soil covered), some elements of cover should be left in-situ along the top of the wall. In such circumstances short grass is preferable to bracken. These works will enhance the walls' ability to perform vital functions as both refugia and hibernacula for common lizards.
- Create non-linear fire breaks at the southern slope which also will also provide structurally diverse and open edge habitats for basking and feeding opportunities. These open habitats can also be used by other resident wildlife.
- Larger areas of gorse in close proximity to private property could be "mob grazed" via high intensity, short term rotation by cattle or goats in order to retain structural complexity and reduce fire risk. Mechanical removal will also suffice.



**Figure 11.** A map of Shielmartin. Solid red lines indicated where cutting or strimming of bracken are best placed along boundary walls. Red open blocks indicate where large patches of bracken, scrub, and gorse should be cut low in non-straight lines to provide firebreaks. These will increase habitat connectivity and create open spaces for resident wildlife and any lizards that may be present. Blue lines and the open blue blocks are areas where reseeding with *Calluna* and *Erica* species may increase amounts of favourable habitat. The green circle is an area of slowly regenerating heather dominated heathland with some good underlying soil base.

## Summit

Like Shieltmartin, Summit is very exposed. However, it does contain areas of heathland habitat that may yet prove to have resident common lizards. There is significant scrub and bracken growth along the southern boundary which should be intensively cut back to permit regeneration of heathland. The other areas suffer from dense stands of tall gorse and bracken that will require manual removal of extensive areas to allow for *Calluna* and *Erica* species to re-establish in sufficient quantities. The areas near to Blacklynn and Greenhollows should be allowed to regenerate naturally.

Recommendations for Summit are as follows:

- Cutting, strimming and clearing of the bracken stands growing and covering the eastern and southern faces of dry-stone walls. In situations where the wall now constitutes a mound wall (either partially or almost completely soil covered), some elements of cover should be left in-situ along the top of the wall. In such circumstances short grass is preferable to bracken. These works will enhance the walls' ability to perform vital functions as both refugia for the resident stoat (*Mustela erminea hibernica*)
- The creation of non-linear fire breaks which will also provide structurally diverse and open edge habitats for basking and feeding opportunities. These open habitats can also be used
- The larger areas of gorse near private property could be "mob grazed" via high intensity, short term rotation by cattle or goats in order to retain structural complexity and reduce fire risk.
- Deploy artificial refugia in strategic areas near open private gardens and conduct a survey of property owners to determine if populations of lizards still exist in gardens.



**Figure 12.** A map of the Summit site where mechanical control of dense stands of tall gorse could allow regeneration of the heathland and provide better habitat for common lizards. Open red blocks indicate areas where gorse (and to a lesser extent bracken and scrub) should be monitored and reduced in height to reduce shading of walls and allow regeneration of heathland. Yellow blocks indicate areas of heathland favourable for common lizards available at this site. Bright yellow lines indicate the presence of walls.

## **East Mountain**

East mountain is the stronghold for common lizards in Howth. Therefore, we recommend that a concerted effort be made to maintain the existing heathland and cliff grassland habitats while also trying to reconnect the cliff walk heathland in the east to the heathland bordering the private lands in the west. Creating this habitat linkage is achievable via the removal of large amounts of the bracken stands and providing a structurally complex mosaic of gorse and heather stands of 30-100cm in height. Given that large areas require remediation works, clearance of bracken should be conducted in multiple stages and in irregular shapes. Ideally, the irregular shaping of clearance patches will coincide with existing boundaries (man-made and natural). Clearance in this manner will allow features of importance to remain while limiting disturbance and loss of habitat to other resident wildlife. A priority should be to remove bracken growth along the margins of the old walls to reduce shading. This may require multiple cutting/strimming events over the space of the growing season.

The following works will have immediate benefits to the local common lizard population (see Figure 13 for reference):

- Cutting, strimming and clearing of the bracken stands growing and covering the eastern and southern faces of dry-stone walls. In situations where the wall now constitutes a mound wall (either partially or almost completely soil covered), some elements of cover should be left in-situ along the top of the wall. In such circumstances short grass is preferable to bracken. These works will enhance the walls' ability to perform vital functions as both refugia and hibernacula for common lizards.
- The creation of non-linear fire breaks which also will also provide structurally diverse and open edge habitats for basking and feeding opportunities.
- Bracken clearance near Kilrock to create a dispersal route and habitat linkage between the lizard population along the cliff walks and the mosaic of wall and heathland habitats at Kilrock.
- Large areas of gorse could be "mob grazed" via high intensity, short term rotation by cattle or goats in order to retain structural complexity and reduce fire risk.



- Creation of a wetland complex (a series of ponds and wet grasslands) in a natural hollow between Rock Cottage and Kilrock (53.382834, -6.047940). The topology of the area, and the presence of a small stream that bisects the site, coupled with pluvial flooding facilitates surface and groundwater retention. A purpose made wetland in this area would increase both habitat diversity and biodiversity which would also benefit the resident common frog population (*Rana temporaria*).

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**Figure 13.** Map of East Mountain highlighting areas of known suitability for *Zootoca vivipara* (yellow) and large areas of marginal habitat (orange). Solid red lines indicate where cutting or strimming of bracken along the old walls are necessary to improve exposure to sun, create micro-habitats, and reduce shading. Black open blocks indicate where large patches of bracken, scrub, and gorse should be cut low in non-straight lines to provide firebreaks which will also increase connectivity and habitat linkages and create open spaces for basking and feeding. The provision of sections of low height (~30-100cm) structurally complex gorse and scrub stands should be sufficient. The blue oval indicates an area where installation of a wetland complex is best placed to increase habitat and species diversity due to the natural water retention topography of the area and the presence of a small stream that could also be used to facilitate wetland creation.

We strongly suggest that the management of any vegetation should not take place between 1st March and 31st October, which covers most of the activity season of *Zootoca vivipara*, except in the case of small levels bracken clearance. An exception to this rule is when controlling bracken growth. This can also be conducted in early summer and or late Autumn, particularly in areas where the shading out of important areas/habitats may occur. However, summer and Autumn strimming or removal should be conducted manually with a walk over of the site/section prior to commencement. This allows any resident lizards to move away from the immediate works area. The effects of the herbicide Asulox® is unknown on common lizards and we only recommend it use in areas where there are large continuous stands. Once habitat management is done in a manner that limits disturbance and or reduces chances of injury or greater exposure of lizards to predators then negative impacts are likely to be negligible. This may necessitate the use of a medium term (5+years), primarily manual removal focussed control regime to effectively manage the area for heathland and control undesirable species.

Ideally, all large-scale habitat management will take place during the winter months. Greater awareness also needs to be made to limit deliberate and accidental fires along the cliff walks (warnings about flicking cigarette butts into the dry heath etc.). This is the greatest area for tourism as well as lizard occupancy, so it best serves all stakeholders for fires to be limited in their frequency and size. We reiterate that habitat management can provide opportunities for local community and volunteer engagement which can be an important part of outreach, education, and project ownership.

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## Appendix 1:

### Common Lizard Survey of Howth 2019 Encounter Data

Date	Location	Site	Route	Lifestage	Sex	Time	N	W	Habitat
17/09/2019	East Mountain	5	1	Adult	Male	10:26	53.36544	-6.05492	Cliff heath
17/09/2019	East Mountain	5	1	juvenile	NA	10:44	53.36462	-6.05648	Heath
17/09/2019	East Mountain	5	1	Adult	Male	10:50	53.36528	-6.05790	Wall
17/09/2019	East Mountain	5	1	Adult	Female	10:50	53.36528	-6.05790	Wall
17/09/2019	East Mountain	5	1	juvenile	NA	11:22	53.36884	-6.05417	Heath
17/09/2019	East Mountain	5	2	Adult	Female	11:30	53.37014	-6.05346	Heath
17/09/2019	East Mountain	5	2	Adult	Female	11:37	53.37066	-6.05195	Heath
17/09/2019	East Mountain	5	2	juvenile	NA	11:45	53.37114	-6.05109	Bracken dominated heath
17/09/2019	East Mountain	5	2	Adult	Male	11:53	53.37141	-6.05097	Heath
17/09/2019	East Mountain	5	2	Adult	Female	11:58	53.37252	-6.05029	Heath
17/09/2019	East Mountain	5	2	Adult	Male	12:06	53.37350	-6.04937	Heath
17/09/2019	East Mountain	5	2	Adult	Female	12:08	53.37352	-6.04932	Heath
17/09/2019	East Mountain	5	2	Adult	NA	12:09	53.37353	-6.04934	Heath
17/09/2019	East Mountain	5	2	Adult	NA	12:37	53.37471	-6.04752	Heath
17/09/2019	East Mountain	5	2	juvenile	NA	12:44	53.37586	-6.04654	Heath
17/09/2019	East Mountain	5	2	SubAdult	NA	13:01	53.37622	-6.04624	Heath
17/09/2019	East Mountain	5	2	juvenile	NA	13:25	53.37716	-6.04626	Heath
17/09/2019	East Mountain	5	2	Adult	NA	13:28	53.37754	-6.04607	Heath
17/09/2019	East Mountain	5	2	Adult	Female	13:33	53.37840	-6.04571	Heath
17/09/2019	East Mountain	5	2	Adult	Female	13:39	53.37908	-6.04586	Heath
17/09/2019	East Mountain	5	2	Adult	Male	13:39	53.37908	-6.04586	Heath
17/09/2019	East Mountain	5	2	juvenile	NA	13:39	53.37908	-6.04586	Heath

17/09/2019	East Mountain	5	2	Adult	Female	13:42	53.37929	-6.04581	Heath
17/09/2019	East Mountain	5	2	Adult	Female	13:42	53.37929	-6.04581	Heath
17/09/2019	East Mountain	5	2	SubAdult	Female	13:42	53.37929	-6.04581	Heath
17/09/2019	East Mountain	5	2	Adult	Female	13:49	53.37930	-6.04584	Rank grass at edge of heath
17/09/2019	East Mountain	5	2	juvenile	NA	13:53	53.37972	-6.04609	Heath
17/09/2019	East Mountain	5	2	Adult	Male	14:00	53.38058	-6.04507	Heath
17/09/2019	East Mountain	5	2	Adult	Female	14:02	53.38075	-6.04512	Heath
17/09/2019	East Mountain	5	2	Adult	Female	14:11	53.38266	-6.04599	Heath
17/09/2019	East Mountain	5	2	Adult	Female	14:15	53.38317	-6.04630	Heath
17/09/2019	East Mountain	5	2	SubAdult	NA	14:16	53.38336	-6.04634	Heath
17/09/2019	East Mountain	5	2	SubAdult	Female	14:20	53.38381	-6.04115	Heath
17/09/2019	East Mountain	5	2	Adult	Female	14:25	53.38453	-6.04613	Heath
17/09/2019	East Mountain	5	4	juvenile	NA	15:26	53.37304	-6.05141	Rank grass
06/09/2019	Red Rock	1	2	Adult	Male	12:44	53.36611	-6.08845	Bracken regrowth near steps
05/09/2019	Bellingham's Farm	2	1	Adult	Female	11:54	53.36155	-6.08007	Heath
05/09/2019	Bellingham's Farm	2	1	juvenile	NA	12:06	53.36141	-6.07961	Heath
05/09/2019	East Mountain	5	4	Adult	Female	13:28	53.37250	-6.05173	Heath
05/09/2019	East Mountain	5	4	Adult	Female	13:34	53.37302	-6.05142	Rank grass
05/09/2019	East Mountain	5	4	Adult	Male	13:34	53.37302	-6.05142	Rank grass
05/09/2019	East Mountain	5	4	juvenile	NA	13:34	53.37302	-6.05142	Rank grass
01/09/2019	East Mountain	5	2	Adult	Male	11:09	53.37094	-6.05123	Heath
01/09/2019	East Mountain	5	2	juvenile	NA	11:13	53.37117	-6.05106	Heath
01/09/2019	East Mountain	5	2	Adult	Female	11:46	53.37735	-6.04626	Heath

01/09/2019	East Mountain	5	2	Adult	Male	11:51	53.37762	-6.04611	Heath
01/09/2019	East Mountain	5	4	juvenile	NA	12:54	53.37303	-6.05136	Rank grass
01/09/2019	East Mountain	5	4	juvenile	NA	12:57	53.37298	-6.05141	Rank grass
08/08/2019	East Mountain	5	1	Adult	Male	16:04	53.36765	-6.05584	Heath
08/08/2019	East Mountain	5	1	Adult	Male	16:10	53.36754	-6.05586	Heath
08/08/2019	East Mountain	5	1	Adult	Male	16:17	53.36699	-6.05597	Heath
08/08/2019	East Mountain	5	1	Adult	Male	16:25	53.36645	-6.05573	Heath
08/08/2019	East Mountain	5	1	Adult	Male	16:34	53.36609	-6.05568	Heath
08/08/2019	East Mountain	5	1	Adult	Male	16:37	53.36585	-6.05533	Heath
08/08/2019	East Mountain	5	1	SubAdult	Female	16:41	53.36578	-6.05516	Heath
08/08/2019	East Mountain	5	1	Adult	Female	16:46	53.36570	-6.05522	Heath
08/08/2019	East Mountain	5	1	SubAdult	Male	17:10	53.36725	-6.05569	Heath
08/08/2019	East Mountain	5	1	Adult	Female	17:14	53.36744	-6.05552	Heath
08/08/2019	East Mountain	5	1	Adult	Female	17:21	53.36835	-6.05471	Heath
29/06/2019	Bellingham's Farm	2	1	SubAdult	NA	15:35	53.36125	-6.07928	Heath
18/06/2019	East Mountain	5	1	Adult	Male	14:36	53.36855	-6.05624	Heath
18/06/2019	East Mountain	5	1	Adult	Female	14:42	53.36824	-6.05617	Heath
18/06/2019	East Mountain	5	1	yearling	NA	15:20	53.36555	-6.05733	Old wall
18/06/2019	East Mountain	5	2	Adult	Female	15:40	53.36729	-6.05570	Heath
18/06/2019	East Mountain	5	2	yearling	NA	15:44	53.36737	-6.05544	Heath
18/06/2019	East Mountain	5	2	Adult	Female	16:42	53.38037	-6.04505	Heath
18/06/2019	East Mountain	5	2	Adult	Female	16:42	53.38037	-6.04505	Heath
18/06/2019	East Mountain	5	2	Adult	Male	16:42	53.38037	-6.04505	Heath
18/06/2019	East Mountain	5	2	Adult	Male	16:42	53.38037	-6.04505	Heath
18/06/2019	East Mountain	5	2	Adult	Female	17:07	53.38435	-6.04602	Heath

09/06/2019	East Mountain	5	4	Adult	Male	13:09	53.38065	-6.04942	Old Wall overgrown with heath
09/06/2019	East Mountain	5	4	Adult	Male	13:09	53.38065	-6.04942	Old Wall overgrown with heath
09/06/2019	East Mountain	5	4	Adult	Male	13:17	53.38060	-6.04950	Old Wall overgrown with heath
09/06/2019	East Mountain	5	4	Adult	Female	13:23	53.38057	-6.04955	Old Wall overgrown with heath
09/06/2019	East Mountain	5	4	Adult	Female	13:29	53.38066	-6.04980	Old Wall overgrown with heath
15/05/2019	Bellingham's Farm	2	4	yearling	NA	12:02	53.36364	-6.08526	Rocky heath
14/05/2019	Bellingham's Farm	2	1	yearling	NA	11:38	53.36493	-6.08793	Rank grass with bramble
04/05/2019	East Mountain	5	4	yearling	NA	14:02	53.37304	-6.05133	Rank grass
04/05/2019	East Mountain	5	4	yearling	NA	14:02	53.37304	-6.05133	Rank grass
03/05/2019	East Mountain	5	1	Adult	NA	12:17	53.36885	-6.05416	Old Wall in heath
03/05/2019	East Mountain	5	1	Adult	Female	12:24	53.36890	-6.05414	Old Wall in heath
03/05/2019	East Mountain	5	1	Adult	Female	12:24	53.36890	-6.05414	Old Wall in heath
03/05/2019	East Mountain	5	1	Adult	Female	12:24	53.36890	-6.05414	Old Wall in heath
03/05/2019	East Mountain	5	1	yearling	NA	12:35	53.36897	-6.05416	Old Wall in heath
03/05/2019	East Mountain	5	1	yearling	NA	13:05	53.37533	-6.04739	Heath
10/04/2019	Red Rock	1	2	yearling	NA	12:40	53.36712	-6.04115	Gorse/bracken heath regrowth on burnt bracken
10/04/2019	Red Rock	1	2	yearling	NA	12:42	53.36719	-6.08793	Gorse/bracken heath regrowth



									on burnt bracken
10/04/2019	Red Rock	1	2	Adult	Female	12:42	53.36719	-6.08793	Gorse/bracken heath regrowth on burnt bracken
10/04/2019	Red Rock	1	2	yearling	NA	12:42	53.36719	-6.08793	Gorse/bracken heath regrowth on burnt bracken

### *Common Lizard Survey of Howth 2019- Historical Encounter Data*

Year	Lifestage	Sex		N	W	
11/06/2018	Adult	Female	12:31	53.36741	-6.05378	Heath
11/06/2018	Adult	NA	13:45	53.38095	-6.04515	Heath
13/07/2017	Adult	NA	10:07	53.37124	-6.05095	Heath. On low gorse (1m above ground)
13/07/2017	Adult	Male	11:27	53.37224	-6.05056	Heath. On concrete bench. Stub/regen tail
26/05/2017	NA	NA	10:57	53.38306	-6.04628	Only tail seen
22/05/2017	Adult	Female	14:43	53.3753	-6.04742	Heath
14/03/2017	Adult	NA	13:24	53.36662	-6.05626	In gorse at Wall
14/03/2017	Adult	Male	14:20	53.3649	-6.0561	Heath
19/09/2016	Adult	Male	13:13	53.37126	-6.05102	Heath
19/09/2016	Adult	NA	13:25	53.37241	-6.05048	Heath
19/09/2016	juvenile	NA	13:25	53.37241	-6.05048	Heath
12/08/2016	Juvenile 2016	NA		53.37064	-6.05197	Heath
12/08/2016	Juvenile 2016	NA		53.37064	-6.05197	Heath
12/08/2016	NA	NA		53.37175	-6.05085	Heath
12/08/2016	Adult	M		53.37223	-6.05086	Heath
12/08/2016	Juvenile 2016	NA		53.37238	-6.05046	Heath
12/08/2016	Juvenile 2017	NA		53.37246	-6.0504	Heath
12/08/2016	Juvenile 2018	NA		53.37566	-6.04701	Heath
15/07/2016	Adult	Male	15:00	53.37075	-6.05174	On gorse branch
15/07/2016	Juvenile 2016	NA	15:00	53.37075	-6.05174	On gorse branch

15/07/2016	Juvenile 2016	NA	15:00	53.37075	-6.05174	On gorse branch
15/07/2016	Juvenile 2016	NA	15:00	53.37075	-6.05174	On gorse branch
15/07/2016	Juvenile 2016	NA	15:00	53.37075	-6.05174	On gorse branch
15/07/2016	Adult	Female	15:30	53.37505	-6.04757	
15/07/2016	Adult	Male	16:13	53.37238	-6.05046	Heath On concrete bench
13/05/2016	Adult	Female	14:36	53.37704	-6.04635	Heath
13/05/2016	Adult	Female	14:52	53.37507	-6.4755	Heath
13/05/2016	Adult	Female	15:22	53.37124	-6.05099	Heath
15/09/2015	Adult	NA	11:53	53.36603	-6.08843	Heath
15/09/2015	juvenile	NA	12:29	53.36333	-6.08503	Rank grass
15/09/2015	NA	NA	12:59	53.36142	-6.07971	Heath
15/09/2015	Juvenile	NA	14:19	53.36506	-6.05743	Heath
07/10/2013	juvenile	NA	13:31	53.37158	-6.05092	Heath
07/10/2013	juvenile	NA	13:31	53.37158	-6.05092	Heath
23/09/2011	Adult	NA	14:18	53.37728	-6.04636	Heath
23/09/2011	Adult	NA	14:30	53.3773	-6.04642	Heath
15/09/2011	Adult	NA	14:02	53.37317	-6.04948	Heath
15/09/2011	juvenile	NA	14:15	53.3746	-6.04782	Heath
15/09/2011	juvenile	NA	14:15	53.3746	-6.04782	Heath
15/09/2011	juvenile	NA	14:15	53.3746	-6.04782	Heath
15/09/2011	Adult	NA	14:30	53.3714	-6.05097	Heath
15/09/2011	Adult	NA	14:31	53.37737	-6.04632	Heath
08/04/2011	Adult	NA	12:52	53.37628	-6.04634	Heath
08/04/2011	Adult	NA	13:06	53.37751	-6.04617	Heath
03/09/2010	Adult	NA	NA	53.37292	-6.0498	Heath
26/08/2010	Adult	NA	NA	53.37098	-6.05124	Heath
26/08/2010	Adult	NA	NA	53.37177	-6.05089	Heath
08/08/1971	NA	NA	NA	53.37223	-6.06233	An Foras Forbartha Data
01/09/1908	NA	NA	NA	53.36791	-6.07752	An Foras Forbartha Data