

# Comparing fieldwork, local knowledge and citizen science for bird monitoring in Súðavík, Iceland

David Pierre Milesi-Gaches<sup>1</sup>

## Abstract

This study investigates the complementary roles of structured fieldwork, local contributors, and online citizen science platforms in building a bird species inventory in Súðavík, Westfjords, Iceland. A total of 70 bird species were recorded, including 23 confirmed breeders on the Langeyri peninsula. Local contributors added rare and seasonal records to field observations, often compensating for gaps caused by harsh weather or limited access. Online data helped validate observations and extended spatial coverage. The integration of these approaches improved species detection, reduced uncertainty, and highlighted the value of citizen science, especially in remote regions facing logistical constraints. Despite some limitations, such as observer biases or identification challenges, citizen science proved to be a critical tool for enhancing biodiversity monitoring.

**Keywords:** Environment, ornithology, birds, Iceland, citizen science.

## Comparaison entre observations de terrain, connaissances locales et science participative dans le suivi des oiseaux à Súðavík, Islande

## Résumé

Cette étude examine les rôles complémentaires du travail de terrain, des contributions d'observateurs locaux et des plateformes de science participative en ligne dans l'élaboration d'un inventaire des espèces d'oiseaux à Súðavík, dans les fjords de l'ouest islandais. Au total, 70 espèces d'oiseaux ont été recensées, dont 23 confirmées comme nicheuses sur la péninsule de Langeyri. Les contributeurs locaux ont apporté des données rares ou saisonnières, venant compléter les observations de terrain, notamment lorsque les conditions météorologiques ou l'accès au site limitent le travail de terrain. Les données en ligne ont aidé à valider certaines observations et à élargir la couverture spatiale. L'intégration de ces approches a amélioré la détection des espèces, réduit l'incertitude et mis en lumière la valeur de la science participative, en particulier dans les régions reculées soumises à des contraintes logistiques. Malgré certaines limites, comme les biais d'observation ou les difficultés d'identification, la science participative s'est révélée être un outil essentiel pour renforcer le suivi de la biodiversité.

**Mots clés :** Environnement, ornithologie, oiseaux, Islande, science participative.

## 1. Introduction

Iceland holds a unique position in the field of ornithology due to its rich birdlife and geographical location at the intersection of migratory routes between North America and Europe. The island's diverse habitats, including vast wetlands, coastal cliffs, and volcanic landscapes, provide breeding grounds for numerous seabirds and waterfowl species, some of which have globally significant populations (Petersen, 1998; Asbirk, 1997).

In recent years, Iceland has experienced exponential growth in tourism (Maher *et al.*, 2022), which brings

increased human presence to wild and remote areas. Regions offering wildlife observation, such as birdwatching, face significant anthropogenic impacts (Croxall *et al.*, 2012), which interact with broader global challenges like climate change (Daunt & Mitchell, 2013; Paleczny *et al.*, 2015). The consequences of these combined pressures include habitat degradation and disruptions in species' breeding cycles, such as reduced incubation periods (Croxall *et al.*, 2012; Dias *et al.*, 2019).

Before implementing effective management actions, it is crucial to develop a comprehensive understanding of the ecological, environmental, and social dynamics

1. University of South Bohemia, Czech Republic, Department of Zoology, 420 Súðavík, Iceland: milesi.david@gmail.com



that shape these ecosystems. Interventions based on incomplete knowledge risk unintended consequences, while a deeper understanding supports adaptive management and long-term sustainability (Westgate *et al.*, 2013). As Holling and Meffe (1996) emphasised, successful ecosystem management requires a precautionary approach that accounts for the complexities and uncertainties inherent in natural systems.

Citizen science is increasingly recognised for its potential to engage extensive networks of volunteers, thereby enabling data collection on a scale and resolution often unattainable by individual researchers. As well, it allows the execution of conservation initiatives which wouldn't be feasible through traditional research methods alone (Kobori *et al.*, 2016; Miller-Rushing *et al.* 2012; Silvertown 2009). It not only supplements traditional research methods but also leverages local knowledge, especially vital in complex environments like urban ecology where private lands remain largely inaccessible for structured scientific study (Evans *et al.* 2005; Lepczyk, 2005; Kobori & Primack 2003). One successful example of citizen science in action is the eBird project, which collects approximately five million bird observations each month and has contributed to around 100 peer-reviewed articles across various scientific disciplines (Sullivan *et al.* 2014).

However, utilising citizen science data is not without challenges, notably concerning data accuracy. Issues can arise from the predominance of records for common species over rare ones, as well as the spatial precision and documentation quality of the collected data (Young *et al.*, 2019). These limitations can be mitigated by providing volunteers with adequate training and the necessary tools for accurate data collection. Concerns about species misidentification, often cited due to the involvement of non-professionals, have been addressed in several studies which show that well-designed citizen science projects can achieve high levels of accuracy (Gorleri *et al.*, 2023; Greenwood, 2007; Cohn, 2008).

In addition to its contribution to scientific research, citizen science holds educational value, helping to demystify the scientific process and foster lifelong learning among participants of all ages (Bonney *et al.* 2009; Brewer, 2002). Therefore, while challenges exist, the potential benefits of integrating citizen science into contemporary research are manifold, particularly in improving knowledge of undersampled taxa and regions in the Arctic (Fraisl *et al.*, 2022).

This study examines how different sources of information can be combined to create a bird species inventory in Súðavík, Iceland, and to evaluate their respective contributions to local monitoring. Súðavík, with its mix of privately owned lands and areas near touristic and industrial activities, presents an opportunity to examine the potential impacts of human disturbances on bird populations. Given the Icelandic Tourist Board's (Ferðamálastofa) policy framework for sustainable tourism through 2030, which emphasises research-based

decision-making (Ferðamálastofa, 2020), establishing a thorough understanding of local birdlife is important for guiding future conservation efforts and informing local governance (Moore *et al.*, 2020).

To this end, I combine three complementary data sources: (1) online records from citizen science platforms, (2) field observations collected in Álftafjörður between 2021 and 2023, and (3) observations from experienced local birdwatchers. Species are classified according to their pattern of occurrence (e.g. breeding species, regular visitors, occasional visitors, rare sightings), and their conservation status is reported. By assessing the strengths and limitations of each data source, this study discusses their complementarity for monitoring bird communities at the local scale.

A selection of emblematic bird species from the Súðavík area is presented in **Fig. 1**, providing a visual overview of the local avifauna.

## 2. Methods

### 2.1. Study area

Súðavík, nested within Álftafjörður fjord in Iceland's Westfjords, is a pivotal fishing village located about 20 kilometres from Ísafjörður's urban centre. Súðavík holds both ecological and touristic significance. The Arctic Fox Centre (Melrakkasetur Íslands, 2023), and sea angling ventures by Iceland Sea Angling (2023) bring tourists that are sensitive to wildlife. Notable natural landmarks encompass the Langeyri peninsula. Despite its commercial and industrial undertakings, it stands out as an important breeding and nesting hub for various bird species (**Fig. 2**).

Recent initiatives have highlighted the Langeyri peninsula as a key area for development within Súðavík. Human activities occupy a space of 39,600 square metres, constituting 26% of the peninsula's total area of 150,000 square metres. The majority of the peninsula remains in its pristine state, apart from the presence of a minor pathway (**Fig. 2**).

The ecological composition of Langeyri is diverse, featuring rocky coastlines, barren coastal fields, a small cultivated area, shrublands, and a freshwater pond (**Fig. 2**). On an annual basis, this habitat serves as an attraction for various migratory bird species including Arctic terns *Sterna paradisaea* (Pontoppidan, 1763), Black-headed gulls *Chroicocephalus ridibundus* (Linnaeus, 1766), Common eiders *Somateria mollissima* (Linnaeus, 1758), Common redshanks *Tringa totanus* (Linnaeus, 1758) or Eurasian oystercatchers *Haematopus ostralegus* (Linnaeus, 1758).

Although the Langeyri peninsula serves as the primary avian habitat in Súðavík, a variety of other bird species can also be observed in different areas within the town and further in the Álftafjörður fjord. For example, Common redpoll (*Acanthis flammea*, Linnaeus, 1758) can be spotted within the town itself.



**Fig. 1** - Examples of typical bird species in the Súðavík area, Westfjords, Iceland. **(A)** Arctic tern *Sterna paradisaea*. **(B)** Common eider *Somateria mollissima* (female). **(C)** Atlantic puffin *Fratercula arctica*. **(D)** Black-headed gull *Chroicocephalus ridibundus*. **(E)** Black guillemot *Cepphus grylle*. **(F)** Black-tailed godwit *Limosa limosa*. **(G)** European golden plover *Pluvialis apricaria*. **(H)** Red-throated diver *Gavia stellata*. **(I)** Harlequin duck *Histrionicus histrionicus* (male). (Photographs: Pixabay, Saxifraga)

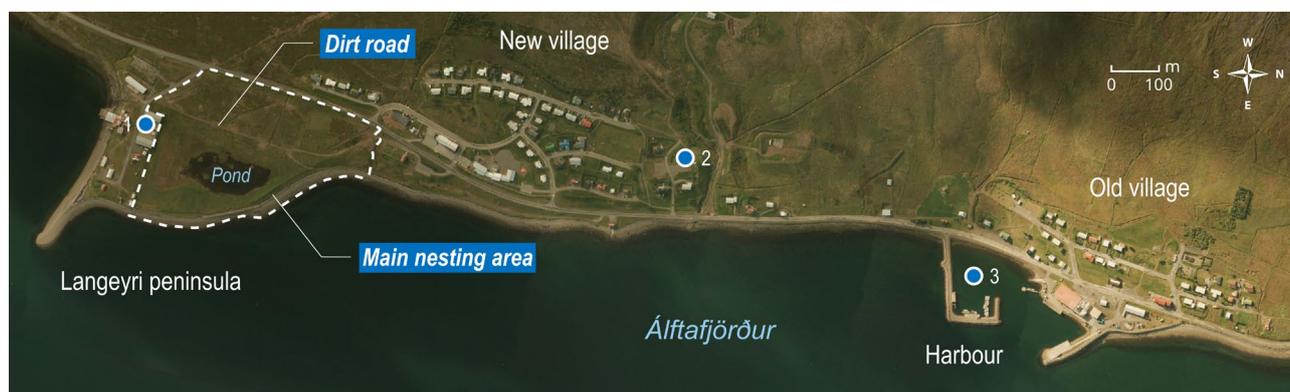
Near the harbour, species such as the Black guillemot and the Northern fulmar (*Fulmarus glacialis*, Linnaeus, 1761) are frequently sighted. Further into the fjord, the Whooper swan (*Cygnus cygnus*, Linnaeus, 1758) can be seen alongside the seashore and in fields.

While Súðavík urban area remains limited, numerous small trees are present on the mountainside, in the backyard of houses, thus increasing the likelihood that owners can observe bird species appreciating these habitats.

## 2.2. Data collection

### 2.2.1. Online records from citizen science platforms

Data from citizen science platforms were scrutinised and incorporated when relevant. Records from eBird (eBird, 2023) were evaluated with particular attention to observer reliability (e.g. biological background, ornithological expertise or status as experienced birdwatcher), and only sightings with sufficient evidence such as photographs or multiple independent reports were



**Fig. 2** - Map of Súðavík showing key districts and areas. (1) Industrial facilities. (2) The Arctic Fox Centre. (3) Iceland Sea Angling (Basemap: Loftmyndir ehf).

retained. Additional species records were obtained from the Global Biodiversity Information Facility (GBIF.org, 2023), using a search polygon covering approximately  $2.21 \times 10^9 \text{ m}^2$  around Súðavík to spatially filter queries.

### 2.2.2. Field observations

Bird species were recorded during fieldwork carried out in Álftafjörður between 2021 and 2023. These observations included direct sightings made while conducting research on seal behaviour, general wildlife surveys, a plant inventory in Langeyri (Milesi-Gaches, 2025), and experiments on nest-defence behaviour in *Sterna paradisaea* (Tabl. 1). Additional opportunistic sightings were also noted in the area during routine daily activities.

### 2.2.3. Observations from experienced local contributors

Additionally, local expertise was gathered through consultations with two experienced birdwatchers from

the community, whom I connected with via word of mouth. Their long-term observations provided valuable insights into species behaviour and distribution, complementing the fieldwork data. These consultations also allowed for an assessment of their skill levels and the reliability of their observations (Cohn, 2008).

### 2.2.4. Data categorisation and analysis

Species were assigned to taxonomic families and classified according to their pattern of occurrence in Súðavík, following the criteria presented in Tabl. 2. The national conservation status of each species was compiled using the 2018 red list published by the Icelandic Institute of Natural History (Náttúrufræðistofnun Íslands, 2018).

## 3. Results

A total of 70 avian species were identified (Tabl. 3), of which 23 breed and nest on the Langeyri peninsula (Fig. 3). Among these, 17 are regular visitors, indicating

**Tabl. 1** - Summary of secondary fieldwork activities detailing observational and experimental studies conducted on Arctic fauna and flora, 2023–2024.

Secondary fieldwork	Period	Total duration	Description
Behavioural ecology or harbour and grey seals	2023-2024	70 hours	Direct observations of seals' behaviour and interspecies interactions to assess behavioural patterns.
Habitat and behaviour of pre-nesting Arctic terns	5-10 June 2023	2 hours	20-minute observation sessions and experimentation (flight initiation distance).
Nest defence behaviour of Arctic terns	24-26 June 2023	24 hours	20-minute experiments involving dummy presentations to observe defence behaviours, with 40-minute intervals between sessions.
Flora species identification (Langeyri peninsula)	12-19 August 2023	30 hours	Identification and documentation of flora species within the Langeyri peninsula.
Nesting preferences of black guillemots	Summer 2023	10 hours	Regular observations of black guillemots in the harbour area to locate and document nesting preferences.

**Tabl. 2** - Classification of avian visitors to the Langeyri peninsula, Súðavík, and the Álftafjörður fjord based on frequency and patterns of occurrence.

Category	Definition
Breeding and nesting birds	All species breeding and/or nesting in Langeyri.
Regular visitors	Refers to species that are consistently observed in the Langeyri peninsula, Súðavík, and the Álftafjörður fjord, engaging in routine activities like feeding and preying. These species are typically sighted either daily or multiple times per week.
Occasional visitors	Refers to species that are sporadically observed in the Langeyri peninsula, Súðavík, and the Álftafjörður fjord. These species are sighted with varying frequency, ranging from a few times a week to multiple times per month.
Rare visitors	Refers to species that are infrequently observed in the Langeyri peninsula, Súðavík, and the Álftafjörður fjord, with sightings occurring once a month or less. This category also includes species that were observed only during a single year or breeding season, as well as species that were formerly regular or occasional visitors but have not been observed for several years.
Migratory stopover visitors	Refers to species known to make brief sojourns in the Langeyri peninsula, Súðavík, and the Álftafjörður fjord as part of their migratory routes.

# Birds in Súðavík

70 Species 8 Families

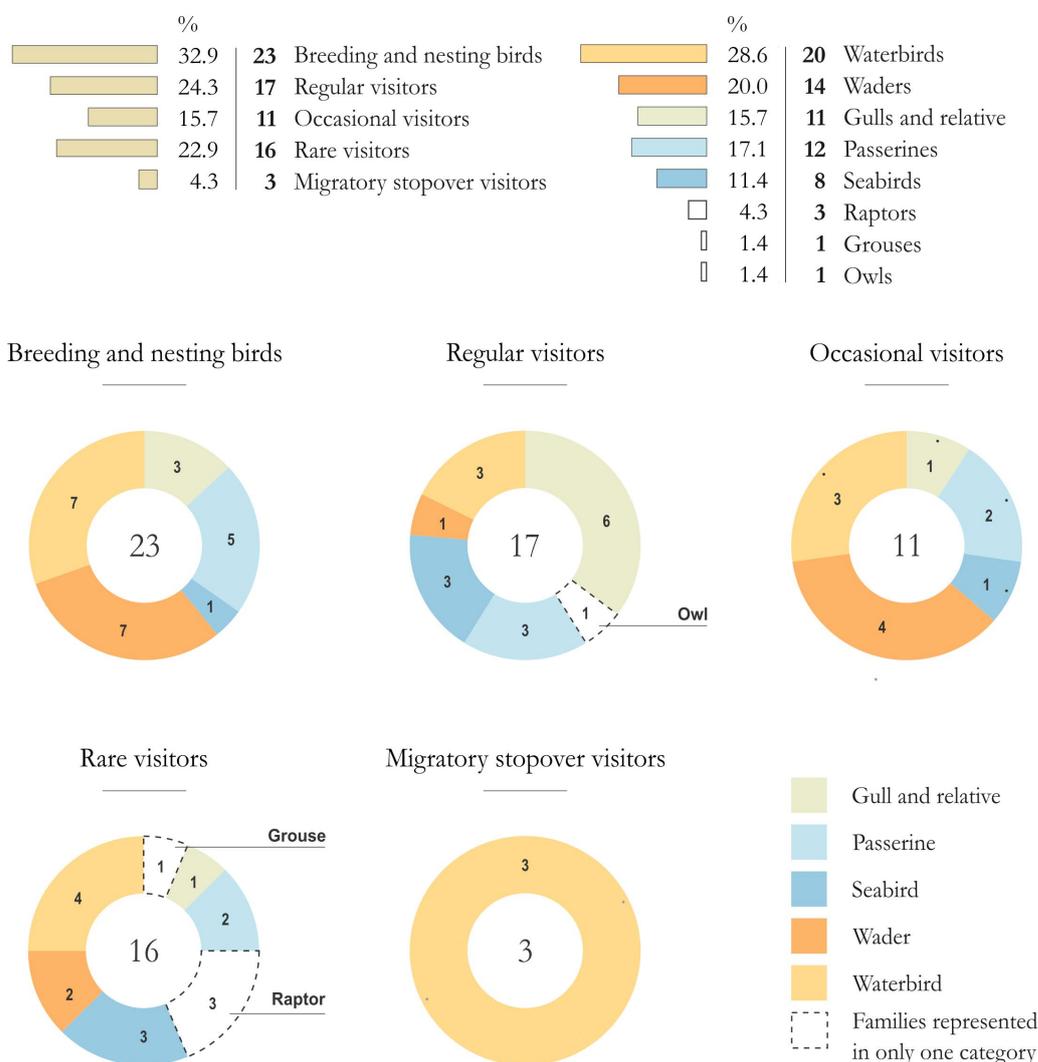


Fig. 3 - Summary of bird species identified around Súðavík.

that 40 species inhabit Súðavík, utilising the peninsula, the urban area, and nearby environs to meet their daily requirements. The waterbird family is the predominant one among the eight families identified. Notably, waders had a strong representation among both breeding and nesting species, with seven species classified in this category.

The families of gulls and their relatives, passerines, seabirds, waders, and waterbirds are represented across breeding and nesting birds, as well as regular, occasional, and rare visitors. Only three families are exclusive to a single category: a singular owl species manifests as a regular visitor, while one species of grouse and three raptor species are classified as rare visitors. Migratory stopover visitors were only observed from the waterbird family (Tabl. 3).

Due to its diverse habitats, the Langeyri peninsula stands out as the primary nesting site in Súðavík. The distribution of nesting bird species aligns with anticipated patterns in Iceland. Particularly noteworthy is the presence of Black guillemots *Cephus grylle* (Linnaeus, 1758). While most alcids are colonial, Black guillemots can exhibit more dispersed nesting habits (Preston, 1968). This is evident in Súðavík, where a few pairs have been observed nesting along the seashore and within the harbour.

### 3.1. Conservation status

Among the 70 identified species, one (the little auk *Alle alle* Linnaeus, 1758) is regionally extinct in Iceland, two are critically endangered (the Atlantic puffin and

**Tabl. 3** - Bird species observed in the Súðavík area, categorised by status.

Type	Family	Specie	Scientific name	
<b>Breeding and nesting birds</b>	Gulls and relative	Arctic tern	<i>Sterna paradisaea</i>	
		Black-headed gull	<i>Chroicocephalus ridibundus</i>	
		Lesser black-backed gull	<i>Larus fuscus</i>	
	Passerines	Eurasian wren	<i>Troglodytes troglodytes</i>	
		Meadow pipit	<i>Anthus pratensis</i>	
		Northern wheatear	<i>Oenanthe oenanthe</i>	
		Redwing	<i>Turdus iliacus</i>	
		White wagtail	<i>Motacilla alba</i>	
	Seabirds	Black guillemot	<i>Cepphus grylle</i>	
	Waders	Black-tailed godwit	<i>Limosa limosa</i>	
		Common redshank	<i>Tringa totanus</i>	
		Common ringed plover	<i>Charadrius hiaticul</i>	
		Common snipe	<i>Gallinago gallinago</i>	
		Eurasian oystercatcher	<i>Haematopus ostralegus</i>	
		European golden plover	<i>Pluvialis apricaria</i>	
		Red-necked phalarope	<i>Phalaropus lobatus</i>	
		Waterbirds	Common eider	<i>Somateria mollissima</i>
			Eurasian wigeon	<i>Mareca penelope</i>
			Greylag goose	<i>Anser anser</i>
			Mallard	<i>Anas platyrhynchos</i>
Red-breasted merganser			<i>Mergus serrator</i>	
Red-throated diver			<i>Gavia stellata</i>	
Tufted duck			<i>Aythya fuligula</i>	
<b>Regular visitors</b>	Gulls and relative	Arctic skua	<i>Stercorarius parasiticus</i>	
		Black-legged kittiwake	<i>Rissa tridactyla</i>	
		Common gull	<i>Larus canus</i>	
		Glaucous gull	<i>Larus hyperboreus</i>	
		Great black-backed gull	<i>Larus marinus</i>	
		Herring gull	<i>Larus argentatus</i>	
	Owls	Short-eared owl	<i>Asio flammeus</i>	
	Passerines	Common raven	<i>Corvus corax</i>	
		Common redpoll	<i>Acanthis flammea</i>	
		Snow bunting	<i>Plectrophenax nivalis</i>	
	Seabirds	Atlantic puffin	<i>Fratercula arctica</i>	
		Great cormorant	<i>Phalacrocorax carbo</i>	
		Northern fulmar	<i>Fulmarus glacialis</i>	
	Waders	Whimbrel	<i>Numenius phaeopus</i>	
	Waterbirds	Eurasian teal	<i>Anas crecca</i>	
		Long-tailed duck	<i>Clangula hyemalis</i>	
		Whooper swan	<i>Cygnus cygnus</i>	
<b>Occasional visitors</b>	Gulls and relative	Iceland Gull	<i>Larus glaucooides</i>	
	Passerines	Barn Swallow	<i>Hirundo rustica</i>	
		Common starling	<i>Sturnus vulgaris</i>	

	Seabirds	European Shag	<i>Gulosus aristotelis</i>
	Waders	Purple Sandpiper	<i>Calidris maritima</i>
		Red knot	<i>Calidris canutus</i>
		Ruddy turnstone	<i>Arenaria interpres</i>
		Sanderling	<i>Calidris alba</i>
	Waterbirds	Common shelduck	<i>Tadorna tadorna</i>
		Greater Scaup	<i>Aythya marila</i>
		Northern Pintail	<i>Anas acuta</i>
<b>Rare visitors</b>	Grouses	Rock Ptarmigan	<i>Lagopus muta</i>
	Gulls and relative	Great skua	<i>Stercorarius skua</i>
	Passerines	Bohemian waxwing	<i>Bombycilla garrulus</i>
		Common blackbird	<i>Turdus merula</i>
	Raptors	Gyrfalcon	<i>Falco rusticolus</i>
		Merlin	<i>Falco columbarius</i>
		White-tailed eagle	<i>Haliaeetus albicilla</i>
	Seabirds	Common Murre	<i>Uria aalge</i>
		Little auk	<i>Alle alle</i>
		Razorbill	<i>Alca torda</i>
	Waders	Eurasian curlew	<i>Numenius arquata</i>
		Grey heron	<i>Ardea cinerea</i>
	Waterbirds	Goosander	<i>Mergus merganser</i>
		Harlequin duck	<i>Histrionicus histrionicus</i>
		King eider	<i>Somateria spectabilis</i>
Mandarin duck		<i>Aix galericulata</i>	
<b>Migratory stopover visitors</b>	Waterbirds	Barnacle goose	<i>Branta leucopsis</i>
		Brent goose	<i>Branta bernicla</i>
		Great northern diver	<i>Gavia immer</i>

great skua *Stercorarius skua*, Brünnich, 1764), and nine are classified as endangered (**Fig. 6**). The black guillemot, which nests and breeds in Súðavík, is among the endangered species. Of these nine endangered species, two (greater scaup *Aythya marila*, Linnaeus, 1761; and purple sandpiper *Calidris maritima*, Brünnich, 1764) are occasional visitors, while the others are regular visitors. Eleven species are vulnerable, including three breeding and nesting species: the Arctic tern, Eurasian oystercatcher, and common eider.

### 3.2. Contribution of the three data sources

The bird species list was compiled from three complementary sources: online records from citizen science platforms (eBird, GBIF), my own field observations, input from two local birdwatchers with over 30 years of experience each. While both local birdwatchers are highly knowledgeable, only one is proficient in bird photography. Both possess a deep understanding of bird ecology, especially within Iceland. The eBird and GBIF databases helped document several species that were not recorded during fieldwork or

by local observers, particularly among seabirds and waterbirds. Conversely, species frequenting private gardens or residential trees were more likely to be documented by local birdwatchers. Neither the local birdwatchers nor I had submitted observations directly to online databases (**Tabl. 4**).

When breaking down species identification by family, local contributor 1 observed the most diversity, identifying 69 out of the 70 species on the list. The lone missing species from contributor 1's list, the Bohemian waxwing *Bombycilla garrulus* (Linnaeus, 1758), was only observed by local contributor 2. Known as a vagrant species in Iceland, the Bohemian waxwing was photographed by contributor 2 while feeding in a private garden, reducing its detectability outside private property.

All sources identified species belonging to gulls and relatives, seabirds, passerines, waterbirds, and waders. Raptors, grouse, and owls were less frequently observed in Súðavík. For instance, I did not encounter any raptors during fieldwork, and the Short-eared owl *Asio flammeus* (Pontoppidan, 1763) was exclusively noted by local contributor 1.

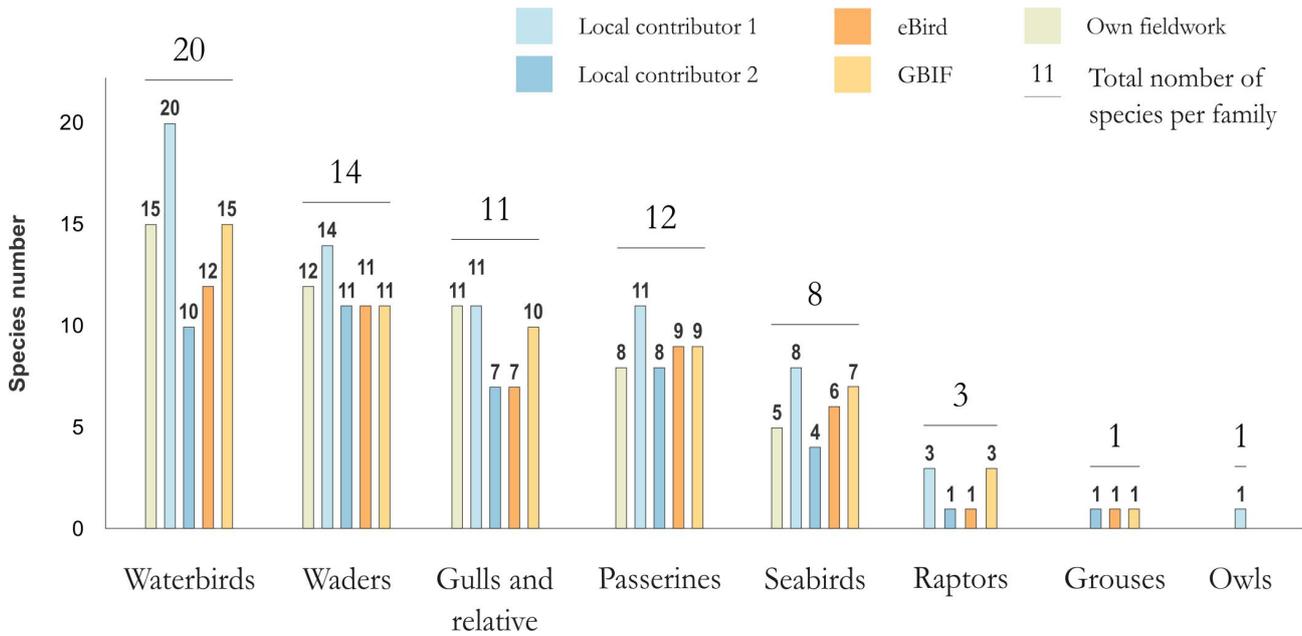


Fig. 4 - Number of species identified by family and by data source.

Breeding and nesting birds were the most frequently identified across sources, followed by regular visitors. Both local contributors and online records documented more rare visitors than occasional ones (Fig. 5).

#### 4. Discussion

This paper aimed to evaluate the contribution of online records from citizen science platforms (eBird, GBIF), field observations, and input from local contributors to the development of a bird species inventory in

comparison to traditional fieldwork. Although the fieldwork spanned three years, contributions from local residents identified a greater number of bird species and provided information extending beyond the 2021–2023 fieldwork period. Despite Iceland being a renowned destination for birdwatchers, global databases like eBird and GBIF did not offer more comprehensive data than what was gathered by local contributors. However, these databases played a crucial role in validating the accuracy of both the fieldwork and local citizen reports through cross-referencing species identifications. Registered

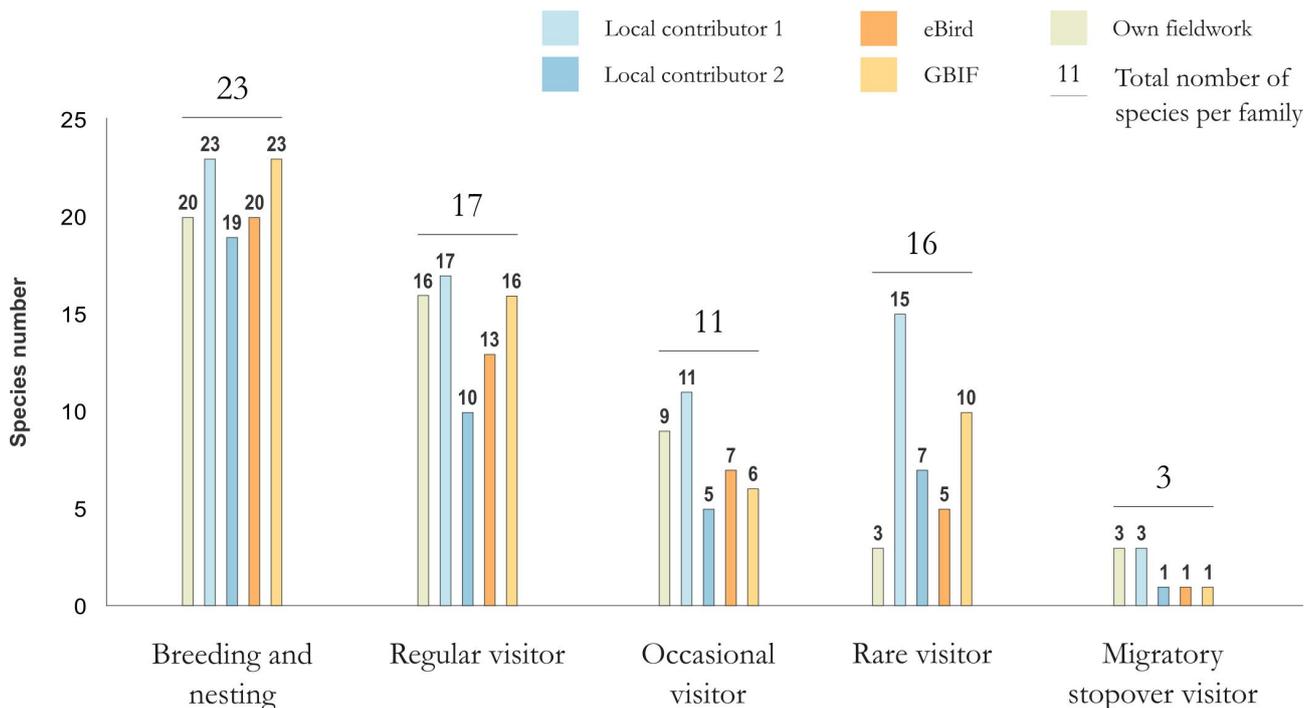
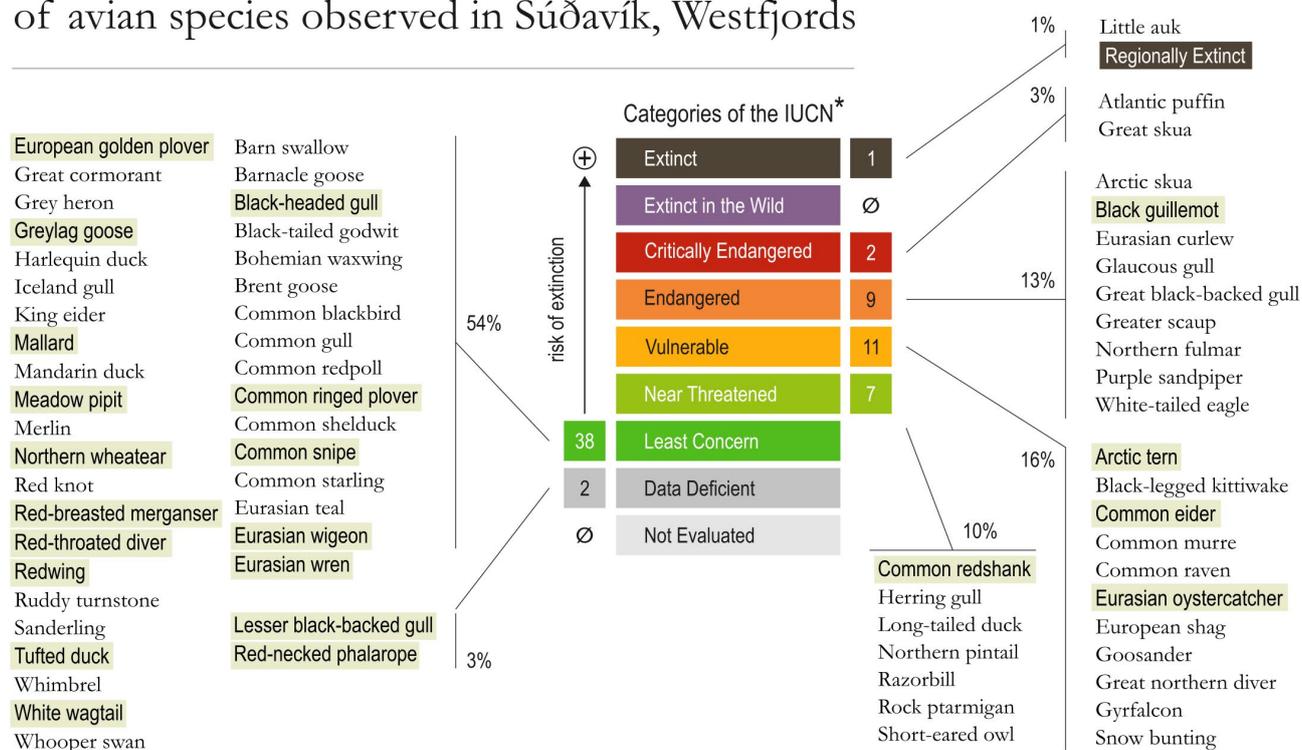


Fig. 5 - Number of species identified by pattern of occurrence and by data source.

**Tabl. 4** - Number of bird species identified by sources for Súðavík.

Source	Own fieldwork	Local contributor 1	Local contributor 2	eBird	GBIF
<i>Number of species</i>	51	69	42	46	56

## Icelandic conservation status of avian species observed in Súðavík, Westfjords



**Common redshank** Bird specie breeding and nesting in the Langeyri peninsula.

\* Categories as defined by the International Union for Conservation of Nature (IUCN), with the classification from Náttúrufræðistofnun Íslands (Icelandic Institute of Natural History, IINH).

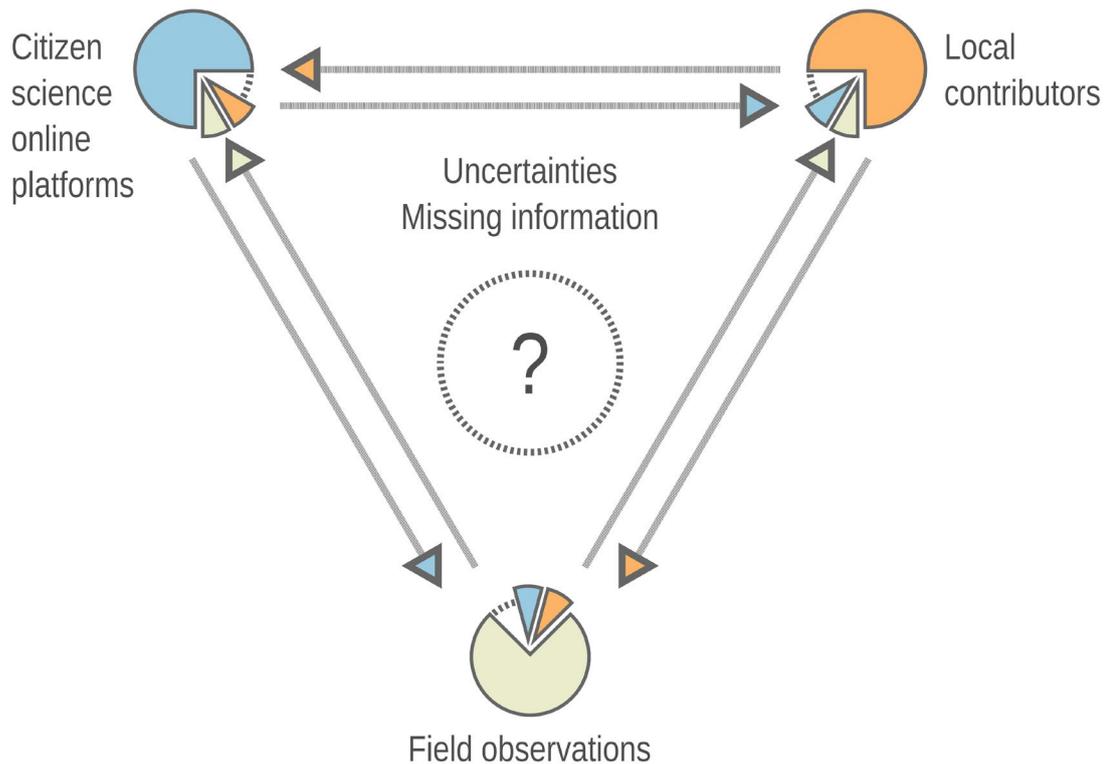
**Fig. 6** - Bird species identified in Súðavík and their conservation status in Iceland (amended from Náttúrufræðistofnun Íslands).

observations were often accompanied by detailed notes on species characteristics, such as breeding status, age (juvenile or adult), and photographs, enhancing the reliability of the data.

While conducting fieldwork around nesting areas is relatively straightforward for an experienced ornithologist during the breeding season, it remains time-consuming to explore and monitor more distant areas and different times of the year. The most challenging task was recording birds during migratory stopovers due to their fleeting presence. Identifying 51 species in this study was only possible because of my involvement in other research projects in the area, allowing for extensive time spent outdoors throughout the spring, summer, and autumn. Living locally also provided an observational advantage, introducing a positive bias compared to researchers based outside the region. For

example, although I did not record any raptors during formal fieldwork, I observed a white-tailed eagle twice during the winter of 2023-2024 while commuting between Ísafjörður and Súðavík, approximately 6 km from the study area (66.092329, -23.016051). This proximity helped to validate similar sightings reported by local contributors, supporting the reliability of these observations. This complementarity also reflects my own dual position as both a researcher conducting formal fieldwork and a local observer living year-round in the area, which allowed me to contribute in both structured and informal ways.

The contribution of citizens to the bird species inventory in Súðavík did not surpass or replace conventional methods. Instead, it served as a complementary approach, providing valuable insights and helping to verify data from global databases and



**Fig. 7** - Each method's gaps and uncertainties are mitigated by the others, demonstrating their complementary roles in the bird species inventory process.

fieldwork (**Fig. 7**). Each of the three approaches—online records, field observations, and local contributors—complemented the others, filling gaps and addressing uncertainties in the data from the other two methods. In addition to their complementarity, these approaches differ in the kind of contribution they typically offer (**Tabl. 5**). Fieldwork offered focused and repeatable observations across key breeding habitats, while local contributors added long-term continuity and access to private areas. Online platforms, although more variable, contributed broader spatial coverage and useful records for cross-checking rare or occasional sightings.

When the aim of any study is to provide comprehensive information, including the presence of rare or vagrant bird species, all sources of data become essential, even if the sighting of a vagrant species does not fully reflect the typical bird ecology of a specific location. Just as researchers engage in continuous education and databases are regularly updated, it is equally important that citizens participating in research activities have opportunities to update their knowledge. Individuals interested in citizen science should have access to accurate information that helps them make comprehensive and reliable contributions to scientific efforts. However, a major challenge for the scientific community is to make the scientific process more accessible and to effectively communicate findings to a non-scientific audience (Brewer, 2002; Greenwood, 2007; Cohn, 2008).

Indeed, concerns frequently arise regarding the

accuracy of species identification in citizen science databases, primarily because data collection is often undertaken by non-professionals. Such misidentifications can lead to two concurrent types of errors: false positives, where a species is incorrectly reported, and false negatives, where the misidentified species goes unreported (Gorleri et al., 2023). Particularly in Iceland, certain bird species can be difficult to identify and distinguish from others with similar traits, such as juvenile seagulls, which often look alike across species. Similarly, female goosander *Mergus merganser* (Linnaeus, 1758) and red-breasted merganser *Mergus serrator* (Linnaeus, 1758) are hard to differentiate, with goosanders distinguishable primarily by their slightly curved beak or the subtle line separating their brown and white plumage (**Fig. 8**).

Additionally, lighting conditions at sunrise or sunset can further complicate bird identification, as colours and patterns become harder to discern. Mistakes in identification can stem not only from these environmental or morphological challenges but also from the observer's own overconfidence. Those who feel certain in their identification skills might overlook small but crucial details, leading to potential misidentifications.

In their comprehensive review of the eBird database focused on the southern Neotropics, particularly Argentina, Gorleri et al. (2023) analysed more than 104,000 images spanning 377 passerine species. Their findings revealed an impressive 97% accuracy rate in species identification across the dataset. However, it is

**Tabl. 5** - Summary of the specific contributions, strengths, and limitations of each data source used for the bird inventory in Súðavík, Iceland.

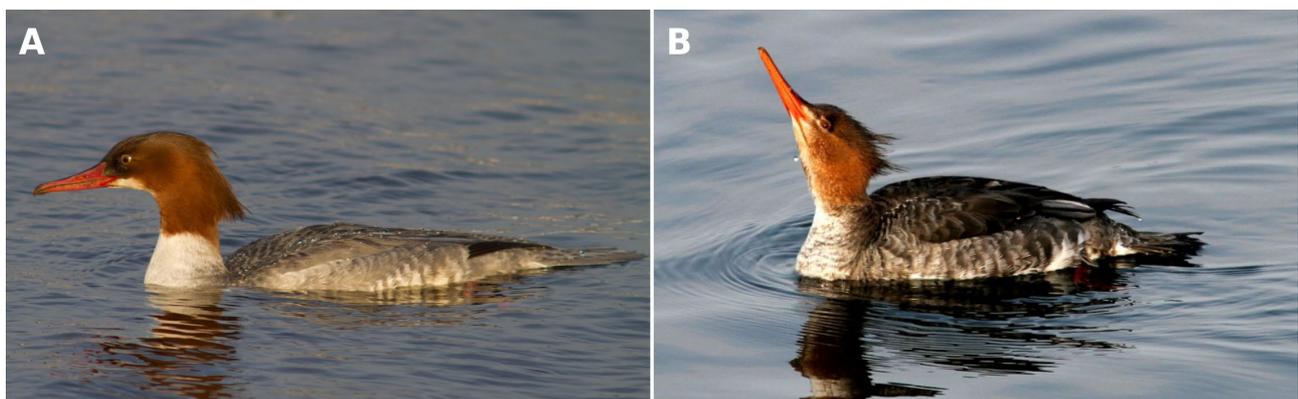
	Citizen science platforms	Field observations	Local contributors
<b>Origin</b>	eBird, GBIF	Author's fieldwork (2021–2023)	Local birdwatchers
<b>Mainly observed species</b>	Waders, seabirds, wide range diversity	Common breeders, regular	Rare/vagrant, garden birds
<b>Temporal coverage</b>	Irregular, includes historical records	Spring to late summer	Year-round, multi-year
<b>Spatial coverage</b>	Wide geographic coverage, variable resolution	Specific transects and selected habitats	Residential and informal areas
<b>Validation</b>	Cross-referenced, sometimes vague	Direct validation by expert	Cross-checked via dialogue and repeated sightings
<b>Strengths</b>	Breadth of data, potential for independent verification	Precision, repeatability, breeding status	Contextual richness, insights into local trends

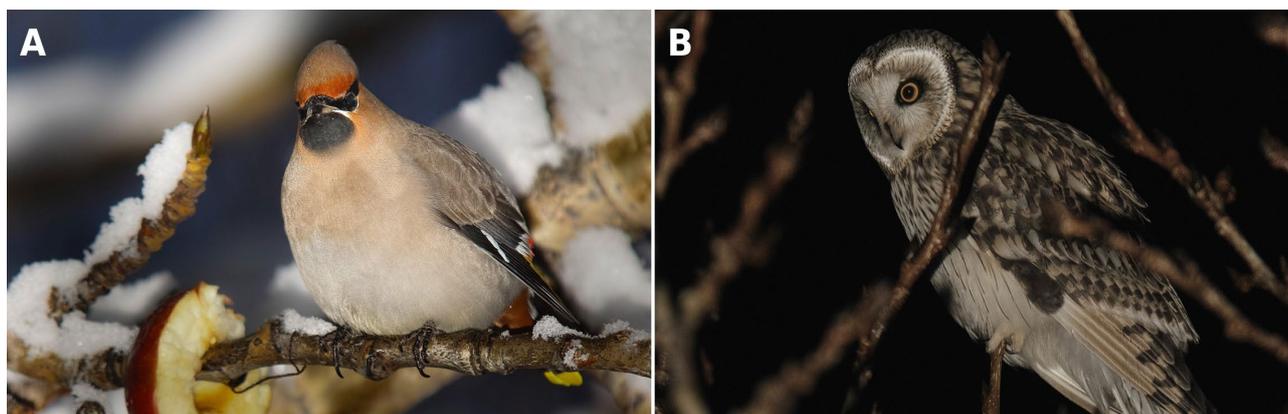
noteworthy that a small subset of species—about 10% (n=40)—that are typically difficult to identify had a considerably lower data quality, with precision or recall scores falling between 63% and 90%.

A key limitation of this study is the involvement of two skilled and experienced bird enthusiasts, in addition to my own residency in the area and the prominence of birdwatching tourism, which contributed to a more thorough inventory of bird species. This may have introduced biases, increasing the likelihood of focusing on birds from more accessible or nearby habitats, as well as on species that are particularly endangered or of specific research interest (Galván *et al.*, 2022). Similarly, my side fieldwork on Arctic terns, black guillemots, and

seals increased my chances of observing shorebirds and seabirds, as these activities were concentrated near coastal habitats. Consequently, I was less likely to identify passerines, which typically inhabit areas farther from the coastline, such as the mountainside, where I spent less time. Compiling a comparable bird inventory in a different location could face greater challenges if local bird enthusiasts are absent or if global databases offer insufficient coverage.

The contribution of citizens in this study in Iceland was crucial, especially due to frequent adverse weather conditions that can limit the feasibility of fieldwork (e.g., road closures due to avalanche risks). In such circumstances, local contributors become an invaluable

**Fig. 8** - (A) A female goosander *Mergus merganser*. (B) A female red-breasted merganser *Mergus serrator*.



**Fig. 9** - Examples of species recorded by a local contributor in Súðavík in winter. **(A)** *Bombycilla garrulus* (Bohemian waxwing). **(B)** *Asio flammeus* (short-eared owl). Both observations were documented within residential areas and contributed to confirming seasonal presence beyond formal fieldwork.

resource for ongoing bird monitoring, at least within their own properties, as demonstrated by the documented sighting of a vagrant Bohemian waxwing (**Fig. 9**).

This paper then corroborates that citizen science plays a valuable role in urban ecology, where private lands often represent significant but generally inaccessible ecological resources (Evans *et al.*, 2005; Lepczyk, 2005; Kobori & Primack, 2003). This study further supports the findings of Kosmala *et al.* (2016), who emphasised that biases in citizen science data suggest volunteers and professionals exhibit similar patterns of errors.

However, unstructured citizen science databases should not be considered a substitute for structured monitoring data. The former lacks the sensitivity to detect population changes, thereby failing to serve as an effective early warning system for population declines, which is a crucial function of structured monitoring programs (Kamp *et al.*, 2016). Thus, a combination of citizen science and structured fieldwork is essential for comprehensive and effective biodiversity monitoring.

### Acknowledgement

I thank the different owners who gave their authorisation to conduct fieldwork on their land, as well as Linda Lee Bluet, Marianne Elisabeth Joubert and Þórður Kristinn Sigurðsson for their help and contribution.

### References

- Asbirk, S. (1997). Population Sizes and Trends of Birds in the Nordic Countries: 1978-1994. Nordic Council of Ministers.
- Bonney, R., Cooper, C.B., Dickinson, J., Kelling, S., Phillips, T., Rosenberg, K.V. & Shirk, J. (2009). Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy. *BioScience* 59, 977–984. <https://doi.org/10.1525/bio.2009.59.11.9>
- Brewer, C. (2002). Outreach and Partnership Programs for Conservation Education Where Endangered Species Conservation and Research Occur. *Conservation Biology* 16, 4–6. <https://doi.org/10.1046/j.1523-1739.2002.01613.x>
- Cohn, J.P. (2008). Citizen Science: Can Volunteers Do Real Research? *BioScience* 58, 192–197. <https://doi.org/10.1641/B580303>
- Croxall, J.P., Butchart, S.H.M., Lascelles, B., Stattersfield, A.J., Sullivan, B., Symes, A. & Taylor, P. (2012). Seabird conservation status, threats and priority actions: a global assessment. *Bird Conservation International* 22, 1–34. <https://doi.org/10.1017/S0959270912000020>
- Daunt, F. & Mitchell, I. (2013). Impacts of climate change on seabirds. *MCCIP Science Review* 2013 9 pages. <https://doi.org/10.14465/2013.ARC14.125-133>
- Dias, M.P., Martin, R., Pearmain, E.J., Burfield, I.J., Small, C., Phillips, R.A., Yates, O., Lascelles, B., Borboroglu, P.G. & Croxall, J.P. (2019). Threats to seabirds: A global assessment. *Biological Conservation* 237, 525–537. <https://doi.org/10.1016/j.biocon.2019.06.033>
- eBird (2024). eBird - Discover a new world of birding... [WWW Document]. URL <https://ebird.org/home> (accessed 10.7.24).
- Evans, C., Abrams, E., Reitsma, R., Roux, K., Salmonsén, L. & Marra, P.P. (2005). The Neighborhood Nestwatch Program: Participant Outcomes of a Citizen-Science Ecological Research Project. *Conservation Biology* 19, 589–594. <https://doi.org/10.1111/j.1523-1739.2005.00s01.x>
- Ferðamálstofa (2020). Leading in sustainable development.
- Fraisl, D., Hager, G., Bedessem, B., Gold, M., Hsing, P.-Y., Danielsen, F., Hitchcock, C.B., Hulbert, J.M., Piera, J., Spiers, H., Thiel, M. & Haklay, M. (2022). Citizen science in environmental and ecological sciences. *Nat Rev Methods Primers* 2, 1–20. <https://doi.org/10.1038/s43586-022-00144-4>

- Galván, S., Barrientos, R. & Varela, S. (2022). No Bird Database is Perfect: Citizen Science and Professional Datasets Contain Different and Complementary Biodiversity Information. *arla* 69, 97–114. <https://doi.org/10.13157/arla.69.1.2022.ra6>
- GBIF.org (2023). GBIF Occurrence Download [WWW Document]. URL <https://www.gbif.org/occurrence/download/0012077-230918134249559> (accessed 10.7.24).
- Gorleri, F.C., Jordan, E.A., Roesler, I., Monteleone, D. & Areta, J.I. (2023). Using photographic records to quantify accuracy of bird identifications in citizen science data. *Ibis* 165, 458–471. <https://doi.org/10.1111/ibi.13137>
- Greenwood, J.J.D. (2007). Citizens, science and bird conservation. *J Ornithol* 148, 77–124. <https://doi.org/10.1007/s10336-007-0239-9>
- Hilmarrsson, J.O. (2011). Icelandic Bird Guide: Appearance, Way of Life, Habitat, 2nd Edition. ed. MAL OG MENNING, Reykjavík.
- Holling, C. s. & Meffe, G.K. (1996). Command and Control and the Pathology of Natural Resource Management. *Conservation Biology* 10, 328–337. <https://doi.org/10.1046/j.1523-1739.1996.10020328.x>
- Iceland Sea Angling (2024). Iceland Sea Angling | Boat Fishing in the Westfjords. URL <https://icelandseangling.is/> (accessed 9.26.23).
- Kamp, J., Oppel, S., Heldbjerg, H., Nyegaard, T. & Donald, P.F. (2016). Unstructured citizen science data fail to detect long-term population declines of common birds in Denmark. *Diversity and Distributions* 22, 1024–1035. <https://doi.org/10.1111/ddi.12463>
- Kobori, H., Dickinson, J.L., Washitani, I., Sakurai, R., Amano, T., Komatsu, N., Kitamura, W., Takagawa, S., Koyama, K., Ogawara, T., Miller-Rushing & A.J. (2016). Citizen science: a new approach to advance ecology, education, and conservation. *Ecol Res* 31, 1–19. <https://doi.org/10.1007/s11284-015-1314-y>
- Kobori, H. & Primack, R.B. (2003). Participatory Conservation Approaches for Satoyama, the Traditional Forest and Agricultural Landscape of Japan. *ambi* 32, 307–311. [https://doi.org/10.1579/0044-7447\(2003\)032\[0307:PCAFST\]2.0.CO;2](https://doi.org/10.1579/0044-7447(2003)032[0307:PCAFST]2.0.CO;2)
- Kosmala, M., Wiggins, A., Swanson, A. & Simmons, B. (2016). Assessing data quality in citizen science. *Frontiers in Ecology and the Environment* 14, 551–560. <https://doi.org/10.1002/fee.1436>
- Lepczyk, C.A. (2005). Integrating published data and citizen science to describe bird diversity across a landscape. *Journal of Applied Ecology* 42, 672–677. <https://doi.org/10.1111/j.1365-2664.2005.01059.x>
- Maher, P.T., Jóhannesson, G.P., Kvidal-Røvik, T., Müller, D.K. & Rantala, O. (2022). Touring in the Arctic: Shades of grey towards a sustainable future, in: Renewable Economies in the Arctic. *Routledge*, pp. 82–98.
- Melrakkasetur Íslands (2024). Melrakkasetur Íslands – Melrakkasetur Íslands – Arctic Fox Centre. URL <https://www.melrakki.is/> (accessed 9.26.23).
- Milesi-Gaches, D.P. (2024). Illustrated list of bird-life in Súðavík, Iceland. University of South Bohemia.
- Milesi-Gaches, D.P. (2025). Floristic diversity of the Langeyri peninsula: a comprehensive inventory and the distribution of nootka lupine. *Carnets Natures* 12, 45–53.
- Miller-Rushing, A., Primack, R. & Bonney, R. (2012). The history of public participation in ecological research. *Frontiers in Ecology and the Environment* 10, 285–290. <https://doi.org/10.1890/110278>
- Moore, A.J., Beckerman, A.P., Firm, J.L., Foote, C.G. & Jenkins, G.B. (2020). Nature Notes: A new category for natural history studies. *Ecology and Evolution* 10, 7952–7952. <https://doi.org/10.1002/ece3.6534>
- Náttúrufræðistofnun Íslands (2018). Red List for Birds | Icelandic Institute of Natural History [WWW Document]. URL <https://www.ni.is/en/resources/publications/red-lists/fuglar> (accessed 9.19.23).
- Paleczny, M., Hammill, E., Karpouzi, V. & Pauly, D. (2015). Population Trend of the World’s Monitored Seabirds, 1950-2010. *PLOS ONE* 10, e0129342. <https://doi.org/10.1371/journal.pone.0129342>
- Petersen, A. (1998). The status of seabirds in Iceland. *Oikos* 42, 507–521.
- Pixabay (2024). 4.1 million+ Stunning Free Images to Use Anywhere - Pixabay - Pixabay [WWW Document]. URL <https://pixabay.com/> (accessed 9.19.23).
- Preston, W.C. (1968). Breeding Ecology And Social Behavior Of The Black Guillemot, *Cephus Grylle*. (Thesis). <https://doi.org/10.7302/10256>
- Saxifraga - Freenatureimages (2024). Saxifraga - Freenatureimages [WWW Document]. URL <http://www.freenatureimages.eu/> (accessed 9.19.23).
- Silvertown, J. (2009). A new dawn for citizen science. *Trends in Ecology & Evolution* 24, 467–471. <https://doi.org/10.1016/j.tree.2009.03.017>
- Sullivan, B.L., Aycrigg, J.L., Barry, J.H., Bonney, R.E., Bruns, N., Cooper, C.B., Damoulas, T., Dhondt, A.A., Dietterich, T., Farnsworth, A., Fink, D., Fitzpatrick, J.W., Fredericks, T., Gerbracht, J., Gomes, C., Hochachka, W.M., Iliff, M.J., Lagoze, C., La Sorte, F.A., Merrifield, M., Morris, W., Phillips, T.B., Reynolds, M., Rodewald, A.D., Rosenberg, K.V., Trautmann, N.M., Wiggins, A., Winkler, D.W., Wong, W.-K., Wood, C.L., Yu, J. & Kelling, S. (2014). The eBird enterprise: An integrated approach to development and application of citizen science.

*Biological Conservation* 169, 31–40. <https://doi.org/10.1016/j.biocon.2013.11.003>

Visit Westfjords (2024). Valagil [WWW Document]. Visit Westfjords. URL <https://www.westfjords.is/en/place/valagil> (accessed 9.26.23).

Westgate, M.J., Likens, G.E. & Lindenmayer, D.B. (2013). Adaptive management of biological systems: A review. *Biological Conservation* 158, 128–139. <https://doi.org/10.1016/j.biocon.2012.08.016>

Wikimedia Commons (2024). Wikimedia Commons [WWW Document]. URL [https://commons.wikimedia.org/wiki/Main\\_Page](https://commons.wikimedia.org/wiki/Main_Page) (accessed 9.19.23).

Young, B.E., Dodge, N., Hunt, P.D., Ormes, M., Schlesinger, M.D. & Shaw, H.Y. (2019). Using citizen science data to support conservation in environmental regulatory contexts. *Biological Conservation* 237, 57–62. <https://doi.org/10.1016/j.biocon.2019.06.016>

**DOAJ**  
DIRECTORY OF  
OPEN ACCESS  
JOURNALS



Soumis le 17 novembre 2025

Accepté le 10 janvier 2026

**Publié en ligne (pdf) le 24 janvier 2026**