NÁTTÚRUSTOFA VESTFJARÐA

Aðalstræti 12
415 Bolungarvík
nave@nave.is

GLAUCOUS GULL MONITORING IN THE WESTFJORDS 2020-2023

VÖKTUN HVÍTMÁFSVARPA Á VESTFJÖRÐUM 2020- 2023

Uccello dei fiordi occidentali d'Islanda.

Cristian Gallo

December 2023

NV nr. 30-23

Frontpage picture: Glaucous gull drawings by Jón Sigurpálsson, taken from ,,Handan við hafdjúpin bláu/Beyond the blue oceans deep and wide.'' made for *Carbon- Kolefni vísindi listanna*, Ísafjörður.

Forsíðumynd: Hvítmáfur teikningar Jóns Sigurpálssonar, hluti verksins ,,Handan við hafdjúpin bláu“ unnið í tengslum við *Carbon- Kolefni vísindi listanna*, Ísafirði.

NÁTTÚRUSTOFA VESTFJARÐA

		Month-Year/ Mán- ár: December 2023
Report/Skýrsla nr: NV nr. 30-23	**Worknumber/Verknúmer:** 413	**Distribution/Dreifing:** ☒ Open/Opin ☐ Close until/Lokuð til: ☐ Háð leyfi verkkaupa
Number of pages/Blaðsiður: 19	**Work stage/Verkstig:** Final report/Lokaskýrsla	
Title/Heiti skýrslu: Glaucous gull monitoring in the Westfjords. 2020-2023. Vöktun hvítmáfsvarpa á Vestfjörðum. 2020-2023.		**Worked for/Unnið fyrir:** Icelandic Ministry of Environment, Energy and Climate (URN)/ Umhverfis-, orku- og loftslagsráðuneytið
Author/Höfundur: Cristian Gallo		**Project manager/Verkefnastjóri:** Cristian Gallo

ABSTRACT/ ÚTDRÁTTUR

Glaucous gull colonies in the Westfjords (Iceland) have been annually monitored for this study in the period 2020-2023. Breeding pairs were counted in 11 colonies during the most active period, from the end of May to the beginning of June. Results for this period indicate stable numbers of breeding pairs in five colonies, a slight increase in two, and a decrease in the number in four of the 11 colonies. These counts were compared to precedent counts, mainly from 2005. Six colonies showed signs of an increase in the number of breeding pairs, three showed signs of a decrease, and one was considered stable. Even though the redistribution of breeding pairs must be further considered, this study yielded valuable insights into the population dynamics of these colonies.

Hafin var vöktun hvítmáfs varpa á Vestfjörðum árið 2020. Varppör eru talin árlega í 11 vörpum á virkasta tíma varptímans/varpsins frá enda maí til fyrrihluta júní. Niðurstöður fyrstu þriggja áranna sýna stöðugan fjölda varppara í fimm vörpum, eilitla fjölgun í tveimur og fækkun í fjórum af þeim 11 sem talið er í. Talningar síðustu ára voru einnig bornar saman við eldri talningar, að mestu frá árinu 2005. Frá þeim tíma hefur orðið fjölgun varppara í sex vörpum, í þremur fækkaði pörunum en í einu varpinu var lítil breyting. Þrátt fyrir að skoða þurfi betur möguleika á að pör flytji sig milli varpa veitir rannsóknin mikilvæga innsýn í breytingar á þeim stofnum sem nýta vörpin.

Signature of project manager/ Undirskrift verkefnastjóra:	**Reviewed by/Yfirfarið af:** Ingrid Bobeková Sigurður Halldór Árnason

TABLE OF CONTENTS

INTRODUCTION

This study is part of the project, "Bird Monitoring in the Westfjörds" ("Fuglavöktun á Vestfjörðum"), which is funded by the Icelandic Ministry of Environment, Energy and Climate (URN). In 2019 Náttúrustofa Vestfjarða (NAVE) secured funding directly through URN specifically allocated towards the monitoring of birds in the Westfjords by Nave. The Bird Monitoring project includes monitoring of the Glaucous gull (*Larus hyperboreus*), Guillemots (*Uria aalge* and *Uria lomvia*), Razorbill (*Alca torda*), Kittiwake (*Rita tridactyla*), Fulmar (*Fulmarus glacialis*) on two bird cliffs, the Arctic tern (*Sterna paradisaea)*, the black Guillemot (*Cepphus grille)*, and birds in winter (Vetrafuglatlningar). In this report we focus specifically on the monitoring of the Glaucous gull.

In Iceland, *L. hyperboreus* is known to breed predominantly in the Westfjords region, the Snæfellness peninsula, and on a scattered islands in Breiðafjörður bay (Petersen Ævar, 1989, Petersen et al. 2014). The species is thought to be monogamous, with findings suggesting that mated pairs reunite annually at the same nesting site (Emily Weiser and H. Grant Gilchrist, 2020). They nest in colonies, small groups, or solitarily, with single pairs being documented and appearing rather common (Petersen et al., 2014). The Glaucous gull population has experienced in Iceland a noticeable decline in recent decades (Asbirk et al. ,1997, Petersen Ævar, 2008, Petersen et al., 2014). Surveys of Glaucous gull breeding pairs in Iceland have been infrequent and sporadic (Petersen et al., 2014). The estimated number of breeding pairs ranged from 10,000 to 15,000 in 1990 but drastically decreased to 2,400 pairs in the count conducted around 2007. This decline represents a substantial 75% reduction since 1995 (Petersen et al., 2014).

Due to the rapid the rate of this decline, the Glaucous gull was classified as "Endangered" (EN, A2abc) on the 2018 Icelandic Red List, marking a significant shift from its previous categorization as a species of "Least Concern" (LC) in 2000 (NÍ, 2023). The Glaucous gull is also among the 22 Arctic seabird species proposed for priority circumpolar monitoring by Arctic countries, as a species of international responsibility (Petersen et al., 2008). Despite its endangered status, Icelandic regulation number 456/1994 allows for the collection of Glaucous gull eggs and permits hunting of these birds (Umhverfisráðuneyti, 2023).

This monitoring program aimed to gathering long term data on the number of Glaucous gull breeding pairs across 11 colonies in the Westfjords area, making it the first of its kind in the country.

METHODOLOGY

NAVE has been monitoring Glaucous gull breeding pairs in several colonies in the Westfjords since 2020. Eleven Glaucous gull colonies were selected in the Westfjords, with selection of colonies primarily based on ease of access for land-based surveys (refer to Figure 1). As per methodology detailed out by Ævar Petersen et al. (2014), the counting of breeding pairs took place during the main activity period, from the end of May to the beginning of June each year.

Each survey season, the colonies are observed consistently from the same vantage point using a Carl Zeiss Diascope (85T*FL). However, due to the cracks and crevasses in the cliffs, observations occasionally necessitate multiple locations. Although the field counting data is preferentially utilized, photographs of the colonies and detailed shots of breeding birds are also captured using a Nikon D3200 with a Sigma 150-600mm lens (refer to Figure 2). These images serve to confirm the number of breeding pairs.

Surveyed colonies include from number 1 to 11: Höllustaðabjarg and Hákallaströnd in Reykhólasveit, Vellir in Kollafjörður, Fjarðarbjarg in Kerlingarfjörður, Rauðsdalsfjall, Hamarshyrna, and Litluhlíðarfjall in Barðaströnd, Lambavatnsfjall in Rauðasandur, Eyrarfjall in Dýrafjörður, Óshyrna in Bolungarvík, and Borðeyri in Jökulfjörður.

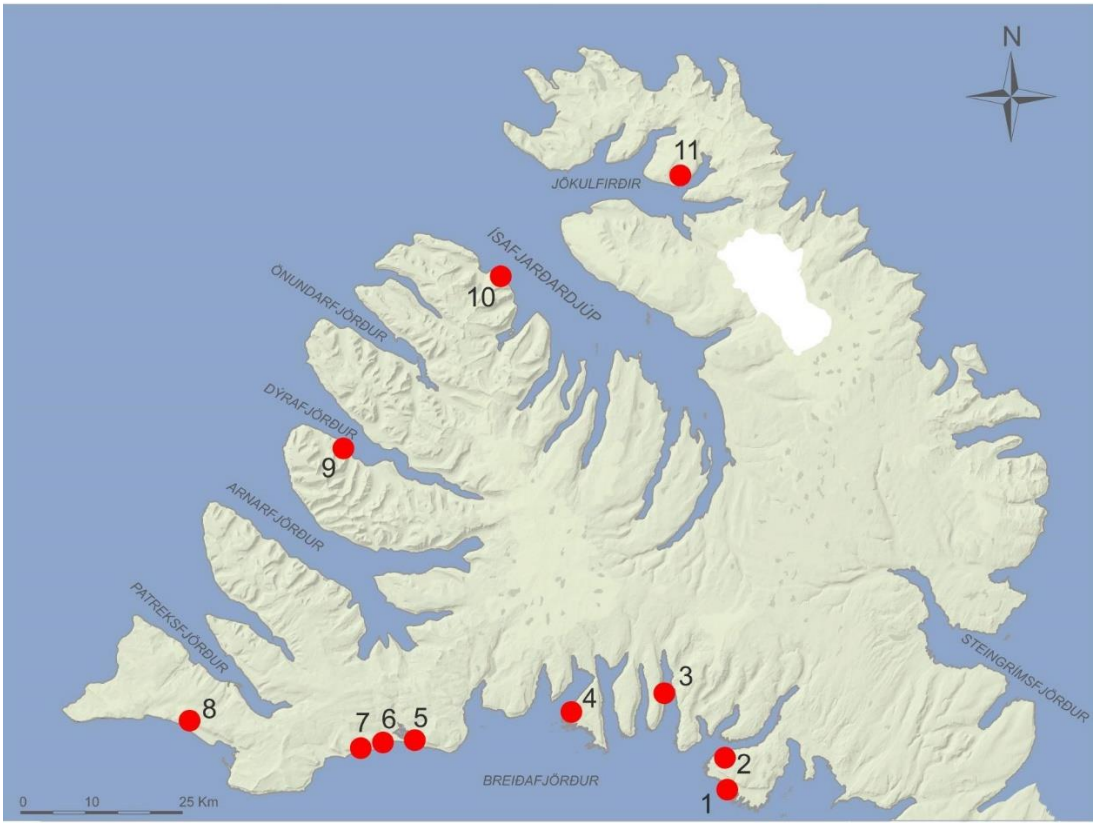

Figure 1. *Locations of surveyed Glaucous gull colonies in the Westfjords.*

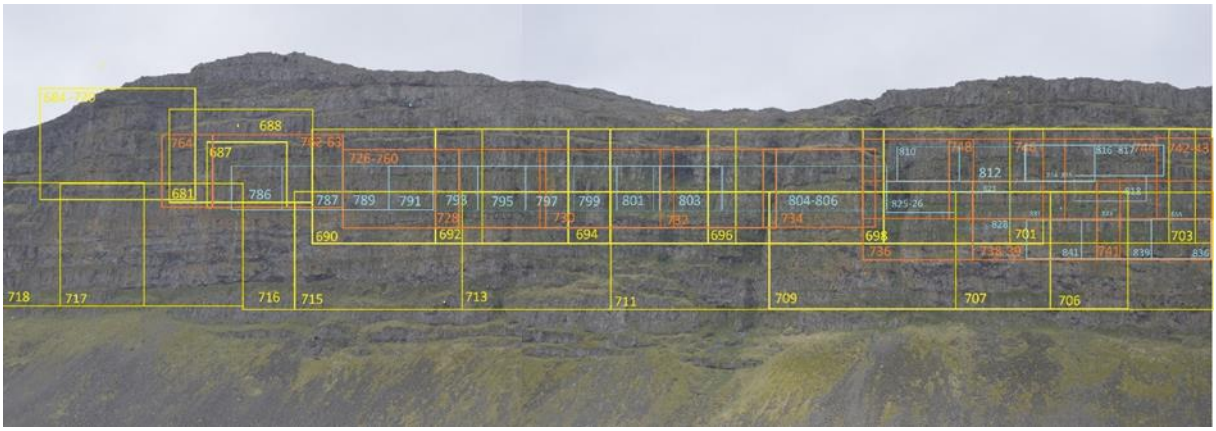

Figure 2. *Glaucus gull colony in Lambavatnsfjall Brúnir. Frames indicate different pictures used to confirm counting of breeding pairs.*

COLONIES

Höllustaðabjarg

Höllustaðabjarg is a mountain cliff situated above the farm Höllustaðir in the Reykhólasveit county on the east side of Breiðafjörður bay. The cliff, approximately 200 m high, extends from Heyáfoss to the west and Grundarfoss to the east. The Glaucous gull colony is located on the west side of the cliff (Figure 3). The observer position for counting is at (65°27'10.1"N 22°14'25.2"W).

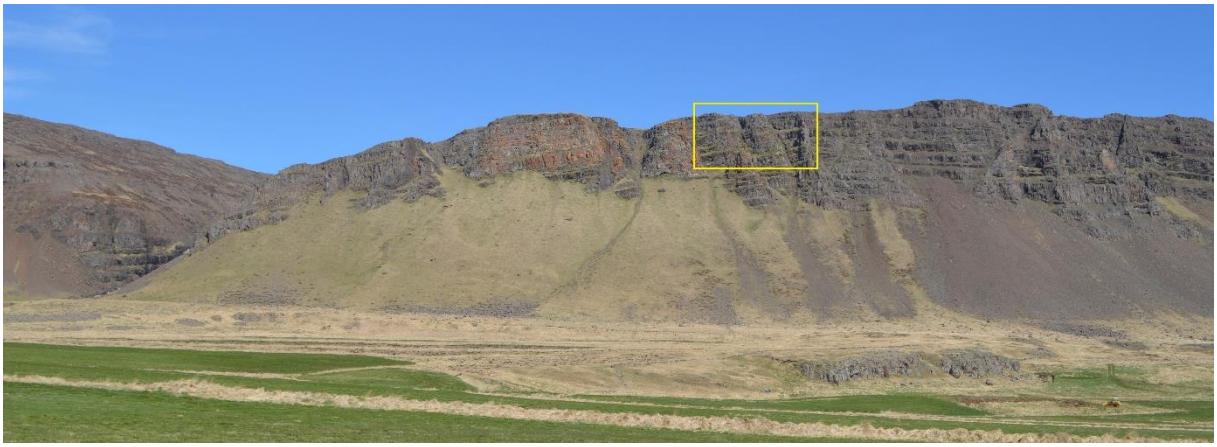

Figure 3*. Höllustaðabjarg in Reykhólasveit, with a yellow frame indicating where Glaucous gull breeding pairs are found.*

Hákallaströnd

Hákallaströnd (also called Hákarlaströnd) is a cliff above the summerhouse at Laugaland in Þórskafjörður, Reykhólasveit county. This cliff, around 200 m high, hosts the Glaucous gull colony extending for approximately 1 km (Figure 4). The observer position for counting is at (65°31'54.0"N 22°19'58.4"W). The best observation time is in the late afternoon due to the direction of sunlight.

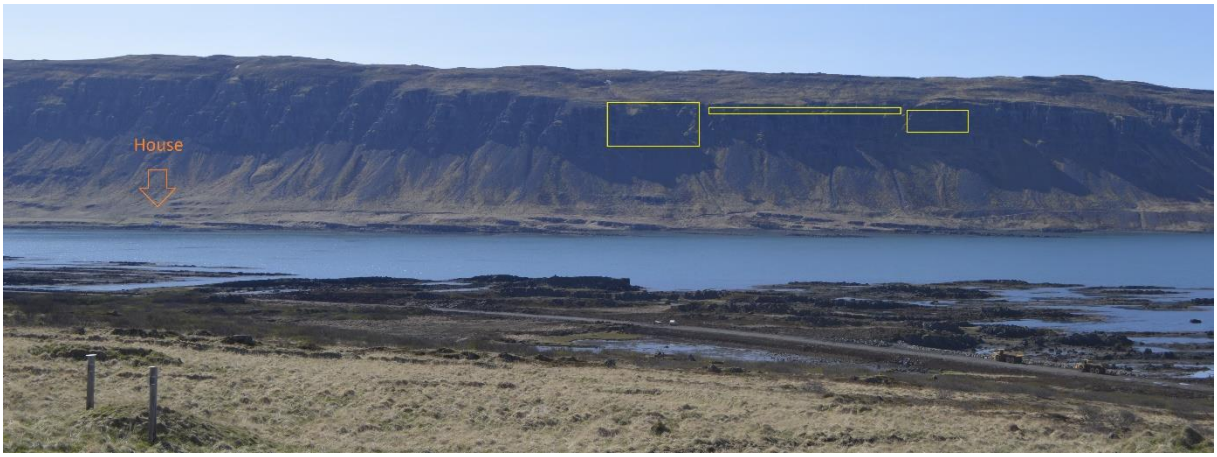

***Figure 4**. Hákallaströnd in Reykhólasveit, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Vellir

Vellir is a cliff south of a former farmhouse called Klettur in Kollafjörður on the north side of Breiðafjörður bay. The cliff, approximately 240 m high, houses the Glaucous gull colony in two locations: one higher under the main mountain ridge and a second one under the ridge in the middle of the cliff (Figure 5). The colony extends for around 500 meters, and the observer position for counting is at (65°37'27.6"N 22°31'38.6"W). The best observation time is early in the day with the sun facing the cliff.

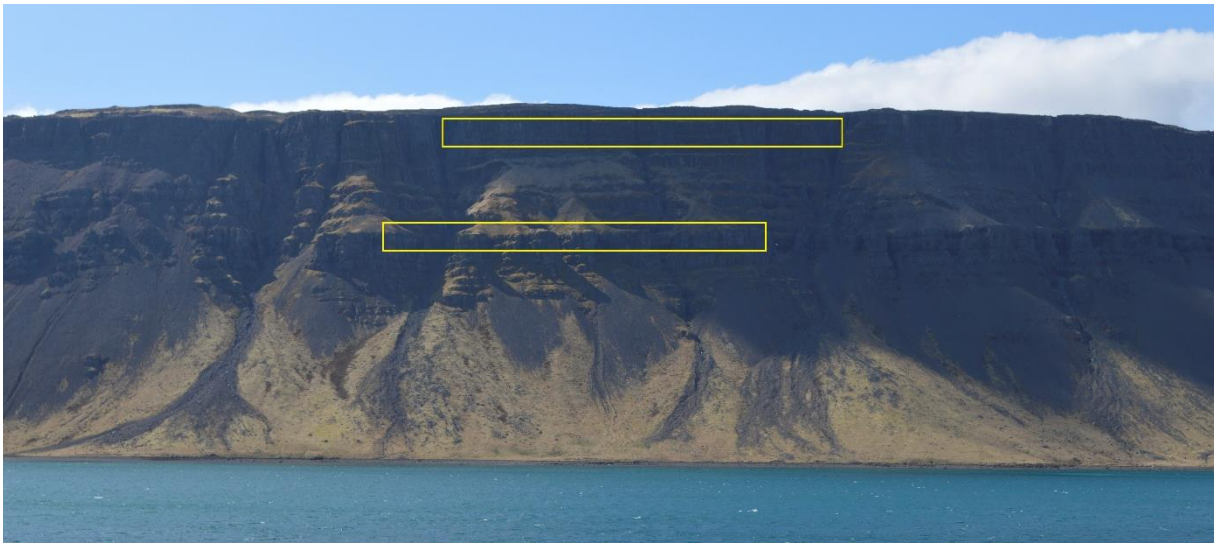

***Figure 5.** Vellir in Kollafjörður, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Fjarðarbjarg

Fjarðarbjarg (Mávabjarg) is a 200 meters high cliff north of former farmhouse Fjörður in Kerlingarfjörður on the north side of Breiðafjörður bay. Glaucous gull colony is located on the highest part of cliff and extend for approximately 2 km (Figure 6). The observer position for counting is at (65°33'56.5"N 22°50'12.2"W). The best observation time is late in the day due to the direction of sunlight.

Figure 6. *Fjarðarbjarg in Kerlingarfjörður, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Rauðsdalsfjall

Rauðsdalsfjall is a mountain on the north side of Breiðafjörður bay, west of Rauðsdalur or Efri-Rauðsdalur farm in Barðaströnd. The Glaucous gull colony occupies the cliff on the eastern part of the mountain, with birds concentrated around two separate spots, one at 150 m and one at 300 m height (see fig. 7). Observation is conducted from the point (65°29'19.3"N 23°16'32.7"W). Best time for observation is in middle of the day.

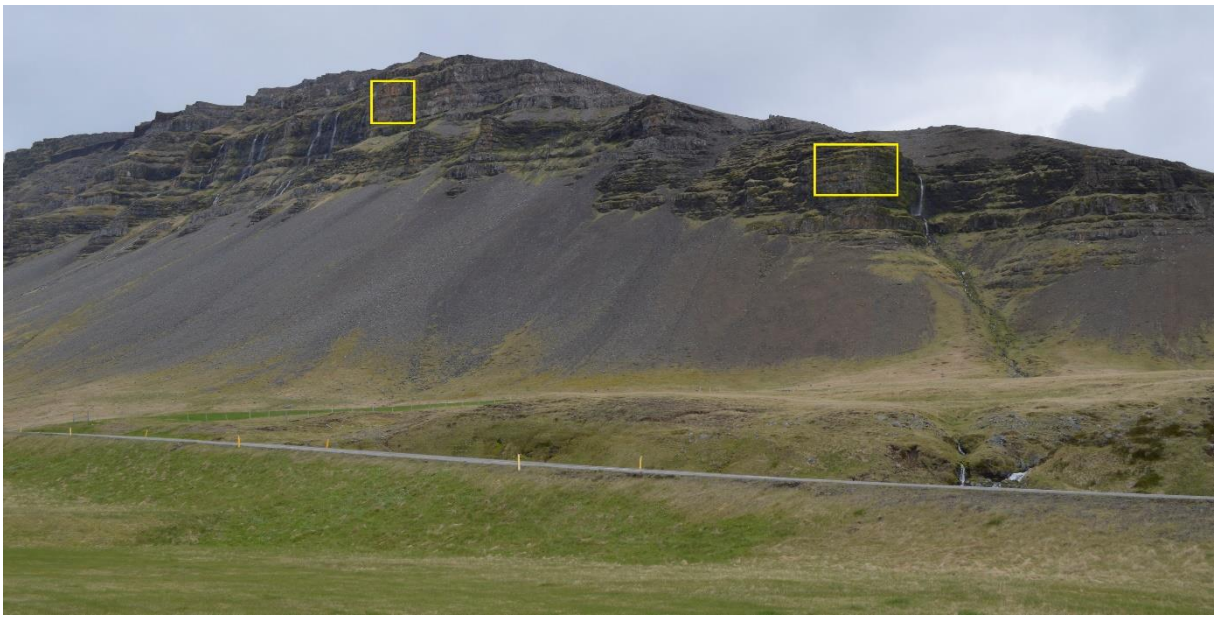

Figure 7. *Rauðsdalsfjall in Barðaströnd, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Hamarshyrna

Hamarshyrna is a cliff-rock formation protruding from Hamarsfjall between the farms Hamar and Hvammur in Barðaströnd, north side of Breiðafjörður bay. This rock formation is between 150-400 m high, and the Glaucous gull colony occupies the cliff around 200 m high (Figure 8). The observer position for counting is at (65°30'03.7"N 23°21'09.1"W).

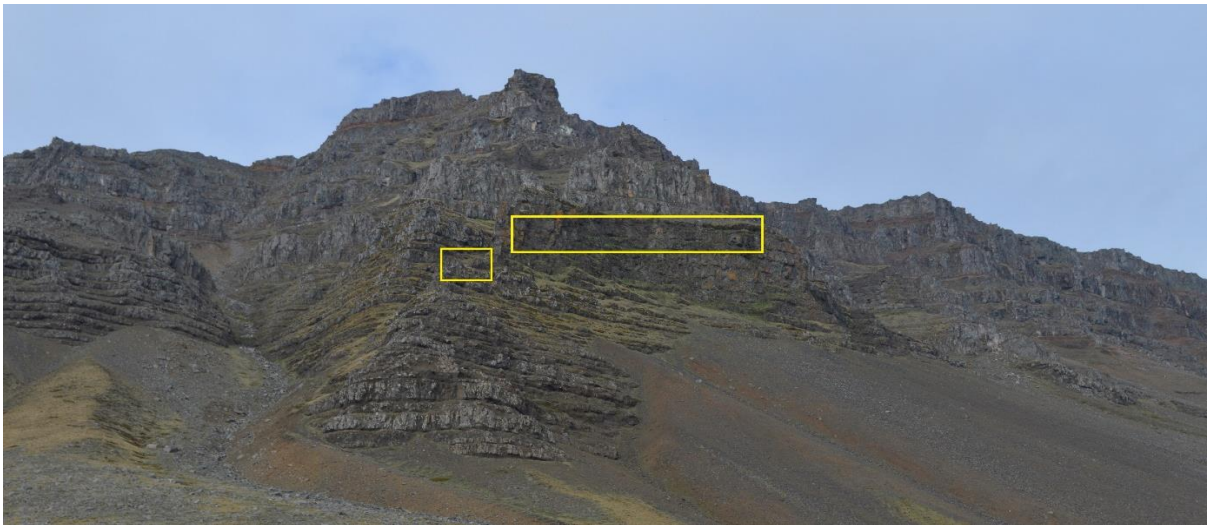

***Figure 8**. Hamarshyrna in Barðaströnd, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Litluhlíðarfjall

Litluhlíðarfjall is a 300 m high cliff north of the Breðafjörður bay, located behind the farm of Litlahlíð in the Barðaströnd county. The Glaucous gull colony at Litluhlíðarfjall occupies the cliff around 250 m high. The colony is rather scattered, with breeding birds occupying 4 separate spots, extending for around 700 meters (Figure 9). The colony is observed from the road (65°28'39.7"N 23°31'18.0"W). The best observation time is in the middle of the day due to the direction of sunlight.

***Figure 9.** Litluhlíðarfjall in Barðaströnd, with yellow frames indicating where Glaucous gull breeding pairs are found.*

Lambavatnsfjall

Lambavatnsfjall is a 360 m high mountain in Rauðasandur facing south to Breiðafjörður bay. The Glaucous gull colony is divided into 2 areas: Lambavatnsfjall efra located behind and above the farm Lambavatn Efra, and Lambavatnsfjall Brúnir around 1 km west above the Skaufhóll lake. The colony at Lambavatnsfjall Efra is rather scattered (Figure 10) and is observed from the point (65°29'28.5"N 24°05'33.0"W). The colony at Lambavatnsfjall Brúnir extends for around 800 meters (Figure 11) and is observed from the point (65°29'38.2"N 24°07'24.1"W). The best observation time is in the middle of the day due to the direction of sunlight.

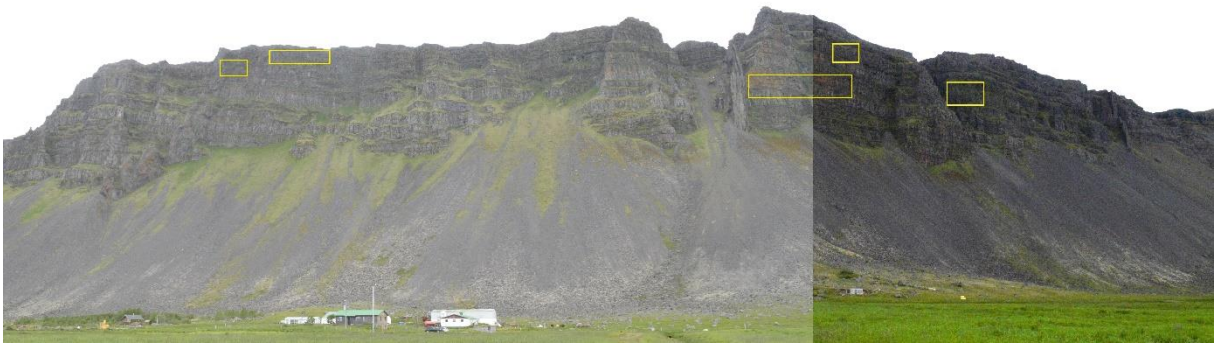

***Figure 10**. Lambavatn Efra, with yellow frames indicating where Glaucous gull breeding pairs are found.*

***Figure 11.** Lambavatnsfjall Brúnir, with a yellow frame indicating where Glaucous gull breeding pairs are found.*

Eyrarfjall

Eyrarfjall is a 556 m high mountain in Dýrafjörður. The Glaucous gull colony occupies the middle part of the mountain cliff, between 300-500 m high, in a place also known as Ófæruhvílft (Figure 12). The colony is observed from Alviðra (65°55'55.7"N 23°37'15.2"W). The best observation time in a sunny day is early morning but day with no sun is preferable.

***Figure 12**. Eyrarfjall in Dýrafjördur, with a yellow frame indicating where Glaucous gull breeding pairs are found.*

Óshyrna

Óshyrna is a 630 m high mountain on the west side of Óshlið, facing Ísafjarðardjúp and the town of Bolungarvík. This mountain presents a descending rock formation called Óshyrna, which presents 2 faces, one facing west and one facing east. The Glaucus colony occupies both faces, but only the west face can be observed from land. The colony on the west face extends from 200-400 m altitude and includes four separate areas (Figure 13). This face is observed from Óshólar (66°09'07.7"N 23°12'32.3"W). The east face was observed in 2021 from a boat (Figure 14).

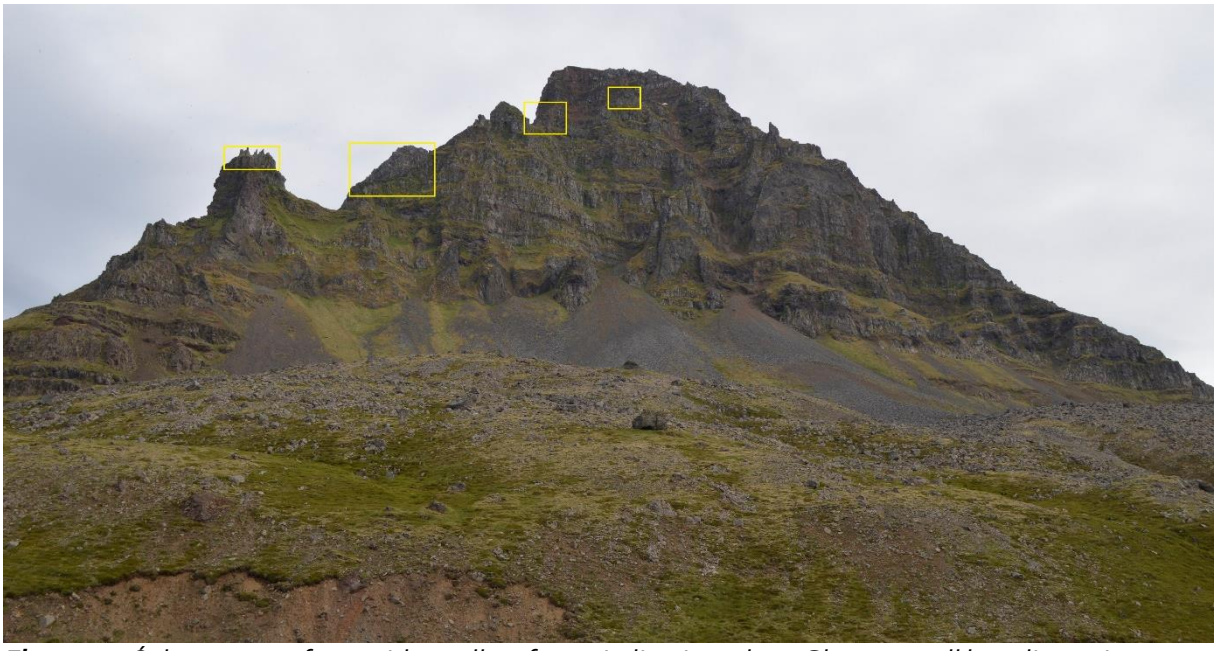

***Figure 13**. Óshyrna west-face, with a yellow frame indicating where Glaucous gull breeding pairs are found.*

***Figure 14**. Óshyrna east-face, photographed on 7 July 2021, 7:00pm.*

Borðeyri

Borðeyri is an isthmus located on the east of Kvíar, under the 169-metre-high mountain Múli in Lónafjördur (Jökulfjörður). The Glaucous gull colony is located on a cliff between 120-160 meters high (see fig. 15). The colony is observed from the isthmus itself (66°17'06.8"N 22°35'01.5"W).

Figure 15. *Borðeyri, with yellow frames indicating where Glaucous gull breeding pairs are found.*

RESULTS

The results from the counts of breeding pairs in the 11 Glaucous gull colonies during the period of 2020-2023 are summarised in Table 1. The colony in Borðeyri was not observed in 2023 due to weather (low fog) and boat trip schedules. Going forward, the colony at Lambavatnsfjall will be considered as 2 separate colonies, and this will bring the number of surveyed colonies up to 12. According to Ævar Petersen, the colony had likely split over the last decades (Ævar Petersen, personal communication).

Table 1. *Counts of breeding pairs (Pairs) in 11 Glaucus gull colonies between 2020-2023, along with the date and time of counting. Colonies number refer to Figure 1. Also included is previous counts and years of breeding pairs for the same colonies, according to Petersen et al. (2014). Numbers in bold indicate the number of breeding pair counted in the field and confirmed on pictures. *Number of breeding pair for Borðeyri (300 pairs in 1992) should be considered unrealistic (Petersen et al. 2014, Ævar Petersen personal comment).*

Colonies		**2020**		**2021**		**2022**		**2023**		**Pairs**
Nr.	**Name**	**Day (time)**	**Pairs**	**Day (time)**	**Pairs**	**Day (time)**	**Pairs**	**Day (time)**	**Pairs**	**(year)**
1	**Höllustaðabjarg** (Höllustaðir in Reykhólasveit)	3.6.20 (12-14)	**9-12**	27.5.21 (9-11)	15	24.5.22 (8-10)	12-13	27.5.23 (12-13)	**12-13**	9 (2005)
2	**Hákallaströnd** (Laugaland in Reykhólasveit)	4.6.20 (9-11)	**26-30**	26.5.21 (16-18) 8.6.21 (10-12)	27-32 29-34	23.5.22 (19-21)	**39-45**	27.5.23 (09-11)	34-40	18 (2005)
3	**Vellir** (Klettur in Kollafjörður)	2.6.20 (15-17) 4.6.20 (12-14)	**84-89**	8.6.21 (15-16) 17.6.21 (9-11)	64-67 68-78	24.5.22 (11-13)	63-68	27.5.23 (14-16)	61-67	71 (2005)
4	**Fjarðarbjarg** (Fjörður in Múlanesi)	2.6.20 (17-19)	**86-96**	8.6.21 (15-16) 17.6.21 (10-13)	---- 72-79	23.5.22 (16-18)	68-71	27.5.23 (17-19)	**85-98**	56 (2005)
5	**Rauðsdalsfjall** (Rauðsdalur in Barðaströnd)			8.6.21 (17-18) 22.6.21 (14-15)	4-6 6	30.5.22 (13-14)	**7-8**	10.6.23 (10-11)	**7-8**	17 (2005)
6	**Hamarshyrna** (Hamar in Barðaströnd)			7.6.21 (18-19) 22.6.21 (12-13)	10-12 9-10	30.5.22 (14-15)	8-9	10.6.23 (17-18)	**5-6**	13 (2005)
7	**Litluhlíðarfjall** (Litlahlíð in Barðaströnd)			7.6.21 (17-18) 22.6.21 (13-14)	11 11	30.5.22 (20-21)	9-10	10.6.23 (16-17)	8-9	26 (2005)
8	**Lambavatnsfjall efra** (Lambavatn in Rauðasandur)	24.6.20 (11-14)	**25-27**	23.6.21 (17-19)	20-24	30.5.22 (16-19)	18-20	10.6.23 (12-13)	14-16	50 (1990)
	Lambavatnsfjall Brúnir (Lambavatn in Rauðasandur)					30.5.22 (16-19)	**98-105**	10.6.23 (13-15)	**107-117**	
9	**Eyrarfjall** in Dýrafjörður	9.7.20 (12-15)	**32-36**	30.6.21 (9-11)	33-36	1.6.22 (14-16)	29-33	4.6.23 (14-16)	37-42	24 (1979)
10	**Óshyrna vestan** (Óshlíð)	8.7.20 (15-17)	**10**	7.7.21 (11-12) (17-18)	8-10	9.6.22 (13-14)	9-11	7.6.23 (11-13)	8-10	9
	Óshyrna austan (Óshlíð)			7.7.21 (19)	**13-15**					(2009)
11	**Borðeyri** (Kvíar in Jökulfjörður)	28.7.20 (11-16)	**16-20**	8.7.21 (11-15)	10-11	14.6.22 (13-14)	8-9	----	----	300? (1992)*

DISCUSSION

Counting breeding pairs of Glaucous gulls on cliffs requires comprehensive observation to effectively spot nests, study the movements of adults in case chicks are already present, and to observe the interactions of guarding partners. The distance and lower angle of the observer in relation to the position of the breeding colonies make it especially challenging. Grass obstructing the observer's vision, the angle of the sitting bird, and less than perfect visibility creates uncertainty, in some cases, identifying sure sightings of birds sitting on their nest and those exhibiting nesting behaviours from those that are not. Therefore, a definite number cannot be provided most of the time and instead, a range is given. In 2021, two counts were conducted for each colony to enhance precision. This approach proved useful in reducing the number of doubtful breeding pairs but did not eliminate all uncertainties.

Though an extensive discussion on colony sizes cannot be concluded at this preliminary stage, trends in the number of breeding pairs for these four years (2020-2023) indicate stable numbers in five of the twelve colonies (Höllustaðabjarg, Fjarðarbjarg, Rauðsdalsfjall, Litluhlíðarfjall, and Óshyrna west face). All these colonies have counts of less than 15 pairs, except for Fjarðarbjarg, which had between 85-98 pairs in 2023. The number of breeding pairs slightly increase in two of the twelve colonies (Hákallaströnd and Eyrarfjall), both being middle-sized colonies with between 34-42 pairs. In four colonies, the number of breeding pairs decreased during the study period from 2020-2023 (Vellir, Hamarshyrna, Lambavatn efra, and Borðeyri). The colony at Lambavatn Brúnir was surveyed only for two years (2022 and 2023).

Comparisons of breeding pairs between the counts of these four years and previous surveys carried out mainly between 2005 and 2009, but also in 1979 for Eyrarfjall, 1990 for Lambavatnsfjall and 1992 for Borðeyri, as reported in Ævar Petersen et al. (2014), give us good insight into the population dynamics patterns for the surveyed colonies. For example, the colonies at Hákallastönd, Fjarðarbjarg, Lambavatnsfjall and Óshyrna show sign of increase in number of breeding pairs. At Höllustaðabjarg and Eyrarfjall sign of increase is minimal. All 3 colonies at west-Barðastrandasyslu (Rauðsdalur, Hamar and Litlahlíð) show sign of clear decrease in number of breeding pairs, while for Vellir sign of decrease is minimal or can be considered stable. Number of breeding pair for Borðeyri (300 pairs in 1992) was considered unrealistic by Ævar Petersen himself as probably represented an estimation of breeding pairs in the entire Hornstrandir area (Petersen et al. 2014, Ævar Petersen personal comment) therefore no comments can be made. Results are summarized in figure 16 for the seven colonies located in Breiðafjörður bay.

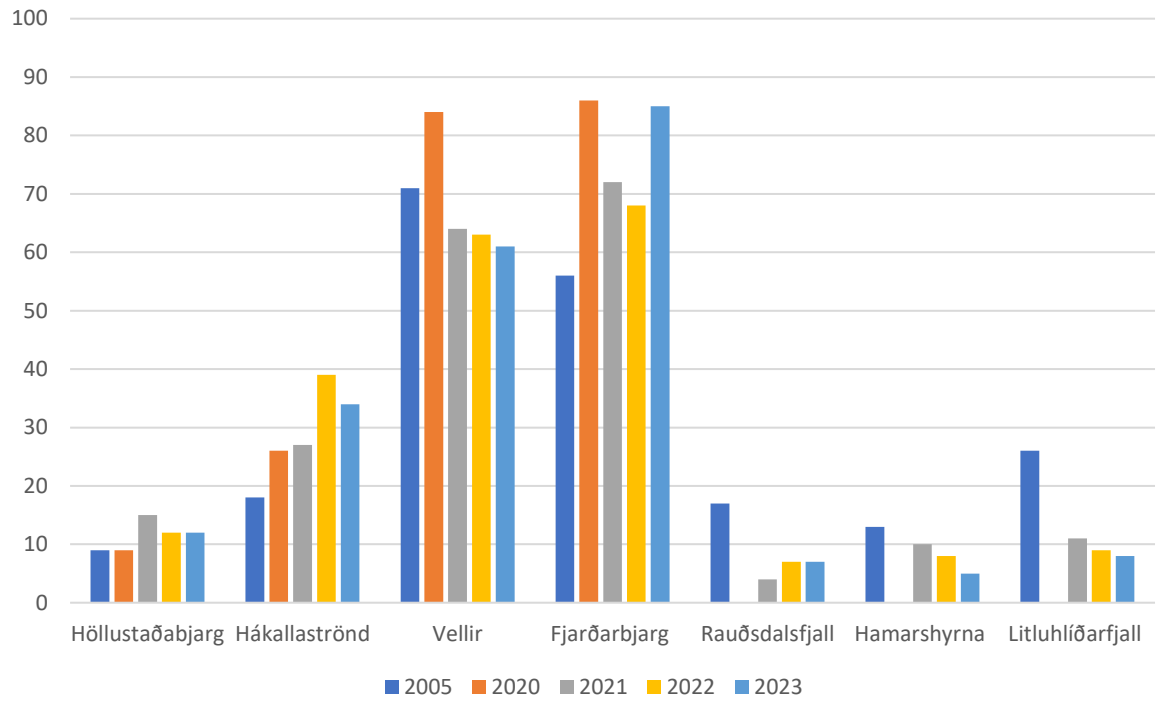

Figure 16. *Breeding pairs counts for 7 Glaucus gull colonies in the Breiðafjörður bay. Numbers are from 4 years, year 2005 (Petersen et al. 2014) and years between 2020-2023 from this study.*

Even though it is suggested that Glaucous gull mated pairs reunite annually at the same nesting site, redistribution of breeding pairs must be considered. This phenomenon, for Glaucous gulls, is not well known, but there seems to have been some redistribution of breeding pairs in Iceland (Petersen, 2015). In 14 years long study of a Canadian colony, Gaston and colleagues found to be 40% the proportion of Glaucous gulls returning to breed at their natal colony, with rest 60% be recruits from outside the colony (Gaston et al., 2009). Knowledge on the movement of breeding pairs between colonies or the establishment of a new breeding pair on a colony, rather than as a solitary pair or nesting site selection processes appears to be undocumented.

It is important to note that eight surveyed colonies in this study were among the largest colonies in the north-east part of Breiðafjörður bay, according to the 2005 counting (Petersen et al. 20214). Four colonies in Reykhólasveit county and nearby fjords (Höllustaðir, Hákallaströnd, Vellir, and Fjarðarbjarg) show few reported solitary pairs in their vicinity, with Ballará and Melar á Skarðsströnd (24 pairs together) and Staðarfell á Fellsströnd (48 pairs) as the closest colonies. The same can be said for the four colonies in west-Barðastrandasyslu (Rauðsdalur, Hamar, Litlahlíð, and Lambavatnsfjall). These were the biggest colonies in the 1990 and 2005 counting. The clear increase seen in Lambavatnsfjall could be due to the merging of scattered pairs or new pair recruits joining the colony from the colony in Látrabjarg and/or from all over the Breiðafjörður area. Eyrarfjall in Dýrafjörður and Óshyrna in Bolungarvík can be considered small to medium-sized colonies among many big colonies from Arnarfjörður to Ísafjarðardjúp. The Glaucous gull colony in Arafjall (Óshlíð) was documented in 2021. Number of breeding pairs was between 80-95, representing a slight increase from the 2009 counting (Petersen et al. 2014).

The colony in Borðeyri can be considered a medium to big size colony based on what is known in the Hornstrandir area (Petersen et al. 2014).

This survey has yielded valuable insights into population dynamics of Glaucus gull colonies. The annual monitoring offers detailed information on finer-scale changes. Expanding the number of monitored colonies and/or observing individual known pairs of breeding birds could enhance our understanding of the Icelandic Glaucus gull population.

ACKNOWLEDGEMENTS

I sincerely thank Ævar Petersen for the instructive discussions, reviewing images of challenging cases, responding to inquiries, and providing valuable guidance.

REFERENCES

Asbirk, S., Berg, L., Hardeng, G., Koskimies, P. & Ævar Petersen 1997. Population sizes and recent trends in the Nordic countries 1978–1994. TemaNord 1997:614. Nordisk Council of Ministerråd. 88 pages.

Emily Weiser and H. Grant Gilchrist, 2020. Version: 1.0 — The Cornell lab of Ornithology. Published March 4, 2020; https://birdsoftheworld.org/bow/species/glagul/cur/introduction

Gaston, A. J., Descamps, S., Gilchrist G., 2009. Reproduction and survival of Glaucous Gulls breeding in an Arctic seabird colony. Journal of Field Ornithology.80 (2): 135-145.

Petersen Ævar 1989. Náttúrufar í Breiðafjarðareyjum. Í Árni Björnsson, Eysteinn G. Gíslason og Ævar Petersen. Breiðafjarðareyjar. Árbók Ferðafélag Íslands 1989, bls. 17–52. Reykjavík: Ferðafélag Íslands.

Petersen, A., Irons, D., Anker-Nilssen, T., Artukhin, Y., Barrett,R., Boertmann, D., Egevang, C., et al. 2008. Framework fora Circumpolar Arctic Seabird Monitoring Network. CAFFCBMP Report No. 15. Akureyri, Iceland: CAFF InternationalSecretariat.

Petersen Ævar, Sverrir Thorstensen og Böðvar Þórisson 2014. Útbreiðsla og breytingar á fjölda hvítmáfa á Íslandi. Náttúrufræðingurinn 84: 153–163.

Petersen Ævar, D.B. Irons, H.G. Gilchrist, G.J. Robertson, D. Boertmann, H. Strøm, M. Gavrilo, Y. Artukhin, D.S. Clausen, K.J. Kuletz og M.L. Mallory 2015. The status of Glaucous Gulls Larus hyperboreus in the circumpolar Arctic. Arctic 68: 107–120.

NÍ, Válisti Fugla (2023, 30 november): https://www.ni.is/is/midlun/utgafa/valistar/fuglar/valisti-fugla

Skarphéðinsson Kristinn Haukur, 2018
https://www.ni.is/is/biota/animalia/chordata/aves/charadriiformes/hvitmafur-larus-hyperboreus

Umhverfisráðuneyti, Reglugerð um fuglaveiðar og nýtingu hlunninda af villtum fuglum (2023, 30 november): https://www.reglugerd.is/reglugerdir/allar/nr/456-1994