



SEATRACK
Seabird Tracking



Annual Report
2025



Cover photo

Black-legged kittiwake equipped with a geolocator.
Photo: Morten Ekker

Authors

Svenja Neumann¹, Vegard Bråthen², Sebastien Descamps¹, Julian Evans²,
Per Fauchald³, Caitlin Frankish¹, Børge Moe², Hallvard Strøm¹, Arnaud Tarroux³,
Lars Ursem¹, Nanette Verboven¹ & Benjamin Merkel¹

¹Norwegian Polar Institute
Fram Centre
P.O. Box 6606 Langnes
9296 Tromsø
Norway

²Norwegian Institute for Nature Research
P.O. Box 5685 Torgarden
7485 Trondheim
Norway

³Norwegian Institute for Nature Research
Fram Centre
P.O. Box 6606 Langnes
9296 Tromsø
Norway

Contact: benjamin.merkel@npolar.no

Summary 2025

This short report sums up the field season and briefly highlights some of our research activities and key deliverables in 2025 – the third year of SEATRACK phase III.

This report provides details about the following:

- The field season 2025 went well with a total deployment success rate of 76% and an overall retrieval rate of 51%. Most planned field trips were completed with only four sites partly cancelling field work for some species. Reasons for this were among others challenging weather conditions, lack of personnel due to sickness and poor breeding seasons for some species at some sites (pages 8–16).
- Work on the five SEATRACK species newly included in phase III is progressing well, with both deployment and retrieval success rates improving since the first season in 2023. Logger recovery rates now align with those of the historic SEATRACK species (pages 18–19).
- After a very successful first season with GPS–GSM deployments in SEATRACK, we expanded deployments on the three large gull species to six new locations, including three sites in Norway (page 11).
- The SEATRACK database now contains information about ~29000 deployed and ~14000 retrieved devices from ~7800 individual seabirds belonging to 16 different species. This translates to ~8 million positional datapoints and ~1.9 billion other sensor datapoints covering more than 16000 bird years (figure 1).
- We redesigned our seabird distribution app featuring new functionalities including a distance and a measuring tool. Seasonal distributions of tracked SEATRACK species are now visualized on a rotating globe (page 21).
- SEATRACK data are an essential component in assessing the impact of offshore wind energy development on seabirds in Norway (page 17).
- SEATRACK continues its cooperation with the scottish project Aukestra that is tracking auks in Scotland in 2024 and 2025 (page 5).
- We have welcomed Julian Evans as a new technician to the SEATRACK project group (page 20).
- Field preparations become increasingly complex as we are now coordinating tracking work on 16 species, at more than 100 field sites across 14 countries, involving several hundred people, and using 3 different technologies (pages 4–7).
- In 2025, SEATRACK contributed to six peer-reviewed publications, two reports, six presentations at conferences & seminars, and five defended student theses (two Master and three PhD students; pages 22–23).

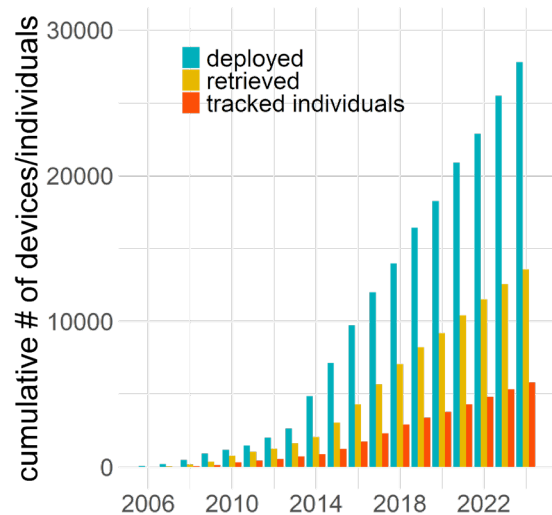


FIGURE 1: Amount of data in the SEATRACK database 2005–2024. Some pre-SEATRACK data has been contributed to the programme, but 2014 (the start of SEATRACK) marks a steep increase in tracking data gathered. Status April 2026. Data from the 2025 field season are not yet included.

Programme status 2025

SEATRACK is in its third year of phase III. In the following sections, we describe our current progress in phase III in detail and the results and experiences from 2025.

We maintain a strong collaboration with our established SEATRACK partners, many of whom have been involved since the programme started. In addition, we successfully expanded the network by including new partners and field sites, thereby enhancing the project's geographical coverage across the North Atlantic. Compared to the previous year, the project has grown further and now includes 75 partners operating at more than 100 field sites.

Planning the 2025 field season

Given the scale SEATRACK has reached in recent years, one of the key tasks within the

programme is the coordination and planning of the field season, ensuring that all partners receive the necessary equipment and support. Feedback and user experience related to field equipment are typically collected in the autumn, following the field season. This allows sufficient time to evaluate needs and place orders for new tools before the end of the year. Preparations for the upcoming summer field season generally begin in early spring.

Leg-mounted GPS prototype development continued in close collaboration with Pathtrack. For the 2025 field season, two distinct types of prototypes were distributed to project partners:



FIGURE 2: SEATRACK field sites throughout the North Atlantic that are part of phase III (red dots). Russian colonies are not included in phase III of the programme (white dots), but have been part of earlier phases.

one prototype with increased depth proofing level for the two deep diving guillemot species and a second prototype with strengthened antenna to withstand stronger wear and tear for all other species. Similarly to the 2025 prototypes, these models had an external antenna, but increased battery life compared to the previous prototype from 2024. We also continued our efforts with GPS-GSM deployments on three large gull species at both previously established and new locations.

In addition to deployments on adult birds, we continued equipping juveniles of six species with geolocators across eleven field sites, including both auk and gull species. Movement patterns of juvenile birds remain poorly understood, yet this knowledge could be highly valuable – particularly given that juveniles can represent a substantial proportion of the total population. Typically, juveniles begin returning to their breeding colonies as early as two years after fledging. Thus far we have already retrieved 264 loggers of juvenile birds in SEATRACK.

For the 2025 field season, we planned to deploy devices on birds at all previous sites with the exclusion of all Russian sites and some sites in the Canadian High Arctic. SEATRACK continues its collaboration with the Scottish bird tracking project Aukestra, focussing on common guillemots and razorbills at SEATRACK sites. This project is scheduled to run over a two-year period, spanning 2024 and 2025.

After our experiences from the last seasons, outbreaks of highly pathogenic avian influenza (HPAI) were anticipated but luckily not detected, and hence no special precautions were implemented. However, as in the previous year, all field teams were free to suspend activities if deemed necessary.

For the 2025 season, we planned to deploy a total of 2440 new devices on adult birds including: 2030 geolocators on all species at more than 100 sites, 340 leg-mounted GPS on nine species (great skua, northern fulmar, northern gannet, common guillemot, Brünnich's guillemot, glaucous gull, herring gull, lesser black-backed gull, European shag, and common eider) at 42 locations, as well as 70 GPS-GSM on the three large gull species (glaucous gull, herring gull, lesser black-backed gull) at 11 field sites, including three new locations in Norway. In addition, we expected to reuse approximately 300 geolocators produced in previous years, all in all making up ~ 2700 deployments on adult birds.

Furthermore, we planned to deploy 695 geolocators on juvenile Atlantic puffin, black-legged kittiwake, Brünnich's guillemot, common guillemot, glaucous gull, and little auk at twelve sites, including one new site to track immature black-legged kittiwakes in France.



FIGURE 3: Weighing a Leach's storm petrel on the Faroe Islands. Photo: Jon Aldara.



FIGURE 4: Field work on Akpatok Island, Canada, where helicopter is the sole means of transportation.
Photo: Douglas Noblet.

About SEATRACK

Since 2014, SEATRACK has been instrumental in the collection and coordination of seabird tracking data in the North Atlantic, thereby enhancing scientific production and spurring new initiatives and cooperations among the North Atlantic seabird communities and stakeholders in industry and management. This way SEATRACK facilitates more holistic approaches for investigating how seabirds, a major player in the marine ecosystem, adapt to current and future challenges in the marine environment.

In phase I (2014–2018), SEATRACK focused on tracking 11 seabird species, representing five ecological groups and breeding in the Northeast Atlantic, from Iceland to Novaya Zemlya. Light-level geolocators were chosen to track birds, as they are light (0.4–3.4g) and long-lived (1–5 years), but provide low accuracy (100s km) and require retrieval to access their data.

Phase II (2019–2022) continued to focus on these 11 species and expanded to the entire North Atlantic, while also starting to track juvenile birds in addition to adult breeders.

In phase III (2023–2026), the project expanded spatial coverage again, especially around the North Sea, and introduced lightweight leg-mounted GPS loggers as well as GPS-GSM tags for more accurate tracking. Five new species were added to improve data representability for science and management.

We would like to thank our funders at the Norwegian Ministry of Climate and Environment, the Norwegian Environment Agency, the Norwegian Ministry of Energy, the Norwegian Water Resources and Energy Directorate, the Norwegian Coastal Administration, the Research Council of Norway and Offshore Norge with Equinor, AkerBP, Vår energi, Total, ConocoPhillips, Shell, OKEA, Hafslund Vekst, Vårgrønn, Fred. Olsen Seawind, Statskraft, JERA Nex BP, Sval and Harbour Energy for new and a continued support.



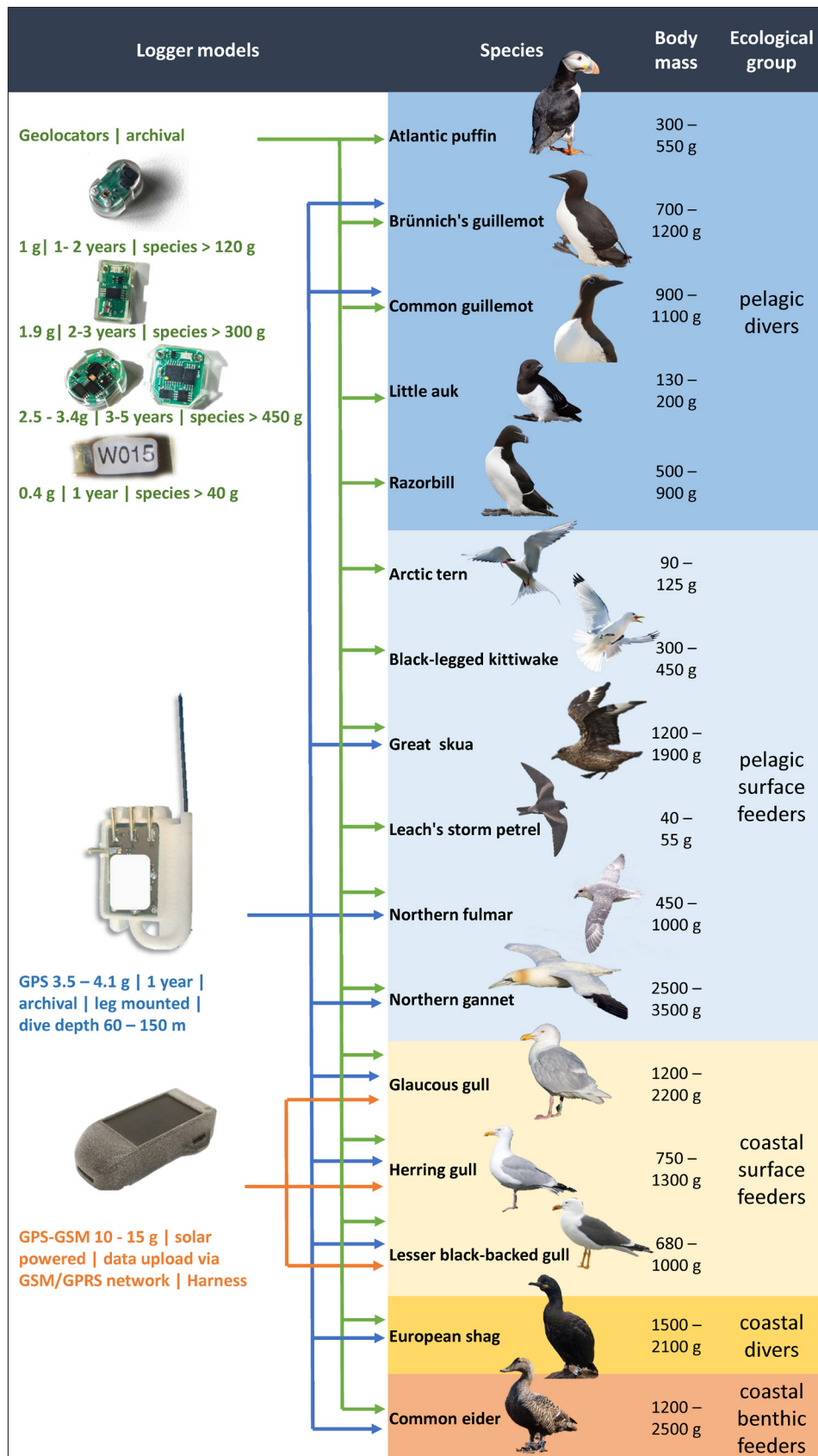


FIGURE 5: An overview of logger and tag models used in SEATRACK, their weight and expected life span, and which species they are suited for. The weight, but also the size of the different loggers are an important consideration when deploying on species of varying body mass and flight capacity. The figure further provides an overview of the species that are tracked in SEATRACK, their approximate weight, and which ecological group they represent.

Field season 2025

Across the North Atlantic, field expeditions were conducted between April and September at more than 100 field sites, deploying loggers and tags on 16 species.

Overall, the field season went very well for SEATRACK, and most planned field expeditions were completed (figure 6) with only a few partly cancelled field work for some species: Eider duck work at Mandal & Lindesnes could not be carried out due to sickness & boat problems and fulmar work at the Faroe Islands was not carried out due to lack of manpower. Fieldwork at the Icelandic locations Melrakkaey and Reykjanes were also cancelled.

At some field sites, deployment efforts were reduced this year due to poor weather or breeding conditions. For example, bad weather conditions delayed field visits to some Icelandic locations

missing the opportunity to work with alcids as they had already left with the juveniles by the time the field team arrived at the sites. Some partners reported problems catching razorbills during daylight but were more successful during dusk and dawn. One field site in Norway had problems catching herring gulls, so the fieldwork was carried out at a nearby colony instead.

The deployment success was high (exceeding 75%) for most species in 2025 with a few exceptions. An average breeding season but further colony decline was reported for northern fulmars at Eynhallow in the UK with only a few retrievals and no deployments.

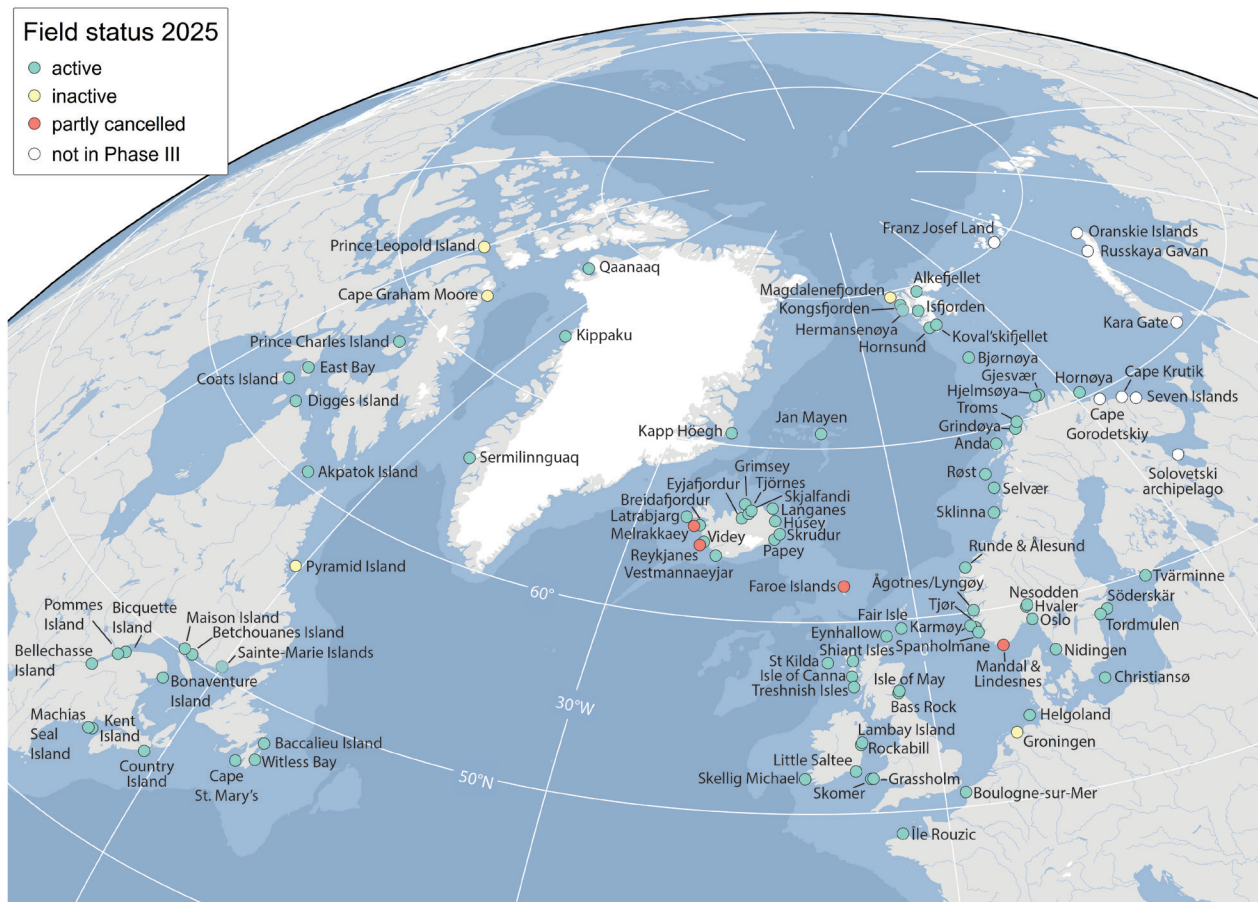


FIGURE 6: SEATRACK field sites phase I-III. Locations where fieldwork took place as planned in 2025 are coloured green. Red sites indicates colonies where fieldwork was cancelled or restricted. Yellow and white sites indicate where fieldwork was not planned this year. Russian colonies are not included in Phase III.

Species	Phase I: 2014–2018		Phase II: 2019–2022		Phase III: 2023 - 2025		2025				Total
	Median Ret	Median Dep	Median Ret	Median Dep	Median Ret	Median Dep	Ret	Dep	Expected Dep	Dep success	% Ret
Atlantic puffin	147	316	119	287	167	434	146	300	395	76%	44%
Brünnich's guillemot	139	278	147	253	156	246	153	158	255	62%	58%
Common guillemot	167	249	148	259	171	397	148	161	235	69%	63%
Little auk	44	86	49	90	117	253	82	201	196	103%	58%
Razorbill					33	141	52	145	200	73%	42%
Arctic tern					13	82	19	48	90	53%	30%
Black-legged kittiwake	241	439	271	428	216	402	204	353	429	82%	63%
Great skua					25	114	61	111	140	79%	60%
Leach's storm petrel					53	89	70	122	130	94%	59%
Northern fulmar	88	176	79	177	78	120	67	67	143	47%	56%
Northern gannet					67	167	102	150	190	79%	104%
Glaucous gull*	30	74	17	58	15	74	10	20	40	50%	39%
Herring gull*	15	104	4	1	5	72	4	68	85	80%	17%
Lesser black-backed gull*	11	89	3	0	0	26	1	26	25	104%	17%
European shag	76	146	36	84	37	119	40	77	113	68%	46%
Common eider	92	179	53	85	103	217	102	188	186	101%	55%
Total	1050	2136	926	1722	1256	2953	1261	2195	2852	76%	51%

TABLE 1: Previous median annual numbers of loggers (geolocators, GPS logger, and GPS-GSM) retrieved (Ret) and deployed (Dep) on adults in phase I, phase II and phase III, together with numbers from 2025. '% Ret' refers to the proportion of loggers retrieved since 2015 in relation to all loggers deployed since 2014 up to 2024. 'Dep success' refers to the proportion of loggers deployed in relation to the sum of planned deployments. For deployment success in 2025, numbers of expected deployments for sites where actual deployments have not yet been accounted for have been excluded from these calculations. ** Aukestra deployments are not included. *** GPS-GSM deployments included.

For one SEATRACK site in the high Canadian Arctic geolocator deployments on Arctic terns were paused in 2025 due to anticipated funding limitations, which raised concerns about the ability to retrieve deployed loggers in the near future. In addition, Arctic terns in Iceland were reported to have a bad breeding season and thus, no geolocators were deployed for SEATRACK. For these reasons, the deployment success for this species appears low (53%). While fieldwork for Leach's storm petrels went very well in Canada, partners in Europe faced a variety of problems this year. The field team at Røst encountered difficulties catching storm petrels in 2025 and might have to reduce efforts in the years to come. It was a difficult season for the field team working with Leach's storm petrels in Iceland due to a combination of bad weather and lack of dedicated petrel staff, and thus deployment and retrieval rates are lower this year.

On the other hand, field work at Alkefjellet in the European high Arctic was carried out in 2025 (while it was cancelled in 2024) marking its 10th

anniversary this year. Another positive highlight is that Akpatok Island in the Canadian Arctic, a major Brünnich's guillemot colony, was included as a new SEATRACK field site and was visited for the first time this year – all provided GLS for Brünnich's guillemots were successfully deployed by the team (figure 4).

No big outbreaks of HPAI were reported for any SEATRACK site, only a few local cases at Norwegian sites that did not affect project-related fieldwork. However, retrieval success for Glaucous gull, Herring gull and Lesser black-backed gull might remain lower at certain sites where we have introduced GPS-GSM tags, which do not require recovery. We have in fact been very successful with these deployments on the three large gull species (table 7, figure 8) and further expanded deployments.

For adults, 2195 loggers have been reported deployed and 1261 retrieved, which is comparable to numbers in previous years (2023 and 2024; table 1). When comparing actual

deployments to planned deployments for each respective species and site, we have a deployment success rate of 76%, a great result considering that five new species and several new sites were added to the project with phase III.

Aukestra reports a mixed picture for the auks at the Scottish colonies. For common guillemots, deployment success was very good in the north and in the east this year (and higher than last year), while it was poor for razorbills. For both species, deployment success was really bad at some colonies in the west.

For juveniles, deployment success was very good for Atlantic puffins, common guillemots, little auks, Brünnich's guillemots, and glaucous gulls, but not successful for black-legged kittiwakes (29 %; table 2). This is still due to the HPAI outbreaks at several black-legged-kittiwake locations in late 2023, from which the populations have yet to recover from. The percentage of loggers retrieved from birds that were instrumented as chicks is high

again in 2025. Since we started deployments on juvenile birds in 2019 the retrieval rate increased over the years from 1% in 2021 to 3%, 6 %, 7% and 8% in 2022, 2023, 2024 and 2025, respectively. This is an exciting development with an increasing presence of juveniles or young birds previously instrumented as chicks returning to the colonies.

Presenting a comprehensive overview of deployment and retrieval numbers for all species and field sites becomes increasingly complex. Below, we present four simplified tables aggregated by species and marine ecoregions (see figure 7). Seabirds, being long-lived and prioritizing their own survival over breeding success, are not expected to breed every year and when not breeding are mostly out of reach. As feeding and breeding conditions across the North Atlantic are expected to vary from year to year, the numbers of birds attending colonies and being available for the retrieval of loggers will also vary.

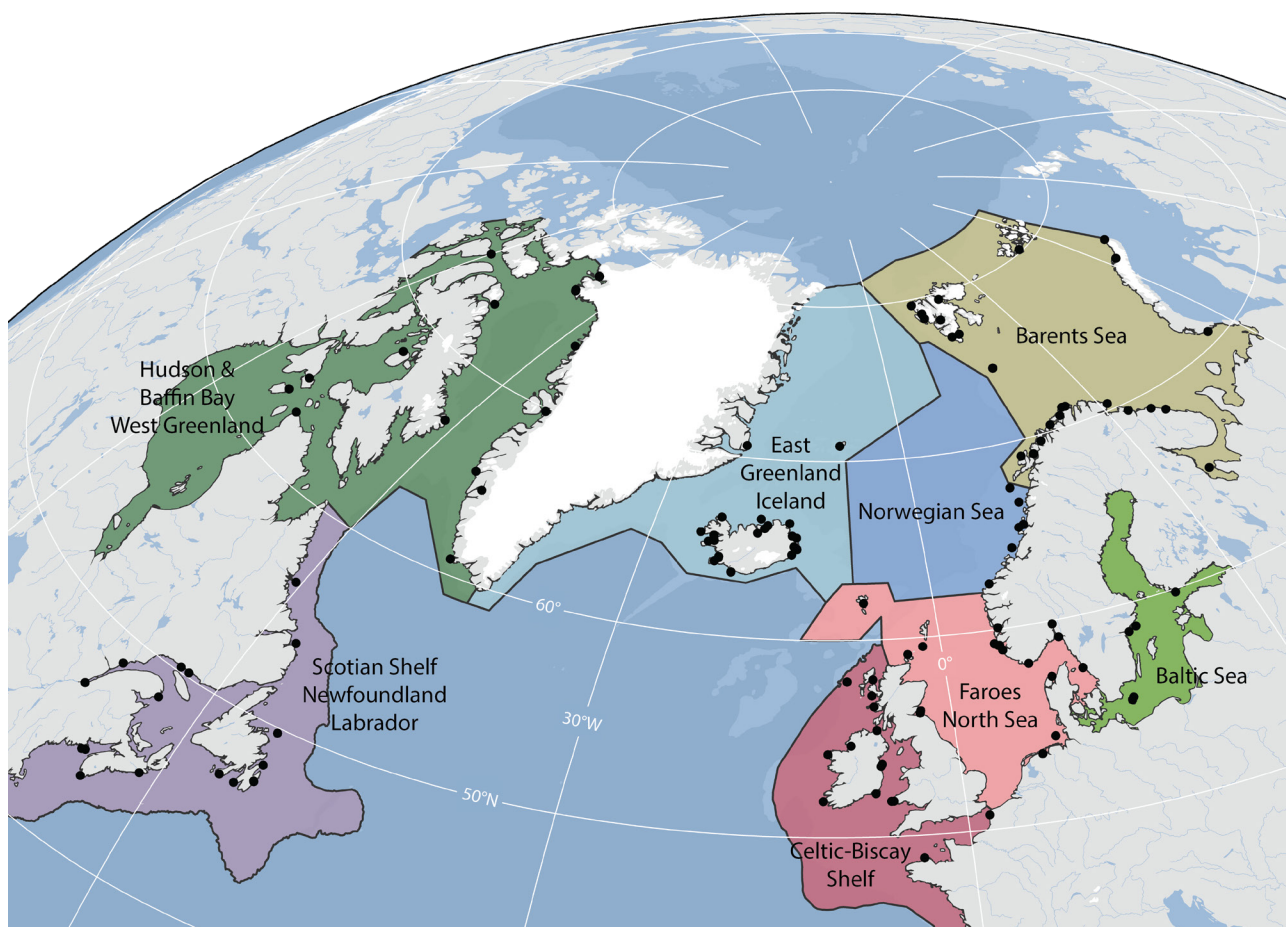


FIGURE 7: Simplified marine ecoregions used to present areas where SEATRACK instruments breeding birds, eight in total, based on the Large Marine Ecosystem approach (Sherman 1991) which divides marine areas close to any coast or large islands into marine ecosystems.

Tables 3 – 7 show varying deployment and retrieval numbers in all marine ecoregions. Extended tables for instrumentations on adult birds can be seen in the appendix (table A1; light-level geolocators, table A2; leg-mounted GPS loggers).

Deployment numbers for leg-mounted GPS are low this season and several locations did not deploy any GPS loggers. We recommended partners to hold off deploying these loggers due to performance challenges observed when retrieving the 2024 prototypes. Analysis of the first datasets collected across multiple species using the 2024 leg-mounted prototype indicates that most devices successfully recorded immersion and accelerometry data for at least part of the year, whereas positional data was collected more sporadically. We have run a detailed analysis of the data obtained from the 2024 prototypes and have together with Pathtrack derived a way forward to push past these setbacks. A first step was a successful concluded short-term experiment during the austral summer (December) off the coast of Queensland, Australia.

Expansion of GPS-GSM deployments

In 2025, GPS-GSM deployment efforts were intensified, resulting in 70 deployed GPS-GSM tags within SEATRACK on three gull species across the North Atlantic (compared to 35 deployed devices in 2024). After a successful first season with GPS-GSM deployments in SEATRACK in 2024, we continued with GPS-GSM deployments on three gull species (glaucous gull, herring gull, and lesser black-backed gull).

We maintained our work at existing sites (Bellechasse Island, Christiansø, Melrakkaey, Reykjanes and Nidingen), while also expanding to new locations in Germany, Canada, Iceland and Norway (Witless Bay, Helgoland, Eyafjordur, Troms, Mandal & Lindesnes and Oslo; table 7 and figure 8), further broadening the geographical scope of the SEATRACK programme.



FIGURE 8: On the left: A lesser black-backed gull equipped with a GPS-GSM transmitter in Troms, Norway. Photo: Svenja Neumann. On the right: SEATRACK GPS-GSM field sites in 2025. Sites used since 2024 are coloured in yellow, while new locations added in 2025 are highlighted in green.

Species	2019		2020		2021		2022		2023		2024		2025				Total
	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Exp. Dep	Dep succ.	% overall Ret
Atlantic puffin		162		85		168	5	74	9	85	16	139	11	100	100		6%
Brünnich's guillemot		32	1	24		15	2	7	1	4	1	61	2	59	80	74%	5%
Common guillemot		50		53	10	105	2	84	20	103	16	117	14	122	150	81%	12%
Little auk		120		150	7	151	11	80	25	89	25	89	18	106	130	82%	13%
Black-legged kittiwake	1	98		74	1	75	7	60	26	76	12	76	12	45	155	29%	13%
Glaucous gull		49	1	50	2	86	1	64	0	35	3	70	2	49	80	61%	3%
Total	1	511	2	436	20	600	28	369	81	392	73	552	59	481	695	71%	8%

TABLE 2: Numbers of geolocators retrieved (Ret) and deployed (Dep) annually on juveniles since 2019, together with expected number of deployments in 2025 and deployment success. '% overall retrieved' refers to the proportion of loggers retrieved since 2019 in relation to all loggers deployed between 2019 and 2024.

Species	Barents Sea		Norwegian Sea		East Greenland & Iceland		North Sea & Faroes		Baltic Sea		Hudson & Baffin Bay - West Greenland		Scotian Shelf Newfoundland Labrador		Celtic-Biscay Shelf		Total	
	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites
Atlantic puffin	112	4	39	3	56	3	20	3					20	1	53	4	300	18
Brünnich's guillemot	31	6			31	3					93	6					155	15
Common guillemot	56	3	61	2	11	3	7	4	0	1	1	1	0	1			136	15
Little auk	144	2			27	1					30	1					201	4
Razorbill	40	2	19	2	7	2			8	2	13	1	58	4			145	13
Arctic tern	30	2			0	1	7	1			11	2					48	6
Black-legged kittiwake	105	5	63	3	23	1	59	4			51	3	14	4	60	4	375	24
Great skua	80	4	4	1	11	1	5	2									100	8
Leach's storm petrel			0	1	4	1	20	1					80	3	18	1	122	7
Northern fulmar	21	2			32	4	3	3									56	9
Northern gannet	15	1	4	1	20	1	39	3					46	2	15	2	139	10
Glaucous gull	20	2															20	2
Herring gull	6	1					15	3					0	1			21	5
Lesser black-backed gull							0	1									0	1
European shag	10	1	24	2	0	1	22	2							7	1	63	7
Common eider	30	2	20	1	42	2	54	5	17	2							163	12
Total	700	37	234	16	264	24	251	32	25	5	199	14	218	16	153	12	2044	156

TABLE 3: Numbers of geolocators deployed on adult breeding birds in 2025 grouped by species and marine ecoregion. Number of sites where geolocators were deployed within each ecoregion are shown in column "Sites". The cell colours represent deployment success: ≥ 90 % of scheduled deployments carried out (green), 50–89 % (yellow), 1–49 % (orange) and 0 % (red). * Aukestra deployments.

Light-level geolocators Retrievals 2025	Barents Sea		Norwegian Sea		East Greenland & Iceland		North Sea & Faroes		Baltic Sea		Hudson & Baffin Bay – West Greenland		Scotian Shelf Newfoundland Labrador		Celtic–Biscay Shelf		Total	
	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites
Atlantic puffin	40	4	23	3	39	3	15	3					5	1	24	4	146	18
Brünnich's guillemot	37	7			13	3					72	6					122	16
Common guillemot	43	3	42	2	10	3	32	4	0	1	0	1	0	1	1	1	128	16
Little auk	65	2			0	1					17	1					82	4
Razorbill	12	2	5	2	6	2			2	2	8	1	19	4			52	13
Arctic tern	0	2			0	1	1	1			18	2					19	6
Black-legged kittiwake	59	5	38	3	15	1	33	4			32	3	5	4	34	4	216	24
Great skua	34	4	3	1	7	1	0	2									44	8
Leach's storm petrel			0	1	3	1	7	1					60	3	0	1	70	7
Northern fulmar	14	2			21	4	10	3							5	1	50	10
Northern gannet	2	1			3	1	41	3					28	2	0	2	74	9
Glaucous gull	5	2															5	2
Herring gull							2	3					2	1			4	4
Lesser black-backed gull							1	1									1	1
European shag	2	1	9	2	0	1	10	2							0	1	21	7
Common eider	12	2	4	1	8	2	28	5	13	2							65	12
Total	325	37	124	15	125	24	180	32	15	5	147	14	119	16	64	14	1099	157

TABLE 4: Numbers of geolocators retrieved from adult breeding birds in 2025 grouped by species and marine ecoregion. Number of sites where geolocators were retrieved within each ecoregion are shown in column "Sites". Colours illustrate retrievals relative to number of deployments in 2024 as $\geq 45\%$ (green), 25–44% (yellow), 1–24% (orange) and 0% (red). * Aukestra deployments.



FIGURE 9: A field team preparing geolocators for deployment on northern gannets on Helgoland, Germany. Photo: Stefan Garthe.

Leg-mounted GPS logger Deployments 2025	Barents Sea		Norwegian Sea		East Greenland & Iceland		North Sea & Faroes		Baltic Sea		Hudson & Baffin Bay – West Greenland		Scotian Shelf Newfoundland Labrador		Celtic-Biscay Shelf		Total	
	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites
Brünnich's guillemot	2	4			5	3					24	5					31	12
Common guillemot	2	3	0	2	5	3	0	1					3	1	10	2	20	12
Great skua	12	3	5	1	0	1											17	5
Northern fulmar	9	2			8	3	0	2									17	7
Northern gannet	2	1			0	1	8	3					17	2	1	2	28	9
Glaucous gull	5	2															5	2
Herring gull	0	1			0	1	0	1									0	3
European shag	5	1	6	2	0	1	5	1							3	1	19	6
Common eider	5	2	10	1	7	1	5	1	10	2							37	7
Total	42	19	21	6	25	14	18	9	10	2	24	5	20	3	14	5	174	63

TABLE 5: Numbers of GPS loggers deployed in 2025 grouped by species and marine ecoregion. Number of sites where geolocators were deployed within each ecoregion are shown in column "Sites". The cell colours represent proportional success. For deployment $\geq 90\%$ of scheduled deployments carried out (green), 50–89 % (yellow), 1–49 % (orange) and 0 % (red).

Leg-mounted GPS logger Retrievals 2025	Barents Sea		Norwegian Sea		East Greenland & Iceland		North Sea & Faroes		Baltic Sea		Hudson & Baffin Bay – West Greenland		Scotian Shelf Newfoundland Labrador		Celtic-Biscay Shelf		Total	
	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites	N	Sites
Brünnich's guillemot	0	4			6	3					8	5					14	12
Common guillemot	16	3	2	2	4	3	1	1					1	1	1	2	25	12
Great skua	8	3	1	1	2	1											11	5
Northern fulmar	2	2			5	3	0	2							4	1	11	8
Northern gannet	2	1			1	1	5	3					3	2	0	2	11	9
Glaucous gull	0	2															0	2
Herring gull	0	1			1	1	0	1									1	3
European shag	3	1	5	2	0	1	3	1							3	1	14	6
Common eider	7	2	10	1	7	1	1	1	0	2							25	7
Total	38	19	18	6	26	14	10	9	0	2	8	5	4	3	8	6	112	64

TABLE 6: Numbers of GPS loggers retrieved in 2025 grouped by species and marine ecoregion. Number of sites where geolocators were deployed within each ecoregion are shown in column "Sites". The cell colours represent proportional success, relative to number of deployments since 2022, as $\geq 45\%$ (green), 25–44 % (yellow), 1 – 24 % (orange) and 0 % (red).

GPS-GSM Deployments 2025	Herring gull	Lesser black-backed gull	Glaucous gull	Total
Bellechasse Island	5			5
Troms	4	6		10
Witless Bay	10			10
Christiansø	5			5
Melrakkaey			0	0
Reykjanes		0		0
Eyjafjordur	5			5
Oslo		5		5
Mandal and Lindesnes	5	5		10
Nidingen	6	4		10
Helgoland	4	6		10
Total	44	26	0	70

TABLE 7: Numbers of GPS-GSM tags deployed on adult birds by species and location in 2025. The cell colours in the header represent the species' ecological grouping; coastal surface feeders (light yellow). The cell colours represent proportional success, for deployment ≥ 90 % of scheduled deployments carried out (green), 50–90 % (yellow), 1–49 % (orange).



FIGURE 10: A herring gull equipped with a GPS-GSM transmitter on Bornholm, Denmark Photo: Anders Mosbech.

	Atlantic puffin		Brünnich's guillemot		Common guillemot		Little auk		Black-legged kittiwake		Glaucous gull		Total	
	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep	Ret	Dep
Kongsfjorden									13	36	2	24	15	60
Isfjorden	10	60											10	60
Hornsund							17	60					17	60
Bjørnøya			2	2	12	21	1	30			0	25	15	78
Hornøya	0	40											0	40
Anda	1	0							0	1			1	1
Kap Høegh							0	16					0	16
Røst									0	8			0	8
Skinna					2	61							2	61
Coats Island			0	57									0	57
Boulogne-sur-Mer									0	0			0	0
Machias Seal Island					0	40							0	40
Total	11	100	2	59	14	122	18	106	13	45	2	49	59	481

TABLE 8: Numbers of geolocators retrieved (columns marked "Ret") and deployed (columns marked "Dep") on juvenile birds by species and location in 2025. The cell colours in the header represent the species' ecological grouping; pelagic divers (dark blue), pelagic surface feeders (light blue) and coastal surface feeders (yellow). The cell colours represent proportional success, for deployment $\geq 90\%$ of scheduled deployments carried out (green), 50–90 % (yellow), 1–49 % (orange).



FIGURE 11: Working with juvenile puffins sometimes means getting your hands dirty. Atlantic puffin chick on Hornøya, Norway. Photo: Svenja Neumann.

Assessments of offshore wind energy developments in Norway

The Norwegian Water Resources and Energy Directorate (NVE) has conducted strategic environmental impact assessments of 20 areas identified as suitable for offshore wind energy developments (OWED). Data from SEATRACK have played an important role in the assessment.

The first assessment was completed in November 2024 and included three areas in the North Sea (Moe et al. 2024). The second assessment was completed in June 2025 and included the remaining 17 areas (Moe et al. 2025).

Data from SEATRACK have played an important role in the assessments. The population maps have been used in combination with species-specific vulnerability indicators to yield maps of seabird vulnerability and consequences to OWEDs. They have also been used for identifying the monthly abundance of the pelagic species within each assessment area and their breeding origin.

The results showed that both Norwegian and foreign populations will be impacted. Among the 20 assessment areas, the consequence on seabirds was greatest in Nordavind B (Barents Sea), Vestavind A (North Sea/Norwegian Sea) and Vestavind F (North Sea). There are important seabird colonies in the vicinity of these areas, and the areas are important in the breeding and the non-breeding seasons. Sørvest A–F (in the southwest North Sea) had the lowest consequences among the assessment areas.

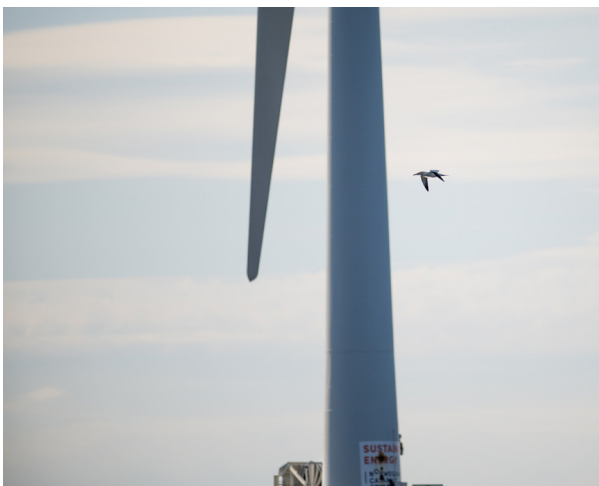


FIGURE 12: Northern gannet passing a wind turbine at Karmøy. Photo: Oskar Bjørnstad



FIGURE 13: The 20 assessment areas for offshore wind in the Norwegian economic zone. The three areas Sørvest F, Vestvind F, and Vestvind B were assessed in 2024. The remaining 17 areas are assessed in 2025.

The results also showed that there will likely be serious consequences on national seabird populations if OWEDs are established in all 20 assessment areas to provide a total of 30 GW.

It is therefore important to strengthen the seabird monitoring for mapping of populations and tracking of individuals. Such data are important for guiding the placement of offshore wind farms to areas of low impact and understanding the potential long-term effects of OWED on seabird populations.

A successful journey: new SEATRACK species in phase III

2025 marked the third season of deployments and the second season of retrievals for the five new species included in phase III of SEATRACK. Here we highlight our experiences so far.

The first field season of phase III had a lower deployment success for four out of five new SEATRACK species compared to the average of the 11 historic SEATRACK species (figure 14, left panel). The Leach's storm petrel was the exception with very successful fieldworks in 2023 thanks to the high effort of field teams in Canada. Subsequent adjustments have led to increased deployment success rates aligning with the average of the historic SEATRACK species. One example of this kind of adjustment includes the razorbill: instead of working during daytime field teams have put increased effort into working at night time to catch birds, which has proven to be an effective adjustment following method discussions at our annual SEATRACK workshop in 2023.

Arctic terns were the exception showing lower deployment success in 2025. Fieldwork with this species was challenging mainly due to challenging weather conditions and funding constraints.

It's encouraging to see that the proportion of retrieved loggers now aligns with numbers from other SEATRACK species (figure 15; right panel). SEATRACK has so far retrieved a total of 495 loggers from all five species; 32 from Arctic terns (all GLS), 86 from great skua (with 22 GPS), 123 from Leach's storm petrel (all GLS), 169 from northern gannet (with 22 GPS) and 85 from razorbills (all GLS).

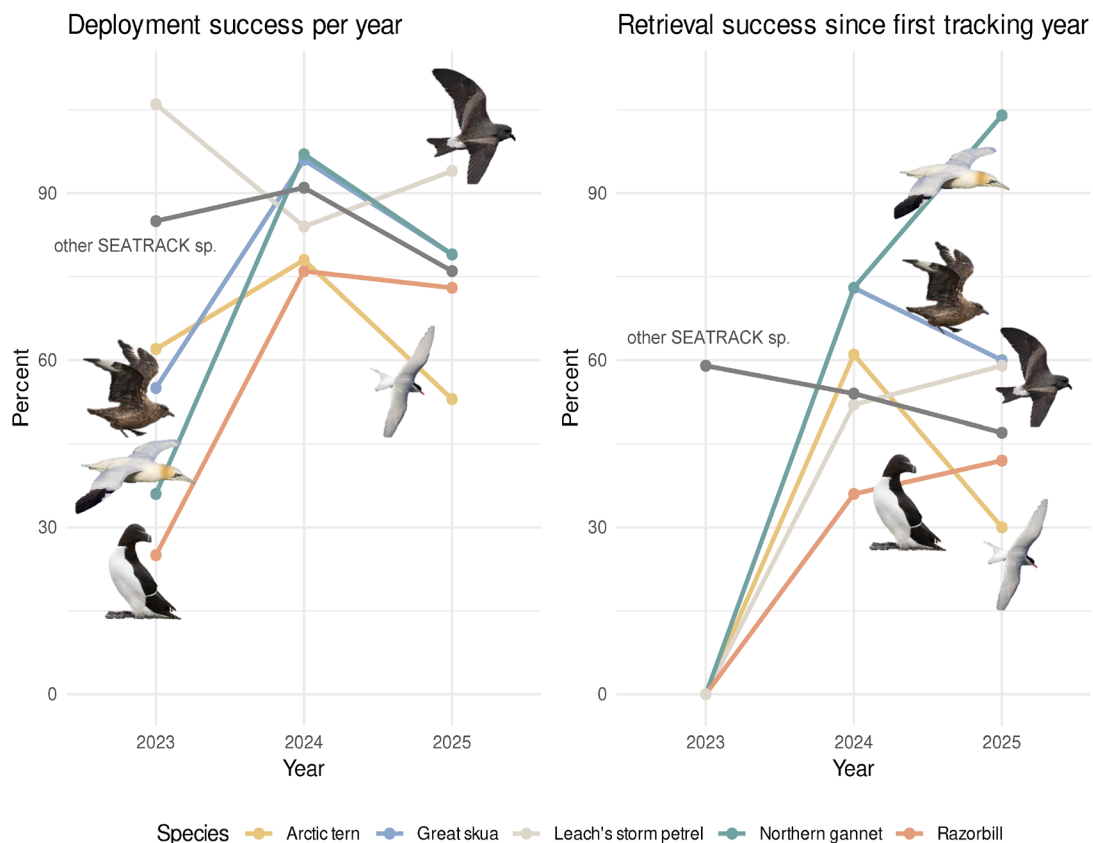


FIGURE 14: Proportional deployment (left panel) and retrieval (right panel) success for the five new SEATRACK species (Arctic tern, great skua, northern gannet, Leach's storm petrel and razorbill). In the first deployment year 2023, no loggers were retrieved.

We present the estimated winter distributions (November–January) of these five species, derived from the logger data collected in 2024 (figure 15). The map illustrates notable differences in distribution patterns and habitat use among the species.

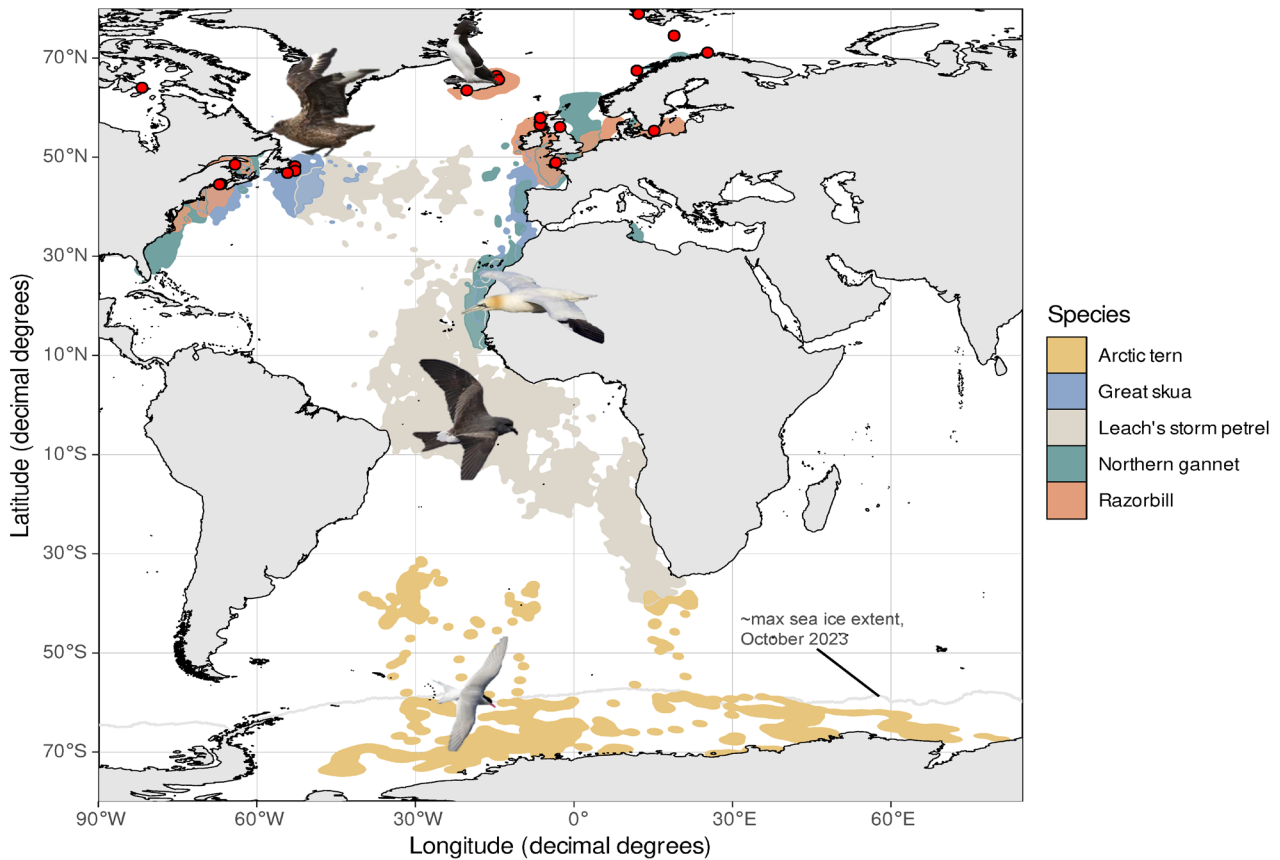


FIGURE 15: Winter distributions (November–January), shown as 90% kernel utilization distributions based on light-derived positions from archival geolocators. Data were collected in 2024 for five species newly included in SEATRACK Phase III. Locations where geolocators were retrieved are indicated in red. Arctic Tern data originate from Svalbard and Canada. Great Skua data derive from Svalbard. Leach's Storm petrel positions were mainly collected in Canada and Iceland, with one individual from Norway. Northern Gannet tracks are represented from France, northern Norway, and Canada. Razorbill data come from several sites across northern Europe and Canada.



FIGURE 16: Left: Leach's storm petrel in Iceland. Photo Stephen Hurling. Right: Great skua on Bjørnøya. Photo: Anne-Marie Austad.

New SEATRACK staff

The SEATRACK project group has welcomed a new member.

In September 2025 Julian Evans started at NINA as SEATRACK technician, taking over for Vegard Bråthen. Julian has previously worked in a wide variety of projects, with a strong focus on building data tools and pipelines to handle and access large datasets. Before starting with SEATRACK he worked as a data scientist at the University of Amsterdam, as part of a large biodiversity infrastructure development project. In SEATRACK, he will work on further developing our database and data pipelines. Vegard Bråthen has left his technician position in January 2026 to start a PhD within SEATRACK.



SEATRACK TECHNICIAN

Julian Evans



FIGURE 17: Adult and juvenile northern gannets at Bass Rock, United Kingdom. Photo: Jana Jeglinski.

Update of distribution app

SEATRACK redesigned its distribution app showing kernel data.

The updated SEATRACK distribution application features enhanced functionality, offering a more efficient interface for visualising seasonal distributions of tracked SEATRACK species. Users can access contextual guidance by clicking the question mark icon, which provides detailed instructions on utilizing the new application features, including layer selection, interactive pop-up displays for field site metadata, and a distance and area measurement tool (figures 18 & 19).

The new version supports simultaneous visualization of up to five species, along with bathymetric and sea ice data, all rendered interactively on a rotating globe.

Visit the new application at:
distributionapp.seatrack.net

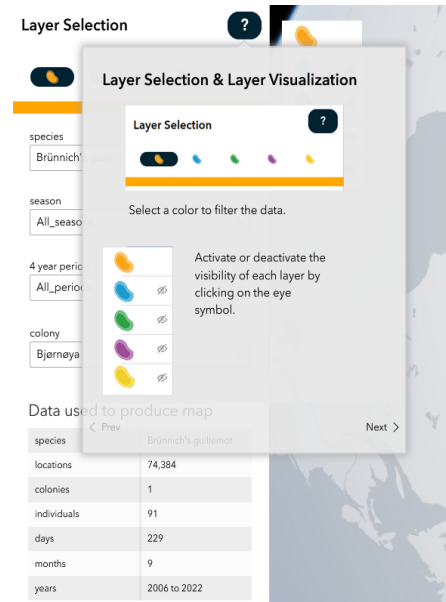


FIGURE 18: A screenshot of the contextual guidance users can access by clicking on the question mark icon on the new SEATRACK distribution application.

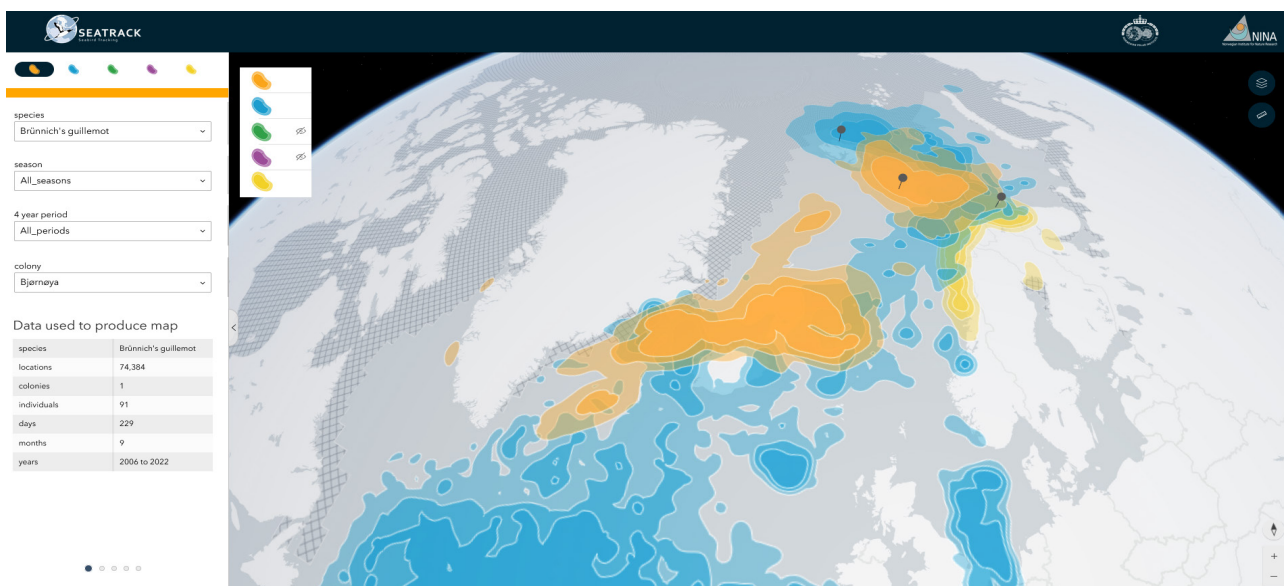


FIGURE 19: A screenshot of the SEATRACK distribution application displaying the year-round distribution of black-legged kittiwake from Alkefjellet (blue), Brünnich's guillemot from Bjørnøya (orange), and European shag from Hornøya (yellow) and spring sea ice extent (gray grid).

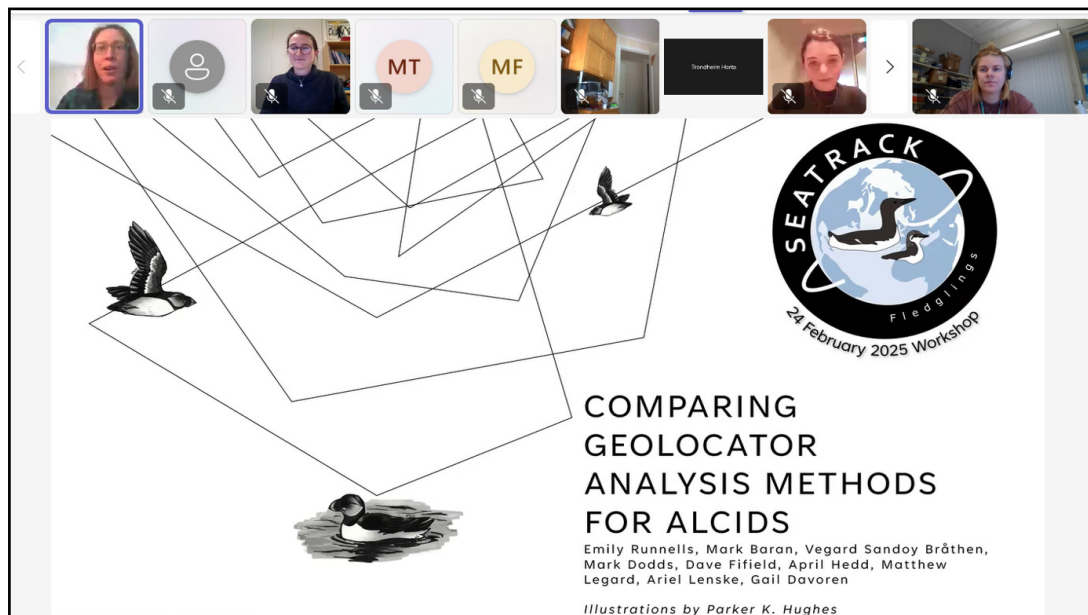


FIGURE 20: Phd student Emily Runnells presenting her work during the digital SEATRACK fledgling seminar on 24–25 February 2025.

Publications, degrees & presentations

Articles and reports published in 2025 using SEATRACK data

Buckingham, L., et al. An improved method to derive behavioural budgets and energetics from geolocator data in Common Guillemots *Uria aalge*. *Seabird Journal* 37. <https://doi.org/10.61350/sbj.37.6>

Christensen-Dalsgaard, et al. Artificial nesting sites for seabirds on offshore base structures: Decommissioning of Statfjord A as a case study. NINA Rapport 2547. Norsk institutt for naturforskning. <https://hdl.handle.net/11250/3182854>

Descamps, S., Merkel, B. and Strøm, H. Local variations in population trends and migration strategies of Brünnich's guillemots on Svalbard. *Marine Ecology Progress Series* 765:101–114. <https://doi.org/10.3354/meps14893>

Johnston, D., et al. A review of the Biological Defined Minimum Population Scale (BDMPS) approach and methodology to apportioning season impacts on seabirds arising from offshore wind farms. BTO Research Report 791: British Trust for Ornithology, Thetford, UK.

Layton-Matthews, K, et al. Demographic responses of North Atlantic seabirds to seasonal ocean

warming, *Proc. Natl. Acad. Sci. U.S.A.* 122 (50) e2507531122, <https://doi.org/10.1073/pnas.2507531122>.

Léandri-Breton, D.J., Testing the abundant centre hypothesis in a seabird: higher energy expenditure at the wintering range centre does not reduce reproductive success. 2025, *Ecography*, <https://doi.org/10.1111/ecog.07498>.

Moe, B., et al. Fagutredning for virkninger av havvind på fugl, flaggermus og insekter i 17 utredningsområder i Nordsjøen, Norskehavet og Barentshavet. NINA Rapport 2438. Norsk institutt for naturforskning. <https://hdl.handle.net/11250/3200876>

Olsen, B., et al. Half a century of environmental variability and seabird trends on the Faroe Shelf in the North Atlantic Ocean. *Frontiers in Marine Science*, 2025, 12, <https://doi.org/10.3389/fmars.2025.1544866>.

Talks given in 2025 using SEATRACK data

Hoogsteen, S. Methods matter: Geolocation analysis in Arctic tern migration. Talk at SEATRACK fledgling seminar 2025-02-24–2025-02-25.

Hunter, I. Site fidelity to wintering area of Brünnich's guillemot (*Uria lomvia*) breeding in Greenland colonies. Talk at SEATRACK fledgling seminar 2025-02-24-2025-02-25.

Piening, K. Within-pair behaviour during migration and in wintering quarters of the little auk (*Alle alle*). Talk at SEATRACK fledgling seminar 2025-02-24-2025-02-25.

Runnells, E. Comparing geolocator analysis methods for alcids. Talk at SEATRACK fledgling seminar 2025-02-24-2025-02-25.

Syposz, M. Timing of phenology events in Little Auk. Talk at SEATRACK fledgling seminar 2025-02-24-2025-02-25.

Talpt, M. Sexual differences in moult patterns of Razorbills (*Alca torda*) breeding on Machias Seal Island. Talk at SEATRACK fledgling seminar 2025-02-24-2025-02-25.

PhD and Master thesis finished in 2025 using SEATRACK data

Due, K.U. Mercury exposure in female common eiders (*Somateria mollissima*), and its association with thyroid hormone concentrations during breeding. Norwegian University of Science and Technology, Trondheim, Norway. 2025 MSc.

Edney, Alice. Population monitoring of North Atlantic seabirds using remote technologies, including drones, time-lapse cameras, and tracking data. University of Oxford, Oxford, United Kingdom, 2020 – 2025. PhD.

Collins, Sydney. Consistency of behaviour across spatial and temporal scales and its applicability to conservation. University of Newfoundland, St. John's, Canada. 2019– 2025. PhD.

Mørk, M. E. Effects of breeding site, wintering latitude, and diet on PFAS plasma levels in Oslofjord common eiders (*Somateria mollissima*). Norwegian University of Science and Technology, Trondheim, Norway. 2025. MSc.

Rouyer, M-M. Bridging science, policy and society to inform marine conservation at an ocean basin scale: a case study of marine protected areas and seabirds in the Atlantic. Université de Montpellier, Montpellier, France. 2025. PhD.

Media coverage in 2025 about SEATRACK data

Article about adult puffins published in Science News "How a puffin patrol in Iceland is saving the iconic seabirds". Article can be found here: <https://www.sciencenews.org/article/puffin-patrol-iceland-conservation-bird>



FIGURE 21: Necessity is the mother of invention – Morten Frederiksen and Flemming Merkel weighing a Brünnich's guillemot at the field site Kippaku, Greenland using a SEATRACK beanie. Photo: Benjamin Merkel.

Location	Brünnich's gull		Common gull		Great skua		Northern fulmar		Northern gannet		Glaucous gull		Herring gull		European shag		Common eider		Total	
	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D
	Iceland and East Greenland																			
Jan Mayen	3	5	4	5			3	5											10	15
Grimsey	0	0	0	0															0	0
Langanes	3	0	0	0															3	0
Skjalfandi							2	3											2	3
Eyjafljörður												1	0						1	0
Húsey					2	0													2	0
Breidafjörður																7	7		7	7
Melrakkæy														0	0				0	0
Skrudur									1	0									1	0
Videy							0	0											0	0
Vestmannaeyjar																			0	0
Barents Sea																				
Alkefjellet	0	0					0	0											0	0
Kongsfjorden	0	0			0	0					0	5				6	0		6	5
Hopen	0	0																	0	0
Bjørnøya	0	2	13	2	8	12	2	9			0	0							23	25
Hjelmsøya			0	0	0	0													0	0
Gjesvær									2	2									2	2
Hornøya			3	0									0	0	3	5			6	5
Grindøya																	1	5	1	5
Norwegian Sea																				
Røst			2	0											0	0			2	0
Selvær																	10	0	10	0
Skinna			0	0											5	6			5	6
Runde and Ålesund					1	5													1	5
Hudson and Baffin Bay																				
Qaanaaq	0	5																	0	5
Kippaku	4	9																	4	9
Sermilinnuaq	1	1																	1	1
Coats Island	3	9																	3	9
Akpatok Island	0	0																	0	0
Baltic Sea																				
Tvärminne																	0	5	0	5
Christiansø																	0	5	0	5
North Sea and Faroes																				
Faroe Islands							0	0	0	0						1	5		1	5
Lyngø													0	0					0	0
Eynhallow							0	0											0	0
Isle of May			1	0											3	5			4	5
Bass Rock									5	0									5	0
Helgoland									0	8									0	8
Celtic-Biscay Shelf																				
Shiant Isles			1	5											3	3			4	8
Isle of Canna			0	5															0	5
Little Saltee							4												4	0
Grassholm									0	0									0	0
Île Rouzic									0	1									0	1
Scottian Shelf - Newfoundland																				
Betchouanes Island			1	3															1	3
Bonaventure Island									3	17									3	17
Cape St. Mary's									0	0									0	0
Total	14	31	25	20	11	17	11	17	11	28	0	5	1	0	14	19	25	27	112	164

TABLE A2: Numbers of GPS retrieved (columns marked "R") and deployed (columns marked "D") on adult birds by species and location in 2025. The cell colours in the header represent the species' ecological grouping; pelagic divers (dark blue), pelagic surface feeders (light blue), coastal surface feeders (yellow), coastal divers (light orange) and coastal benthic feeders (dark orange). Deployments are coloured by deployment success: ≥90 % of scheduled deployments carried out (green), 50–89 % (yellow), 10–49 % (orange) and ≤ 9 % (pink). Retrievals are coloured relative to number of deployments in 2023: ≥45 % (green), 25–44 % (yellow), 6–24 % (orange) and ≤ 5 % (pink). Red cells represent locations where fieldwork was cancelled. Black cells represent locations where numbers have not been reported.



FIGURE 22: Kippaku Island, Greenland from above. Photo: Benjamin Merkel.

