



**SEATRACK**  
Seabird Tracking

# Geolocator and general protocols for 2026

**NEW  
!!!**

**New content for 2026 in the protocol is marked  
with this symbol – please read carefully!**



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These protocols are meant to serve as guidelines for field work carried out in cooperation with SEATRACK in 2026. Please distribute them as whole or in part to field teams as you see fit. If any questions, please contact [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no) or [Julian.Evans@nina.no](mailto:Julian.Evans@nina.no)

# SEATRACK about the project

updated



This document is a collection of protocols covering activities within SEATRACK. Protocols for deploying leg-mounted GPS and back-mounted GPS-GSM are described separately. Some protocols apply only to specific fieldwork (e.g. Arctic terns or Leach's storm petrels), while others depend on each field team's capacity and interest (e.g. Arctox of effect studies).

In 2026 we plan to deploy approx. 3300 GLS tags and 65 GPS-GSM transmitters distributed between 84 sites and 16 species. All GLS loggers sent to SEATRACK participants have been started beforehand.

Visit [seatrack.net](https://seatrack.net) for more information about the program.

SEATRACK  
Seabird tracking

The SEATRACK programme aims to map the non-breeding distribution of seabirds breeding throughout the North Atlantic and understand how changes in environmental conditions and other threats affect their demography and population trajectories.

The programme was initiated in 2014 and is currently in its third phase. It is a large international collaboration of scientists from 52 institutions based in 14 countries.

A map showing all sites within the SEATRACK project (Russian sites are not part of phase II, in white)

**View data**  
All data can be visualized in two interactive mapping applications, where you can create your own custom views for specific species or locations.

Distribution app | Abundance app

**Annual report 2024**

Learn about the species | Learn about the study area

# General information after the field season

**NEW**



## After the field season – What we kindly ask you to do

To ensure a smooth data handling after the field season, we ask all partners to complete the following steps **before 1 November 2026**:



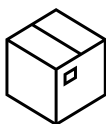
### 1. Submit Metadata

Please fill in the SEATRACK metadata sheet



### 2. Download and send logger data

Download the data from all loggers  
(Fill in the logger return metadata sheet)



### 3. Return loggers

Please return retrieved and unused loggers to:

There is a new  
metadata sheet  
this year!

Send metadata sheet  
and data to

[Svenja.neumann@npolar.no](mailto:Svenja.neumann@npolar.no)

**Norsk Polarinstitut  
Att: Svenja Neumann  
Postboks 6606 Stakkevolla  
N-9296 Tromsø  
NORWAY**

Please have a look at what to consider when sending a package on the next page.

# General information

## sending packages to SEATRACK

NEW

## What to consider when sending packages to SEATRACK

### RECOMMANDATIONS FOR SHIPPING LABEL

**Purpose of shipment:** gift or return to owner



**Item description:** scientific equipment

**Value:** We usually use one 1 NOK for one logger.

**Note: It's very important that the value of the proforma invoice AND the shipping label are the same (both amount and currency).** If not, that will lead to problems on the way and probably extra fees after customs toll when shipping to Norway.

Also, overstated value will lead to us paying extra tax when the shipping arrives in Norway! Of course, the data on those loggers have great scientific importance to us but they are however used and should not be tolled again, which will happen when you put a high value. The package will also not be transported more carefully when the value is high, so from our experience a value around 100 NOK or lower is best.

**Additional invoice information, you may include something like:**

*Scientific equipment of a research project for bird tracking. The items are property of the Norwegian Polar Institute, were retrieved from birds and are now being returned back to Norway for data download.*

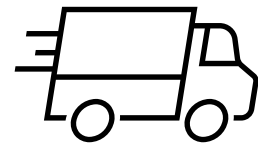
# General information sending packages to SEATRACK

NEW

Example of proforma invoice. Parts where your information is needed are marked in **yellow**.

**Include your institution's logo**

## PRO-FORMA INVOICE STATEMENT OF VALUE



**NAME OF OWNER:** Norsk Polarinstitutt  
Att.: Svenja Neumann  
Tlf +47 96632215  
E-post: Svenja.Neumann@npolar.no

**SHIP TO:** Norsk Polarinstitutt  
Att.: Svenja Neumann  
Framsenteret  
Boks 6606 Stakkevollan  
9296 Tromsø  
NORWAY

**CONTENTS:**  
**number** PCS mk3006 light loggers.  
**number** PCS mk4083 light loggers.  
**number** PCS GPS loggers.

Note: Important to add specific description including numbers of loggers to Proforma Invoice.

**PURPOSE:** Gift – no sale

**RETURN ADDRESS:** **sender address, please fill inn**

**VALUE:** **NOK**

We usually use one 1 NOK for one logger.

**Additional invoice Information** Scientific equipment of a research project for bird tracking. The items are property of the Norwegian Polar Institute. They were retrieved from birds and are now being returned back to Norway for data download.

**ALL FREIGHT, HANDLING AND SERVICES ARE PAID FOR BY SHIPPER.**

**DATE:** **date**  
**name & signature**

# SEATRACK 2026

software

updated

**IMPORTANT:** The latest Lotek and Migrate Technology software versions should be installed on your machine. Contact [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no) or [Julian.Evans@nina.no](mailto:Julian.Evans@nina.no) if you experience problems using the links below.

- **NOTE** that all GLS loggers sent to SEATRACK participants have been started beforehand ([in the recommended modes](#)).

All relevant software can be downloaded following these links:

## For Migrate Technology

Please contact [info@migratetech.co.uk](mailto:info@migratetech.co.uk) for the latest version of the software.

## Lotek (formerly Biotrack and BAStack)

<https://www.lotek.com/support/>

# SEATRACK 2026

## NEW GLS recording modes in SEATRACK!

Until 2025, SEATRACK has focused on **maximising the recording durations**, which resulted in robust baseline sample sizes baseline for most species and populations.

In 2026, SEATRACK is adopting new logger modes to enhance data quality. This includes recording across **full light ranges** and **increasing the temporal resolution of immersion data**:

- Recording across the full light range increases the likelihood of successfully locating animals during periods of continuous daylight and enables additional analytical applications.
- Higher temporal resolution in immersion data allows for more reliable estimates of behaviour, such as feeding activity and energy expenditure.
- The trade-off is a slightly faster depletion of memory or battery capacity. For this reason, the new modes are applied (mostly) only to adult instrumentations.

For **juveniles**, maximizing **recording duration** is the primary priority, and the recording mode used in previous years (6B) is therefore kept for those carrying c180 and c331 loggers and returning after 3 or more years.

updated

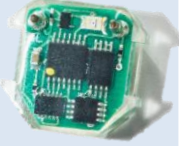

# SEATRACK 2026

## GLS modes currently used in SEATRACK!

**Lotek**  
advancing wildlife science



### Lotek geolocators currently used in SEATRACK

Model	Size (mm)	Weight (g)	Recording life (years)	Light		Immersion		SST
				Range	Time res.	Range	Time res.	
<b>mk3006</b> 	16 x 14 x 6	2.5	3	0 - 64arb	3s->10m	0-200	3s->10m	*
<b>mk4083</b> 	17 x 10 x 6.5	1.9	<3	0 - 64arb	3s->10m	0-200	3s->10m	no

\*after 20m continuously wet and thereafter each 20m

# SEATRACK 2026

## GLS modes currently used in SEATRACK!

updated

Please note: Migrate Tech GLS provided by SEATRACK in 2026 are started in the modes we recommend below.



Migrate Tech geolocators currently used in SEATRACK

Model	Size (mm)	Weight (g)	Mode	Est. battery life (months)	Light		Immersion		SST
<b>c331</b> 	17 x 19 x 6	3.4	9	36*	<b>Unclipped,</b> 1 -74klux	60s->5m	-	6s	**
<b>W30A9-SEA-NOT</b> 	15 x 5 x 4	0.45	6	13	<b>Unclipped,</b> 1 -74klux	60s->5m	-	30s->10m	
			7	12	<b>Unclipped,</b> 1 -74klux	60s->5m	0-50	6s->5m	**
<b>c65_super</b> 	14 x 8 x 6	1	7	21	<b>Unclipped,</b> 1 -74klux	60s->5m	0-50	6s->5m	**
			9	19	<b>Unclipped,</b> 1 -74klux	60s->5m	-	6s	**
<b>c180</b> 	116 x 10 x 8	1.7	6	36	<b>Clipped,</b> 1 -1.2klux, clipped	60s->5m	0-20	30s->10m	**
			9	24*	<b>Unclipped,</b> 1 -74klux	60s->5m	-	6s	**

\* 22 months estimated recording duration of light data in mode 9

\*\*after 20m continuously wet and thereafter max, min & mean temperature recorded every 8h

# SEATRACK 2026

## GLS modes currently used in SEATRACK!

updated



### How to distinguish between c65\_super and c180

**Note:** The c65\_super and c180 models look very similar.

The most reliable way to distinguish them is by **size** — the **c180 is slightly larger than the c65\_super** due to its larger battery. Aside from this size difference, the devices share a very similar in shape.



c180



c65\_super

# SEATRACK 2026

## GLS mode setup

updated

Please note: Migrate Tech GLS provided by SEATRACK in 2026 are started in the modes we recommend below.

Please find our setup for the different species and age combinations below:

For all adult individuals, regardless of species, we suggest:

Logger model	Mode	Light range
c331, c65_super, c180	9	unclipped/full
w30	6	unclipped/full

For juveniles we suggest:

Species	Logger model	Mode	Light range
Little auk  Atlantic puffin 	c65_super	7	unclipped/full
Black-legged kittiwakes  Common guillemot  Brünnich's guillemot 	c180	6	clipped
Glaucous gull  Great skua 	c331	9	unclipped/full

# SEATRACK 2026

## Discontinued GLS models

### Discontinued geolocator models in SEATRACK

**c250** Migrate 2.6 g 17x18x6 mm 5 years  
Technology

Light: Clipped range, sampled every minute, max value recorded every 5 minutes

Immersion: State obtained every 30 sec. Recorded in 10 min bins (0:20)

SST: Measured continuously after 20 minutes submersion, max, min and mean recorded every 4 hours.

**c330** Migrate 3.4 g 17x19x6 mm 4 years  
Technology

Light: Clipped range, sampled every minute, max value recorded every 5 minutes

Immersion: State obtained every 30 sec. Recorded in 10 min bins (0:20)

SST: Measured continuously after 20 minutes submersion, max, min and mean recorded every 4 hours.

**mk4093** Lotek 1.5 g 15x10x6 mm 2 years

Light: Maximum value recorded every 10 minutes

Immersion: State obtained every 3 sec, recorded in 10 minute bins (0:200)

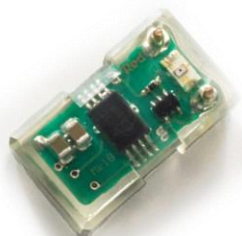
SST: Does not record SST

**c65/f100** Migrate 1 g 14x8x6 mm 1-2 years  
Technology

Light: Clipped range, sampled every minute, max value recorded every 5 minutes.

Immersion: State obtained every 30 sec. Recorded in 10 min bins (0:20)

SST: Measured continuously after 20 minute submersion, max, min and mean recorded every 8 hours (accuracy considered very low for c65 and w65)



# What loggers should be redeployed?

updated

- We recommend reusing GLS loggers of model mk3006 and mk4083 produced in 2025
- See table below for the serial numbers of loggers with enough battery to be redeployed. In **colour** are serial numbers for loggers that are **not recommended** to be redeployed in SEATRACK, but which still can hold battery capacity of >6 months.

Model		
	2024	2025
mk3006	B9247 – B9999 F0000 – F0102	F0183-F1277
mk4083	C9602 – C9999 G0000 – G0980	G1006 -G1961
c65_super	/	CX555 -CX996 CY000 – CY999

All GPS loggers should be retrieved. If possible, please attempt to download the data and send the devices back to us.



If you decide to redeploy GLS, please remember to note and keep track of start times. Note clearly time zone, preferably GMT. Please use the “LOGGER STARTUPS sheet” in the [metadata template](#).

# Equipment needed for GLS deployment

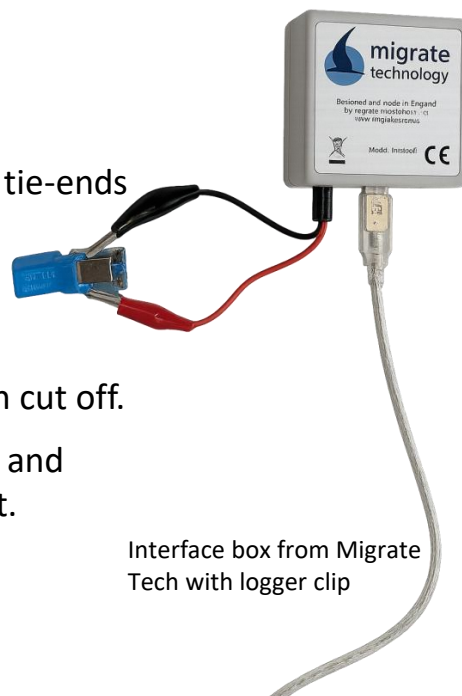
NEW

All partners will be or have been provided with:

- Loggers
  - All loggers sent to participants in the project have already been started in the recommended modes.
- Interface boxes
  - Please contact project-staff if you are missing interface boxes needed for downloading data from either Migrate Tech or Lotek loggers.

• Logger clip → more about these on the next page

- Colour rings / Logger mounts
- Cable ties
- Cable tie-pistol
  - For strapping cable ties & snipping loose cable tie-ends
- Amalgating tape
- Super glue
  - A drop of superglue should be placed in the cable tie lock after the loose cable tie end has been cut off.
- If participating in ARCTOX sampling bags, syringes, and vials will be provided by Jerome Fort by agreement.
- In addition, all teams should be equipped with:
  - Ringing pliers and circlip pliers
  - Metal rings
  - Wing ruler
  - Callipers
  - Spring balance/scales
  - Bird bags
  - Notebook and pens



Interface box from Migrate Tech with logger clip



Logger clip

# Equipment needed for GLS deployment

NEW



- Some of you received a logger clip this year. We plan to make sure everyone gets one in the next years.
- The clip allows you to connect the GLS to your computer via the interface cable which makes starting the loggers and downloading data easier.
- Instructions from Migrate Tech below:



## C330/C331/C65/W65A/W30A Intigeo logger clips



If desired, the gold coloured metal connection terminals on the logger can be shortened by carefully cutting down with wire cutters. Do not cut into the plastic of the logger. The clips shown below will enable the IntigeoIF interface unit to connect to loggers as received from us, as well as most with cut down or worn down terminals. The shiny metal tabs on the clip must make a metal-metal contact between the logger terminal and crocodile clip. The two shiny metal tabs must not be touching each other for communication to function.



1 - C330/C331 and C65/C65-SUPER combo clip. Note interface clip polarity. With C65 fitted in the combo clip, reverse the red and black connections (as below).



2 - C65/C65-SUPER clip. Note clip polarity. The logger shown does not have cut down terminals.



3 - W65A/W30A clip. The logger can be tried with serial number facing out or in but remember to reverse the red and black connections if facing in. The logger shown has cut down terminals.

# Equipment needed for GLS deployment

**NEW**

## Tip for handling rings:

- It can be **helpful to warm the rings** before using them to deploy GLS on the birds. This is especially important for **Arctic fieldwork**, as gently heating plastic rings beforehand can make them easier to apply.
- You can warm the rings either by placing them in **warm water that you bring to the field** or by **keeping them close to your body**, so they warm up through body heat.



**NEW**

## Use of GLS across new and previously tagged individuals:

- GLS do not need to be deployed exclusively on new individuals; redeployment on previously tagged individuals is also possible. Ideally, the deployment would include a **mix of both previously tagged and new individuals**. However, we understand that this may not be feasible.

# Mounting of mk3006 & c330/331

updated

1. Optionally, you can wrap the logger groove (where the cableties will sit) with amalgating tape. **DO NOT COVER THE LIGHT SENSOR.**
2. Place the ring on the bird's tarsus
3. Thread two cable ties through the ring, one from each side.
4. Loop the cable ties but do not tighten them too much.
5. Place logger inside the cable tie loops and tighten with pliers and/or cable tie strapper. It is important that the terminals (golden pins) should always face outwards, away from the bird's leg.
6. Make sure that when you tighten the ties, that the locks fall within the groove and over the opposite cabletie.
7. Cut the loose cabletie-ends off by the lock and put a drop of superglue inside the lock.
8. Make sure that the light sensor is not covered and everything is tight and ok, if so release the bird.

- 1.) Note that the cable ties must be threaded one from each side, i.e. not the same way.
- 2.) Do not tighten the cableties fully until you have positioned both ties in the groove of the logger so the locks' edges clamp down on the opposite tie.

Note: It is not necessary to apply glue under the tape; instead, it is best to place a small drop of glue on the cut-off ends of the cable ties

Note correct position of cabletie locks

# Mounting of mk4083 & c65\_super

updated



It can be helpful to bend the tip of the cable tie to make it easier to thread through the holes.



Note: It is not necessary to apply glue under the tape; instead, it is best to place a small drop of glue on the cut-off ends of the cable ties

1. Remember to wrap the logger groove (where the cabledies will sit) with self amalgamating tape. **DO NOT COVER THE LIGHT SENSOR.**
2. Place the ring on the bird's tarsus
3. Thread a single cable tie through the pre-drilled holes in the ring. Note that it can be stiff and tight but it still should fit.
4. Place logger (with amalgating tape) inside the cable tie loop and tighten with pliers and/or cable tie strapper. It is important that the terminals (golden pins) should always face outwards, away from the bird's leg. When mounting the smaller loggers, the terminals should be on the lower half of the logger relative to the bird's leg.
5. Cut the loose cabletie-end off by the lock and put a drop of superglue inside the lock.
6. Check that the light sensor is not covered and everything is tight and ok, if so release the bird.



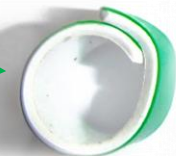
Note that in some cases loggers can be attached to smaller logger-mounts that can be placed above the metal-ring. Note though that the logger-mount should in no way be attached to the metal ring.

# GLS-logger deployment

Keep in mind...

- The geolocator is purely archival; you must recover the instrument in order to get the data. Therefore, logger deployment should mainly be limited to breeding birds which can be trapped again at the same location in another year (a **mix of both previously tagged and new individuals**).
- Amalgating tape increase friction to keep logger and cable ties in place.
- Amalgating tape is very elastic and it is enough to use a piece of half a centimeter width or less. Wrap it tightly around the logger where the cable tie will be. **This can be done before heading out trapping and we advise you to do so to minimize handling-time.**
- Loggers **should not** be mounted on doubly wrapped rings beforehand.

*Partially overlapped  
(x 1.2) ring.  
Logger can be  
mounted beforehand*

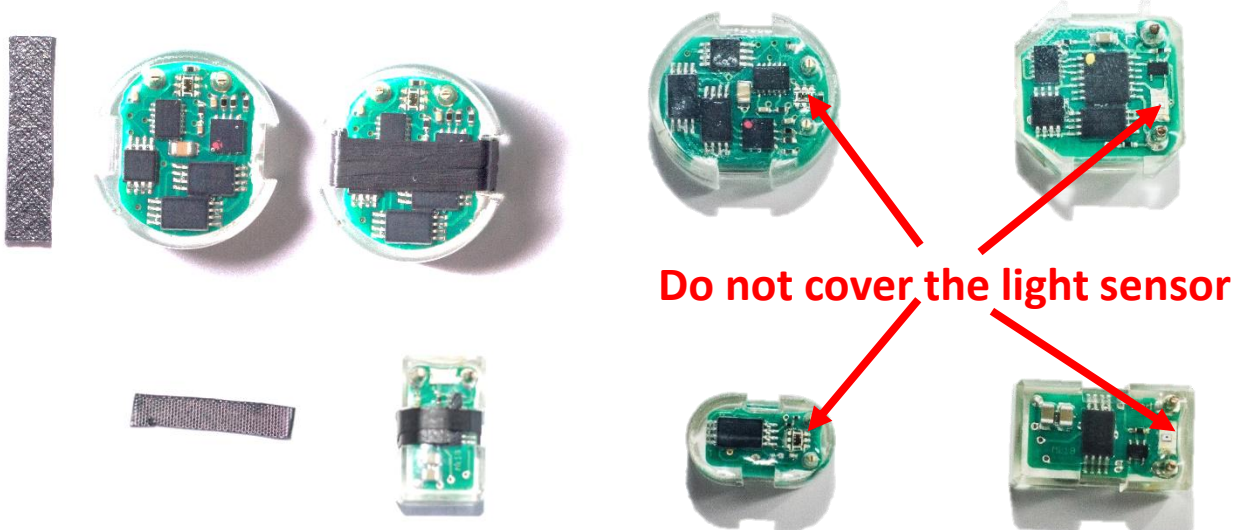


*Fully overlapped/doubly  
wrapped (x 2.2) ring.  
Logger should **NOT** be  
mounted beforehand*



- **BE VERY CAREFUL NOT TO COVER THE LIGHT SENSOR!**

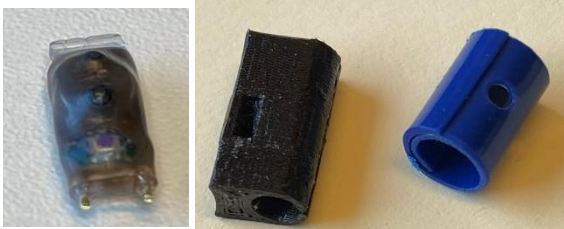
It is essential that you do not cover the light sensor when attaching the logger to the bird! Otherwise, the data will be useless.



# Mounting of w30A9

## Arctic tern (ARTE) and Leach's storm petrel (LSP)

### GLUE and ring material

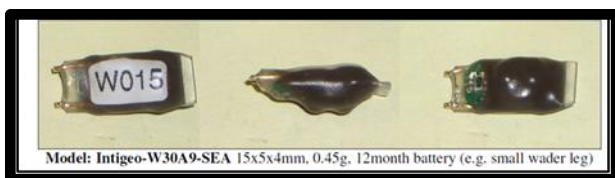


3D-printed nylon plastic rings for LSP (left) and PVC plastic rings for ARTE (right)



- The plastic materials used to produce the rings supplied for ARTE (PVC) and LSP (3D printed nylon plastic ) do NOT attach well to the standard Loctite super glue we supply for the other rings/species.
- Instead you should use **Loctite super glue ALL PLASTICS** which is supplied by us together with the loggers and the rings. [https://www.loctite-consumer.co.uk/en/products/super-glue-liquid/super\\_glue\\_all\\_plastics.html](https://www.loctite-consumer.co.uk/en/products/super-glue-liquid/super_glue_all_plastics.html)
- It consists of an activator pen which you apply first and an all plastics super glue which you apply after 60 sec.
- Practise application of glue before going in the field
- Note that the black cap may easily get stuck to the transparent base of the top. If so, try to use two plyers to reopen.
- Also, bring a spare tube in the field.

### Loggers



- Intigeo--w30A9-SEA by Migrate Technology for ARTE and LSP.
- 15 x 5 x 4 mm, 0.45 gram
- 12 month battery. We started them (with a delay) just before sending them to you- to maximize the battery life for the deployment period.

### Cable ties or glue only

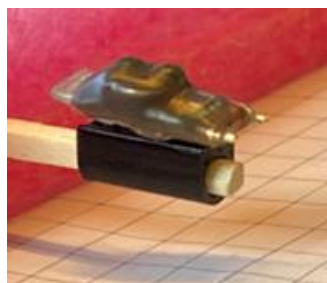


- We use **1.6 mm** wide cable tie for ARTE (left)
- We use only glue (all plastic) for LSP (right)

# Mounting on Leach's storm petrel (LSP)

## Mounting on leg [pre-mounted loggers]

1. The logger comes pre-mounted on the 3D-printed ring, attached with glue only. Hence, loggers are already well glued and attached to the ring.



NOTE:  
LOGGER-ID is written on the plastic bag.

2. Mount it on the leg (tarsus) with gold pins pointed up to avoid damage to foot webbing of the LSP.
3. Open the ring by using two applicators (same as passerine banders use to put color bands). Remove the applicators to close the ring around the tarsus.



4. Glue: Apply the activator pen on both sides of the slit before or after closing the ring. After closing the ring and 60 sec after the activator pen, apply the all plastic super glue along the slit.
5. Tape: Add a thin line of Tesa tape over the slit (lower right picture). Let the glue soak into the tape. Note: You need to get the tape yourself. Tesa-4671-25-mm (white, 25 mm) [Tesa 4651 Gaffa Tekstiltape 19 mm - Transportkasser & Flightcase produsent siden 1983](#)



Photos/method credit: April Hedd, Dave Fifield, Børge Moe.

# Mounting on Arctic tern (ARTE)

## Mounting on leg [pre-mounted loggers]

- Loggers are pre-mounted on the PVC ring attached with 1.6 mm cable tie. Already well glued to the ring.
1. Mount it on the leg (tarsus) with gold pins pointed down to have light sensor away from body (we don't think potential damage to foot webbing is an issue here).
  2. Use your fingers and nails to open the ring and wrap/work it around the leg.



Note: The plier tooth is meant to represent the leg and not a method to open the ring

NOTE:  
LOGGER-ID is written on the plastic bag.

3. Activator: Apply the activator pen along the opening of the ring
4. 60 sec after the activator, apply the all plastic super glue.



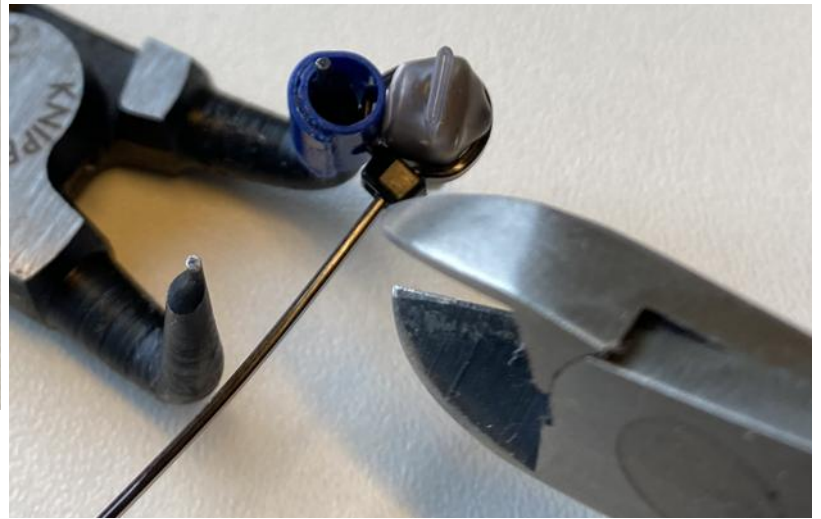
2 examples of logger on PVC ring on ARTE tarsus.

Note: The plier teeth are meant to represent the legs and not a method to open the rings

# Mounting on Arctic tern (ARTE)

## Mounting on leg

- Loggers are not pre-mounted on the PVC ring



1. Ring: Use your fingers and nails to open the ring and wrap/work it around the leg (left picture)
2. Thread the 1.6mm cable tie through the holes.
3. Activator: Apply activator inside the overlap of the ring.
4. GLUE: Apply all plastic super glue inside the overlap of the ring to firmly close the ring.
5. Activator: Apply activator on back of the logger and on the ring surface
6. GLUE: Apply all plastic super glue on the back of the logger
7. Tighten the cable tie carefully around the logger with the cable tie pistol- but DO NOT AIM to use the pistol to CUT because this cable tie may easily break.
8. Cut the cable tie with another cutter (right picture)
9. GLUE: Apply all plastic super glue between the logger and the ring
10. GLUE: Apply all plastic super glue around the cable tie (do not cover the light sensor)

# Retrieval

- At retrieval remove the logger from the plastic ring and if you are so inclined, replace it with a new logger.
- Preferably take all measurements requested (see '[Field Notes and Metadata](#)'), but at the least weigh the bird and note down the bird's breeding status.
- Take feather samples (see sampling protocol – additional feather samples and blood if sampling for ARCTOX)
- If you do download the files directly, please send a copy to [Julian.Evans@nina.no](mailto:Julian.Evans@nina.no) or [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no)

Whether you do so or not, all GLS-loggers, other than those redeployed, should be sent to:

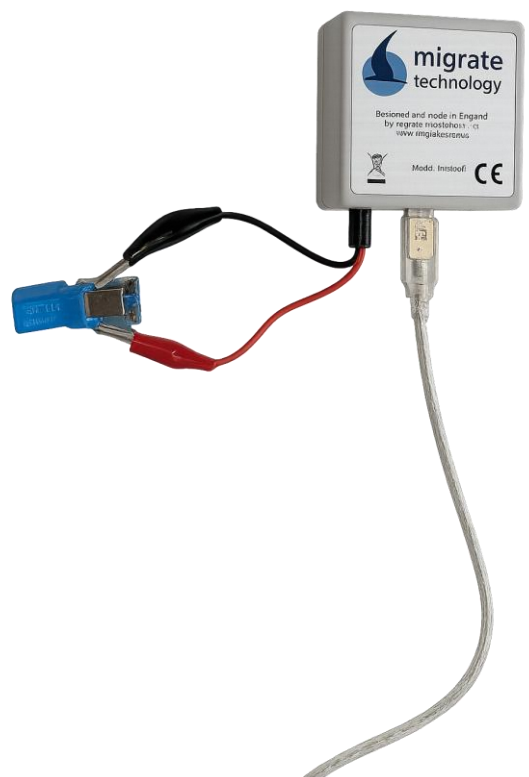
**Norsk Polarinstitutt  
Att: Svenja Neumann  
Postboks 6606 Stakkevollan  
N-9296 Tromsø  
NORWAY**

- Regardless of the data having been downloaded or not. If you have attempted to download before sending the loggers to Tromsø, please include a list of which loggers were successfully downloaded and which ones gave an error message. For this purpose, a template can be found this year as a separate sheet in the METADATA-file that is distributed to each participant!



# Downloading GLS-loggers

- **NB!** *The only loggers that SEATRACK requires to be downloaded during the field season are loggers intended for redeployment. However, all loggers should preferably be downloaded by participants on retrieval, if possible, and the files sent to [Julian.Evans@nina.no](mailto:Julian.Evans@nina.no) or [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no). The sooner the logger is downloaded, the better. If you are not able to download yourself, SEATRACK staff will do it for you. All loggers should be sent to Tromsø at the end of the field season, where we are able to attempt a second download if anything went wrong the first time.*
- If you are able to download the data, we urge you to do so but be very careful not to wipe the memory, unless you have a logger intended for redeployment.
- Wiping the memory happens at different stages in the downloading process varying between producers:
- Lotek (Biotrack) loggers wipe the memory when they are turned off/sent to sleep mode,
- If you do not intend to redeploy the logger – be sure to select **NO** when presented with the last question in the downloading process in “Communicate.exe” after downloading data from, mk3005, mk3006, mk4083 and/or mk4093.
- **Migrate technology** loggers need to be turned off to be downloaded, the memory is wiped when they are started again. It is very important that you make sure that you have the latest versions of the software from Lotek and Migrate Technology ([page 7](#)).



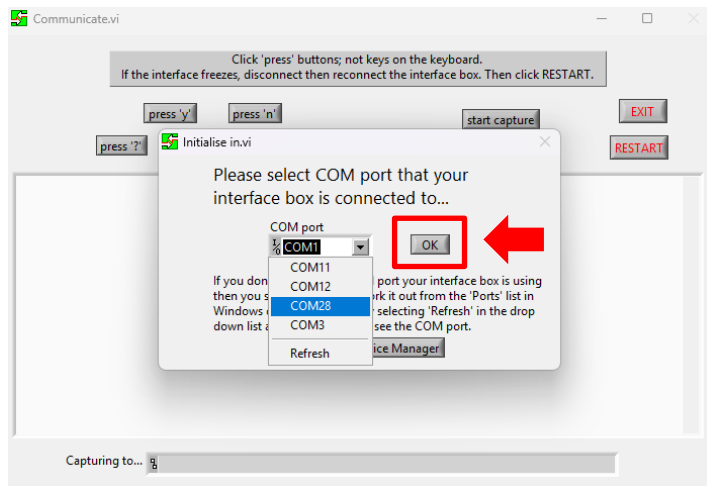
# Downloading Lotek GLS-loggers

In this section the download procedures for GLS loggers produced by Lotek (formerly Biotrack; mk4093, mk4083, mk3005 and mk3006) are described. Data can also be downloaded by SEATRACK staff. If you download the data yourself, please send a copy of the .txt files.

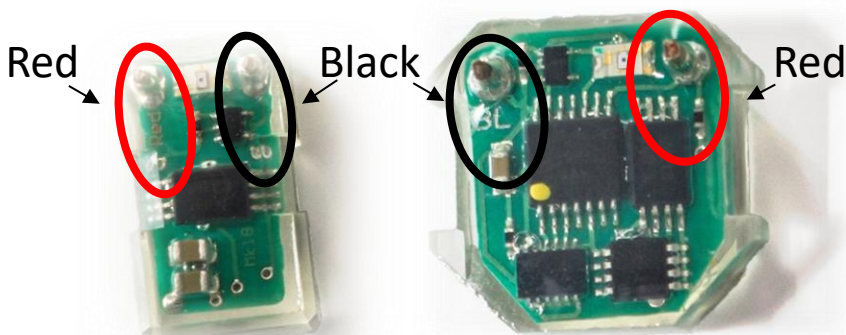
It is important that you make sure that you have the latest versions of the software from Lotek (Biotrack) ([page 7](#)).

## The step by step downloading procedures are as follows:

1. Plug the interface box in to a USB communication port (COM port) of a computer on which the software has been installed.
2. Select and open "Communicate.exe"
3. Select the COM-port to which the interface box is connected, it is often the highest numbered port on the list. If you are having problems finding the correct COM-port you can find it via Windows Device Manager (Start -> Control Panel -> System -> Hardware -> Device Manager -> Ports for XP); most likely under 'USB Serial Port'. Some trial and error may be needed at first.

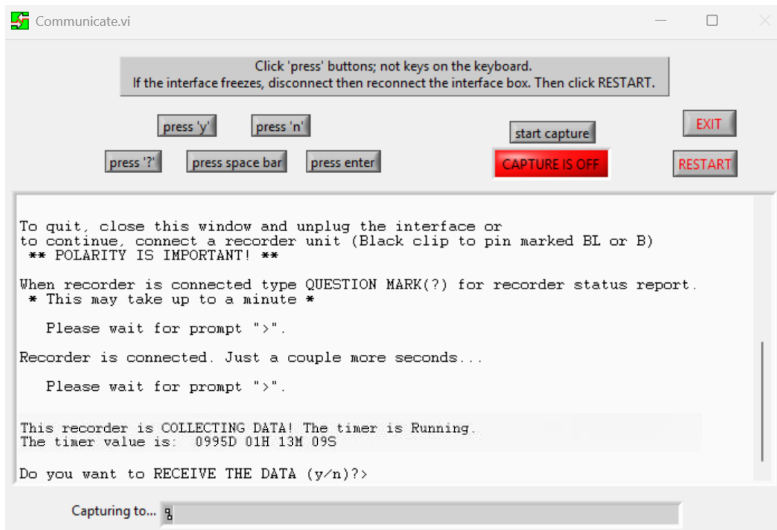


4. When you have the dialog window up and running, connect the red and black clips to the golden pins on the logger. **Polarity is important** and on the logger, by either pin, you should see markings; "BL", "Black", "R" or "Red", telling you which clip should go where. Reversing the clips will not damage the logger in any way, it will result in an error-message and you won't be able to download the data until you connect it again correctly. **The interface does not allow for using the keyboard** so be aware you will always need to click the buttons with your mouse. **Use the mouse cursor to select the button marked "press "?"**.



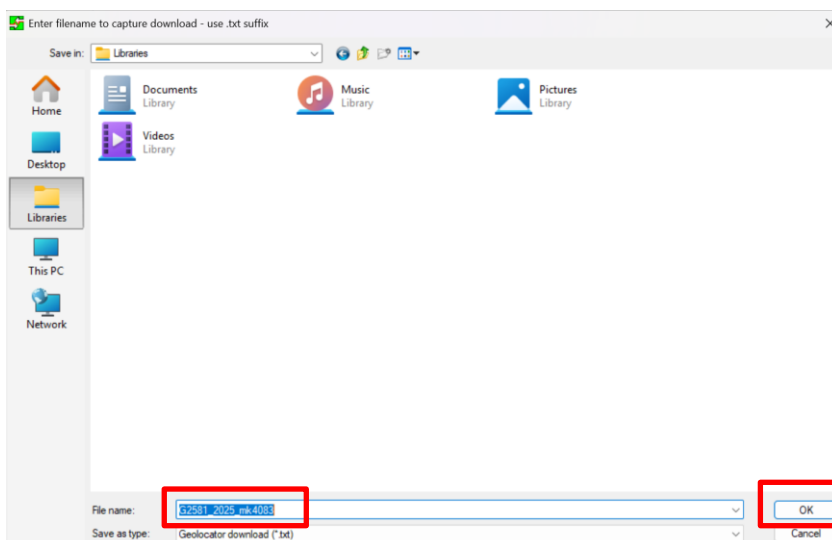
# Downloading Lotek GLS-loggers

- When you have connected the logger correctly and pressed the “press “?”” button the interface will connect with the logger and show the logging status, e.g., “logger is connected” and if everything is working as it should be: “This recorder is COLLECTING DATA! The timer is Running. The timer value is: XXXXD XXH XXM XXS”.



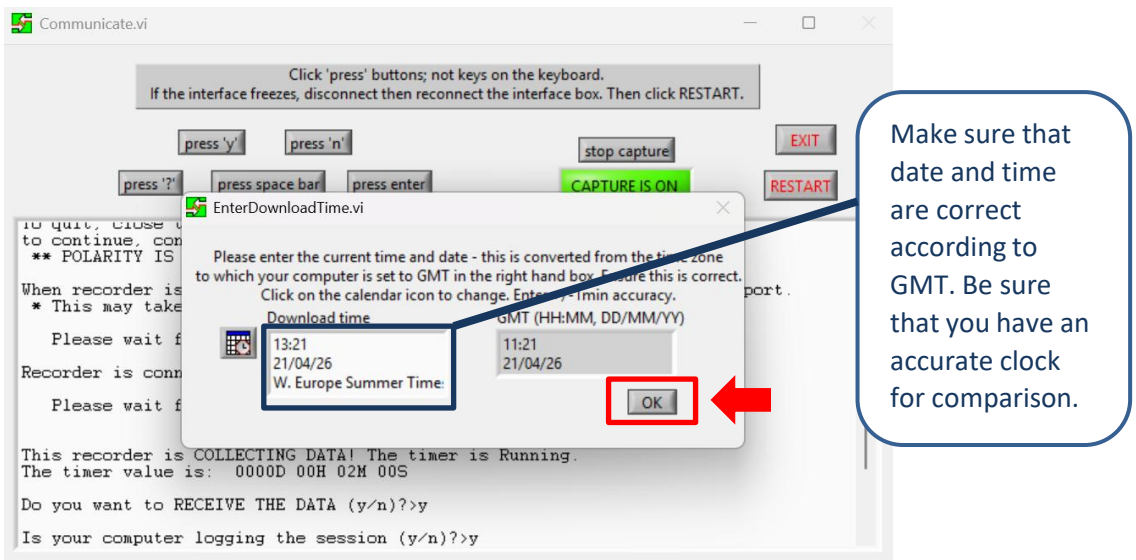
updated

- You will then be asked if you want to “RECEIVE THE DATA (y/n)?”. Press the “Press “y”” button in the interface with your mouse cursor.
- Now a window will pop up asking you to specify what you want to name the file you are about to download and where you would like to save it. **Files must be named using loggerID, year downloaded and model, separated by “\_” , e.g., “G2581\_2025\_mk4083.txt”** for a mk4083 logger retrieved and downloaded in 2025. When you have entered a name and a location to save the file in, press OK.

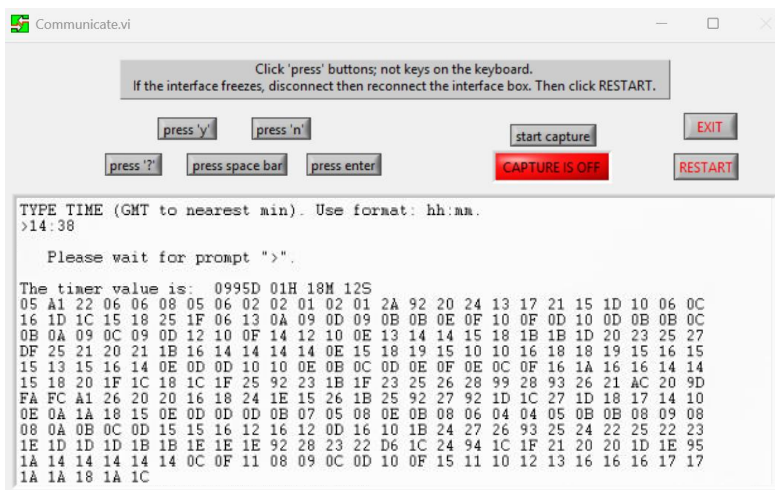


# Downloading Lotek GLS-loggers

- Next you will be asked to enter, or more likely confirm, the download time. The time is adjusted to the time zone your computer is set to in the left hand display but GMT on the right. If the time is ok select "OK" if not adjust the time but be aware to use the same format, and then click "OK". (NOTE if backspace is used the timer value in the .txt file must be adjusted).

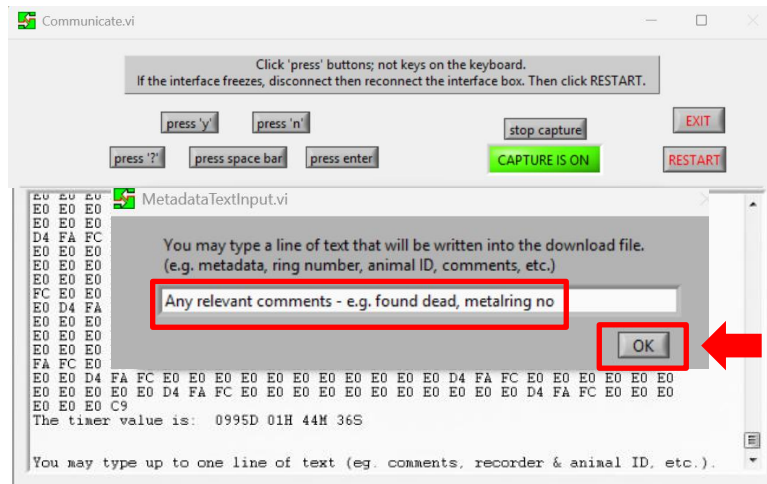


- Now downloading commences, first the timer value will appear again and then a long sequence of numbers and letters. This might take several minutes, the more data the longer the download will take.

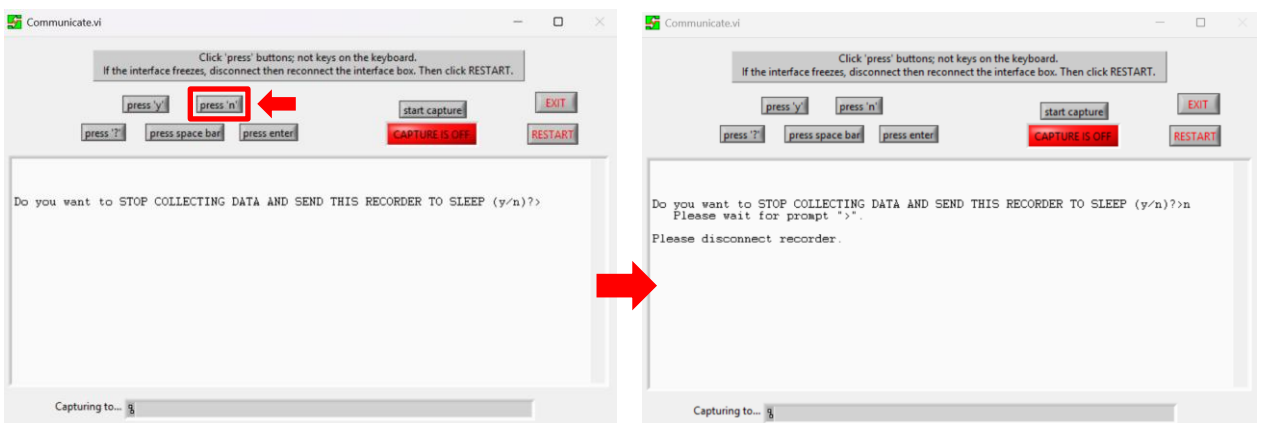


# Downloading Lotek GLS-loggers

- When the data is downloaded a “MetadataTextInput.vi” window will pop up where you can enter any relevant comments. However this is not necessary and all info entered into this window should also be entered into the metadata-file. Press “OK”



- Now you are asked in the interface: “Do you want to STOP COLLECTING DATA AND SEND THIS RECORDER TO SLEEP (y/n)?” If you do NOT intend to redeploy the logger it is very important that you press the “press “no”” button on the interface. By sending a Biotrack logger to sleep you effectively erase its memory, do NOT do that UNLESS you intend to restart the logger for redeployment! If you select “Press “yes”” by accident there is a fail-safe, you will be asked if you are sure and then, be sure to select “Press “No””!



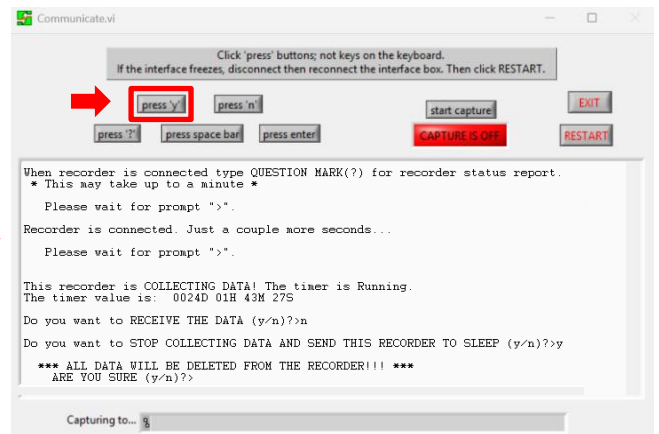
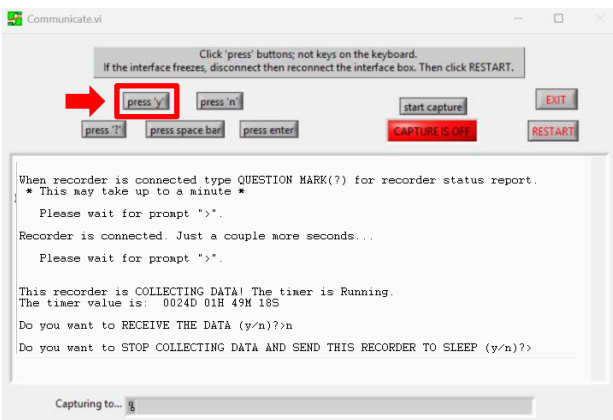
- After selecting “Press “No”” you are asked to disconnect the logger, do so and the procedure is over, you can either shut the program down or start the process again to download another logger.
- If you intend to restart the logger and redeploy it see the following page.

# Restarting Lotek GLS-loggers

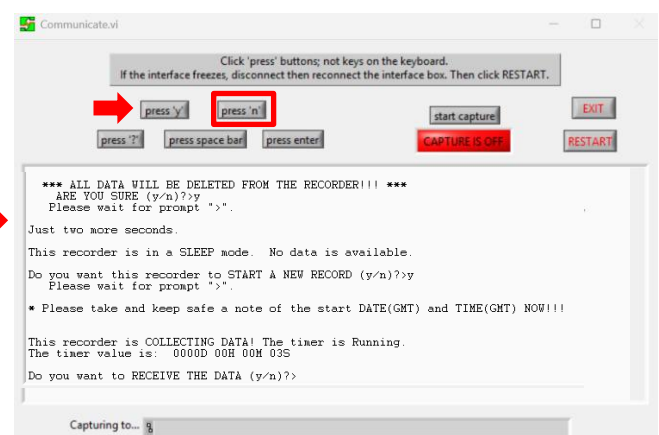
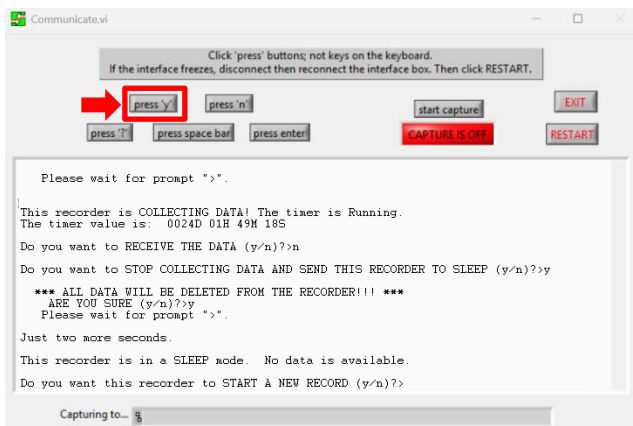
(Only loggers that are intended for redeployment)

1. Set the logger to sleep mode\*. If you have just downloaded the logger and have been presented with the window asking: "Do you want to STOP COLLECTING DATA AND SEND THIS RECORDER TO SLEEP (y/n)?", press the "press "y"" button on the interface. You will be asked if you are sure and informed that the memory will be erased. Select yes.

*\*If you have safely downloaded the data in an earlier session simply connect the logger with the interface-box, select "press"?" and wait for the prompt and "press "no"" when asked if you want to download the data. You will subsequently be asked if you want to put the logger to sleep.*



2. Now you will be informed that the logger is in SLEEP mode and No data is available. You are then asked: Do you want the recorder to START A NEW RECORD?", select "Press "yes"". You are then prompted with the message: "\* Please take and keep safe a note of the start DATE(GMT) and TIME(GMT) NOW!!!". Please DO SO and make sure beforehand that you have an accurate clock, preferably an online one, for comparison. **Note the start date and time (GMT) down in the LOGGER STARTUP sheet of the metadata template.**



3. Now you will be informed that : "This recorder is COLLECTING DATA! The timer is Running. The timer value is: 0000D 00H 00M 03S". Subsequently you are asked if you want to RECEIVE THE DATA?, select "Press"no"" and finally you are asked if you want to STOP COLLECTING DATA AND SEND THIS RECORDER TO SLEEP? Select "Press"no"", wait for the prompt and disconnect recorder. It is ready for another deployment session.

# Downloading Migrate Technology GLS-loggers

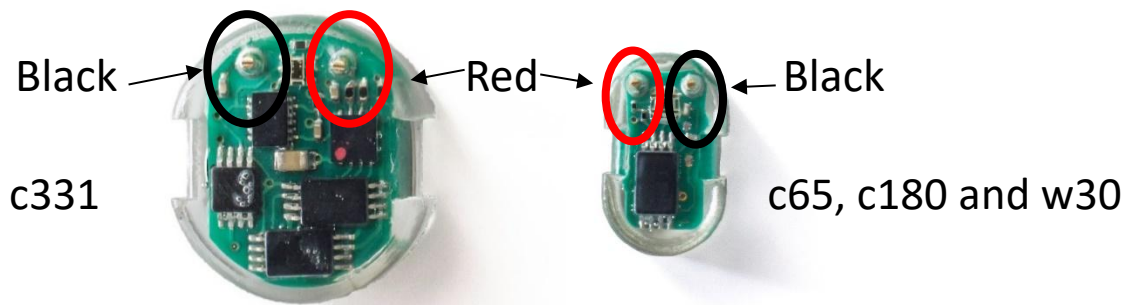
updated

*In this section the download procedures for GLS loggers produced by Migrate Technologies Ltd.*

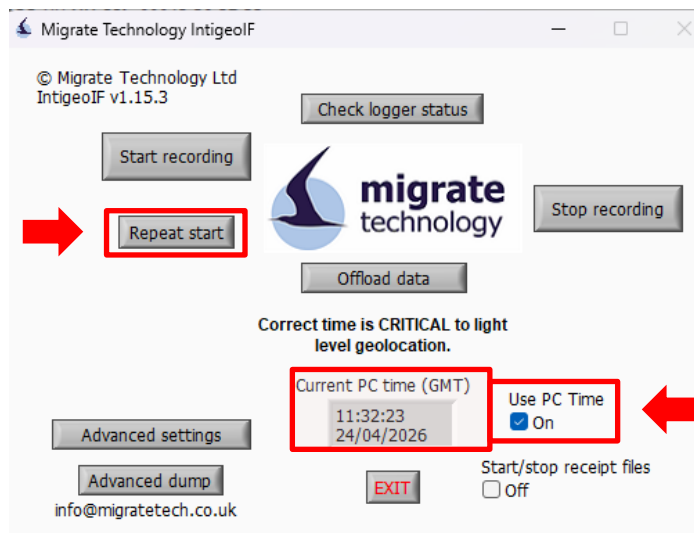
It is important that you make sure that you have the latest versions of the software from Migrate Technology (v1.15.3, [page 7.](#))

**The step-by-step downloading procedures are as follows:**

1. Plug the Migratetech interface box into a USB communication port (COM port) of a computer on which the latest Migratetech software has been installed.
2. Select and open “IntigeoIF.exe”
3. When you have the dialog window up and running, connect the red and black clips to the golden pins on the logger. **Polarity is important**, the figure below shows which clip should go where. Reversing the clips will not damage the logger in any way, it will result in an error-message and you won’t be able to download the data until you connect it again correctly.



4. First, select “Use PC Time” to get the current PC time displayed in GMT for **an accurate clock for comparison.**

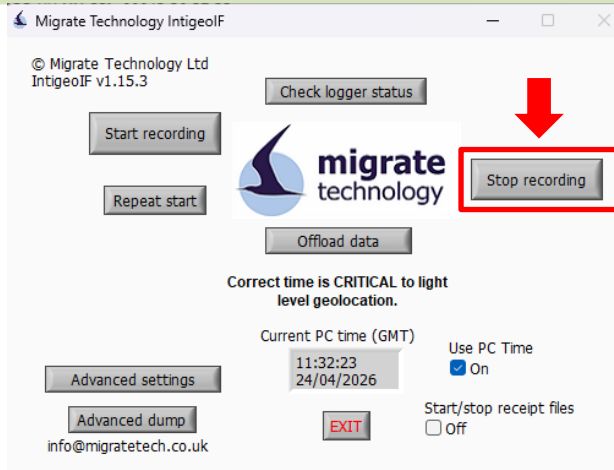


The “repeat start” button will appear once the “use PC time” option is selected. More about this function on [page 39.](#)

Click “use PC time” to get the current PC time.

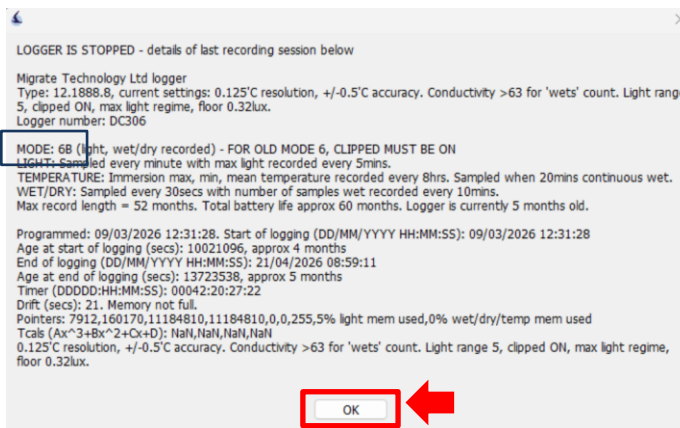
# Downloading Migrate Technology GLS-loggers

updated

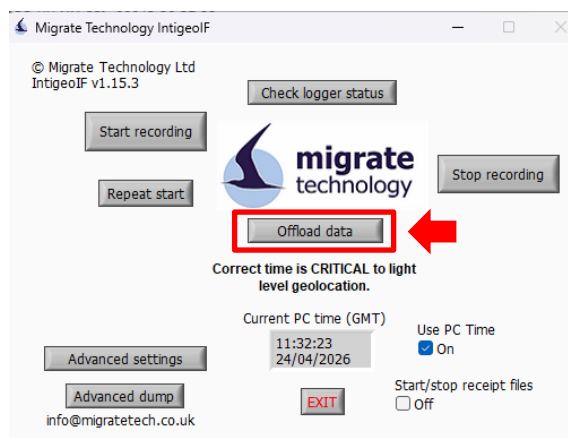


5. Note the difference in the procedures for Biotrack and Migratetech that to be able to download data from Migratetech loggers they must be turned off. Unlike the Biotrack loggers the memory is not erased when the logger is turned off but when it is restarted. When you have connected the logger to the interface select “Stop recording”. You will then be presented with a series of windows:

If a different mode is used, it will be displayed.



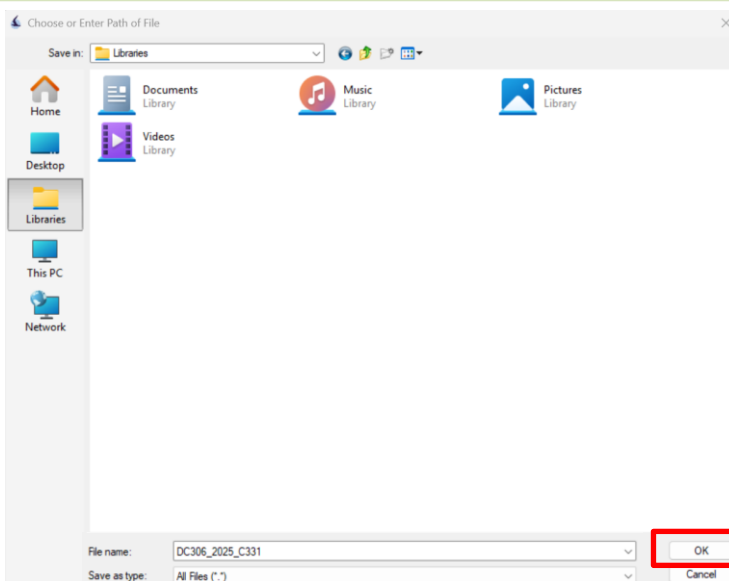
6. Next you will be presented with a window summarizing the stats of last log. Select “OK”, that will bring you back to the main interface module.



7. When you have securely turned the logger off, select “Offload data”, to start the downloading process.

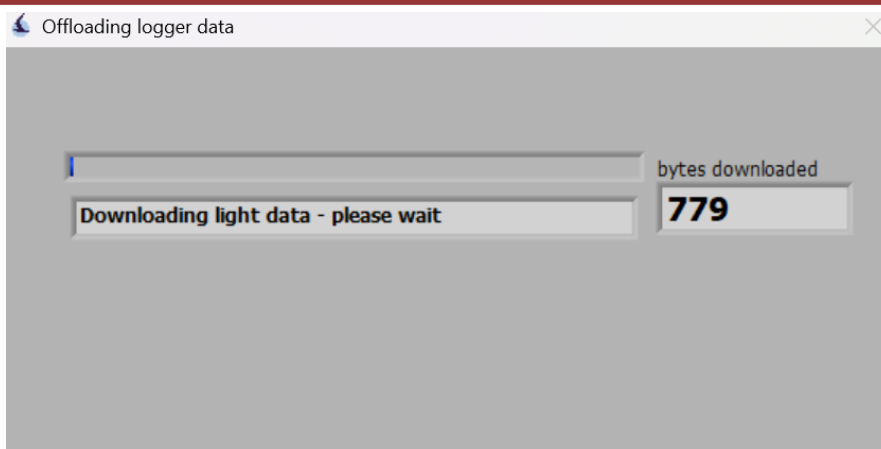
# Downloading Migrate Technology GLS-loggers

updated



updated

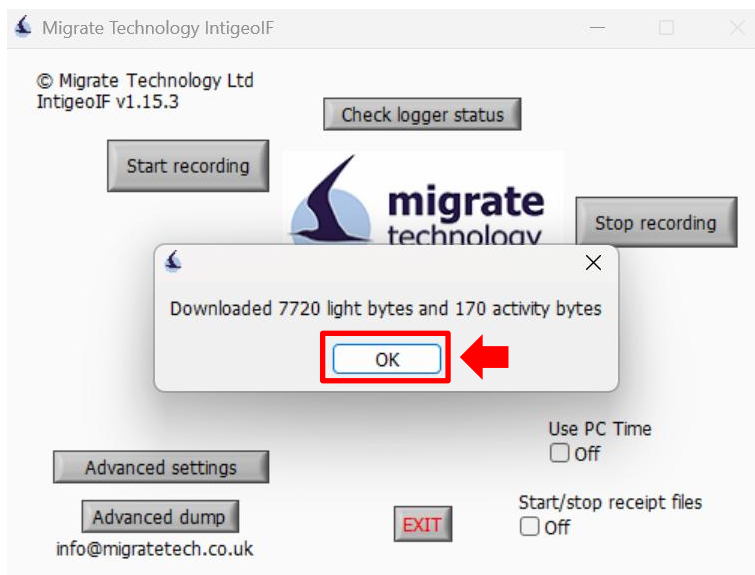
8. Then the program will ask where you want to save the downloaded files and under what name. The program suggests a name, based on the logger ID and download date and time. However, **for SEATRACK files must be named using loggerID, year downloaded and model, separated by “\_”, e.g., “R133\_2019\_c250”** for a c250 logger retrieved and downloaded in 2019, or **“CB476\_2021\_c65\_super”** for a c65 super logger retrieved and downloaded in 2021. Since the downloaded data is written to 7 different files, we recommend you create a folder to contain all files from each individual logger.



9. When you have selected where you want to save the files, the download commences. This process is much quicker than with the Lotek loggers but also varies with how long the logger has been recording and in what mode.

# Downloading Migrate Technology GLS-loggers

updated



10. When the download is finished you will be prompted with a summary window, select ok and the process is over, the download is complete. If you are redeploying a Migrate Technology logger, please make sure that all files have been downloaded before you start the logger up again.

Name	Status	Date modified	Type
DC306_2025_C331.deg	✓	21/04/2026 11:14	DEG File
DC306_2025_C331.rat	✓	21/04/2026 11:14	Rating System File
DC306_2025_C331.sst	✓	21/04/2026 11:14	Microsoft Serialised Certificate St...
DC306_2025_C331driftadj.deg	✓	21/04/2026 11:14	DEG File
DC306_2025_C331.lux	✓	21/04/2026 11:14	LUX File
DC306_2025_C331.ral	✓	21/04/2026 11:14	RAL File
DC306_2025_C331driftadj.lux	✓	21/04/2026 11:14	LUX File

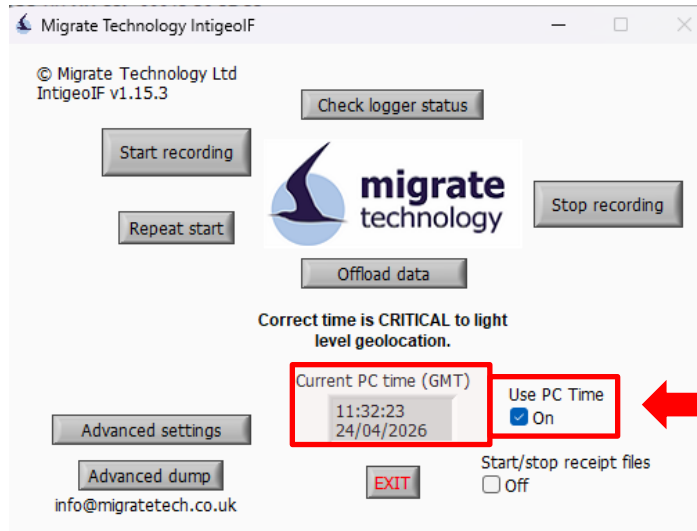
11. From each logger you should receive 7 different files, \*.deg, \*.lux, \*.ral, \*.rat, \*.sst, \*driftadj.deg and \*driftadj.lux. Afterwards, please ZIP the folder containing all the files and send it to [Julian.Evans@nina.no](mailto:Julian.Evans@nina.no) or [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no)

# Start-up/restarting Migrate Technology GLS-loggers

updated

- **NB! only after you are sure you have successfully downloaded the data from previous deployment.**

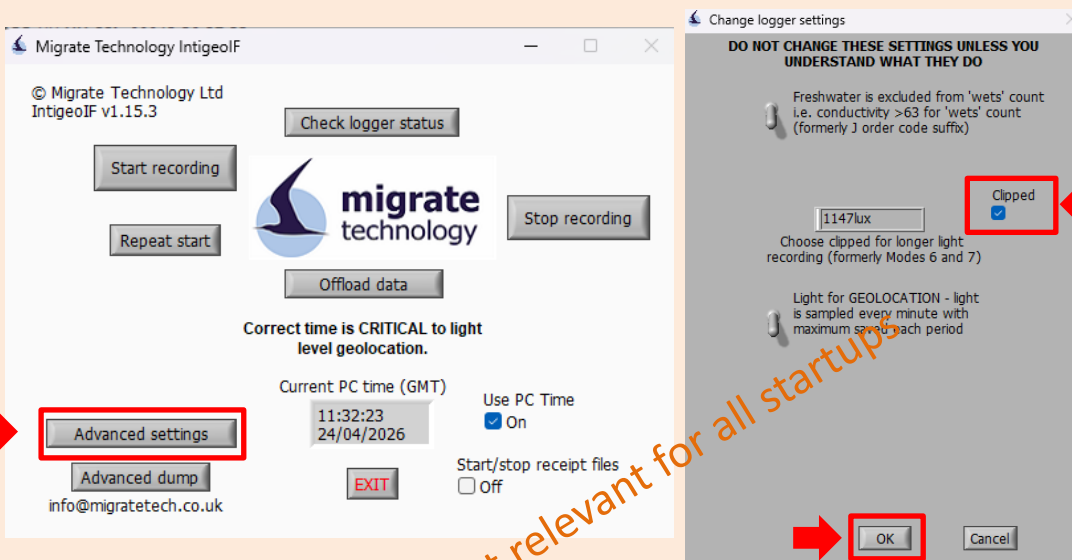
1. First, select “Use PC Time” to get the current PC time displayed in GMT for **an accurate clock for comparison.**



Click “use PC time” to use the current PC time.

1b) **This step only applies if you start a logger with clipped range** (see [logging modes](#)) or change clipping settings. If you would like “unclipped” you don’t have to open advanced settings as unclipped is the default.

If you would like to select “clipped” open the main module select “Advanced settings”. Next you are presented with a window where you have to select if light range should be **clipped**. Check this box. This is the important step.



In this example, we selected the **clipped light range**.

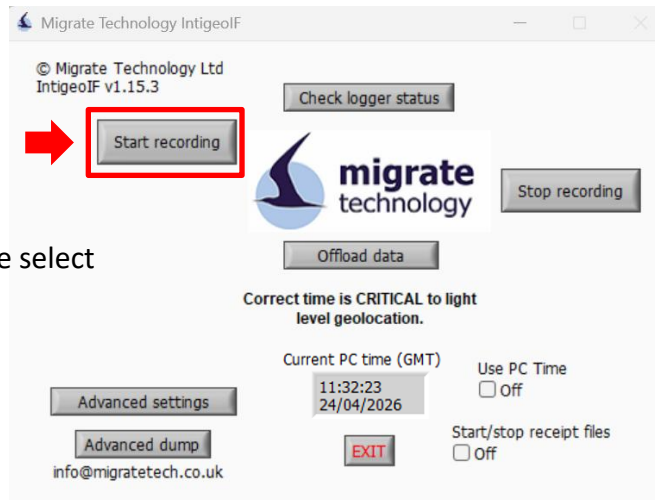
However, depending on the species and age of the bird, a different mode may be more appropriate.

See our mode setups on [page 12](#)

# Start-up/restarting Migrate Technology GLS-loggers

updated

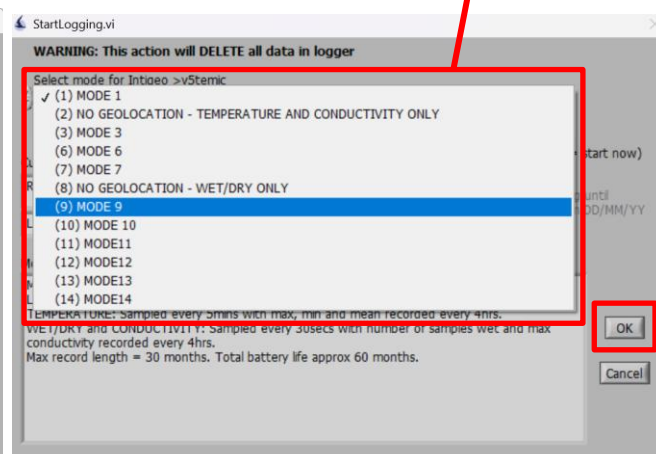
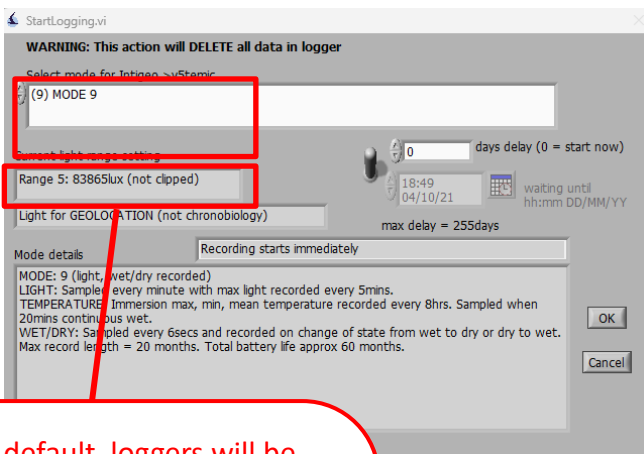
- **NB! only after you are sure you have successfully downloaded the data from previous deployment.**



2. In the main module select "Start recording".

In this example, **mode 9** has been selected. However, depending on the **species and age of the bird**, a different mode may be more appropriate.

See **our mode setups** on [page 12](#)



By default, loggers will be unclipped. However, depending on the **species and age of the bird**, it may be more appropriate to use a clipped light range.

See **our recommendations** on [page 12](#) and check clipping on startup. See **previous page** for changing clipping settings.

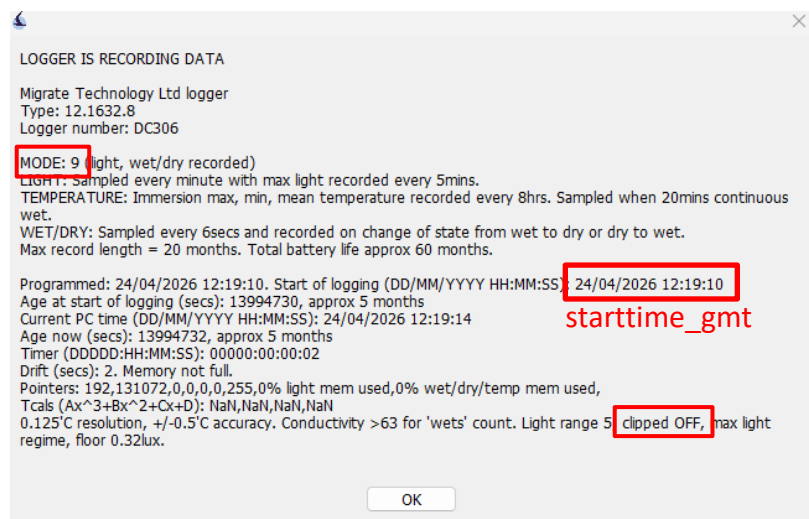
3. Next you are presented with a window where you have to select recording mode. When first opened "Mode 1" is automatically selected, make sure to change this to the **mode you would like to use** before selecting "OK"! This is the important step. (Note that 'range' can be 4 or 5 depending on logger model/firmware version)

# Start-up/restrating Migrate Technology GLS-loggers

updated

In this example, a **c331 logger** was started for an adult individual in **mode 9 with unclipped light range**. However, depending on the **species and age of the bird**, a different mode may be more appropriate!

See [our mode setups on page 12](#)

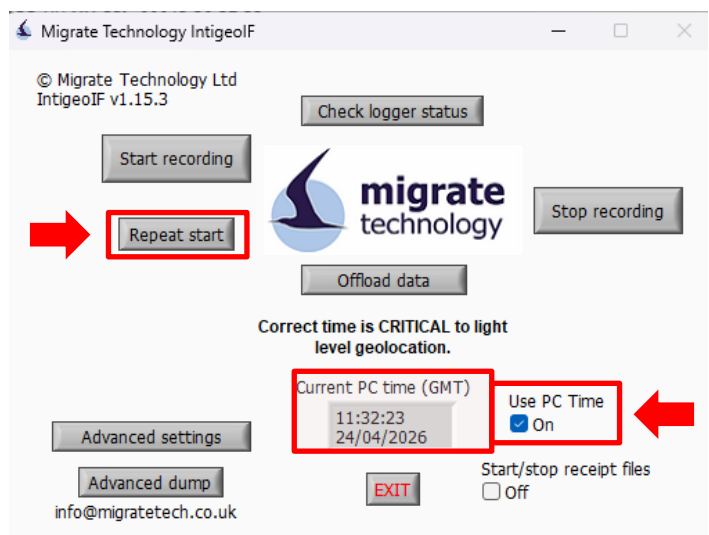


4. When you have successfully turned the logger on, this message appears, double check whether MODE and /or start time are ok. Then you can proceed, either to processing the next logger or exit the program.

After starting the logger **note the start date and time (GMT) and mode down in the Metadata-template in the "LOGGER STARTUPS" sheet.**

## Repeat startups

If you have multiple devices that you want to start all with the same **mode and 'Advanced settings' configuration** (e.g. clipped light), then after you have successfully started your first, you can connect up another and click the Repeat start button. This can save time and repetition. This button option will not appear until a logger has been started in the normal way and 'Use PC time' must be ticked. You must ensure your logger model name is identical to the one previously started otherwise you could permanently corrupt your logger.



# Sampling for ARCTOX

Getting tissue samples from tagged individual is of great interest for the project, both with regard to diet and toxin exposure on wintering grounds. At the moment SEATRACK has not acquired the funds necessary to carry out any such analyses but we strongly encourage our participants to sample **blood** and **feathers** from all individuals retrieved with GLS loggers. Such samples can then be analysed at a later date or, **if participants agree**, be analysed as a part of Jerome Fort's project ARCTOX. In this later case, analyses of mercury and stable isotopes (N and C) will be performed on each collected sample.

## Please note though:

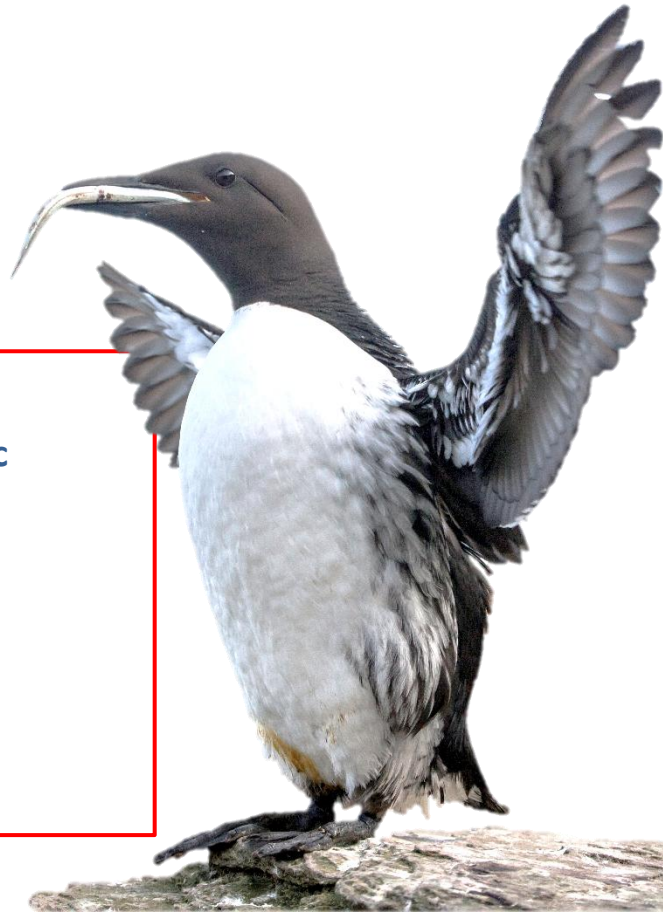
- A. We request that all able participants sample feathers following the protocol detailed below and also **strongly** encourage the collection of blood samples. We further encourage our participants to contact Jerome Fort to see if he is interested in additional samples ([jerome.fort@univ-lr.fr](mailto:jerome.fort@univ-lr.fr)).
- B. ARCTOX is primarily based on a community and large spatial-scale approach and will therefore not overlap with local and/or species-specific projects, for which ARCTOX results will be available (<https://arctox.plumegeo.fr/>).
- C. We are aware that at some localities pre-existing sample regimes are in place preventing participants from taking any additional samples. In such cases, with the agreement of participants as well as their collaborators, SEATRACK requests access to results of such analysis.

## Send all samples to:

please contact Jerome Fort  
([jerome.fort@univ-lr.fr](mailto:jerome.fort@univ-lr.fr)) to arrange delivery.

## Short list of samples of interest:

- **SEATRACK/ARCTOX - Requested basic samples**
  - 6 body feathers: 3 belly and 3 back.
  - 10 head-feathers (Alcids and Larids).
- **ARCTOX - Additional samples**
  - 0,5-0,7 ml whole blood in 70% ethanol.



# ARCTOX

## Monitoring and understanding contamination of seabird communities on a pan-Arctic scale

### ARCTOX in short...

The main objectives of the ARCTOX program are:

1. To monitor and map the year-round Hg contamination of the seabird community at the pan-Arctic scale, and its long-term changes.
2. To evaluate underlying processes and impacts of the large-scale Hg distribution.
3. To use the seabird community as bio-indicators to understand the pan-Arctic contamination of marine food webs and how it has changed over the last 15 years.

### ARCTOX sampling

The ARCTOX sampling regime is based on an international pan-Arctic sampling network and existing field campaigns, with the aim of collecting samples on various seabird species occupying different ecological niches, at a number of colonies spread throughout arctic regions.

- ARCTOX requires two different types of samples, complementary and essential for a year-round approach:
  - **Blood** - *provides information about recent contamination, i.e. exposure during the breeding season.*
  - **Feathers** - *Informative of past contamination, i.e. exposure between two moults during the non-breeding season.*
- **Blood and feathers should be collected on 20 birds for ARCTOX, all breeding adults, preferentially during the chick-rearing period. Retrieved logger birds should be prioritized, but sample-size can be inflated to 20 using birds being deployed for the first time or other birds to reach a sufficient sample size.**
- **Importantly, this project is primarily based on a community and large spatial-scale approach. Data remain available to all partners for local and/or species-specific projects at: <https://arctox.plumegeo.fr/> or by contacting Jerome.**

### Please note

- No feather specifically collected for molecular sexing (calamus of Hg/SI feathers can be used).
- Both Body AND Head Feathers should be collected on all Alcid and Larid species
- Juveniles equipped or **retrieved** with a logger should be **sampled** (feathers)

**Please contact Jerome ([jerome.fort@univ-lr.fr](mailto:jerome.fort@univ-lr.fr)) if you can/plan to collect samples for ARCTOX. Jerome will then provide sampling equipment such as syringes, vials etc.**

# SEATRACK/ARCTOX

## Sampling protocol 2025

### Body feathers (All species)

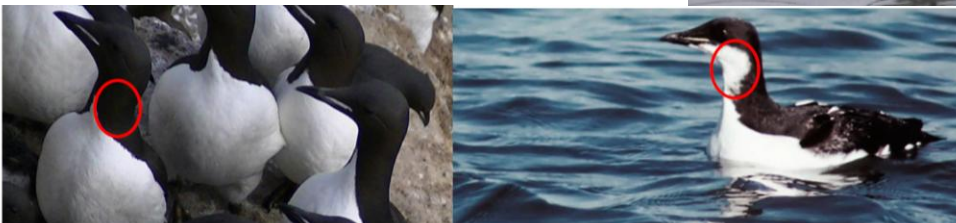
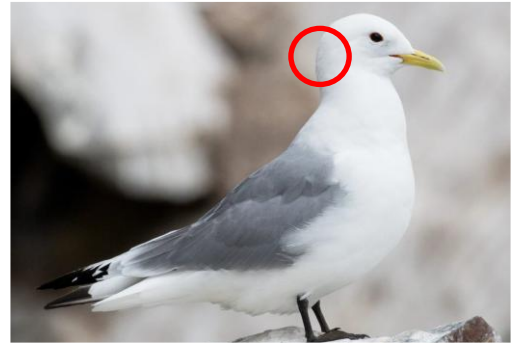
- At least all individuals retrieved with GLS loggers + other birds to reach 20.
- Minimum of **3 belly feathers + 3 back feathers should be collected (total of min. 6)**
- Half from the belly and half from the back.
- Not flight feathers.
- Pluck feathers rather than cut (better for regrowth).
- Place and seal in plastic zip-lock bag **when dry**.
- Mark each bag with species, site, **individual ID** (e.g., metal ring-number and/or logger ID), **year** and sample type, i.e. **"Body-feathers"**. Store at ambient temperatures.
- Intended for SIA, Hg, and corticosterone.

### Head/Throat feathers (only Alcids and Larids)

- ALCIDS: Minimum 10 black feathers from the throat (see figure). LARIDS: minimum 10 feathers from the top of the head.
- Pluck feathers rather than cut (better for regrowth).
- Place and seal in plastic zip-lock bag **when dry**.
- Mark each bag with species, site, **individual ID** (e.g., metal ring-number and/or logger ID), **year** and sample type, i.e. **"Head-feathers"**. Store at ambient temperatures.
- Intended for SIA, Hg, and corticosterone.

### Whole blood samples (All species)

- Total requested is **0.5 mL – 1 mL blood** (Intended for Hg, Se and SIA).
- Place **0.5-1 ml of blood** in a vial with **~1 ml of ethanol 70%**.
- Store the vial at **ambient temperature** or in a freezer if available. Mark the samples with species, site **individual ID** (e.g., metal ring-number and/or logger ID), **year** and sample type, i.e. **"Blood Hg/SIA"**.



Collection of Head feathers in alcids (except atlantic, tufted and horned puffins)



Collection of Head feathers in puffins (atlantic, tufted and horned puffins)

# Effect studies

It is important to assess whether or not GLS loggers affect “our” seabird behaviours and life-histories. To do so, proper control groups are necessary. A meaningful control sample is a group of birds that could have been equipped but were not. To define such a group, one must ideally explicitly spell an **assignment mechanism** before starting the deployment (it could be as simple as assigning every other captured bird or every third captured bird to the control group). It is important that control birds are **not biased towards birds in lower condition and/or birds harder to capture**.



Moreover, beyond the bird condition or trap-happiness/shyness components, two additional important aspects have to be taken into account to be sure the control group is meaningful:

- **Timing of capture:** this timing should be randomly distributed among GLS- and control birds (i.e. do not start by deploying or retrieving loggers and then, when you are done, start capturing control birds).
- **Area of capture:** GLS- and control birds should ideally be part of the same plot or area. If not possible, they should at least be in areas as close and similar as possible.

Having such a control groups is important for both adults and chicks, and the same rules apply for determining a proper control group for both age classes.

- In many systems, including a proper control group may mean to decrease the number of loggers deployed or retrieved. This is up to each site leader to decide whether this is worth it or not. It could also mean that field work expenses would increase. In such a case, get in touch with the SEATRACK project group before the field season to discuss what is feasible.

# Field notes and Metadata

updated

Please read before filling in the metadata template provided

Please bear in mind that one of the key aspects to success of a large-scale operation such as SEATRACK is standardized procedures. That is especially important when it comes to filling in the [metadata sheet](#). We therefore urge you to read the instructions carefully and **please turn in the metadata-sheets as soon as possible after the field-season ends. Please include deployment information from GPS-GSM instrumentations!**

## Our metadata template consists of three excel sheets:

- **The metadata sheet (field notes):** columns that are considered mandatory and/or of high importance are **coloured green**. We urge participants to record as many of them as possible.
- **Logger returns:** Field teams note date of download, if a download was successful or not, and whether a logger will be redeployed in this sheet.  
**This sheet is of high importance if a field team is downloading logger data themselves or redeploying loggers.**
- **Start times:** This sheet is also where a field team can note the start times of **any loggers they started themselves**. For example, retrieved loggers that are redeployed and need to be restarted in the field. Exact date and time of logger start should be noted in this sheet in GMT!

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- When possible, we provide predefined registry-options in dropdown-lists, to better standardize data registration and to simplify the process.

- If you are in doubt how to fill a column, note that **each column header in the excel file is commented (marked with red triangle in the upper right corner)**. If you are still in doubt, you can find a detailed description on the following pages.

The screenshot shows an Excel spreadsheet with columns A through E. Column A is labeled 'date', B is 'ring\_number', C is 'euring\_code', and D is 'euring institutional code'. A dropdown menu is open for the 'euring\_code' cell, showing a list of codes: 'NOS' (Norway), 'ISR' (Iceland), 'RUM' (Russia), 'DKC' (Denmark), '(Copenhagen)/Faroe Island', 'CANADA' (SEATRACK code for Canada), and 'GBT' (UK). A red triangle is visible in the top right corner of the 'euring\_code' header cell. A red box highlights the dropdown menu.

- If you have your own database, you can use this to export metadata to SEATRACK metadata **provided it matches the metadata sheet structure exactly, e.g. sheets, header rows, column names and formatting**.
- Contact [julian.evans@nina.no](mailto:julian.evans@nina.no) if you have any queries.

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# Field notes and Metadata

updated

## Sheet 1: Encounter data

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

### Ringling info

General information about individual ring id's.

- **Date, [Mandatory]** Fixed format: **"yyyy-mm-dd"**. (Note that this refers to the date of an encounter being registered NOT necessarily the original ringing date when the bird was first ringed.)
- **ring\_number, [Mandatory]**. Metal ring ID (e.g. '6294566', 'CA22632', '39445432')
- **euring\_code, [Mandatory]**. Abbreviation for ringing centrals issuing the metal rings (e.g. "NOS" for Stavanger museum in Norway, "NOO" for the ringing central in Oslo, Norway, "ISR" for the Natural history museum in Iceland, "RUM" for the ringing central in Moscow, etc... A more comprehensive list can be found here: [http://www.euring.org/data\\_and\\_codes/euring\\_code\\_list/euring\\_exchange-code\\_2000.pdf](http://www.euring.org/data_and_codes/euring_code_list/euring_exchange-code_2000.pdf) ). **Canadian partners can use "CANADA"**.
- **color\_ring, [Optional]**. Suggested entries are colour and/or ring code (e. g. 'Red(ABB)')

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date
2026-06-25

### Logger Info

ID's and general information about logger or loggers retrieved, deployed or otherwise observed in relation to the registrations. All registries mandatory.

- **logger\_status, [Mandatory]**. How was the individual carrying the logger/loggers observed, Predefined choices (Note that all observations are valuable even if the bird is not caught).
- **logger\_model\_retrieved, [Mandatory provided a logger is retrieved]**. Select the appropriate model from the predefined options on the dropdown list. **If your logger model is not in this list, please select "other" and note the logger model in the comments column.**
- **logger\_id\_retrieved, [Mandatory]**. Register the Id of the logger retrieved, both the series number/letter and the individual ID number. **Be aware of mixing up 0 and O**
- **logger\_model\_deployed, [Mandatory]**. Select the appropriate model from the predefined options on the dropdown list. **If your logger model is not in this list, please select "other" and note the logger model in the comments column.**
- **logger\_id\_deployed, [Mandatory]**. Register the Id of the logger deployed, both the series number/letter and the individual ID number. **Be aware of not mixing up 0 and O**

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Pick a model from the drop-down list.

For pathtrack GPS:  
**PathTrackGPS\_26:** 2026  
**PicoFix\_GEO\_mini2:** 2025 for all other species  
**PicoFix\_GEO\_mini3:** 2025 for BRGU and COGU  
**nanoFix\_GEO\_mini:** 2024

logger_model_retrieved
mk3005
mk4093
mk9
NanoFix_GEO_mini
NanoFix_GEO_mini_5.5g
OrniTrack10
OrniTrack15
PicoFix_GEO_mini2
PicoFix_GEO_mini3
W30A9-SEA
w65
other

# Field notes and Metadata

updated

## Sheet 1: Encounter data

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

### Individual information

Register information about the individual carrying the registered logger/loggers.

- **species, [Mandatory]** (Select one of the species under study in SEATRACK, registered on the predefined drop-down list.
- **morph, [Optional]**. Requested if appropriate and registered/known (e.g. “bridled” or “non-bridled”)
- **subspecies, [Optional]**. Requested if appropriate and registered/known (e.g. “fuscus intermedius”, “fuscus fuscus”)
- **age, [Optional]**. Requested if registered/known. Categories are “adult\_unknown”, “subadult\_unknown” (if exact age in years is not known) and “pullus”. If exact age is known, select the appropriate number, **where 1 would be year of hatch, 2 would be year after hatch year etc.**
- **sex, [Mandatory]**. Select the appropriate option in the predefined drop-downlist: “male”, “female” or “unknown”.
- **sexing method, [Mandatory]**. Select the appropriate option in the predefined drop-downlist: “dna”, “morphology”, “behaviour” or “none\_yet”).

age
adult_unknown
pullus
subadult_unknown
2
3
4
5
6
7
8
9
10

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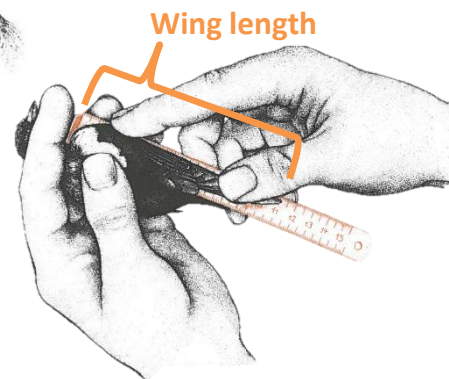
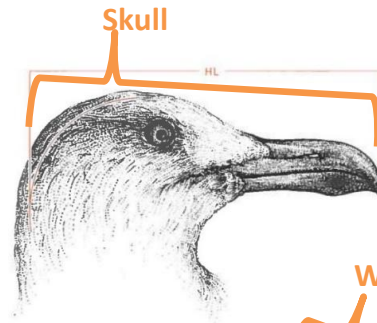
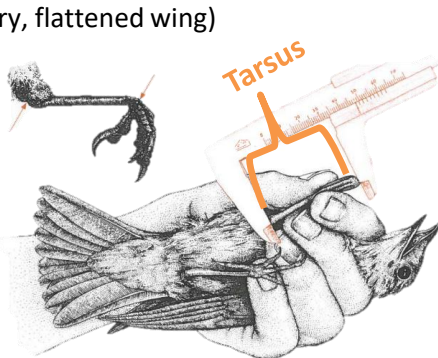
Available categories are “adult\_unknown”, “subadult\_unknown” (if exact age in years is not known) and “pullus”. If exact age is known, select the appropriate number, where 1 would be year of hatch, 2 would be year after hatch etc.

Note that 1 is not available from the list, as individuals in their hatch year should be recorded as “pullus”.

### Morphometrics

Only weight is considered mandatory but all measurements taken are of interest and value to the project.

- **weight, [Mandatory]**, fixed format; value in grams.
- **skull, [Optional]**. Requested if registered/known, fixed format; value in mm. (Note, skull = head + bill)
- **tarsus, [Optional]**. Requested if registered/known, fixed format; value in mm.
- **wing, [Optional]**. Requested if registered/known, fixed format; value in mm. (Note, measure from carpal joint to tip of primary, flattened wing)



We realize you might have your own method but we recommend the measurements are taken as follows, if possible. If not please make a note of it when turning in the metadata-sheet.

**Tarsus** (mm) From the joint between tarsus and toes to the intertarsal joint. Toes are bent backwards ~ 90° to the tarsus with tibia at the same angle. Measured with callipers to the nearest 0.1 mm. **Wing length** (mm) Maximum chord length measured with a ruler to the nearest 1 mm. Carpal joint pressed against stopper and primaries flattened parallel to the scale of the ruler. **Weight** (g) Mass of the bird measured with a spring balance (pesola). Remember to account for weight of the bag that the bird is weight in. **Skull** (mm), maximum distance from the back of the head to the tip of the bill measured with callipers with accuracy of 0.1 mm.

Illustrations by Nils Hoff from Deutsche Ornithologen-Gesellschaft (2011), Measuring birds/Vögel vermessen.

# Field notes and Metadata

updated

## Sheet 1: Encounter data

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

### Breeding status

General information about breeding status of logger carrying individuals on deployment/retrieval/observation event and if obtainable, breeding success of that individual.

- **breeding\_stage, [Mandatory]**. Select, from a predefined dropdown list, the appropriate breeding status for the individual **at the time of handling**.
- **eggs, [Mandatory]**. Enter the number of eggs in the nest (**at the time of handling**)
- **chicks, [Mandatory]**. Enter the number of chicks in the nest (**at the time of handling**)
- **hatching\_success, [Mandatory]**. Select "1" if at least one egg is known to have hatched, i.e. full or partial hatching success, "0" no hatching success at all and "unknown" if unknown.
- **breeding\_success, [Mandatory]**. Select "1" if at least one chick was alive during the last visit but then note that "**breeding\_success\_criterion**" must be specified as well. If nest was fully predated after hatching was known to have occurred select "0". If breeding status was not checked after initial encounter or is not known for any other reason, select "unknown".
- **breeding\_success\_criterion, [Mandatory]**. If, you have registered the breeding success, you are requested to specify by which criterion you judge it to be successful or failed. (e.g., nest is defined to be successful if at least one chick was observed alive apparently older than 10 days, 15 days or if it was known to have fledged). **You can either provide the number of days as a numeric value (e.g. 10, 12 etc.) or write "fledgling" if at least one chick survived to fledging.**

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# Field notes and Metadata

## Sheet 1: Encounter data

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

### Breeding location

General information about location of study sites. All fields mandatory except for “nest\_id”

- **country** Select the appropriate country from a predefined dropdown list, i.e., “Norway”, “Russia”, “Iceland”, or “Great Britain”.
- **colony, [Mandatory]**. Enter the name of the colony or location. Choose the lowest common geographical unit, e.g name of cliff or island, where the work has been carried out.
- **colony\_latitude, [Mandatory]**. Fixed format, **decimal degrees** (e.g. 65.4967).
- **colony\_longitude, [Mandatory]**. Fixed format, **decimal degrees**, positive values for longitude east of Greenwich and negative values for west ( e.g. 15.4967).
- **nest\_id, [Optional]**. Nest identification, if registered can be entered in this column, as noted by participants.
- **nest\_latitude, [recomended]**. Fixed format, **decimal degrees**, positive values for longitude east of Greenwich and negative values for west ( e.g. 15.4967).
- **nest\_longitude, [recomended]**. Fixed format, **decimal degrees**, positive values for longitude east of Greenwich and negative values for west ( e.g. 15.4967).

### Samples

Please specify if any samples are taken from individuals deployed with loggers and for what purposes.

- **blood\_sample, [Mandatory]**. Select the appropriate choice from the predefined dropdown list.
- **feather\_sample, [Mandatory]**. Select the appropriate choice from the predefined dropdown list.
- **other\_samples, [Optional]**. Requested if appropriate. If any other samples are obtained from an individual carrying a GLS logger, please specify what type and for what purposes. (e.g. “cloacal swabs, immunological studies”, “Ticks or other parasites sampled”, etc.)



**Please note that SEATRACK encourages taking feather-samples from all individuals retrieved with loggers if sampling is not in conflict with existing projects. Unless specially requested ARCTOX will have access to all samples.**

# Field notes and Metadata

## Sheet 1: Encounter data

**ENCOUNTER DATA**

LOGGER RETURNS

LOGGER STARTUPS

### Other

Other information relative to the deployment/retrieval/observation of the individual or data sampling in general.

- **data\_responsible, [Mandatory]**. Specify full name of person/persons responsible for the data, who should be contacted regarding publication of data. If this is multiple people, separate them with a ‘;
- **back\_on\_nest, [Optional]**. Requested if observed and registered. If possible to observe please make a note if bird is observed returning to the nest after handling, i.e. “yes” if bird returns, “no” if nest is abandoned and unknown if no further observations are available.
- **logger\_mount\_method, [Optional]**. Requested if appropriate. Almost all SEATRACK loggers are mounted on plastic rings placed on the bird’s tarsus. If you deviate from this we request you make a note of it, e.g., “logger attached to a ring placed on tibia”, “logger placed on back in a harness”, etc.
- **comment, [Optional]**. Requested if appropriate. Please enter any comments you feel that are of importance e.g. relevant to the individual, the logger, nest site etc.
- **other relevant variables, [Optional]**. Any additional measurements and variables recorded can be placed in columns to the right of the main sheet.





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# Field notes and Metadata

## Sheet 3: Logger startups

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

**Logger startups:** Field teams should note down date and time (in GMT!) of loggers that they started themselves or restarted in the field.

Accurate logger start times are vital to the processing of GLS data and for SEATRACK data pipelines.

**If you wish to submit non-SEATRACK logger data, please arrange this with us first and fill in the project column when submitting startup times. If you have an ongoing project using SEATRACK loggers that is not part of the standard SEATRACK objectives (e.g. dual-deployments, short-term deployments) please note this in the project column.**

A	B	C	D	
Logger information				
logger_serial_no	logger_model	producer	production_year	project

Project with which the logger is associated. Should be SEATRACK for seatrack loggers.

### Logger information

Information about the logger being started/restarted.

- **logger\_id [Mandatory]** Register the Id of the logger retrieved, both the series number/letter and the individual ID number. **Be aware of not mixing up 0 and O**
- **logger\_model [Mandatory]** Select the appropriate model from the predefined options on the dropdown list. If your logger model is not available in the list, select “other” and write your logger model in the comments.
- **producer [mandatory if this is not a model from the dropdown list]** Logger manufacturer, e.g. “Lotek” or “Migrate technology”
- **production\_year [mandatory if this not a SEATRACK logger]** Year logger was produced
- **project [Mandatory]** For SEATRACK loggers being used for the SEATRACK standard objectives, this should be entered as “SEATRACK”. If this logger is part of a different project that we have agreed to include in the SEATRACK database, enter an appropriate project name. If this field is left blank, we will assume SEATRACK.

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# Field notes and Metadata

## Sheet 3: Logger startups

ENCOUNTER DATA

LOGGER RETURNS

LOGGER STARTUPS

### Startup information

Important information about when and how the logger was started. Accurate logger start times are vital to the processing of GLS data and for SEATRACK data pipelines.

- **starttime\_gmt [Mandatory]** Register the date/time (**GMT**) when the logger started recording data, in the format YYYY-mm-dd HH:MM. E.g. "2026-07-01 10:34". If the logger was programmed with a delay this should be **programmed\_gmt\_time + days\_delayed** (see below).
- **Logging mode [Mandatory for Migrate technology loggers]** Choose logging mode/settings from dropdown list (for Migrate Technology GLS). See "[GLS mode setup](#)" for [details on modes](#)
- **started\_by** Full name of person starting the logger
- **started\_where** Location where the logger was started
- **days\_delayed [Recommended if starting a Migrate Technology logger with a delay]** Number of days which a logger was programmed to delay starting to record data.
- **programmed\_gmt\_time [Recommended if starting a Migrate Technology logger with a delay]** Register the date/time (**GMT**) when the logger was programmed, in the format YYYY-mm-dd HH:MM. E.g. "2026-06-01 10:34". If using a delay, **starttime\_gmt** should be **programmed\_gmt\_time + days\_delayed**, e.g. programmed\_gmt\_time: "2026-06-01 10:34" + days\_delayed: "10" = starttime\_gmt: "2026-06-11 10:34"

### Intended deployment

Optional fields about deployment plans for a started logger. **If you intend to restart a logger and deploy it in a different location, please fill the restart detail in that location's metadata sheet.**

- **intended\_species** If known, select the species that the logger is intended to be deployed on (Select one of the species in SEATRACK, registered on the predefined drop-down list).
- **intended\_location** If known, record the location that the logger is intended to be deployed.
- **Intended deployer** If known, record the full name of the person who will deploy the logger



### Submit Metadata

Please fill in and send us the metadata sheet **before 1 November 2026** to ensure a smooth data handling after the field season:

[Julian.Evans@nina.no](mailto:Julian.Evans@nina.no) or [Svenja.Neumann@npolar.no](mailto:Svenja.Neumann@npolar.no)

Should you have any comments or questions regarding the metadata sheet, please do not hesitate to contact us.

