SATELLITE-LINKED MARINE ANIMAL LOGGER

LoggLaw DiveSat / DiveSat-GPS

Satellite-linked data logger for diving animals

DiveSat records dives on board and transmits them over the Argos satellite system each time the animal surfaces. Data reaches you whether or not the tag is recovered, and if you do recover it, the full-resolution record is still on board. DiveSat-GPS adds GPS for studies that need positions.

LoggLaw DiveSat-GPS seen from the upper face. The sensors and the GPS / Argos antenna are on this side; the opposite face is curved to follow a carapace. The antenna stands 165 mm above the housing and continues beyond the frame.

01 Overview

Overview

A diving animal is at the surface only for the length of a breath. DiveSat detects that surfacing with a wet/dry sensor and sends the dives it has recorded to the Argos satellites. One transmission carries 20 bytes, so the full 4-second record stays on board and only the essentials go into the uplink.

What the tag does over one deployment

attach → record → transmit at every surfacing → (if recovered) full data

Attach and release
Fix to the carapace, remove the wet/dry short cable, release

›

Measure every 4 s
Depth, water temperature, wet/dry and battery voltage on board

›

Summarise each dive
At the end of a dive, extract the break points of the depth trace

›

Transmit at the surface
While air is detected, transmit to Argos roughly every 60 s

›

Receive and decode
Collected through Kinéis / CLS, decoded and stored on our side

If the tag is recovered
Connect over USB and read out the full-resolution 4-second record (most recent 8.3 days)

- Diving behaviour of air-breathing animals such as sea turtles and pinnipeds
- Long-range movement where recovery cannot be assumed
- Diurnal and seasonal change in dive depth and duration
- Time spent hauled out on land
- Vertical temperature structure the animal experienced
- Post-release survival and range

Suited to

- Getting data reliably from animals you may never recover
- Following dive depth and duration over long periods
- Knowing where the animal is to within a few hundred metres (DiveSat-GPS)

Consider another option if you need

- Sub-second behaviour or body orientation → **LoggLaw C series (recovery required)**
- Underwater video or sound → **LoggLaw CAM**
- Positions of terrestrial animals → **LoggLaw G2C / G2S**

※ Argos is a one-way link. There is no acknowledgement and no retransmission request, so the tag repeats stored messages, newest first, for as long as it is at the surface.

02 What the tag transmits

Data uplink

One transmission carries 20 bytes of user data. What goes into that budget decides what you are left with when a tag is not recovered. DiveSat builds five kinds of message (DiveSat-GPS adds Position, the GPS fix, for six), and the order in which they are sent is configurable.

Message types

Type	Contents	Sent per
Dive Profile	Depth trace of one dive, as pairs of time (% of dive duration) and depth	dive
Summary	Dive count, maximum and mean depth, maximum and mean dive duration, proportion of time diving, maximum / minimum / mean water temperature, battery voltage	summary period
Hauled out	Record of time spent on land	haul-out
Temperature Cast	Vertical profile of water temperature	cast
Position	GPS fix (DiveSat-GPS only)	fix
Temporary	Status notification such as voltages	when none of the above is queued

Transmission

Trigger	While the wet/dry sensor reads air, the tag transmits whatever is queued, repeatedly. There is no fixed number of messages per day.
Interval	About 60 s, with ±10 % jitter (54–66 s)
Message size	20 bytes of user data (31-byte payload including error-correction coding)
Order	A priority is set per message type. There is no scheduling by time of day or by latitude.
Missed messages	No individual retransmission request. Messages are held in on-board Flash and repeated, newest first.

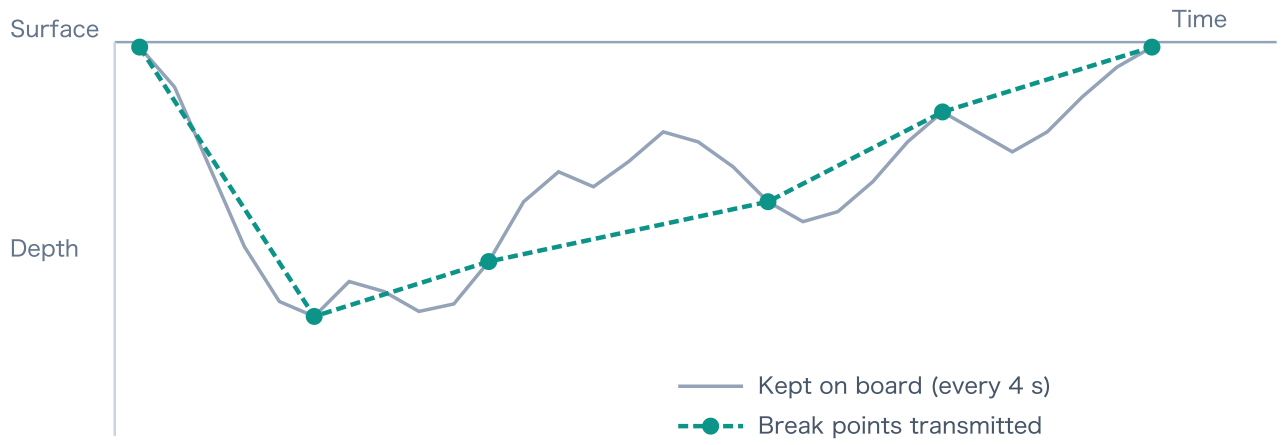
How much gets through depends on how long the animal stays at the surface. Only transmissions that complete during a surfacing are sent. For species that surface briefly at each breath, a single dive may not get its message away. Summary period and priorities are tuned to the surfacing pattern of the study species.

03 Dive profile

Dive profile

Depth is recorded every 4 seconds. When a dive ends, the tag extracts the break points of that depth trace with a Broken Stick Model and sends them as time-and-depth pairs. One dive becomes one message.

From the 4-second record, the points that are sent (schematic)



The number of points sent is configurable (up to 6; the factory default is 4). If fewer break points are found, the remaining slots are left empty.

Depth resolution in the uplink	
0 – 2.55 m	0.01 m
to 25.5 m	0.1 m
to 255 m	1 m
to 2,550 m	10 m

Dive detection	
Start threshold	about 2.9 m *1
Duration	held beyond the threshold for more than 8 s
Uplink unit	1 dive = 1 message
On board	The detailed trace behind the profile is also kept

Resolution is finer near the surface and coarser with depth (8-bit mantissa with a 2-bit scale). This is the range the uplink format can express; the pressure rating and measurement range of the tag are separate figures.

*1: implemented as 1.31 bar absolute. With the 4-second interval, detection takes 12 s in practice. The threshold is expected to be reviewed for each study species.

04 Positioning

Positioning

Positions come from two sources. Argos Doppler locations are computed from the transmissions themselves and are available on both models. GPS, on DiveSat-GPS, takes a fix at every surfacing where higher accuracy is needed.

Argos Doppler	both models
Source	Computed by Argos each time a transmission is received
Accuracy classes	Location Class 3 to B, each with an error radius
Cost to the tag	None beyond the transmission itself
Field trial	59.9 % in Class 3–1; mean error radius 937 m *1

GPS	DiveSat-GPS only
Acquisition	A 30 ms capture at every detected surfacing (every 150 s when on land)
Accuracy	25 m in the uplink, with 5 satellites *2
Processing	Cloud processing required; an assistance (BAS) file is written in advance
Field trial	84.9 % of attempts fixed (404 / 476) *1

Operating requirements

Initial fix	The tag takes an initial fix outdoors when measurement starts, normally within 2–3 minutes (red LED blinking → green LED blinking).
BAS file	Written before shipment. If the tag is deployed more than a month after delivery, the file needs updating.
PTT ID and contract	The Argos PTT ID, the radio licence and the Argos system fees are arranged and paid by the user.
Radio regulation	Operated in Japan under an experimental station licence. Outside Japan, national regulations apply.

*1: from the Kumejima trial of April–May 2026 (one sea turtle, one DiveSat-GPS, 17 days); see section 06. Results depend on the animal, the sea area and how often it surfaces, and are not guaranteed performance.

*2: the uplink carries five satellites, which caps accuracy at 25 m. The on-board record has no such limit: 22 m with 6 satellites, 20 m with 7, 18 m with 8.

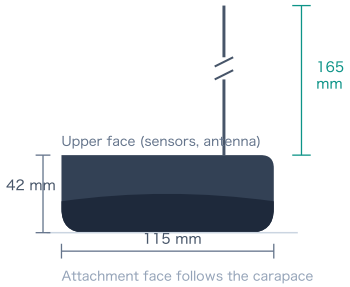
05 Attachment

Attachment

The housing is 115 × 75 × 42 mm and weighs about 315 g in air. The attachment face is curved to follow a carapace, and the sensors and antenna sit on the upper face. Because transmission happens in the moment of a surfacing, mount the tag so that the upper face is clear.

Outline (schematic, nominal dimensions)

Width across the front is 75 mm. The antenna is drawn with a break.



Attachment face follows the carapace

Upper face

The two silver posts are the wet/dry electrodes; the antenna also passes through this face

Size and weight

Item	DiveSat	DiveSat-GPS
Housing	115 × 75 × 42 mm	115 × 75 × 42 mm
Antenna	165 mm above the housing (183 mm overall)	165 mm above the housing (183 mm overall)
Weight in air	315 ± 10 g	320 ± 10 g
Weight in water	approx. 200 g	approx. 205 g

Points to observe when mounting

- Sensors and the GPS / Argos antenna are on the upper face. Do not cover them with resin or putty.
- Remove the wet/dry short cable immediately before release; the tag will not transmit while it is fitted.
- If more than an hour passes between setup and release, fit the short cable to save the battery.
- Fit the connector cap and the sealing tape before attaching the tag.

06 Field trial results

Field results

In April and May 2026 a DiveSat-GPS was deployed on one sea turtle at Kumejima, Japan, and received for 17 days. The figures below are what was measured. They come from one animal and one tag, and are not guaranteed performance.

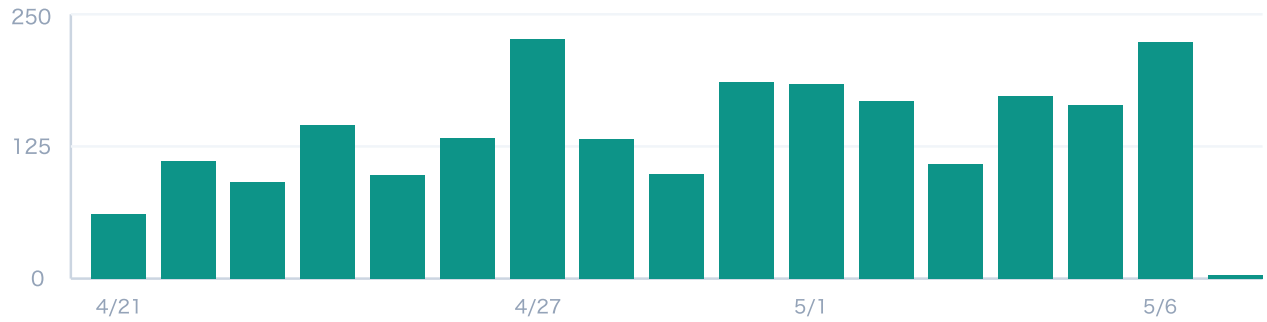
17 days
Continuous reception
2026-04-21 to 05-07

2,305
Messages received
98.7 % with a Doppler location

370
Dive profiles received
04-27 to 05-05

84.9 %
GPS fix rate
404 of 476 attempts

Messages received per day



The final day (5/7) covers up to 00:50 UTC.

Breakdown of what was received

Doppler location classes	Class 3: 24.1 % / Class 2: 28.2 % / Class 1: 7.6 % / Class 0: 4.4 % / Class A and B: 35.7 %
Error radius	mean 937 m (min. 150 m, max. 17,933 m)
Against the GPS fix	Mean separation from the Doppler location 343 m, median 300 m (399 records)
Data integrity	CRC pass rate 91.6 %. Outliers were almost all removed by the CRC check
Satellites	25 distinct satellites (Kinéis constellation, O3, CS, MC and others)

Throughput depends on the surfacing pattern of the animal and on satellite passes. Daily totals ranged from 61 to 226 messages in this trial. Reception at low latitudes has also been confirmed in trials at Ishigaki and Irabu, but conditions vary with the sea area and the study species — please talk to us beforehand.

07 Setup and getting the data

Setup & data

Setup is done from a Windows application. Data arrives by two routes: transmitted messages come in over the satellite link, and if the animal is recovered the 4-second on-board record can be read out.

Over the satellite link

- Collected from the Kinéis / CLS telemetry API
- Decoded and stored on our side
- Delivered through BiP (Biologging intelligent Platform), our research data platform

After recovery

- Connect to a PC with the dedicated interface cable (USB)
- Raw data from every sensor at the 4-second interval (47 bytes per record)
- The detailed trace behind each profile is also available

Setup and read-out

Application	LoggLawSurf DiveSat / DiveSat-GPS (Windows 11, 64-bit or later)
Connection	Dedicated interface cable. Connect tag → cable → PC, in that order
Configurable	Measurement schedule, uplink priorities, summary period, dive threshold
Output	Proprietary binary (.blb) with CSV generated alongside it

Dedicated interface cable
Used for setup and read-out

In the box

Tag	LoggLaw DiveSat or DiveSat-GPS
Interface cable	For setup and read-out (USB)
Wet/dry short cable	Holds off transmission until release and saves the battery
Connector sealing tape	Applied over the connector cap before attachment
Windows application	LoggLawSurf DiveSat / DiveSat-GPS (supplied by your contact)

The measurement area on board is a ring buffer. About 8 MiB used at the 4-second interval comes round in roughly 8.3 days, after which older records are overwritten. Recovery therefore returns the full-resolution record of the most recent period; for anything earlier, what remains is what was transmitted.

08 Specifications

DiveSat / DiveSat-GPS

Housing	
Dimensions	115 × 75 × 42 mm (antenna 165 mm above the housing)
Weight in air	DiveSat 315 ± 10 g / DiveSat-GPS 320 ± 10 g
Weight in water	DiveSat approx. 200 g / DiveSat-GPS approx. 205 g
Material	Photocurable resin, sealed by potting
Depth rating	1,000 m
Operating temperature	-10 to 40 ℃
Clock accuracy	±95 s/year
Memory	24 MiB *1

Sensors	
Configuration	Depth (pressure) | water temperature | wet/dry | battery voltage
Sampling interval	4 s
Depth	Range 1,000 m, accuracy ±1 % FS; resolution 5.5 cm or better on board, 0.01 – 10 m in the uplink (breakdown in 03)
Temperature	-5 to 35 ℃, ±0.2 ℃; resolution 0.005 ℃ or better on board, 0.0024 – 0.039 ℃ in the uplink *2
Calibration	Individually calibrated before shipment (temperature and pressure)

Satellite link and positioning	
System	Argos-2 (401 MHz, 500 mW output)
Transmission	About every 60 s while air is detected; 20 bytes of user data per message
Message types	Dive Profile | Summary | Hauled out | Temperature Cast | Temporary (DiveSat-GPS adds Position)
GPS	DiveSat-GPS only. 25 m accuracy, one fix per detected surfacing
Arranged by the user	Argos PTT ID, radio licence, Argos system contract

Power and software	
Battery	Lithium thionyl chloride, 19 Ah (non-rechargeable)
Application	LoggLawSurf DiveSat / DiveSat-GPS (Windows 11, 64-bit or later)
Data format	Proprietary binary (.blb) with CSV
Warranty	Six months from first use, up to one year from delivery

*1: divided into system and uplink data, measurement data, and detailed data. The measurement area is a ring buffer holding about 8.3 days at the 4-second interval.

*2: temperature resolution in the uplink varies with the message type: 0.0024 ℃ (water temperature in Summary, 14 bit), 0.01 ℃ (Temporary, 12 bit), 0.020 ℃ (Temperature Cast Method 2, 11 bit), 0.039 ℃ (Method 0, 10 bit).

The battery can be carried by air but is handled as dangerous goods (Section I). The tag is operated in Japan under an experimental station licence; national regulations apply elsewhere.

Specifications are subject to change without notice.

09 Contact

Contact

Enquiries about LoggLaw DiveSat

Tell us the study species, the sea area, the attachment surface and the behaviour you want to measure. We will work through the uplink priorities, the summary period, the mounting and the Argos paperwork with you.

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See also

For finer behavioural data where the tag can be recovered, see the **LoggLaw C series** (C7 / C8 / C7XI / C7XIR); for underwater video and sound, see **LoggLaw CAM**. Separate catalogs are available for both.