

Humboldt Penguin Research, Chile, Winter 2026

Report on the June–July 2026 field season

prepared for Sphenisco e.V.

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Summary

The June–July 2026 field season to study the foraging behaviour of Humboldt penguins in Chile was marked by the build-up and onset of a strong El Niño event. This brought unsettled weather that ruled out any island visits: first, persistent south-westerly winds generated heavy swell that made landings too dangerous, and then torrential rain caused massive flooding in the Coquimbo region. Activities this winter were therefore limited to work that could be carried out from the mainland.

Between **1 and 8 July 2026**, a total of **seven Humboldt penguins** (6 females, 1 male) from **Islote Pájaros Niños, Algarrobo**, were fitted with GPS-dive loggers during the early chick-rearing period. The devices recorded the birds' movements at sea, both their geographic distribution and their diving behaviour. In total, **24 foraging trips** were recorded, during which the penguins spent between **6.9 and 26.3 hours at sea** (mean: 19.5 h), travelled between **5.5 and 35.7 km from their colony** and covered **distances between 20.9 and 85.0 km**. A total of **16,815 dives** were recorded, equivalent to between **168 and 1,095 dives per trip**. The penguins reached **maximum dive depths of 27.1–63.8 m**, while the mean dive depth per trip ranged between 7.1 and 24.6 m, reflecting numerous shallow dives associated with travelling. As in the previous year, on 21 of the 24 trips the penguins swam **southwards, very close to the coast (<5 km from the mainland)**, to forage off the **port city of San Antonio** and at the **mouth of the Río Maipo**. The data revealed **potential problems with anthropogenic impacts**: the port of San Antonio is to be expanded, and illegal waste dumping along the Maipo recurs, particularly when heavy rainfall is forecast. Both are likely to have **consequences for the quality of the marine habitat** that is essential for the penguins of Islote Pájaros Niños.

The weather-related loss of further fieldwork was offset by the **development of the *HumboldtCam* system**. The system, which will in future broadcast a **permanent live video stream from a selected penguin nest to the internet**, is primarily intended for public outreach. Experience with comparable systems such as our *TawakiCam* (https://tawaki.cam) shows that such systems **strengthen the public's personal connection with threatened species** and thereby **raise awareness of the problems they face**. The system is based on the already operational *TawakiCam*. Development

involved sourcing the necessary hardware (e.g. camera, solar components, batteries, microcomputer, network infrastructure), assembling the system, writing the control software and carrying out initial field tests in the penguin colony on Islote Pájaros Niños. The tests showed that HumboldtCam needs to be installed in less populated areas, such as **Isla Choros or Isla Tilgo**, because satellite connectivity is limited by data congestion from competing satellite internet users. The final installation was originally planned for the Chilean summer of 2026/27. Because there are currently no active nests in the north as a result of El Niño, it is now scheduled for winter 2027 (June/July).

A rain-free day was used to inspect **Islote Lobos**, about 30 km north of Algarrobo, from the mainland; the island is considered a potential breeding site for Humboldt penguins. Although two penguins were observed by telescope and drone, there was **no clear evidence of breeding** on the island.

Acknowledgements

As every year, **Maximiliano Daigre** and **Paulina Arce** were indispensable during the fieldwork; their experience and expertise in handling Humboldt penguins are second to none! **Alejandro Simeone**, as always, kept things running smoothly behind the scenes and actively supported our work. Special thanks go to **Werner Knauf** (Sphenisco e.V.) for his tireless efforts to sustain support for important research projects such as this one. And last but not least, my thanks go to **Ursula Ellenberg**, who contributed her expertise while holding the fort at home.

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GPS tracking of breeding Humboldt penguins

A first visit to the Humboldt penguin colony on **Islote Pájaros Niños, Algarrobo**, took place immediately after my arrival in Santiago on 25 June 2026. The entire colony was surveyed in detail to determine the stage of the breeding season. Of 71 mapped nests, 51 were found to be active; the remaining 20 nests were either empty or occupied by a non-breeding penguin.

Only a limited number of nests in the colony are suitable for GPS tracking, depending mainly on how accessible the adult birds are. In most of these nests the chicks were only a few days old, so it was decided to wait another week before attaching GPS devices.



On **1 July 2026**, our team therefore returned to Algarrobo to begin GPS tracking. Between 11:30 and 15:00, a total of eight penguins were fitted with GPS-dive loggers. On one bird the attachment proved inadequate and the device had to be removed again. As re-attaching the device would have doubled the handling time for that penguin, we decided against it, so that in the end **7 penguins - 6 females and 1 male - were equipped with devices**.



Maximiliano Daigre with the only male Humboldt penguin that could be fitted with a GPS-dive logger on 1 July 2026; in all other suitable nests, females were brooding chicks aged 10 days or younger.



GPS-dive loggers immediately after attachment to seven breeding Humboldt penguins on Islote Pájaros Niños, Algarrobo, 1 July 2026.

All seven penguins were in good to excellent body condition, with a mean body mass of 4.3 kg (3.8–4.5 kg) for the females and 5 kg for the single male fitted with a GPS-dive logger. All seven penguins went to sea within 20 hours of deployment: three as early as the evening of 1 July, the rest during the night or on the morning of 2 July.

Efforts to recover the devices began on 6 July 2026. Only one of the seven birds was found in its nest during daylight that day; five more penguins were relieved of their GPS-dive loggers in darkness around midnight. The seventh bird made things considerably harder for the team. Although this female had also returned to her nest from a day trip on 6 July, she had not swapped nest duties with her partner but, after feeding her chicks, had gone back to sea. Only during the night of 7 to 8 July did she relieve her partner at the nest; she was then found on the nest that morning and the last GPS-dive logger was recovered.



Maximiliano Daigre recovering the last logger bird on the morning of 8 July 2026

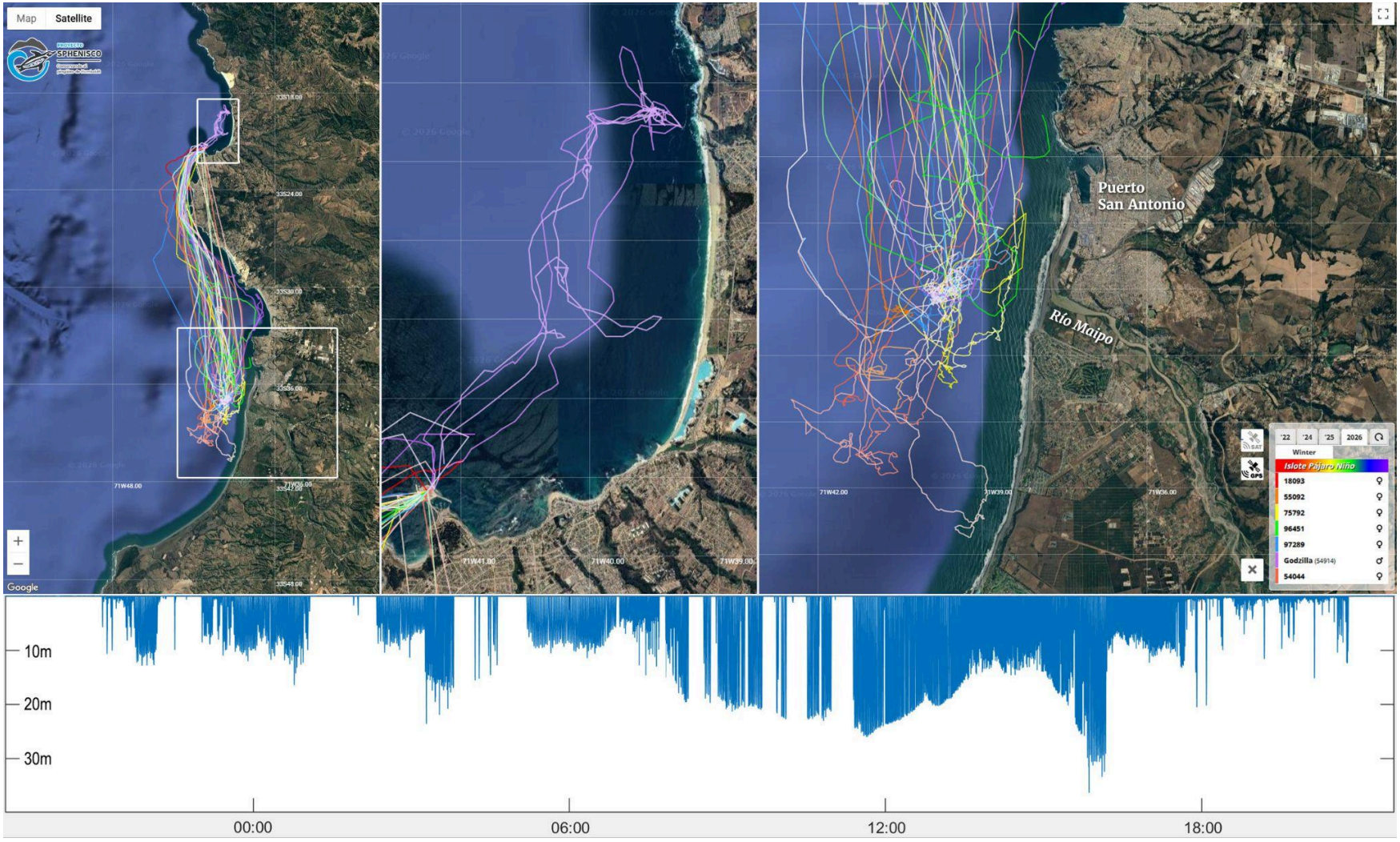
Preliminary results

The seven Humboldt penguins fitted with GPS-dive loggers made 3 or 4 foraging trips during the roughly one-week deployment period; in total, **24 foraging trips** were tracked. Individual trips had a mean **duration of 19.5 hours**, with trip durations ranging between 6.9 and 26.3 hours.

With the exception of three short trips (two by the male, who on 3 and 4 July swam only about 5.5 km north, taking 8.6 and 7.4 hours respectively, and the first trip of a female, who travelled just 9 km south on an excursion of about seven hours), **all tracked birds swam south, close to the coast (<5 km from the mainland)**. The destination of these 21 trips was the **mouth of the Río Maipo**, about 30 km south of Algarrobo. This area also lies directly within the zone of influence of the **container port of San Antonio** (see figure on next page).

Excluding the three short trips, the penguins travelled on average **30.5 km from their breeding colony** (min: 27.3 km, max: 35.7 km) and covered **distances of at least 61.2 to 85.0 km** on these trips (mean: 73.9 km). It should be noted that on some trips only a few GPS positions were recorded during the penguins' return journey, because when travelling the birds generally make only shallow dives and spend little time at the surface between dives. Calculated trip distances in these cases are therefore shorter than the distance actually covered.

The penguins made on average **700 dives per trip** (min: 168, max: 1,095), corresponding to a **rate of 36 dives per hour** (min: 20, max: 59). **Mean dive duration per trip ranged between 33 and 78 seconds** (mean: 47 s), with the penguins reaching **dive depths of up to 63.8 m** (mean of maximum dive depths per trip: 40.8 m). During diving bouts, the penguins spent on average **68% of the time underwater** (min: 59%, max: 74%). **Actual foraging** - i.e. time not associated with descent or ascent - took up on average **28% of dive cycles** (min: 24%, max: 31% on the 21 long trips). **The birds' dive profiles indicate that they forage predominantly at the seafloor**.



Jagstrips von sieben brütenden Humboldt-Pinguinen vom Islote Pájaros Niños zwischen dem 1. und 8. Juli 2026. Eine interaktive Karte ist verfügbar auf https://ptx.lat/hug26. *Unten: Beispiel eines vollständigen Tauchprofils eines vollen Jagdtrips; konsistent erreichter Tauchtiefen (z.B. zwischen 06:00 und 18:00 Uhr) deuten auf primäre Nahrungssuche am Seeboden hin.*

Potentially significant anthropogenic impacts

The GPS data recorded from penguins on Islote Pájaros Niños in July 2026 are consistent with the distribution patterns found at the same site the previous year. It can therefore be concluded that the sea area immediately off the mouth of the Río Maipo is of exceptional importance to the local penguin population during winter chick-rearing. That river mouths often offer increased productivity and, with it, better feeding conditions for penguins has already been shown elsewhere and in other penguin species. For the penguins of Islote Pájaros Niños, however, this behaviour carries considerable potential for exposure to anthropogenic factors that may adversely affect the local population.

Pollution of the Río Maipo

In August 2024, the Chilean Ministry of the Environment declared the Río Maipo basin a "Zona Saturada" (saturated zone)[1], after eight water quality parameters (dissolved oxygen, conductivity, pH, chloride, sulphate, nitrate, orthophosphate and dissolved zinc) exceeded permissible limits across the roughly 15,300 km² catchment - caused by a combination of agricultural, mining and urban discharges and exacerbated by drought-related low river flows; a comprehensive remediation plan for the entire catchment is currently being prepared, although its implementation is not expected for several years.

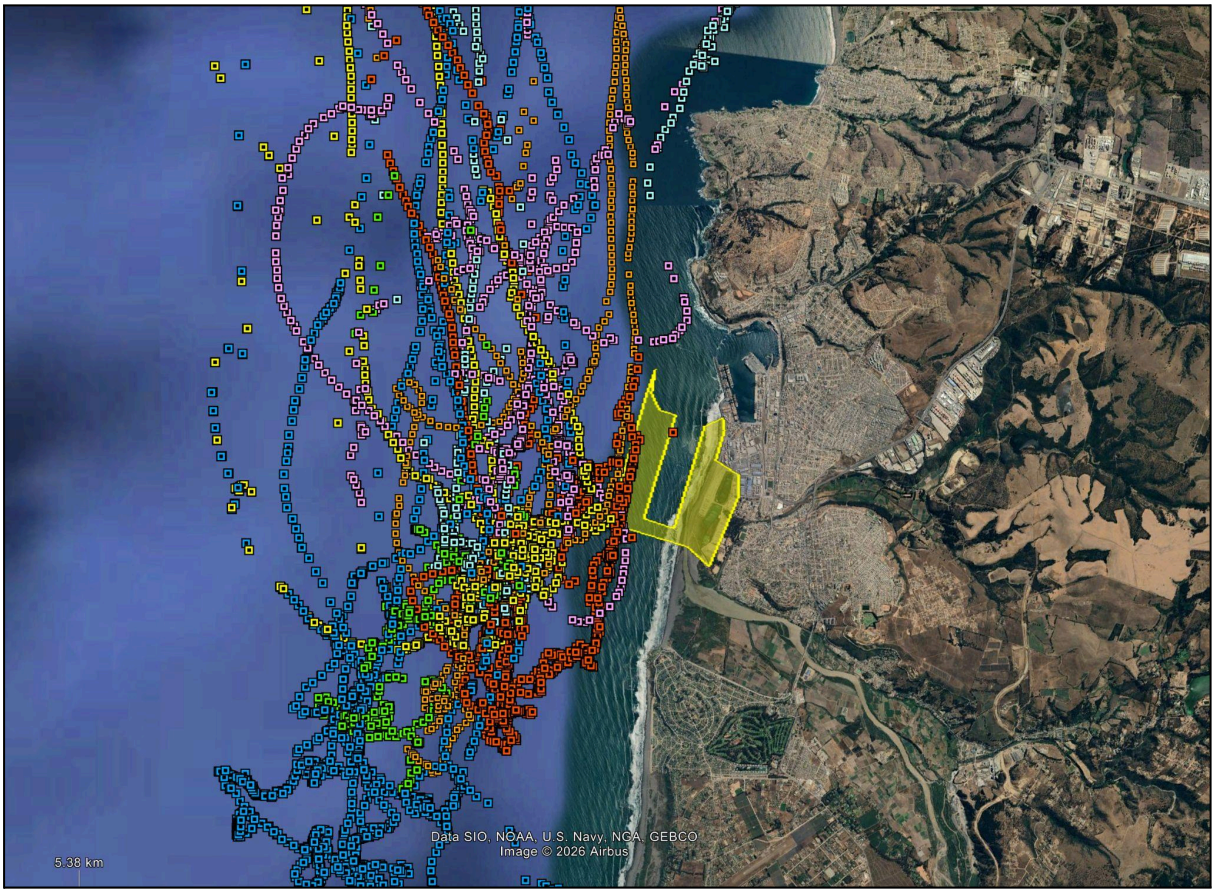
In addition, recurring illegal dumping along watercourses in the Greater Santiago area aggravates the problem, so that heavy rainfall repeatedly washes several tonnes of waste - including pesticide containers and agricultural plastic waste - down to the mouth of the Río Maipo[2].

[1] https://olca.cl/articulo/nota.php?id=110823

[2] https://www.latercera.com/que-pasa/noticia/fotos-muestran-toneladas-de-basura-en-desembocadura-del-rio-maipo-arrastradas-desde-santiago-por-lluvias/IKYMR4RH5ZCWJBB24ROP7HMX3I/

Planned expansion of the San Antonio container port

The "Puerto Exterior de San Antonio" is a port expansion project with an investment volume of around US$4.45 billion, intended to nearly triple the cargo handling capacity of the existing port. It comprises a breakwater of around 4 km, two new terminals each 1,730 m long, and extensive dredging and land reclamation directly at the mouth of the Río Maipo (see figure below). After a six-year environmental impact assessment process (SEIA), begun in 2020 and involving three addenda (Adendas), an Indigenous consultation and more than 6,000 public objections - objections that led to a suspension of the process for around four years - the regional environmental assessment commission (Coeva) of Valparaíso unanimously (12 votes) granted environmental approval (Resolución de Calificación Ambiental, RCA) on 26 May 2026. Construction is scheduled to start in 2027, with the first phase due to become operational in 2036.

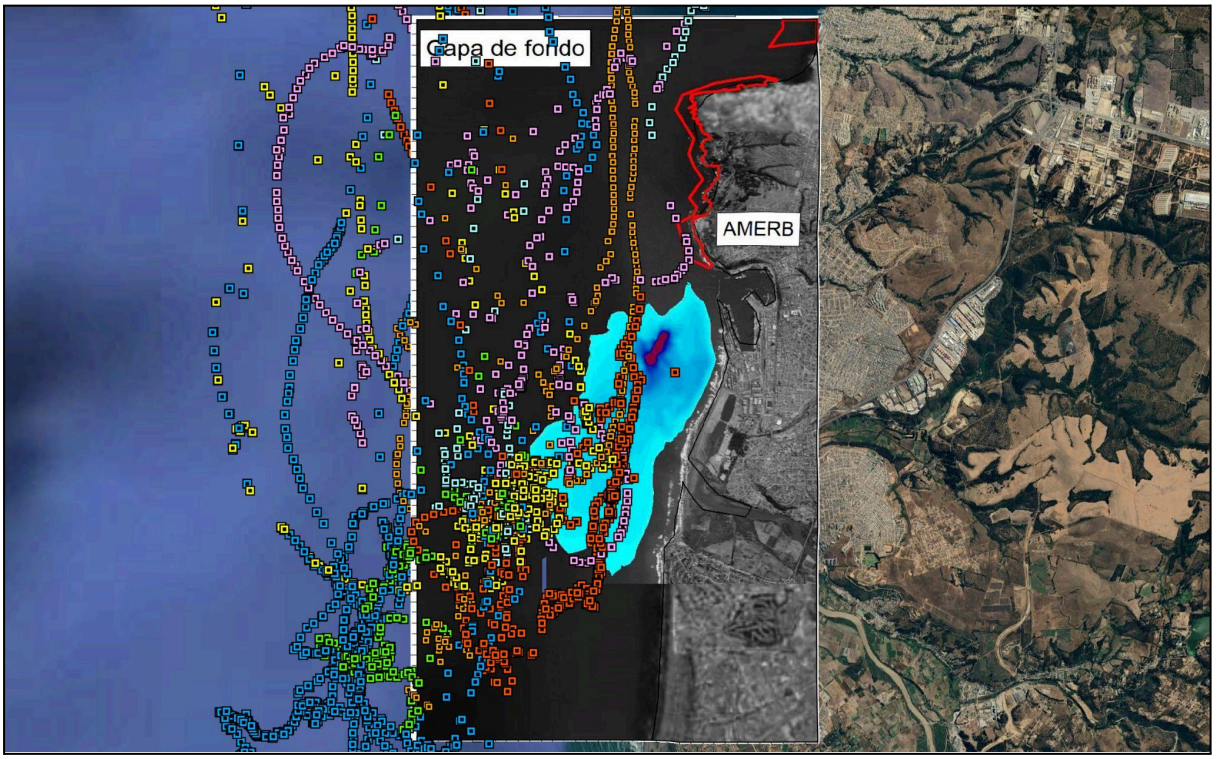


The planned port expansion (yellow polygon) at San Antonio in relation to the foraging grounds of the penguins from Islote Pájaros Niños. Square markers show GPS fixes recorded with GPS-dive loggers during the first week of July 2026.

Besides the likely increase in shipping traffic once the expansion is completed, the penguins of Islote Pájaros Niños face a larger and more immediate problem. Construction of the new terminals will require large volumes of sediment to be moved, making a marine sediment plume in the nearshore area unavoidable during construction.

This **sediment plume** will, on the one hand, **noticeably reduce water clarity**, causing problems particularly for visual predators such as penguins (see figure below). On the other hand, the suspended sediment can be expected to settle on the seafloor within the affected area, which will very likely bring about a **change in this habitat**.

As mentioned in the results, Humboldt penguins forage predominantly at the seafloor, so changes in the benthic habitat may also have consequences for their foraging success. Whether, and to what extent, these works will affect foraging and, in turn, breeding success is unclear and warrants close monitoring should the project go ahead as planned.



Modelled zone of influence of the sediment plume expected from the port expansion works, in relation to the foraging area of the Humboldt penguins from Islote Pájaros Niños.

Humboldt penguins were not considered on the basis of movement data in the environmental impact assessment for the port expansion; the tracking data on penguins from the region needed for this were lacking until we provided them for the first time in 2025 and 2026.

In addition, *Fundación Cosmos* - the organisation appointed by the Chilean state to manage the "Humedal Río Maipo" nature sanctuary - together with the municipality of Santo Domingo and the ornithologists involved, maintain technical objections[3]. They criticise fundamental technical shortcomings in the environmental impact study: it does not allow a reliable assessment of the breakwater's effects on the sediment dynamics of the river mouth (sand deposition and silting). They also fear habitat fragmentation between the Ojos de Mar lagoons of Llolleo and the Río Maipo wetland. The wetland is one of the last significant bird refuges on Chile's heavily industrialised central coast and hosts up to 180 recorded bird species (34% of Chile's avifauna), including migratory shorebirds of the Pacific Flyway and a resident population of coscoroba swans (*Coscoroba coscoroba*)[4]. Ornithologists also pointed to striking inconsistencies in the study's bird survey data, which showed no shorebirds at all during the peak season - contradicting years of monitoring data.

Fundación Cosmos has, together with other organisations - including *Fundación Ojos de Mar*, *Greenpeace Andino* and *Chile Ambiental* - lodged legal and technical objections against the approval; in addition, other environmental organisations have applied for the administrative annulment (invalidation) of the environmental approval[5]. **In this context, the new penguin data can provide an important technical basis for assessing the impacts of the port expansion.**

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[3] https://eldesconcierto.cl/medio-ambiente/administradores-del-humedal-rio-maipo-alertan-que-expansion-del-puerto-san-antonio-arriesga-al-ecosistema-n5459103

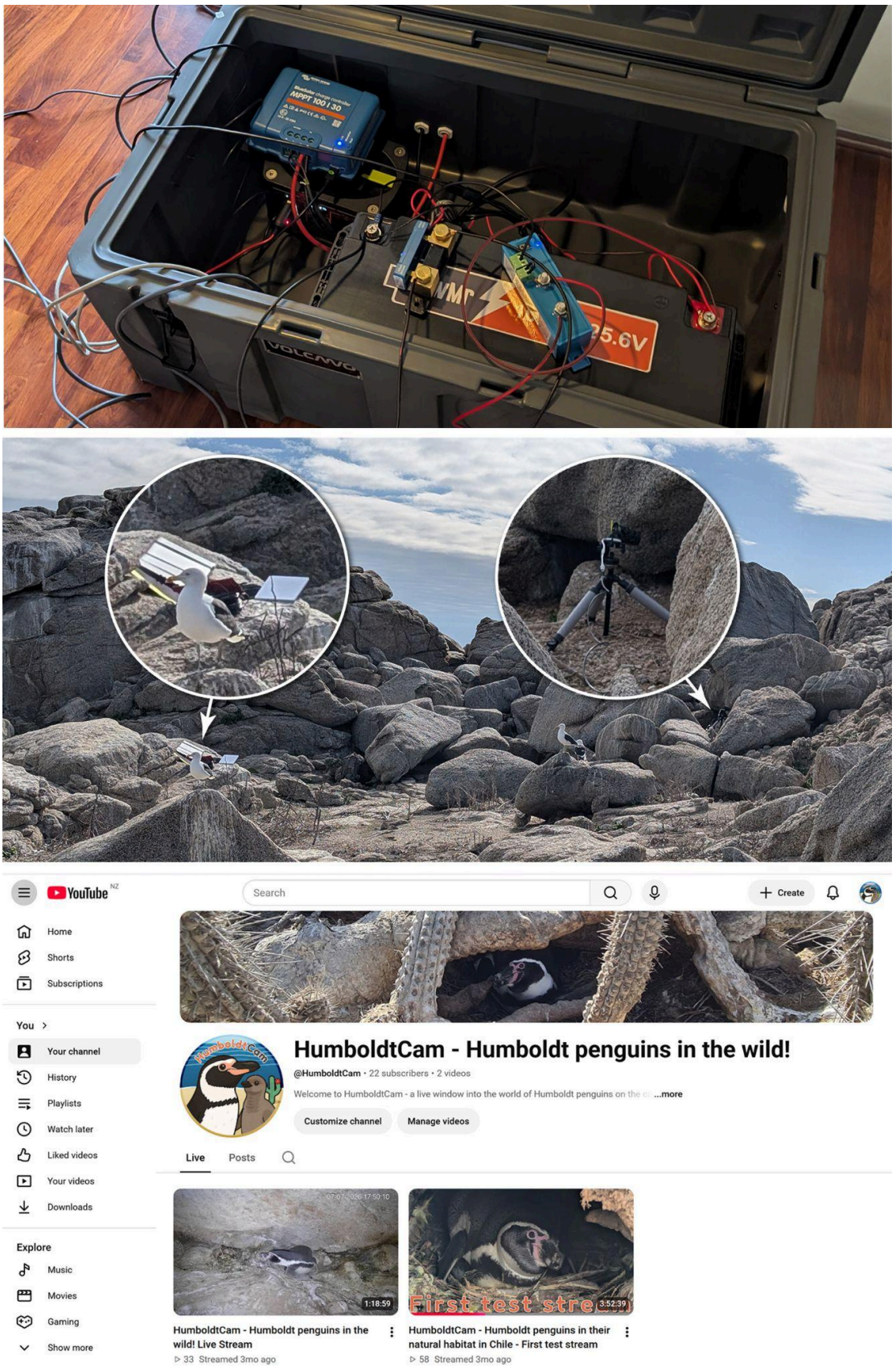
[4] https://laderasur.com/articulo/organizaciones-alertan-por-potenciales-impactos-del-puerto-exterior-de-san-antonio-en-el-humedal-del-rio-maipo-y-en-las-lagunas-de-llolleo/

[5] https://www.glaciareschilenos.org/anuncios/desde-los-glaciares-hasta-el-mar-organizaciones-de-toda-la-cuenca-del-rio-maipo-buscan-revertir-la-aprobacion-ambiental-de-puerto-exterior/

HumboldtCam

Wildlife live streams have become immensely popular in recent years thanks to the popularity of YouTube. Being able to watch animals in their natural environment at any time allows viewers to develop a closer relationship with the species and brings them closer to the wider public, which in turn benefits species conservation. In January 2026, our New Zealand research group developed such a system for this purpose and installed it on the subantarctic Antipodes Islands (https://tawaki.cam). For 10 months now, the system has been broadcasting real-time video from an erect-crested penguin colony, offering a unique insight into the breeding behaviour of a penguin species that the general public knew little or nothing about. The system runs autonomously on the islands and in that time has reached more than 10,000 viewers, who have watched around 3,500 hours of live video. And this despite the fact that no penguins could be seen in the colony from April to September because of their winter migration.

We have now developed a similar system for Humboldt penguins. Individual components were sourced over several days in the Greater Santiago area, so that the system could be assembled, programmed and finally tested in the field. The field tests not only showed how effectively the system performs in terms of solar power, but also allowed us to draw important conclusions about where the **system should be deployed next year (2027)**. Because the video data are transmitted via the Starlink satellite network, populated areas such as Algarrobo and Cachagua, despite their logistical advantages, are unsuitable, as many residents also use Starlink for internet access, causing data congestion and repeatedly interrupted video transmission. **Isla Choros or Isla Tilgo are therefore currently being considered as possible sites for HumboldtCam**.



Technical overview of the HumboldtCam system (top), set-up of the components during the first field test on Islote Pájaros Niños (centre; insets show the solar and Starlink components and the streaming camera aimed at a nest) and the dedicated YouTube channel (bottom).

Islote Lobos

On 14 July, a rain-free day allowed us to inspect Islote Lobos. The rocky islet has historically been suspected to be a potential breeding site for Humboldt penguins. It lies about 150 m off the rocky cliffs below the *Faro Curaumilla* lighthouse, about 10 km south of Valparaíso and 30 km north of Algarrobo.



Islote Lobos

After a drive of about three hours from Santiago, partly on poorly surfaced roads, the last 500 m to the lighthouse were covered on foot. From the lighthouse, the island was then examined with binoculars and telescope, and detailed, high-resolution video footage of the island was taken from all sides by drone.



The team inspecting Islote Lobos using drone, telescope and binoculars.

The island has little vegetation and, apart from a few small shrubs, is sparsely vegetated. It is also rocky, with little sediment or topsoil. Scree fields are therefore the only potential nesting habitat for Humboldt penguins. The seaward side consists almost entirely of steep cliffs offering few landing opportunities and even less nesting habitat for penguins. On the landward side, by contrast, there is a scree field that may provide breeding space for Humboldt penguins. Indeed, two penguins were sighted on the rocks in this part of the island. However, no clear evidence of nests was found, although this does not rule out that Humboldt penguins breed there. If so, probably in relatively small numbers, as the area of suitable breeding habitat is quite limited. Records on online birdwatching platforms also indicate that the island is used as a moulting site. Islote Lobos was, however, occupied by numerous kelp gulls (*Larus dominicanus*) and black vultures (*Coragyps atratus*). It is also a known sea lion rookery where South American sea lions (*Otaria flavescens*) breed.

Apparently low penguin numbers and virtually no landing sites rule out Islote Lobos as a potential study site for breeding penguins.



Two Humboldt penguins sighted on Islote Lobos.

Next steps

The new GPS data underline once again how important it is to study the at-sea distribution of Humboldt penguins. The consistent foraging routes we see in penguins from Islote Pájaros Niños show how important stable foraging grounds are for the species. The fact that the penguins forage mainly within the zone of influence of the Río Maipo suggests, on the one hand, that the region appears to have productive fishing grounds. On the other hand, it shows how easily threatened species can simply be overlooked in environmental assessments, as in the present case of the San Antonio port expansion. **The datasets** we have collected here over the past two years are **of great importance in this respect and can be used for technical submissions on coastal development projects**.

Given that the port expansion has already been approved, it is extremely important to continue documenting the foraging behaviour of the penguins of Islote Pájaros Niños, particularly once construction begins off San Antonio.

The ongoing development of the El Niño event also offers a unique opportunity to study in more detail how it affects the penguins and their behaviour at sea. **As far as the number and condition of breeding penguins allow, it would be of considerable importance to collect GPS tracking data and PenguCam data that provide insights into foraging conditions under exceptional environmental conditions**.

According to current forecasts, El Niño will persist into the austral winter of 2027 and only gradually transition to neutral conditions from June–August 2027 (IRI, October 2026[6]). If breeding conditions permit, it would make sense to push ahead with the installation of HumboldtCam in winter 2027 (June/July), so that a live stream of the species can generate a new kind of attention both in Chile and worldwide.

[6] https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

