Title: First record of *Poa* cf. *annua* on Fildes Peninsula (King George Island), a major human-access node in Antarctica

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Abstract

Antarctic terrestrial ecosystems are highly species-poor and particularly vulnerable to biological invasions. *Poa annua* L. is the only non-native flowering plant known to have established a persistent, self-sustaining population in Antarctica, with confirmed occurrences on King George Island near the H. Arctowski Polish Antarctic Station and the Ecology Glacier forefield. Here we report a new occurrence of *Poa* cf. *annua* on Fildes Peninsula (King George Island), based on georeferenced field photographs of a single individual growing on disturbed ground near logistics infrastructure. This record lies well outside previously documented localities on the island, representing a geographically distinct occurrence in its south-western sector. Fildes Peninsula is one of the most intensively used human-access nodes in Antarctica, hosting multiple research stations and one of the continent's few operational airstrips, and experiencing frequent and repeated human movement. The occurrence is therefore of particular biosecurity concern, as it may facilitate both local establishment and further dispersal. Given the species' demonstrated capacity for seed-bank formation, persistence, and rapid spread under Antarctic conditions, rapid detection and immediate response are essential.

Key words: Antarctica; biological invasions; King George Island; *Poa*; range expansion

Introduction

Antarctica is one of the most environmentally severe and geographically isolated regions on Earth. Its vascular flora is extremely limited, comprising only two native species, *Deschampsia antarctica* and *Colobanthus quitensis* (Parnikoza et al., 2007). As a result, human-assisted introductions pose a disproportionate threat to Antarctic terrestrial ecosystems.

Among non-native plants, *Poa annua* is exceptional: it is the only non-native flowering plant known to have established a persistent, reproducing population in Antarctica (Chwedorzewska et al., 2015). The species was first recorded on the continent in 1953 on Deception Island, although that population was subsequently eliminated by volcanic activity. On King George Island, *P. annua* was first recorded during the 1985/1986 austral summer near the H. Arctowski Polish Antarctic Station, where it established the best-documented invasive population in maritime Antarctica (Chwedorzewska, 2008; Galera et al., 2019). A second population was later recorded in 2008/2009 at the Ecology Glacier forefield, approximately 1.5 km from Arctowski, likely resulting from secondary dispersal (Galerina et al., 2017; Wódkiewicz et al., 2018).

The invasive potential of *P. annua* in Antarctica is reinforced by several traits documented for the King George Island populations. The species is capable of sexual reproduction and forms a persistent soil seed bank, with densities approaching 5000 seeds m^{-2} under maritime Antarctic conditions (Wódkiewicz et al., 2013). This seed bank provides a strong mechanism for long-term persistence and re-establishment following disturbance. In addition, *P. annua* exhibits marked phenotypic plasticity, including the ability to shift from an annual to a biennial or short-lived perennial life cycle under Antarctic conditions, thereby enhancing survival across seasons (Chwedorzewska et al., 2015; Rudak et al., 2026). Recent experimental evidence further indicates that invasion success is not restricted to a single pre-adapted source population, but may arise from multiple global populations, emphasizing the importance of limiting propagule pressure from all origins (Rudak et al., 2026).

Here we report a new occurrence of *Poa* cf. *annua* on Fildes Peninsula, King George Island. Previous records on the island have been restricted to the Point Thomas Oasis sector and the Ecology Glacier forefield (Admiralty Bay). This finding represents a geographically distinct occurrence and a marked range extension within the island. Its presence in one of Antarctica's most intensively used logistical hubs is of particular concern, as it may facilitate further human-mediated introduction and spread.

Materials and methods

On 7 March 2026, while in transit between Antarctic islands, one of the authors (CC) observed a single grass individual growing on disturbed gravel substrate in the Collins Harbour / Fildes Bay area of Fildes Peninsula, King George Island. The location was recorded using a smartphone GPS receiver (Figure 1). The individual was documented using high-resolution *in situ* photographs (Figure 2). Identification was independently verified by an expert co-author (KJC) based on diagnostic morphological traits visible in the photographs, including growth form and inflorescence structure. No voucher specimen was collected, as removal of biological material in Antarctica requires appropriate permits.

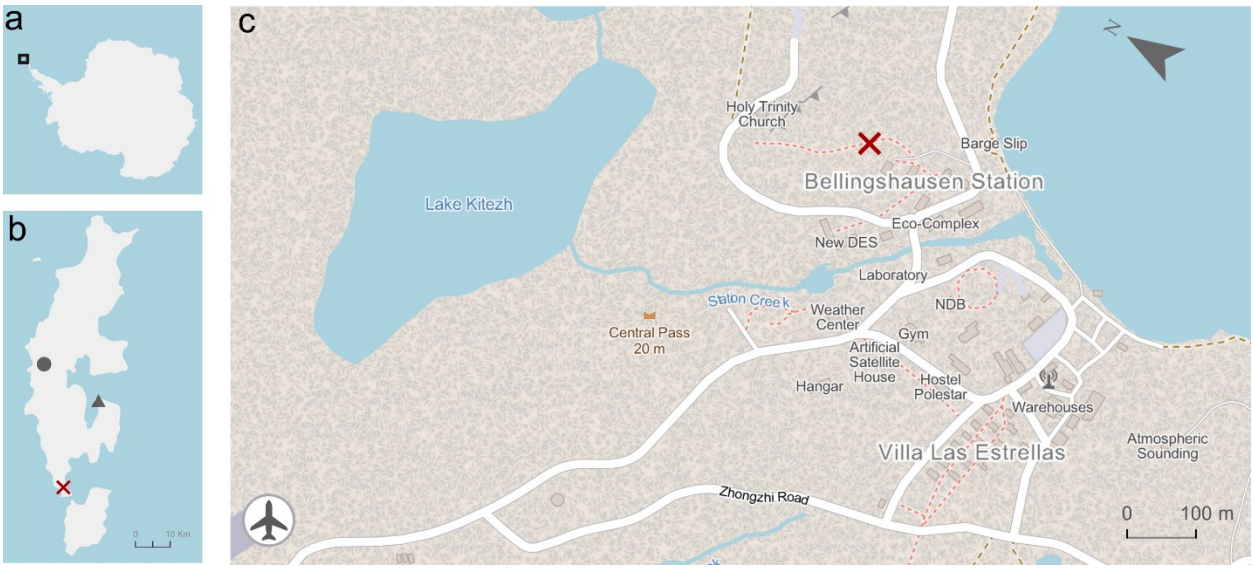

Figure 1. Location of the new record of *Poa cf. annua* on King George Island (South Shetland Islands, maritime Antarctica). (a) Location of King George Island within Antarctica. (b) King George Island showing previously reported occurrences of *Poa annua* at Point Thomas Oasis / H. Arctowski Station (triangle) and the Ecology Glacier forefield (circle). (c) Fildes Peninsula showing the observation site near Collins Harbour, including nearby research infrastructure and the airstrip; the newly observed individual is indicated by a cross. Base map: OpenStreetMap.

Figure 2. Photographic documentation of the *Poa* cf. *annua* individual observed on Fildes Peninsula, King George Island. (a) General view of the plant growing on disturbed gravel substrate in the vicinity of human infrastructure. (b) Top view of the tussock; a shoe is included for scale. (c) Detail of the inflorescence showing developing spikelets.

Results

The specimen is identified as *Poa annua* based on the presence of morphological traits, including a characteristic boat-shaped leaf apex, a bright light-green coloration, and a well-developed membranous ligule. In addition, the individual exhibits a set of pronounced adaptive traits previously observed under Antarctic environmental conditions. The plant

forms dense, multi-individual tussocks in which seed germination occurs within the maternal clump, effectively creating a self-contained structural “trap” that promotes localised recruitment and population persistence. The inflorescences are notably more compact compared to individuals from the species’ core distribution range, accompanied by reduced peduncle and internode elongation. Furthermore, the reddish pigmentation of the inflorescences is interpreted as a stress-induced response, likely associated with exposure to high levels of ultraviolet radiation, low temperatures, and/or water deficit. This anthocyanin accumulation is indicative of physiological adaptation to extreme abiotic stress conditions. Overall, the specimen represents *Poa annua* expressing both its typical diagnostic morphology and a distinct stress-adapted phenotype consistent with extreme environmental selection pressures.

Given the absence of a collected specimen, the taxon is conservatively reported as *Poa* cf. *annua*.

The observation site (−62.19740, −58.95982; WGS84) (Figure 1) is located on Fildes Peninsula, King George Island, in close proximity to research infrastructure and air operations at Teniente R. Marsh Airport. Previously documented occurrences on King George Island have been confined to the Admiralty Bay region, including Point Thomas Oasis near H. Arctowski Station and the Ecology Glacier forefield. In contrast, the Fildes Peninsula record lies more than 25 km away in the south-western sector of the island.

Discussion

This finding is important for three main reasons. First, it indicates a broader spatial distribution of *Poa cf. annua* on King George Island than previously recognized, with occurrences no longer confined to the Admiralty Bay region.

Second, the occurrence is located in one of the most intensively used logistical areas in Antarctica. Fildes Peninsula hosts multiple permanent research stations and lies in close proximity to Teniente R. Marsh Airport, one of the continent’s few operational airstrips. The area functions as a major hub for scientific operations and tourism, and experiences frequent, overlapping human activity, including air, maritime, and ground transport. Such conditions generate high propagule pressure and repeated disturbance and are widely recognized as facilitating biological invasions. The location, therefore, strongly suggests introduction *via* human-mediated pathways, such as contaminated cargo, footwear, vehicles, or aircraft operations. Importantly, the high connectivity of Fildes Peninsula means that this site may also act as a source for secondary dispersal to other ice-free areas within and beyond King George Island through the same transport networks.

Third, the biology of *P. annua* indicates that even a single incipient occurrence may lead to establishment if not addressed rapidly. The species produces viable seeds, forms persistent soil seed banks, and is capable of rapid population expansion under Antarctic conditions. Eradication efforts on King George Island have shown that populations can re-establish following removal, particularly where soil seed banks are not eliminated, and

that long-term management is required to achieve effective control. Importantly, current environmental constraints on establishment may weaken under climate warming, potentially increasing the likelihood of persistence and spread in the future (Rudak et al., 2026).

Similar single-individual occurrences have been reported elsewhere in Antarctica, such as on Signy Island, where early detection enabled successful eradication (Malfasi et al., 2020). These cases highlight the importance of rapid response following initial detection. The Fildes Peninsula observation may represent either a recent introduction or an undetected early-stage establishment, but in either case, it warrants immediate attention.

Although this record is based on photographic evidence and no voucher specimen was collected, the observed morphological characteristics and expert assessment provide sufficient confidence to justify reporting the occurrence. Reporting such early-stage observations is essential for informing biosecurity and management actions in Antarctica.

Conclusions

We document the first known occurrence of *Poa cf. annua* on Fildes Peninsula, King George Island, Antarctica. Located within a highly connected logistical hub, this record raises concern not only about local establishment but also about further human-mediated dispersal across the region. Given the species' demonstrated capacity for reproduction, seed-bank formation, and persistence under Antarctic conditions, this occurrence warrants urgent follow-up. We recommend rapid field verification, targeted removal under appropriate permitting frameworks, and strengthened biosecurity measures in high-traffic Antarctic locations such as Fildes Peninsula.

Acknowledgments

CC acknowledges financial support from the Portuguese Foundation for Science and Technology (FCT; DOI: https://doi.org/10.54499/UID/00295/2025). Antarctic fieldwork was funded by FCT under the project THAWIMPACT (2022.06628.PTDC), with logistical support from the Portuguese Polar Program (PROPOLAR), the Bulgarian Antarctic Institute, and the Spanish Polar Committee.

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