

Aliens in Antarctica

Aliens in Antarctica: the arising researcher

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Since the 1960, our attitudes to both gender and biosecurity have shifted somewhat: The British Antarctic Survey (BAS) now has a woman at the helm in Professor Jane Francis, and we are rapidly learning how even the smallest of invasive species can impact ecosystems, with the movement of soil and non-native species rapidly rising up the agenda for Antarctic Treaty member states. I find the story of how John's and my paths intertwined via one experiment interesting because of this. It highlights some huge changes within society and science over the last 50 years.

As part of an effort by BAS to understand life at the Poles, John Edwards had transplanted plants from South Georgia Island in the sub-Antarctic to Signy Island in the Antarctic (1973, British Antarctic Survey Bulletin, 33: 33–45). But it took nearly 20 years for anyone to realize that the midge, *Eretmoptera murphyi*, had hitched a ride in the plants and taken up residence on Signy Island. By then, it was too late to try and remove it: its soil-dwelling larvae were living within the peat and moss banks on the island, which are some of the best examples of this habitat in the Southern Ocean. Eradication of the midge would have meant significant harm to the vegetation. In any case, you only need to miss one larva for the eradication effort to have been for nothing, as the midge is asexual. And with pre-existing adaptations to the cold, it was thus primed to be a successful invader.

Since its discovery, the midge has spread, and a recent survey from my trip to Antarctica found that it now covers an area of almost 1 km², which is impressive for a flightless midge that has an active season of just a few months each year. Since its establishment, the midge is now the largest terrestrial animal on Signy Island, with native terrestrial



Photo 1: John Edwards with the Signy transplants, 1970. Photo credit: Natural Environmental Resource Council (NERC), BAS archives.

fauna represented by a few collembola and mite species. The island ecosystem is simple, and as a result, we are learning a lot about the impact that a single species introduction can have in Antarctica: We are finding that larvae are so abundant in places that they are affecting soil chemistry, adding as much nitrogen as is seen in areas in and around seal colonies. The success of *E. murphyi* on Signy marks it out as the most successful and persistent introduced invertebrate to Antarctica.

Today, we are using this accidental introduction to highlight the impact of soil transfer in the Antarctic, supporting BAS's efforts to tighten policy and biosecurity measures. The irony of this story now is that we fear another invasive species may have wiped out *E. murphyi* in its native range. Now the Signy population may be the only one left. Should we consider conserving the alien?!

Aliens in Antarctica: the established researcher John Edwards

In the 1960's, Ann Holtom was studying the two native Antarctic flowering plants at Winterbourne Gardens, University of Birmingham. In those days, BAS did not allow women to "go south," so she studied herbarium specimens alongside living material brought from Antarctica by others. I was then a young undergraduate studying microbes at Aberystwyth University but ended up extending her Antarctic research on Signy in the South Orkney Islands.

Bartlett, J., and J. Edwards. 2019. Aliens in Antarctica. Bull Ecol Soc Am 100(3):e01545. <https://doi.org/10.1002/bes2.1545>

Fortune played a large part as my external examiner, Professor Fogg, had spent 1966 “south” with BAS, and he subsequently contacted Dr Stanley Greene about me. Within a few days of graduating, I received a telegram saying “PHONE GREENE POLAR SURVEY IMMEDIATELY.” Ann’s bad luck of being female in the pre-enlightened era was my good fortune, and I became contracted to BAS at the University of Birmingham. My 21st birthday was spent sailing out of the Falkland Is. into the teeth of a force 8 gale, spending three summers and a winter on scenic Signy Island in the maritime Antarctic. I monitored the growth and reproduction of native angiosperms, trying to discover what special features, if any, they possessed that enabled them and no others, to successfully establish in Antarctica. We wondered whether it might be the physical barrier presented by the Southern Ocean that prevented other species from growing there, so Stanley took some endemic Falkland plants to test whether they could survive on South Georgia. He suggested I do the same, taking some additional species from sub-Antarctic South Georgia to Signy. These transplant experiments were carefully monitored to ensure no plant species established, and any plants surviving when the monitoring period ended were removed and burned.

Perhaps fortuitously, the climate—especially the frequent frosts during the growing season—



Photo 2: Jes Bartlett on Signy 2017, collecting *Eretmoptera murphyi* from the moss bank. Photo credit: Aqlima Ahmad.



Photo 3: Adult *E. murphyi*. Photo credit: Roger Key.

proved too harsh for all but a few of the transplanted species. My research suggested that Antarctica’s only two native angiosperms *Deschampsia antarctica* and *Colobanthus quitensis* did indeed possess special eco-physiological features, having relatively low-temperature optima for photosynthesis of around 14°C. However, although not a single botanical transplant became established, the same cannot be said for animals inadvertently imported during my experiment. I failed to notice any minute creatures in the soil the plants came with, but there seems little doubt that at least two invertebrate species traveled among the South Georgian plants: In the 1980’s, scientists on Signy recorded an annelid and a flightless midge in the area used for my transplants which had not been reported elsewhere in Antarctica.

But my “bad luck” in inadvertently introducing aliens became Jesamine’s PhD. She was able to carry out research on the midge *Eretmoptera murphyi*, incidentally also at the University of Birmingham and, unlike my predecessor, she was able to spend a summer studying on Signy Island, almost 50 years after I was there. She tells me an invasive beetle has been decimating invertebrate life on South Georgia and that *E. murphyi* hasn’t been seen there for years, so maybe I’ve accidentally saved this species from extinction!