

Colin Southwell

Australian Antarctic Division, Australia

Remotely operating camera network provides spatially extensive, long term observations of breeding Pygoscelis penguins around Antarctica

Colin Southwell [1], Andres Barbosa [2], Louise Emmerson [1], Tom Hart [3], Jefferson Hinke [4], Mariana Juárez [5,6], Malgorzata Korczak-Abshire [7], Gennadi Milinevsky [8], Kym Newbery [1], Silvia Olmastroni [9], Norman Ratcliffe [10], Mercedes Santos [5], Philip Trathan [10], George Watters [4].

[1] Australian Antarctic Division, Department of the Environment and Energy, Australia; [2] Department of Evolutionary Ecology, Natural History Museum, CSIC, Spain ; [3] Department of Zoology, University of Oxford, South Parks Road, Oxford, OX13PS, UK; [4] Antarctic Ecosystem Research Division, Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S.A.; [5] Departamento Biología de Predadores Tope, Instituto Antártico Argentino, Argentina; [6] National Scientific and Technical Research Council (CONICET), C1425 FQB, Ciudad Autónoma de Buenos Aires, Buenos Aires, Argentina; [7] Institute of Biochemistry and Biophysics, Polish Academy of Sciences, Poland; [8] Space Physics Laboratory, Taras Shevchenko National University of Kyiv, Ukraine; [9] Museo Nazionale dell'Antartide, Dipartimento Scienze Fisiche, della Terra e dell'Ambiente Università degli Studi di Siena, Via Laterina [8] , 53100 Siena, Italy; [10] British Antarctic Survey, High Cross, Madingley Road, Cambridge CB30ET UK

Antarctic seabirds are important indicators of status and change in Southern Ocean ecosystems, but their isolated and remote breeding populations are challenging and expensive to assess and monitor using traditional methods. Time-lapse cameras offer an alternate way of making spatially extensive, cost-effective and reliable observations of key seabird breeding parameters. We describe the recent development and application of a circumpolar network of time-lapse cameras at breeding colonies of *Pygoscelis* penguins to measure the key parameters of breeding success and breeding phenology. Following initial proof-of-concept studies which demonstrated the benefits and practicalities of a broad-scale camera observation system for *Pygoscelis* penguins, remotely operating cameras have been deployed at *Pygoscelis* penguin colonies around Antarctica with over 200 cameras now in place. The community of camera users is working cooperatively to develop standardised methods for processing images, explore methods for automated processing of camera images, and assess the potential of measuring additional parameters such as foraging trip duration. The camera observation network has facilitated the spatial expansion of CCAMLR's Ecosystem Monitoring Program at a time when logistic and financial constraints present new challenges to broad-scale, long term monitoring programs.