# THE AGE OF THE FIRST HOLOCENE MARINE TRANSGRESSION IN POTTER COVE, ISLA 25 DE MAYO (KING GEORGE ISLAND), SOUTH SHETLAND ISLANDS

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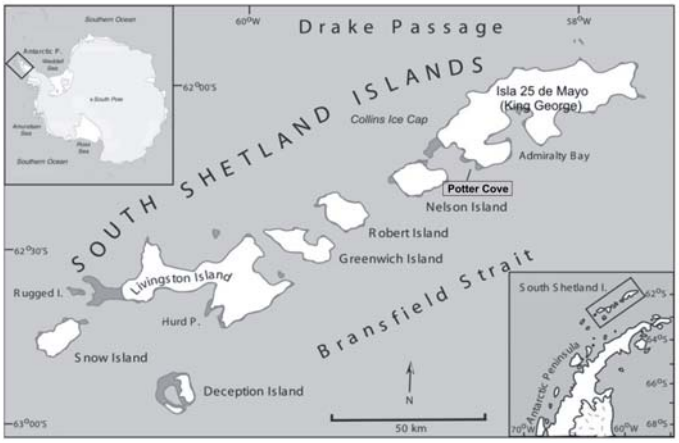


**Figure 1.** Location map of Potter Cove

Since Sugden and John's (1973) paper regarding the glacier fluctuations in the South Shetland Islands, it is generally accepted that the first Holocene marine transgression of this archipelago occurred at least by 9540 ± 235 cal yrs BP (del Valle *et al.* 2007, Hall 2010). All radiocarbon ages presented here are calibrated with Calib611 software (Stuiver and Reimer 1993) using the SHCal04 calibration curve and Björk's *et al.* (1991) reservoir age correction of Bahía Esperanza (1.160 ± 51 yrs, ΔR: 829 yrs). This age is very important, since it provides the minimum on land obtained age of the end of the Last Glacial Maximum (LGM) and start of the Holocene in this Antarctic sector.

The first profile that affords this critical age was performed by Sugden and John (1973) on the southern coast of Potter Cove (Fig. 1). Their age was obtained from a dark silty horizon, which incorporates shell fragments (*laternula* sp.), located 2.7 m below a 6 m asl marine terrace. In the same outcrop, a second age of 7370 ± 99 yrs BP was obtained by the same authors on a seaweed horizon located 1.5 m below the top of the same terrace (Fig. 2).

Here we present our own chronological results (Fig. 3) obtained at this key site, which put in doubt the earliest Holocene radiocarbon age obtained by Sugden and John (1973).

To ensure good replication, or even to obtain an older age than Sugden and John (1973), we excavated a new 3.8 m deep section in the 6 m marine terrace (62º 14' 20.24" S, 58º 40' 15.75" W). This terrace is attached to an old dam located about 100 m west of the Argentine Carlini Station. We penetrated the permafrost table reaching 1.1 m deeper (3.5 m) than any previous work. The lower 2.0 m of this new section are interpreted as marine transgressive deposits, whereas the upper 1.8 m corresponds to a glacier-transgressive, partially deformed, marine near-shore deposit, covered by a lodgment till that include up to 0.8 m large faceted and striated blocks. Our description and interpretation agree mainly with those of other authors (Sugden and John 1973, del Valle *et al.* 2007), but differs with them in assigning a much shorter time interval to the deposition of the marine sediments, with a much larger accumulation rate (6.4 mm/yr, Fig. 3). Four additional samples, collected between 0.7 and 3.5 m depth, were dated and added (Fig. 3) to the previously dated samples obtained: two by Sugden and John (1973), two by del Valle *et al.* (2007), and four by Watcham (2010). All these radiocarbon ages were performed on different organisms: marine shells of *laternula* sp., penguin bones, and seaweed. The agreement of the obtained ages with the accumulation rate follows the graph of Figure 3. The only sample age, that appears to be an outlier and disagrees markedly with this curve (Fig. 3), is the 9.540 yrs BP oldest minimum age obtained by Sugden and John (1973).

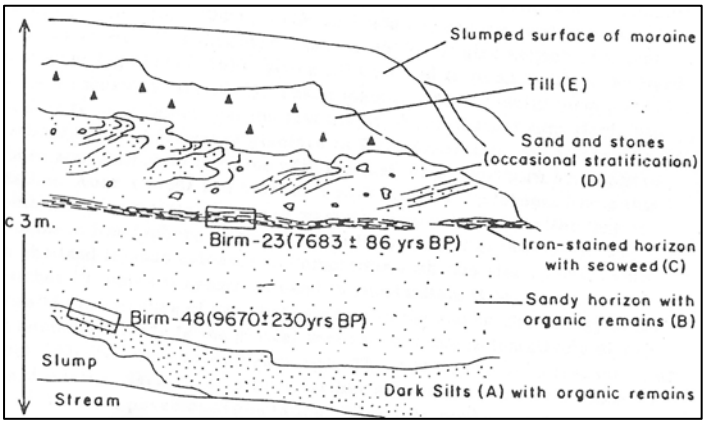


**Figure 2.** Exposure in Potter Cave according to Sugden and John (1973).

The high sedimentation rate is consistent with some escape structures of numerous *laternula* sp. shells that are common over the whole marine part of the profile.

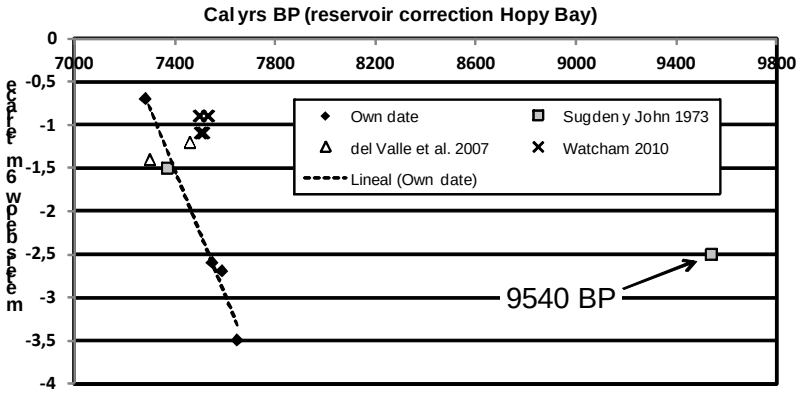


**Figure 3.** Age vs depth graphic for the southern Potter Cove section samples. It is clear the inconsistency of the 9.540 yrs BP

According to the new age interpretation of the southern Potter Cove section, the Holocene postglacial marine transgression initiated before 7650 cal yrs BP, reaching about 12 m altitude above the present sea level (Hall 2010), and was locally interrupted by a glacier advance about 200 yrs later, after 7.285 yrs BP.

The 6 m marine terrace was shaped later, probably during the Late Holocene (Simms *et al.* 2011).

Finally it is worthy to mention that a similar dated glacier advance between 7.250 to 7.100 cal yrs BP was registered NW of James Ross Island (Strelin *et al.* 2006).

Bjork, S., Hjort, C., Ingolfsson, O. y Skog, G. 1991. Radiocarbon dates from the Antarctic peninsula Region. Problems and potential. Quaternary Proceedings 1:55-65.

del Valle, R. A., Montalti, D., Inbar, M. y Boaretto, E. 2007. Holoceno marino en la Península Potter, Isla 25 de Mayo, Antártida. Revista de la Asociación Geológica Argentina 62: 35-43

Hall, B. 2010. Holocene relative sea-level changes and ice fluctuations in the South Shetland Islands. Global and Planetary Change 74: 15-26.

Simms, A. R., De Witt, R., Kouremenos, P. y Drewry, A. M. 2011. A new approach to reconstructing sea levels in Antarctica using optically stimulated luminescence of cobble surfaces. Quaternary Geochronology 6: 50-60.

Strelin, J., Sone, T., Mori, J., Torielli, C. y Nakamura, T. 2006. New data related to Holocene landform development and climatic change from James Ross Island, Antarctic Peninsula. In Fütterer, D., Damaske, D., Kleinschmidt, G., Miller, H. and Tessensohn, F. (eds.) Antarctica: Contributions to Global Earth Sciences, Springer-Verlag: 455-460, New York.

Stuiver, M. y Reimer, P. J. 1993. Extended $^{14}C$ data base and revised CALIB 3.0 $^{14}C$ Age calibration program. Radiocarbon 35: 215-230

Sugden, D. y John, B. 1973. The age of glacier fluctuations in the South Shetland Islands, Antarctica. In van Zinderen Bakker, E.M. (ed.) Palaeoecology of Africa, the Surrounding Islands, and Antarctica. A.A. Balkema: 139-159, Cape Town.

Watcham, E. P. 2010. Late Quaternary relative sea level change in the South Shetland Islands, Antarctica. PhD theses, Durham University (unpublished), 286 p., Durham.