AN EXPLANATION FOR THE POPULATION CRASH OF RED-NECKED PHALAROPES *PHALAROPUS LOBATUS* STAGING IN THE BAY OF FUNDY IN THE 1980s

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SUMMARY

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Numbers of Red-necked Phalaropes *Phalaropus lobatus* in their major autumn staging site in the Bay of Fundy declined by >99% between 1982 and 1989. No other North Atlantic seabird exhibited a similar decline. We propose that at least the first part of the decline was a result of conditions caused by the 1982/83 El Niño-Southern Oscillation (ENSO), which affected the wintering area of this population off Ecuador and Peru.

Key Words: Bay of Fundy, ENSO, Humboldt Current, *Phalaropus lobatus*, population crash, Phalarope, staging

One of the greatest seabird mysteries of the North Atlantic region is the abrupt disappearance of Red-necked Phalaropes *Phalaropus lobatus* from their major autumn staging site in the southwestern Bay of Fundy during the 1980s (Brown 1991, Duncan 1996, Rubega *et al.* 2000, Duncan *et al.* 2001, Nisbet *et al.* 2013). Surveys in the late 1970s and early 1980s yielded estimated totals of up to 2 000 000–3 000 000 birds, with peak numbers in mid-August (Finch *et al.* 1978, Vickery 1978, Mercier & Gaskin 1985), but numbers were reduced in 1983 (Forster 1984) and the birds were virtually absent by 1989 (Duncan 1996). Sporadic searches have failed to locate alternative staging areas, except for a few records of tens of thousands 60–80 km to the southeast, the major autumn staging area for Red Phalaropes *P. fulicarius* (Brown 1991, Duncan 1996). Searches for local explanations of the population crash have focused on declines in abundance and availability of the copepod *Calanus finmarchicus* (Brown *et al.* 2010), which had been the major prey of Red-necked Phalaropes until 1982 (Mercier & Gaskin 1985). However, this copepod remains abundant in the southeastern Bay of Fundy (Thorne & Read 2013), and Red Phalaropes continued to stage there in large numbers through the 1980s (Brown & Gaskin 1988, Brown 1991, Duncan 1996).

Searches for non-local explanations of the crash have been hampered by the paucity of information from the breeding grounds, and by uncertainty about the wintering area. The only known wintering area for large numbers of Red-necked Phalaropes in the Western Hemisphere is in the Humboldt Current off Ecuador, Peru and northern Chile (Murphy 1936, Rubega *et al.* 2000, Spear & Ainley 2008), although small numbers (low hundreds) have recently been reported in winter off the southeastern United States (Haney 1985, Wallace & Wigh 2007). Hence, it is widely believed that most Red-necked Phalaropes that stage in the Bay of Fundy winter in the Humboldt Current (Mercier & Gaskin 1985, Nisbet *et al.* 2013). However, others have regarded this as uncertain or unlikely (Cramp & Simmons 1982, Duncan 1996, Brown *et al.* 2010), in part because no other North Atlantic seabird migrates to the Pacific Ocean, and in part because the species is rarely encountered in intervening areas such as the West Indies and Caribbean Sea. These skeptics have hypothesized that most Red-necked Phalaropes from eastern North America and Greenland must winter somewhere in the North or South Atlantic Oceans, in an area yet to be discovered.

Recently Smith *et al.* (2014) tracked a Red-necked Phalarope marked with a geolocator from its breeding grounds in Shetland, UK. This bird crossed the North Atlantic Ocean to the coast of Labrador, then staged for 5 days in August in the Bay of Fundy before continuing (partly overland) to winter in the Humboldt Current off Ecuador and Peru. Although based on only one bird, this information points to a connection between the Red-necked Phalaropes breeding in the North Atlantic, those staging in the Bay of Fundy and those wintering in the Humboldt Current. This prompted us to revisit the idea that the population crash in the 1980s might have been caused by factors in the wintering area rather than in the staging or breeding areas.

The population crash has been said to have occurred in the late 1980s (Duncan 1996, Rubega et al. 2000), but numbers were already very low when Duncan (1996) started observing in 1985. In fact, marked declines had been reported in 1983 and 1984, when counts were in the low tens of thousands rather than the hundreds of thousands reported in previous years (Forster 1984, 1985, P. D.Vickery, pers. comm.). Although numbers continued to decline until at least 1989 (Forster 1986, Duncan 1996), after reviewing the evidence cited above we conclude that the largest declines had occurred by 1984. We propose the hypothesis that this early decline was caused by the 1982/83 El Niño-Southern Oscillation (ENSO), and that the continuing decline may have been caused by the less intense 1986/87 ENSO (Null 2014). ENSO 1982/83 was one of the two most intense of the century: it caused reproductive failures and major population declines in many seabird species in the eastern tropical Pacific (Duffy *et al.* 1988, Glynn 1988, Duffy 1990, Wilson 1991, Schreiber 2001). El Niño conditions prevailed throughout the

1982/83 winter, and planktivorous fish became severely depleted, indicating the possibility that planktivorous birds such as phalaropes would have been equally affected. These conditions continued until September 1983 (ESRL 2014), and effects on marine ecosystems persisted well into 1984, with some seabirds not recovering fully until 1988 (Glynn 1988, Wilson 1991). Hence, plankton populations likely would have been depleted when the phalaropes arrived in September–October 1983 and probably well into the winter of 1983/84. We know of no direct observations of the response of phalaropes to El Niño: Murphy (1936) observed large numbers of Red-necked Phalaropes off the coast of Peru during the 1926 ENSO, but did not report their behavior or condition. Spear & Ainley (2005) surveyed Red-necked Phalaropes and other seabirds off Peru in 1980–1995, through several ENSOs, but did not report interannual variation in abundance.

Numbers of Red-necked Phalaropes in the southwestern Bay of Fundy continued to decline in the late 1980s: Duncan (1996) recorded a one-day count of 20 000 in 1985 (Forster [1986] reported this as 8 000), whereas his highest count in 1989 was 20. We suggest that this later decline might have been caused by the moderate 1986/87 ENSO, which the surviving phalaropes would have experienced in the winters of 1986/87 and 1987/88. There has been no recent sign of a recovery in numbers staging in the Bay of Fundy in autumn, but there have been at least two records of large numbers on spring migration on Georges Bank and in the Gulf of Maine in 1991 and 2005, respectively (Duncan 1996, Nisbet *et al.* 2013).

Our hypothesis would explain why Red-necked Phalaropes were the only northwestern Atlantic seabird that suffered a population crash in the 1980s (Nisbet *et al.* 2013), and specifically why Red Phalaropes were not equally affected, although they staged <100 km from the staging grounds of Red-necked Phalaropes and fed on the same prey in the same way (Brown & Gaskin 1988): these Red Phalaropes winter off West Africa (Cramp & Simmons 1982, Brown 1986). Our hypothesis leads to two testable predictions: (1) the population crash should have affected all populations of Red-necked Phalaropes breeding in North America and Greenland, and probably those in the northeastern Atlantic as well (Smith *et al.* 2014); and (2) Red Phalaropes breeding in the Arctic regions of western North America and northeastern Siberia should have been equally affected, because they winter with the Red-necked Phalaropes in the Humboldt Current (Tracey *et al.* 2002, Spear & Ainley 2008). Quantitative information on breeding populations is scanty, but Reynolds (1987) reported a 62% reduction in Red-necked Phalarope numbers breeding on a study-plot at La Pérouse Bay, Manitoba, between 1982 and 1984, with a marked reduction in the return rate of banded birds (Reynolds & Cooke 1987). Numbers breeding on this study-plot increased slightly in 1985 and 1986, but decreased by 40% in 1987 and by a further 80% (to 6% of the 1982 numbers) at the next census in 1993 (Gratto-Trevor 1994). At Prudhoe Bay, northwestern Alaska, numbers of breeding Red-necked Phalaropes declined by 85% between 1981 and 1986, recovering to above the 1981 level by 1990; Red Phalaropes exhibited a similar decline and recovery, and the author specifically attributed the declines in both species to the 1982/83 ENSO (Troy 1996). Total numbers of Red-necked Phalaropes breeding in the UK declined by about 50% between 1981 and 1987, but there was no indication of a major decline in any one year; numbers recovered to near the 1981 level by 1992 (Rare Breeding Birds Panel 1983–1995). The small population that bred in Ireland declined by >95% between 1971 and 1973, coinciding with the earlier strong 1972/73 ENSO (Null 2014), and did not start to recover until the 2000s (D. Suddaby, pers. comm.).

Together, the information presented herein shows that large declines in breeding populations of Red-necked Phalaropes and western Arctic populations of Red Phalaropes coincided with ENSO events. However, the information also indicates that the declines in breeding populations of Red-necked Phalaropes were less precipitous than that of the numbers staging in the Bay of Fundy, and that some of the breeding populations recovered within a few years, so that a local explanation (specific to the Bay of Fundy) is probably required as well. A local explanation may also be required for the fact that the northwestern Atlantic population has shown signs of recovery based on numbers seen on spring migration (see above), without records of increased numbers in the Bay of Fundy in autumn. We encourage others who may have data from the 1980s on breeding or staging populations of this species to use them to test our hypothesis.

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REFERENCES

BROWN, R.G.B. 1986. *Revised atlas of eastern Canadian seabirds. I. Shipboard surveys*. Dartmouth, NS: Canadian Wildlife Service, Bedford Institute of Oceanography.

BROWN, R.G.B. 1991. The great Fundy phalarope mystery. *Nova Scotia Birds* 33: 58–59.

BROWN, R.G.B. & GASKIN, D.E. 1988. The pelagic ecology of the Grey and Red-necked Phalaropes *Phalaropus fulicarius* and *P. lobatus* in the Bay of Fundy, eastern Canada. *Ibis* 130: 234–250.

BROWN, S., DUNCAN, C. D., CHARDINE, J., HOWE, M. & THE RED-NECKED PHALAROPE WORKING GROUP. 2010. Red-necked Phalarope research, monitoring and conservation plan for the northeastern US and Maritime Canada. Version 1.1. [Available online at: http://www.whsrn.org/sites/default/files/file/Red-necked_Phalarope_Plan_for_NE_U.S.__CAN_10_02-28_v1.1.pdf; accessed 20 September 2014.]

CRAMP, S. & SIMMONS, K.E.L. (Eds.). 1982. *The birds of the western Palearctic*. Vol. III: Waders to Gulls. Oxford: Oxford University Press.

DUFFY, D.C. 1990. Seabirds and the 1982–84 El Niño Southern Oscillation. In: Glynn, P.W. (Ed.). *Consequences of the 1982–83 El Niño Southern Oscillation*. Amsterdam: Elsevier. pp. 395–415.

DUFFY, D.C., ARNTZ, W.E., SERPA, H.T., BOERSMA, P.D. & NORTON, R.L. 1988. A comparison of the effects of El Niño and the Southern Oscillation in Peru and the Atlantic Ocean. In: Ouelette, H. (Ed.). *Acta XIX Congressus Internationalis Ornithologici*. Ottawa: University of Ottawa Press. pp. 1740–1745.

DUNCAN, C.D. 1996. The migration of Red-necked Phalaropes: ecological mysteries and conservation concerns. *Birding* 28: 482–488.

DUNCAN, C.D., KENNEDY, J. & HICKLIN, P.W. 2001. Phalaropes in the Bay of Fundy. *Bird Trends* 8: 39–40.

ESRL (EARTH SYSTEM RESEARCH LABORATORY). 2014. Monthly ENSO Index (MEI). [Available online at http://www.esrl.noaa.gov/psd/enso/mei/; accessed 20 September 2014.]

FINCH, D.W., RUSSELL, W.C. & THOMPSON, E.V. 1978. Pelagic birds in the Gulf of Maine. *American Birds* 32: 281–294.

FORSTER, R.A. 1984. Northeastern Maritime Region. *American Birds* 38: 175–179.

FORSTER, R.A. 1985. Northeastern Maritime Region. *American Birds* 39: 25–29.

FORSTER, R.A. 1986. The autumn migration: August 1–November 30, 1985. *American Birds* 40: 254–260.

GLYNN, P.W. 1988. El Niño–Southern Oscillation 1982–83: Nearshore, population and ecosystem responses. *Annual Review of Ecology and Systematics* 19: 309–345.

GRATTO-TREVOR, C L. 1994. Monitoring shorebird populations in the Arctic. *Bird Trends* 3: 10–12.

HANEY, J.C. 1985. Wintering phalaropes off the southeastern United States: application of remote sensing imagery to seabird habitat analysis at oceanic fronts. *Journal of Field Ornithology* 56: 321–333.

MERCIER, F. & GASKIN, D.E. 1985. Feeding ecology of migrating Red-necked Phalaropes (*Phalaropus lobatus*) in the Quoddy region, New Brunswick, Canada. *Canadian Journal of Zoology* 63: 1062–1067.

MURPHY, R.C. 1936. *Oceanic Birds of South America*. Vols. I and II. New York: MacMillan Co. & American Museum of Natural History.

NISBET, I.C.T., VEIT, R.R., AUER, S.A. & WHITE, T.P. 2013. Marine birds of the eastern USA and the Bay of Fundy: distribution, numbers, trends, threats, and management. *Nuttall Ornithological Monographs* 29: 1–188.

NULL, J. 2014. El Niño and La Niña years and intensities. [Available online at: http://www.ggweather.com/enso/oni.htm; accessed 20 September 2014.]

RARE BREEDING BIRDS PANEL. 1983–1995. [Annual reports on rare breeding birds in the United Kingdom, 1981–92]. *British Birds* 76: 1–25; 78: 69–92; 79: 53–81, 470–495; 81, 99–125, 417–444; 82, 477–504; 83: 353–390; 84: 379–302; 86: 62–90; 87: 366–393; 88: 67–93.

REYNOLDS, J.D. 1987. Mating system and nesting biology of the Red-necked Phalarope *Phalaropus lobatus*: What constrains polyandry? *Ibis* 129: 225–242.

REYNOLDS, J.D. & COOKE, F. 1988. The influence of mating systems on philopatry: a test with polyandrous Red-necked Phalaropes. *Animal Behaviour* 36: 1788–1795.

RUBEGA, M.A., SCHAMEL, D. & TRACY, D.M. 2000. Red-necked Phalarope (*Phalaropus lobatus*). In: Poole, A. (Ed.) *The birds of North America*, No. 538. Ithaca: Cornell Laboratory of Ornithology. [Available online at: http://bna.birds.cornell.edu/bna/species/538; accessed 20 September 2014.]

SCHREIBER, E.A. 2001. Climate and weather effects on seabirds. In: Schreiber, E.A. & Burger, J. (Eds.). *Biology of marine birds*. Boca Raton, FL: CRC Press. pp. 179–215.

SMITH, M., BOLTON, M., OKILL, D.J., SUMMERS, R.W., ELLIS, P., LIECHTI, F. & WILSON, J.D. 2014. Geolocator tagging reveals Pacific migration of Red-necked Phalarope *Phalaropus lobatus* breeding in Scotland. *Ibis* 156: 870–873.

SPEAR, L.B. & AINLEY, D.A. 2008. The seabird community of the Peru Current, 1980–1995, with comparisons to other eastern boundary currents. *Marine Ornithology* 36: 125–144.

THORNE, L.H. & READ, A.J. 2013. Fine-scale biophysical interactions drive prey availability at a migratory stopover site for *Phalaropus* spp. in the Bay of Fundy, Canada. *Marine Ecology Progress Series* 487: 261–273.

TRACY, D.M., SCHAMEL, D. & DALE, J. 2002. Red Phalarope (*Phalaropus fulicarius*). In: Poole, A. (Ed.) *The birds of North America*, No. 698. Ithaca: Cornell Laboratory of Ornithology. [Available online at: http://bna.birds.cornell.edu/bna/species/698; accessed 26 December 2014.]

TROY, D.M. 1996. Population dynamics of breeding shorebirds in Arctic Alaska. *International Wader Studies* 8: 15–27.

VICKERY, P.D. 1978. Northeastern maritime region. *American Birds* 32: 174–180.

WALLACE, R.D. & WIGH, R. 2007. Pelagic birds of the southern South Atlantic Bight. *North American Birds* 61: 198–207.

WILSON, U.W. 1991. Responses of three seabird species to El Niño events and other warm episodes on the Washington coast, 1979–1990. *Condor* 93: 853–858.