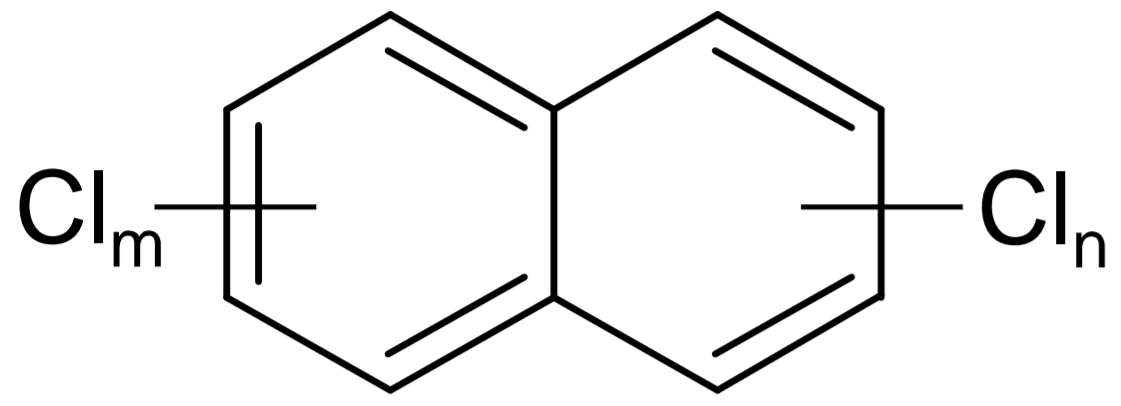


Katrin Vorkamp, Knud Falk, Søren Møller, Frank Rigét, Peter B. Sørensen



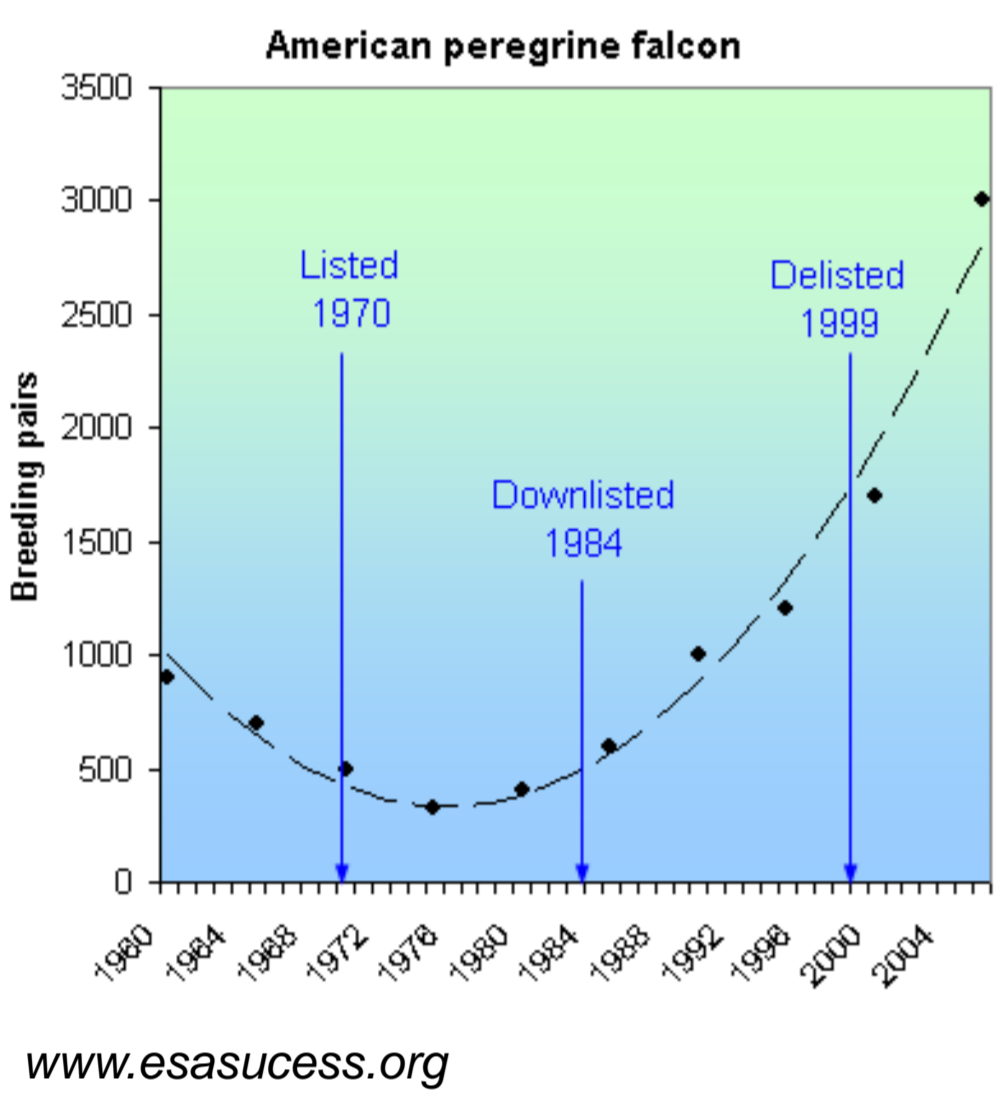
Polychlorinated naphthalenes add to the burden of organochlorines in peregrine falcons



Polychlorinated naphthalenes (PCNs) were used in applications similar to those of polychlorinated biphenyls (PCBs), e.g. in capacitor dielectrics and cutting oils. Their production and use declined or ceased concurrently in the 1970s/1980s. Because of their planar structure, PCNs can exhibit dioxin-like toxicity.

Emission sources also include PCN formation in combustion processes and PCN impurities in PCB formulations. PCNs were included in the Stockholm Convention on Persistent Organic Pollutants (POPs) in 2015, in Annex A (elimination) and Annex C (unintentional production).

The peregrine falcon is an endangered species, which has particularly suffered from the accumulation of POPs, such as DDT and its degradation products. The population in Southwest Greenland has been monitored since the early 1980s including ecological observations, eggshell measurements and determinations of organic contaminants.

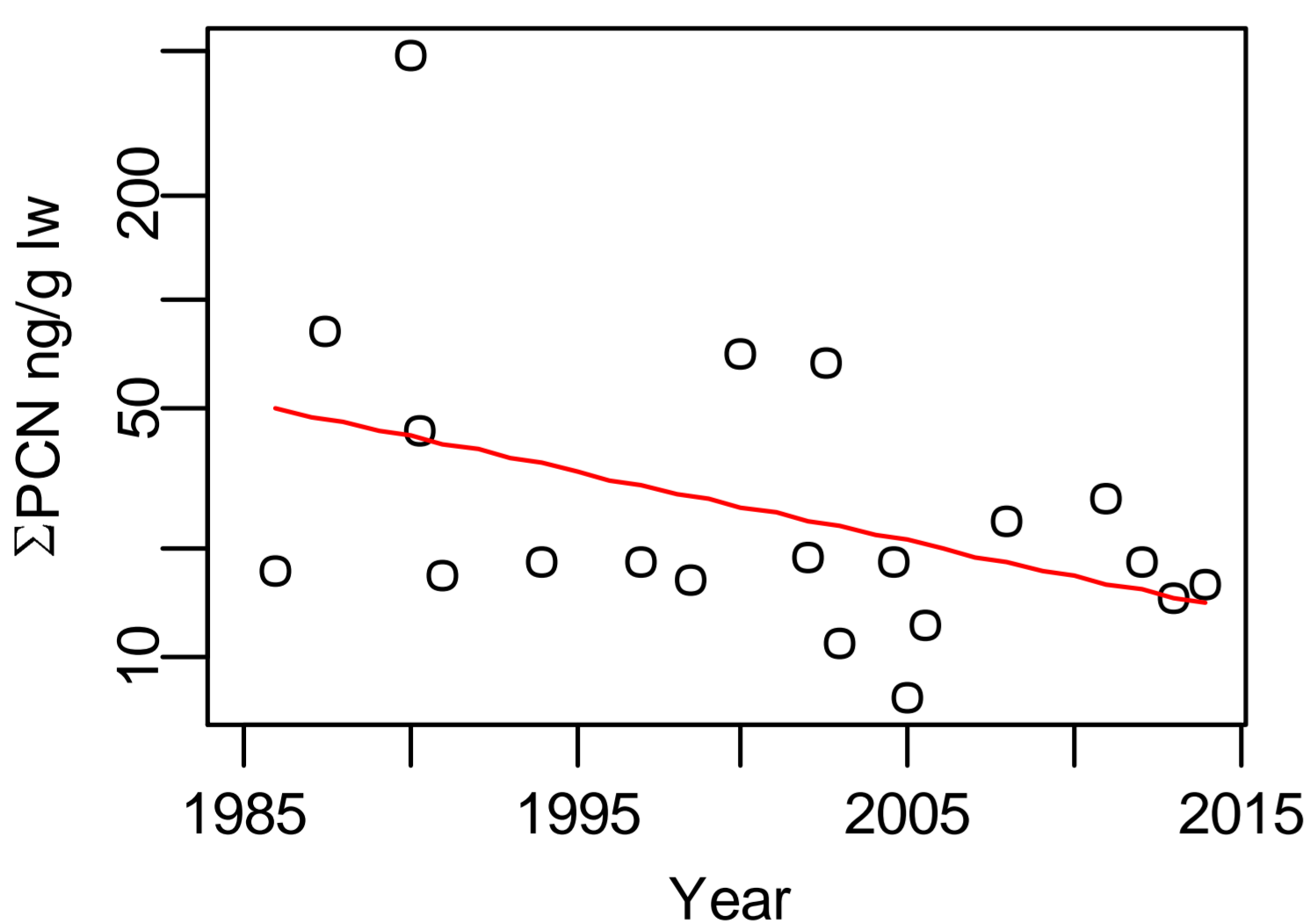
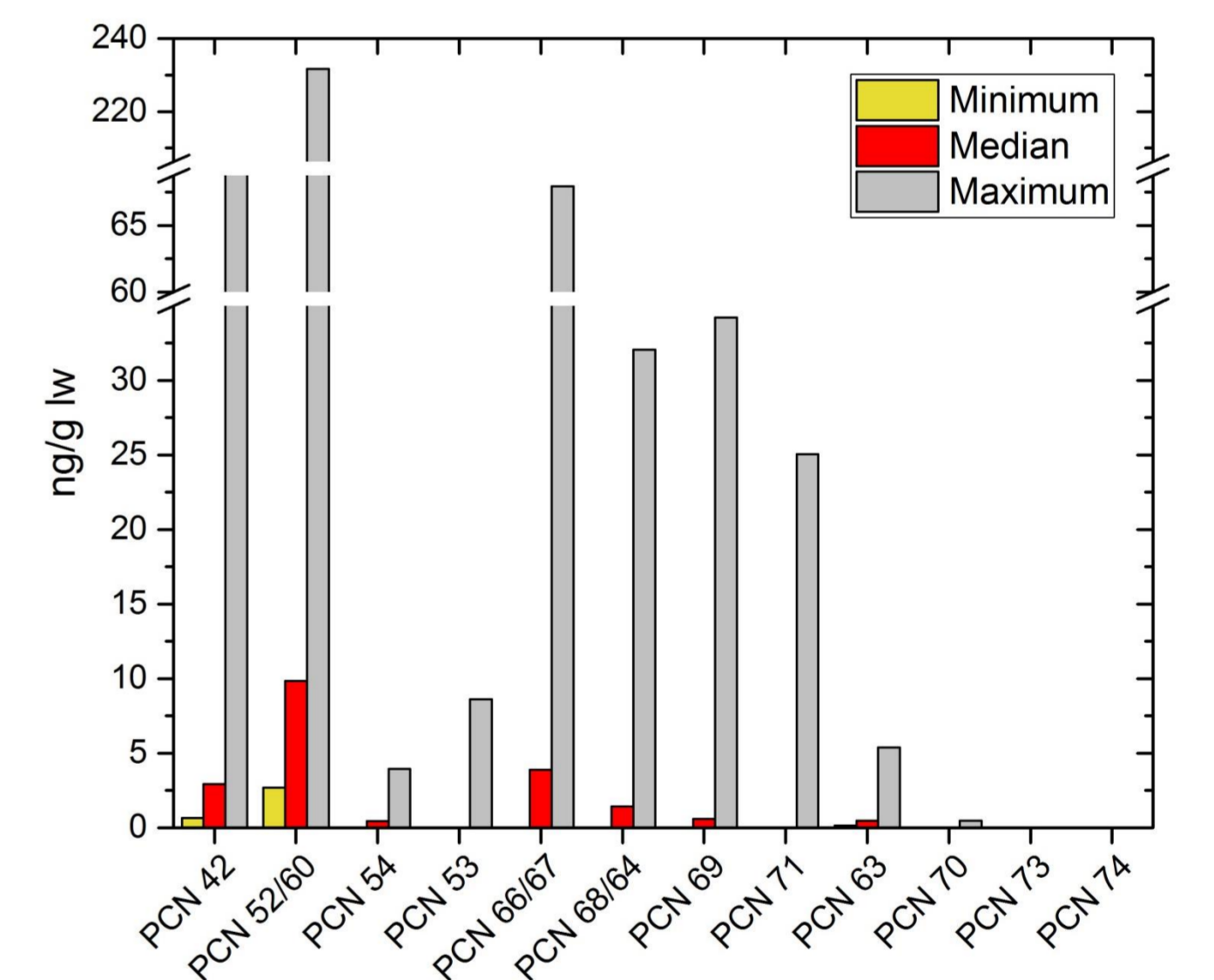


PCNs have now been determined for the first time, in a total of 41 eggs covering the period 1986-2014. The study included the congeners PCN 42, 52/60, 53, 54, 63, 66/67, 68/64, 69, 70, 71, 73 and 74. The samples were extracted with hexane:acetone (4:1) and cleaned up on aluminium oxide and silica with and without H₂SO₄, from which the compounds were eluted with hexane:dichloromethane (1:1). The extracts were concentrated to 200 µl and analysed by GC-MS-ECNI.



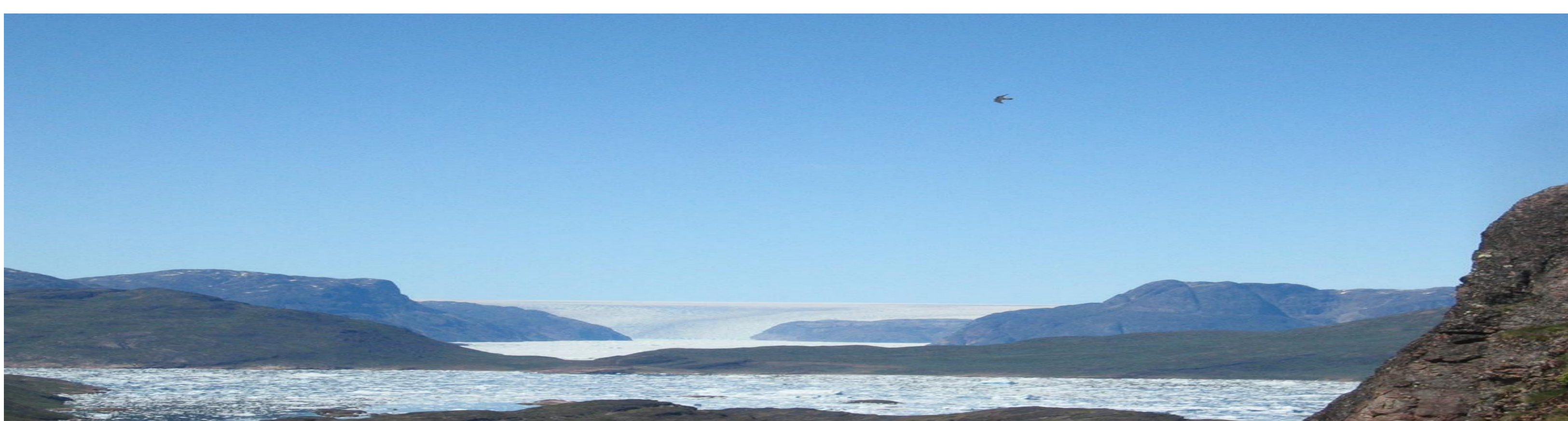
The ΣPCN median concentration in the peregrine falcon eggs was 21 ng/g lipid weight (lw), which places them in the high end of the concentration range reported for bird eggs. Maximum concentrations were much higher.

High PCN concentrations compared with other bird species would be in line with the high levels of other POPs previously reported for this population. The peregrines of this study migrate to wintering sites in Latin America, mainly via the North American east coast, thus integrating contaminant exposure over a large geographical area.



ΣPCN decreased over the study period, with an annual decrease of -4.0% (based on lipid weight concentrations). The highest annual decrease of -6.0% was found for PCN-54. This is remarkable as PCN-54 is an indicator of combustion-related emission sources. For PCN-63, the non-linear time trend component was also significant, indicating a maximum in 1988.

While the few time trend studies in the literature agree on decreases in recent years, they vary with regard to concentration maxima in the environment.



PCNs have not been studied previously in peregrine falcon eggs. Similarly to other organochlorines, their concentrations are high and add to an already high body burden. The high maximum concentrations imply a higher toxicological risk for individual birds. All PCN concentrations have decreased since the 1980s.