

Pre-Columbian purslane (*Portulaca oleracea* L) in the New World

LIKE so many cosmopolitan weeds, purslane (*Portulaca oleracea* L) has a history characterised by paradox and uncertainty. Most botanists have followed De Candolle¹ in assuming that it is native to the Old World and was introduced in the New World. There is, in fact, convincing historical evidence that the species was present in Europe before 1492 (ref. 2), and furthermore that it was introduced to North America in the seventeenth century³. On the other hand, the historical record also contains several anomalously early references to a wild purslane in the New World, and some botanists have argued that the species may have been present on both sides of the Atlantic before 1492 (ref. 4). Asa Gray even went so far as to suggest that the Vikings may have introduced it during their occupation of Greenland and Newfoundland⁵. We now present conclusive evidence that purslane was present in the New World in pre-Columbian times.

Purslane pollen and seeds were found in the sediments of Crawford Lake, which is some 35 km south-west of Toronto, Ontario. It has a surface area of 2.4 ha and a maximum depth of 24 m. Largely because of its morphometry, there is an incomplete circulation in the water column (meromixis) and consequent anoxia is the bottom waters. The sediments are therefore free from disturbance by either water currents or both organisms. The sediments are varved, each varve consisting of a white summer layer rich in carbonate and a dark, winter layer rich in organic matter. Similar sediments have been described from other lakes in Ontario and adjacent New York State^{6–7}. The significance of the varves in the present context is that they can be used to establish an accurate sediment chronology for the past 700 yr.

Sediment samples were obtained from the deepest part of the lake by freezing them *in situ* onto the outside surface of a 2-m long aluminium tube loaded with dry ice. The field and laboratory techniques used in sampling laminated sediments have been discussed in more detail by Swain⁸.

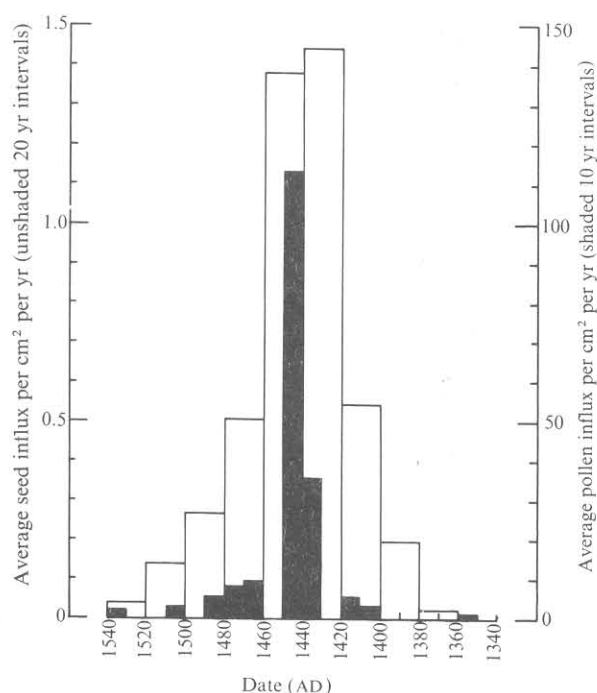


Fig. 1 Average pollen and seed influx.

Routine pollen analysis of contiguous 10-yr intervals indicated that purslane pollen was deposited in the lake during the period 1430–89 AD. More intensive analysis extended the range from 1350 to 1539 AD but not to the present. Figure 1 shows the pollen influx in absolute terms. The total pollen influx (arboreal pollen AP and non-arboreal pollen, NAP) into Crawford Lake during this period was approximately 3,500 grains per cm² per yr. Purslane pollen is relatively large and has a distinctive pericarpate arrangement of furrows (Fig. 2). It cannot be confused with any other pollen type in the local flora⁹. The identification was further confirmed by the discovery of purslane seeds in sediments from the same period. Ten samples (2.5 cm³) from contiguous 20-yr intervals were sieved through a No. 50 mesh (hole size 297 µm) and the residue was analysed for macrofossils. The seeds are generally well preserved, and are characterised by stellate epidermal cells. They correspond closely with modern Ontario herbarium material (Fig. 3). In terms of influx rates they show a similar if somewhat more regular trend than that of the pollen (Fig. 1).

The discovery of purslane pollen and seeds was unexpected. Apart from the problem of supposed Old World origins, the question arose as to how the fossils were deposited into the lake. Pollen dispersal through the atmosphere seemed unlikely as purslane is primarily a self-pollinating species¹⁰. Furthermore, the seeds, although small,

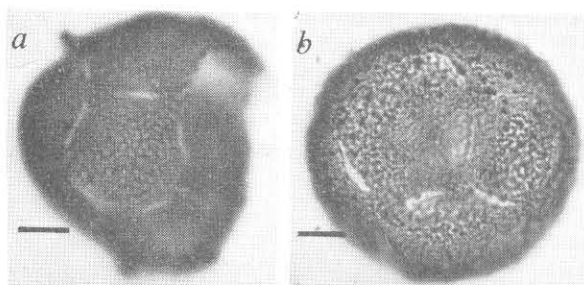


Fig. 2 Photomicrographs of *Portulaca oleracea* pollen grains. a, Fossil pollen grain (slightly broken) from Crawford Lake sediment dating 1430–39 AD. b, Modern pollen grain from southern Ontario. Scale bars represent 10 µm.

are not well adapted to dispersal by wind. Water transport also seemed unlikely as the lake is fed by a spring. The mechanism proposed here is that the pollen and seeds were deposited in the lake by man. More specifically, that agricultural Indians, who lived in the immediate vicinity of the lake, gathered purslane in their corn fields and washed it in the lake before eating it as a potherb. This washing would not only remove the soil from the plant but also release the pollen and seeds into the lake. That agricultural Indians were in the area at this time is also indicated by the presence of maize pollen (*Zea mays*) and sunflower pollen and seeds (*Helianthus annuus*) in the sediments dating from 1360 to 1650 AD. The fossils did in fact lead to the discovery of an Indian village site less than 1 km from the lake. The site is currently being excavated¹¹.

The discovery of purslane pollen and seeds throws new light on what until now have been rather puzzling aspects of the historical record. For example, as early as 1526 Oviedo included purslane in his list of plants native to both Hispaniola and Spain¹². In 1605 Champlain noted that purslane grew among the Indian corn fields near Plymouth, Massachusetts¹³. Similarly, Sagard, who lived with the Huron Indians during the years 1623 and 1624, reported that purslane was a common weed which grew naturally in fields among their corn and pumpkins¹⁴. Sagard's report is

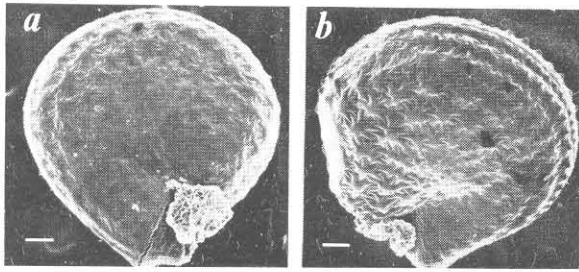


Fig. 3 Scanning electron micrographs of *Portulaca oleracea* seeds. *a*, Fossil seed from Crawford Lake sediment dating 1420-39 AD. *b*, Modern seed from southern Ontario. Scale bars represent 100 µm.

especially significant in that the Huron lived only about 150 km north of Crawford Lake, and were probably the direct descendants of the people who had been living at the Crawford Lake site 300 yr earlier¹⁵. As far as the species' presence in Ontario is concerned, it seems reasonable to assume that it came into the area with Indian agriculture.

Unfortunately, the broader question of ultimate origins cannot be answered on the basis of the evidence presented here. What is established is that the species was present on both sides of the Atlantic before 1492. The question is now raised as to how it achieved its wide distribution. One interesting possibility is pre-Columbian transfer by man. If this was the case, however, it must have been by a more southerly route than Asa Gray's Viking hypothesis suggests. In Europe it does not grow north of latitude 60° and is absent from Iceland, Greenland and Newfoundland¹⁰. Low summer temperatures are probably the limiting factor here as successful germination requires air temperatures greater than 20 °C (ref. 10). A second, perhaps more plausible, explanation is natural dispersal. Purslane seeds are known to be eaten by birds and furthermore have a high viability rate after digestion¹⁰. They are small and presumably could have

been carried either internally or externally. Even though purslane's pre-Columbian presence on both sides of the Atlantic may not be attributable to man, the species is still culturally interesting. Like the bottle gourd (*Lagenaria siceraria*), it was independently used in similar ways in both the Old World and the New.

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