Centaurea cyanus-Pollen in Danish Late-Glacial Deposits.

By

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In July 1943 I carried out a pollen-analytical examination of a series of Late-Glacial samples which a few months earlier (29th April) I had collected in Akkerup Mose, Fyn, with the use of a Hiller peat-drill. In two different samples I found a pollen which was indistinguishable from pollen of cornflower (*Centaurea cyanus*). An examination of the other species of *Centaurea* in Northern Europe showed clearly that none of them had pollen likely to be confused with the exceedingly characteristic form of *C. cyanus*. The closely-related *C. montana*, is the only species with a similar pollen which, however, can be distinguished from cornflower pollen easily and with certainty (see photographs in ZANDER[1])). Finding it was so surprising to me that I refrained from mentioning it when publishing the Akkerup diagrams[2]), as I wished to verify the discovery first. The possibility that a pollen find so entirely isolated as this might be due to recent contamination must of course be taken into consideration at all times, when the plant grows in the vicinity.

A new find was made this year (1947) when H. KROG, M. A., at the Danish Geological Survey was analyzing a Late-Glacial series of samples from Høbbed Mose at Korinth, a locality which is also in Fyn not more than 15 kilometres from the spot where the previous find occurred. With this the probability that *Centaurea cyanus* belongs to our Late-Glacial flora is so great that it will not be out of place to draw the attention of palynologists to these finds, so that *Centaurea cyanus* may be looked for in future pollen analyses of Late-Glacial deposits.

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[1]) E. ZANDER: Beiträge zur Herkunftbestimmung bei Honig I, pp. 318–319 and pls. 77–78. Berlin 1935.

[2]) M. DEGERBØL and JOHS. IVERSEN: The Bison in Denmark. Danm. Geol. Unders. II. Række, No. 73, p. 37 seqq. Copenhagen 1945.

I shall briefly give an account of the reliability of the finds. First, there are the following possibilities of error:

1. Contamination in Late-Glacial time with re-deposited ("secondary") pollen of interglacial age.
2. Contamination during taking of samples.
3. Contamination in the laboratory when preparing analyses.

As to 1, this may be precluded, as *Centaurea cyanus* has never been found in boulder clay and as the three analyses are practically devoid of "secondary" pollen.

Re 2, the samples from Akkerup were collected by myself in spring, before *Centaurea's* flowering time, and so there was no chance of contamination. The samples from Høbbed Mose were taken by U. MØHL-HANSEN, conservator at the Zoological Museum, on the 8th September 1943 and kept in glass tubes. The normal flowering time of *Centaurea cyanus* is in June–July, though there are late-comers. Thus in this case there is a possibility—but a very small one—of contamination.

Re 3, the samples from Akkerup were analyzed in July; as *Centaurea cyanus* is known to grow in a garden not far from the laboratory, the chance of contamination is not excluded. The sample from Høbbed Mose was analyzed in March, long before *Centaurea's* flowering time, and so it cannot have been infected by the pollen of the latter in the laboratory. It may be added that no recent pollen preparations of *Centaurea cyanus* have ever been prepared at the Danish Geological Survey; the *C. cyanus* preparation in our collections was received from Dr. KNUT FÆGRI, Bergen.

It will be seen that whereas any intrusion of recent *Centaurea cyanus* pollen into the samples from Akkerup can only have taken place during analysis in the laboratory, a contamination of the sample from Høbbed Mose can only have happened in the field while securing the sample. However, the probability of either event must be said to be very small. For purposes of comparison I may mention that pollen of *Plantago lanceolata* has only been found once in a Late-Glacial analysis (presumably brought in while sampling)

Plate IV. Fig. 1. *Centaurea cyanus*, Akkerup Mose, Early Dryas Period. HF; $(CH_3CO)_2O + H_2SO_4$, × 500, middle focus. Fig. 2. Same, × 1000, surface focus. Fig. 3. Same, × 1000, middle focus. Fig. 4. Same, × 1000, bottom focus. Fig. 5. *Centaurea cyanus*, Akkerup Mose, Allerød Period. $(CH_3CO)_2O + H_2SO_4$, × 1100, middle focus.

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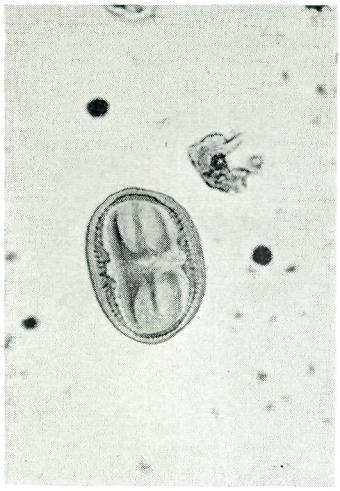

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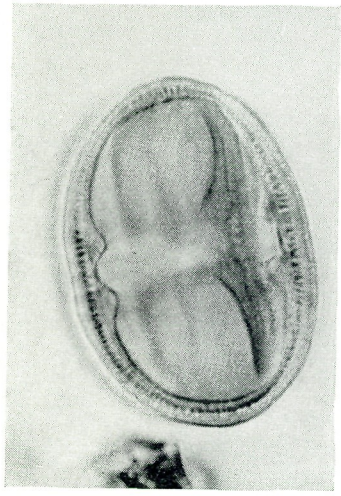

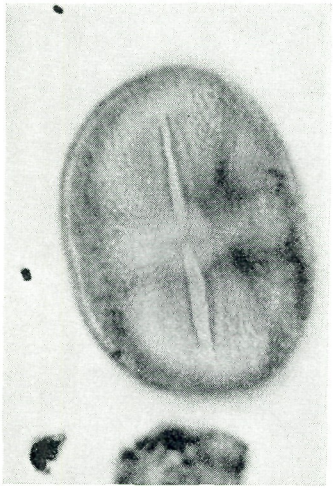

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Phot. by
J. Troels-Smith

notwithstanding the very much greater chances of contamination, this plant being much more common than *Centaurea cyanus* both in the neighbourhood of the laboratory and at the bogs and having a greater production and better dispersal of its pollen (anemophile!). It may also be added that no cornflower pollen has ever been identified in Post-Glacial analyses except in samples from quite late deposits, i. e. Late-Subatlantic time, where the abundant occurrence of *Secale* pollen distinctly shows its association with cornfields.

The three pollen analyses with *Centaurea cyanus* pollen are shown below. According to the pollen diagram from Akkerup[1]) the two Akkerup analyses belong respectively to the close of the Early Dryas period and the Early Allerød period. According to H. KROG's unpublished diagram the analysis from Høbbed Mose belongs to the Late Dryas period.

	I	II	III
Pinus	6	5	11
Betula nana et *B. odorata* coll.	48	68	48
Salix	4	5	7
Hippophaë	.4	—	—
Empetrum	.6	—	—
Vaccinium-type	.1	.3	—
Helianthemum oelandicum coll.	4	—	—
Artemisia	5	1	3
Gramineae	14	5	9
Cyperaceae	17	14	22
Thalictrum	.5	1	.3
Rumus acetosa type	.5	.2	.7
Chenopodiaceae	.2	.2	.3
Plantago major type	—	.2	—
Pollen Total...	858	574	305
Botrychium lunaria coll.	.1	—	—
Selaginella selaginoides	.6	—	.3
Dryopteris Linneana	—	—	28
Equisetum sp.	3	6	—
Sphagnum sp.	—	.3	—
Caryophyllaceae	.1	—	.3
Cirsium cfr. *palustris*	.1	—	—

[1]) DEGERBØL and IVERSEN, l. c. plate IV 195 cm. and 180 cm.

	I	II	III
Filipendula sp.	.5	—	—
Galium sp.	.2	.3	—
Hippuris vulgaris	.2	.2	—
Labiatae, Galeopsis-type	.2	—	—
Myriophyllum	.6	.3	—
Potamogeton sp.	—	.3	—
Tubuliflorae	.3	.2	.3
Typha latifolia	.1	—	—
Umbelliferae	.2	.3	—

Pollen analyses with *Centaurea cyanus* pollen from: I Akkerup (Close of Early Dryas period). II Akkerup (Allerød period). III Høbbed Mose (Late Dryas period).

Of the utmost interest in conjunction with these finds is the fact that SZAFER[1]), describing deposits in Leki Dolne belonging to the penultimate Glacial period, records an achenia of *Centaurea* cfr. *cyanus* together with macroscopic vestiges of a Dryassic flora (e. g. *Dryas octopetala, Polygonum viviparum, Helianthemum alpestre, Saxifraga oppositifolia, Salix herbacea, S. polaris, Betula "alba", B. nana, Empetrum nigrum, Thalictrum alpinum*). Several of these plants have also been observed together with the *Centaurea cyanus* pollen from Fyn; particularly interesting is *Helianthemum alpestre*, which belongs to the collective species *H. oelandicum* s. l. Furthermore, SZAFER'S list includes two genuine steppe plants.

Centaurea cyanus is regarded as growing wild in nature in certain parts of the east-Mediterranean countries, arid mountain slopes in Sicily, in Thessaly and Macedonia and in Western Asia in dry steppes[2]). That, however, it is not sensitive to cold is shown by the fact that as an ornamental plant it still ripens its seed at Karasjok in Finmarken (69° 18′)[3]), and as a weed follows the grain to the cereals limit (70° in Norway).

It is to be hoped that additional finds of *Centaurea cyanus* pollen in Late-Glacial deposits will provide the conclusive proof that the species belongs to our Glacial flora. Until then we must defer the discussion of the plantgeographical consequences.

[1]) M. KLIMASZEWSKI a. W. SZAFER: The pleistocene in Leki Dolne near Farnow, Starunia No. 19. Cracow 1945.

[2]) K. JESSEN and J. LIND: Det danske Markukrudts Historie, p. 232 seqq. Kgl. Danske Vidensk. Selsk. Skrifter. Naturv.-mathem. Afd. 8. Række VIII.

[3]) F. C. SCHÜBELER: Norges Væxtrige. 2. Bd. 1. Hefte, p. 39, Christiania 1886.

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