

Head Lice, *Pediculus humanus capitis* (Anoplura: Pediculidae) from Hair Combs Excavated in Israel and Dated from the First Century B.C. to the Eighth Century A.D.

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ABSTRACT Head lice, *Pediculus humanus capitis* De Geer, and their eggs were discovered on 12 out of 24 hair combs recovered during archaeological digs in the Judean and Negev Deserts of Israel. The finds were dated from the first century B.C. to the eighth century A.D. These are the earliest dates reported for head lice on personal combs.

KEY WORDS Insecta, archaeology, morphology, delousing

THE HUMAN LOUSE, *Pediculus humanus* L., is probably one of the oldest permanent ectoparasites

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of man (Zinsser 1935, Rats, lice and history, Little Brown, Boston; Wallace & Boerver 1983, Diseases of exotic animals, Saunders, Philadelphia). Lice and their eggs have been found in the hair of Egyptian mummies, and in mummified pre-Columbian Indians from Peru (Ewing 1924, Science 60: 389).

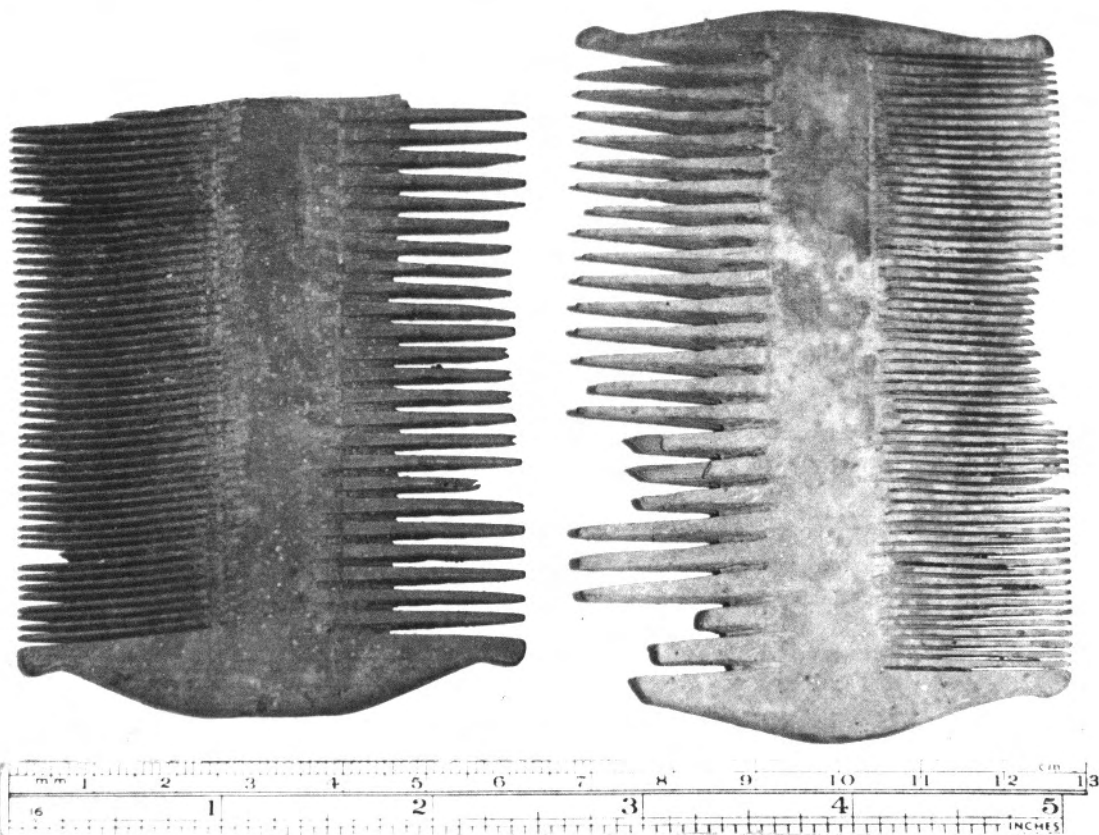


Fig. 1. Wooden combs found at Qumran (Dead Sea) dated from the first century A.D.

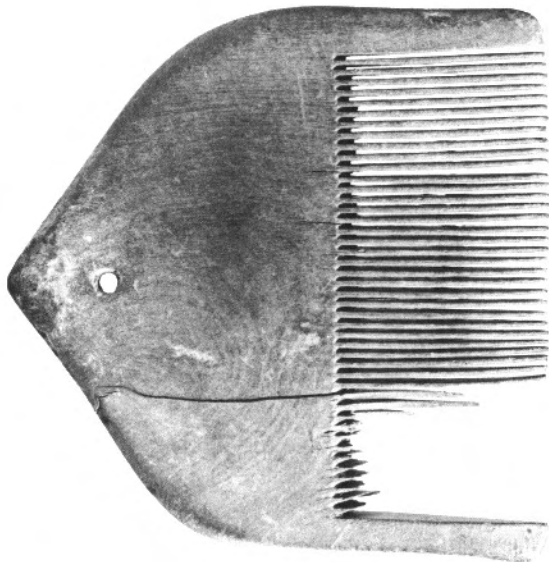


Fig. 2. Single-sided, plano-convex comb from the Judean Desert (600–800 A.D.).

Louse eggs were present in 45% of the mummified remains of prehistoric Indians from the American Southwest (Cockburn 1983, *Mummies, disease and ancient cultures*, Cambridge University Press, Cambridge).

A total of 24 combs excavated in the Judean and Negev Deserts in Israel were examined for the presence of human head lice *Pediculus humanus capitis* De Geer. Most of the combs had been kept for many years in museums in Israel and had been partially cleaned. Two combs dated 68 A.D. are from Qumran (Fig. 1), the site associated with the Dead Sea Scrolls (De Vaux 1978, *Encyclopedia of archaeological excavations in the Holy Land*, vol. IV, Massada Press, Jerusalem), and eight combs dated 135 A.D. are from nearby caves; all of these sites are on the northwestern shore of the Dead Sea. Another 13 combs dating from the first century



Fig. 3. Nymph of *P. h. capitis* from a comb of the first century A.D. Details in the right metathoracic leg indicate that the nymph died during the molting process.

B.C. to the eighth century A.D. are from several sites in the Negev Desert. All of these 23 combs are made of boxwood and are similar in form to modern nit combs. There are an average of 3–5 teeth per cm on one side and an average of 5–15 teeth per cm on the opposite side. An additional comb from a cave in Wadi Farah in the Jordan Valley (600–800 A.D.) is single-sided and plano-

Table 1. *Pediculus humanus capitis* recovered from hair combs from the Judean and Negev Deserts

Excavation site	Date	Specimens recovered		
		Active stages	Operculated eggs	Nonoperculated eggs
Judean Desert				
Wadi Farah	600–800 A.D.	4 nymphs	2	86
Qumran	68 A.D.	—	—	14
Qumran	68 A.D.	2 ♂♂, 2 ♀♀, 8 nymphs	10	17
Massada	73 A.D.	1 nymph	1	4
Wadi Muraba at	135 A.D.	1 nymph	—	3
Wadi Muraba at	135 A.D.	—	—	3
Wadi Muraba at	135 A.D.	—	—	2
Wadi Muraba at	135 A.D.	—	—	1
Negev Desert				
Ein Rachel	100 B.C.–200 A.D.	2 ♂♂, 2 ♀♀, 6 nymphs	—	5
Ein Rachel	100 B.C.–200 A.D.	—	—	4
Ein Rachel	100 B.C.–200 A.D.	—	—	1
Ein Rachel	100 B.C.–200 A.D.	1 ♀, 1 nymph	—	—

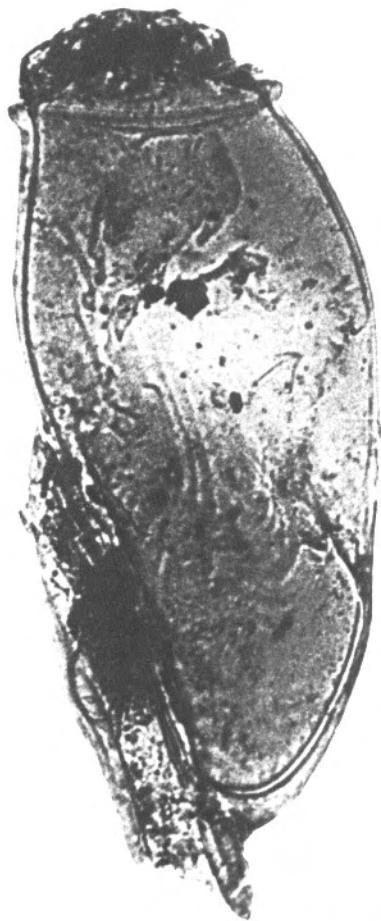


Fig. 4. An operculum-bearing egg of *P. h. capitis* from a comb of the first century A.D. Details of the embryo are visible in the egg.

convex in profile; it measures 0.9 cm in thickness at the base of the teeth (Fig. 2).

Because of the arid climate of the Dead Sea (located 400 m below sea level and with an average annual rainfall of 20 mm) and the less extreme, but quite dry conditions in the Negev Desert, the organic material that we examined was in an excellent state of preservation.

The combs were placed in a solution of 70% ethanol for 0.5 h. Then the organic and inorganic

debris between the teeth was freed into the solution with the aid of a brush and a needle. Following filtration through Whatman #2 filter paper, the material was examined under a stereomicroscope for evidence of head lice.

Eight of the 11 combs from the Judean Desert sites contained head lice (Table 1). One of the combs had 4 lice and 88 eggs. Another comb had 12 lice in all developmental stages and 27 eggs; 2 of the lice were almost intact (Fig. 3) and 10 of 27 eggs had an operculum (Fig. 4). Four of 13 combs from the Negev Desert had lice or eggs.

Morphologically and morphometrically (body length, length and width of head and length of the third antennal segment), these lice were identical to those that currently infest children in Israel.

Obviously, the numbers of lice and eggs on the combs would have been reduced by the circumstances of burial and excavation. In addition, in many cases only fragments of the original combs were available, and combs were handled and partially cleaned during museum storage and other studies. The high percentage of infested combs from the Judean Desert may reflect the historical situation during the period of origin. Wars forced many Jews to leave urban areas and to settle in desert caves, where overcrowding and poor hygienic conditions presumably would encourage parasitic infestations.

The large numbers of lice and eggs on these combs indicate that they were effective delousing implements, and that they probably were designed specifically for this purpose. The side with the lower density of teeth was used for straightening the hair, and the opposite side with a greater density of teeth for delousing. The recovery of operculated eggs shows that some of the combs were effective in removing eggs that had not yet hatched. These eggs, deposited by the female approximately 0.5 cm from the scalp, are particularly difficult to remove.

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