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NEMATODES COLONIZING POWER PLANT ASH DUMPS. I. SOIL NEMATODES IN ASH DUMPS NON-RECLAIMED AND RECLAIMED BY ADDING MINERAL SOIL AND SOWING GRASS

ABSTRACT: Soil nematode communities were analyzed (total abundance, number of taxa, diversity indices of genera and species, trophic structure) in ash dumps that were waste products of the coal-fired power plants. The samples were taken on four occasions during three years from three sites: non-reclaimed ash, reclaimed for 3–5 years, and reclaimed for 11–13 years.

The values of the parameters analysed increased with the time of reclamation. Nonetheless, even after more than ten years of reclamation, nematode communities were more similar to those observed in degraded environments than in grasslands. They consisted mainly of bacterial- and fungal-feeding nematodes, whereas plant-feeders and omnivores were scarce, and predators were absent. All sites were dominated by bacterial-feeding nematodes of the genus *Acrobeloides*. Among fungal-feeding nematodes, *Aphelenchoides* were abundant in the initial period of reclamation, and later on *Aphelenchus avenae*.

KEY-WORDS: ash dump, reclamation, nematode community, *Acrobeloides*, *Aphelenchoides*

1. INTRODUCTION

The main waste products of the coal-fired power plants are ashes. A small part of them, merely about 10%, is utilized in building engineering, for hardening roads (Maciak *et al.* 1974). The remaining ashes are dumped close to power plants, in areas that could be used for agriculture or recreation. Ash dumps constitute a source of pollution for surrounding areas. Ashes penetrate waters, soil and human settlements. Ashes are defined as industrial soils created by industrial management. From the point of view of pedology, they can be classified as sandy loams and light medium sands. But ashes markedly differ from other soil formations. They easily undergo cementation, and their specific gravity ranges between 1.92–2.38 g cm^{-3}. The water capacity of ashes ranges from 49 to 70%, but a large part of water is not available to plants. Moreover, ashes show a strong alkaline reaction (pH 9.1–10.9), contain much silica and salt and relatively little phosphorus and nitrogen (Maciak 1983a). Because of the specific properties of ashes, natural colonization of ash dumps by plants is slow. For this reason attempt are made to reclaim ash dumps through, for example, mixing the top ash layer with soil, and sowing it with grass or covering with turf. The prime objective of reclamation is to preclude dusting, and the ultimate purpose is to develop ash dumps into biological habitats. So far, emphasis has been put on the possibility of introducing vegetation into ash dumps (Maciak 1983b). Information on microorganisms and fauna colonizing ash dumps is very scarce. Thus far, only oribatid communities were analysed in ashes that differed in the way of their reclamation (Bielska and Paszewska 1995).

As specific groups of microorganisms and soil fauna are involved in different soil processes, tracing numerical and qualitative changes in selected soil organisms may be helpful in the assessment of directions of soil changes in the reclaimed ashes. On the other hand, an analysis of succession of organisms in the ash provides information on adaptability of the groups under study to specific conditions of the ash habitat. This information is especially valuable for organisms considered to be bioindicators, since it makes it possible to determine the range within which a given group can be used for bioindication. As nematodes are considered bioindicators of the conditions in soil habitat (Twinn 1974, Wasilewska 1974a, Arpin *et al.* 1984, Samoiloff 1987, Bongers 1990, Popovici and Korthals 1993, Freckman and Ross 1997), nematode communities should be analysed in different habitats, and that is why the colonization of ash dumps by nematodes is studied.

The purpose of the present study is to examine changes in nematode communities in non-reclaimed ashes and reclaimed for more than ten years by using the method of mixing the top ash layer with mineral soil, and sowing it with a mixture of grasses and alfalfa.

2. SITES

The study was conducted on ash dumps being a by-product of the combustion of hard coal in the power plant "Siekierki" in Warsaw vicinity. Ashes were stored on the left bank of the Vistula river, near Warsaw, about 20 km south-east of the city centre. Ash dumps were reclaimed by using one of the methods applied for the transformation of industrial wastes into a biological environment; the top layer of the ash dump (0–15 cm deep) was mixed with soil and sown with a mixture of grasses and alfalfa. In the first year of the study, one of the dumps was 11 years after reclamation (long reclamation), and the other was 3 years after reclamation (short reclamation). On the 11-year-old dump, an experimental plot of about 20 m^2 in area was not reclaimed.

3. METHODS

The study was carried out at three sites: non-reclaimed ash – Ash (A), ash reclaimed for 3–5 years – Short reclamation (SR), ash reclaimed for 11–13 years – Long reclamation (LR).

Soil samples were taken on four occasions from each site: in autumn of the first study year, in spring and autumn of the second year, and in spring of the third year of study. The samples were taken with a soil corer 15 cm deep from 30 points. After a careful mixing of the soil, nematodes were extracted from 500 g of the soil by using the two flasks method of Seinhorst (Flegg and Hooper 1970). The extracted nematodes were counted, identified to species, and divided into five trophic groups: bacterial-feeding, fungal-feeding, plant-feeding, omnivores, and predators, according to the classification proposed by Yeates *et al.* (1993).

Soil pH (H_2O) was measured on each sampling occasion. The number of bacteria and fungi were estimated by dilution plate counts on two sampling occasions, once in autumn in the second year of study and once in spring in the third year of study. For bacteria, agar with soil extract was used as a medium culture, for fungi Martin's medium. On each occasion and at each site 30 replicates were taken for bacteria and 30 for fungi. The significance of differences in number of bacteria and fungi between sites was evaluated by using a significance test for differences between two mean values (Student t-test).

Mann-Whitney U-test (Siegel 1956) was used for statistical evaluation of differences in the total number of nematodes, pH values, and number of genera and species among the three sites.

The diversity of nematode communities was estimated by Shannon-Weaver diversity index (Pielou 1974).

The following categories were used to analyse the dominance structure of nematode communities:

Eudominants > 10%
Dominants 5.1–10%
Subdominants 1.1–5.0%
Recedents < 1%

These dominance classes were established only for nematode communities living in the reclaimed ash. In the non-reclaimed ash, the abundance of nematodes was not sufficient for calculating the percentage of individual species in the community.

4. RESULTS

4.1. ASH pH, ABUNDANCE OF BACTERIA, FUNGI AND NEMATODES

The values of pH of both reclaimed and not reclaimed ashes were high, and ranged from 7.8 to 8.9 (Table 1). The pH of the non-reclaimed ash (A) was significantly higher than those of the ash shorter reclaimed (SR) and longer reclaimed (LR) ($P < 0.05$). The pH of site LR was significantly lower than that of site SR ($P < 0.05$).

The abundance of bacteria and fungi in the reclaimed and non-reclaimed ashes is shown in Table 1. It was significantly lower ($P < 0.05$) in the non-reclaimed ash than in the reclaimed ash. Differences in the abundance of bacteria and fungi between sites SR and LR were also significant ($P < 0.05$).

The abundance of nematodes differed among sites and seasons (Fig. 1). It was lowest at site A, ranging from several thousands to ten thousands individuals per m^2. In the reclaimed ash, it was considerably higher – hundred thousands in most samples, and in one sample even more than million individuals per m^2 (Fig. 1).

The difference in the abundance of nematodes between reclaimed and non-reclaimed ashes was significant ($P < 0.05$), whereas the difference in nematode abundance between the shorter reclaimed site SR (3 to 5 years) and the longer reclaimed site LR (11–13 years) was not significant.

Table 1. Ash pH, abundance of bacteria (N 10^5 cfu g^{-1} dry wt soil) and fungi (N 10^4 cfu g^{-1} dry wt soil) in ash non-reclaimed and ash reclaimed shorter and longer in successive years of reclamation in autumn (A) and in spring (S). Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation, cfu – colony forming units.

	Ash				Short reclamation				Long reclamation			
	11 A	12 S	12 A	13 S	3 A	4 S	4 A	5 S	11 A	12 S	12 A	13 S
pH	8.5	8.5	8.9	8.6	8.3	8.2	8.1	8.5	8.1	8.2	8.0	7.8
Bacteria			3.3	7.8			7.7	17.6			20.6	23.35
Fungi			0.7	1.88			5.9	10.33			6.7	15.9

Different tinge of greyness indicates significant difference ($P < 0.05$).

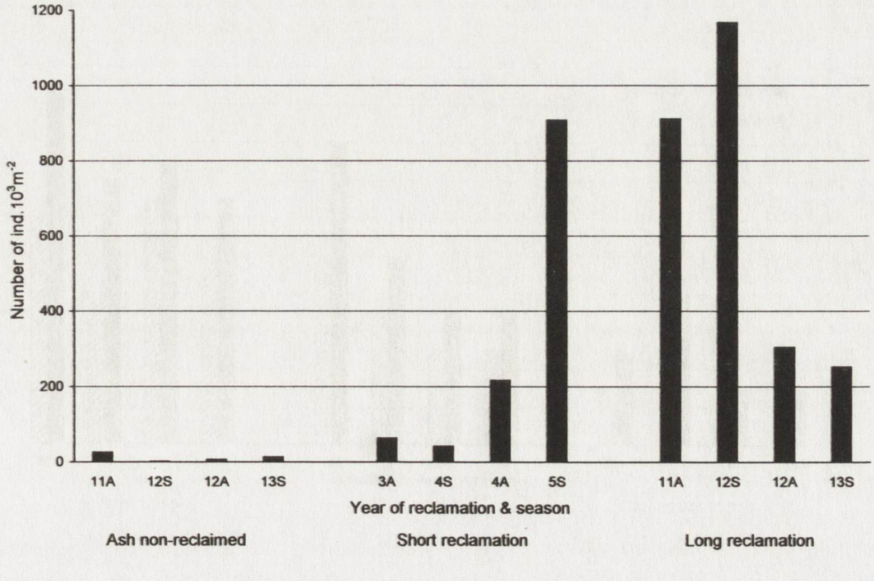

Fig. 1. Total abundance of nematodes in ash non-reclaimed and reclaimed shorter or longer in successive years in autumn (A) and in spring (S). Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation

4.2. COMMUNITY STRUCTURE

4.2.1. ABUNDANCE OF SPECIES, NUMBER OF GENERA AND SPECIES, DOMINANT SPECIES, DIVERSITY INDICES

The non-reclaimed ash was colonized by a small number of genera (1–5), which was significantly lower ($P < 0.05$) than in site SR – shorter reclaimed ash (5–9 genera). On site LR – long reclaimed ash, the number of genera (8–13) was significantly higher ($P < 0.05$) than on site SR (Fig. 2).

The number of species in non-reclaimed ash (3–8) was significantly lower ($P < 0.05$) than that in site LR – longer reclaimed ash (13–19). However, differences in the number of species between sites A and SR and also between sites SR and LR were not significant ($P > 0.05$) (Fig. 2).

Nematodes inhabiting non-reclaimed ash belonged mainly to the family Cephalobidae, and only few to the families Panagrolaimidae, Aphelenchidae, Paraphelenchidae, and Plectidae (Table 2). Cephalobidae were clearly dominated by species of the genus *Acrobeloides*: *A. buetschlii*, *A. enoplus*, and *A. minor*. In addition, the following species were recorded in small numbers: *Cervidellus serratus*, *Panagrolaimus rigidus*, *Aphelenchoides saprophilus*, *Aphelenchoides subtenuis*, and *Paraphelenchus pseudoparietinus*.

In the ash shorter reclaimed, nematodes of the genus *Acrobeloides* were also dominant but, unlike in the non-reclaimed ash, not in all samples. In addition to *Acrobeloides*, the group of eudominant nematodes in site SR consisted of the following species: *P. rigidus* of the family Panagrolaimidae (10–20% in three samples), *A. saprophilus* (20.4% in one sample) and *Aphelenchus avenae* (17% in one sample) of the family Aphelenchidae, and *P. pseudoparietinus* (18% in one sample) of the family Paraphelenchidae. Nematodes of the families Dorylaimidae and Rhabditidae were scarce in this site (Table 2).

In the ash reclaimed longer, nematodes of the genus *Acrobeloides* continued to dominate in as many as 4 samples (11–28%). Like in the ash shorter reclaimed, eudominants also included *C. serratus* – in two samples (13–15%), *A. avenae* – in four samples (18–30%), and nematodes of the family Plectidae, *Plectus pusillus* and *Wilsonema auriculatum* – in two samples (7%). In site LR, there occurred families not recorded from the two other sites: Belonolaimidae, Dorylaimidae, Quadsinematidae, and Tylenchidae. The representatives of these families were recedents.

The diversity indices H' gen. and H' spp. in sites SR and LR were significantly higher ($P < 0.05$) than in site A, whereas no difference was found between sites SR and SL ($P > 0.05$) (Fig. 3).

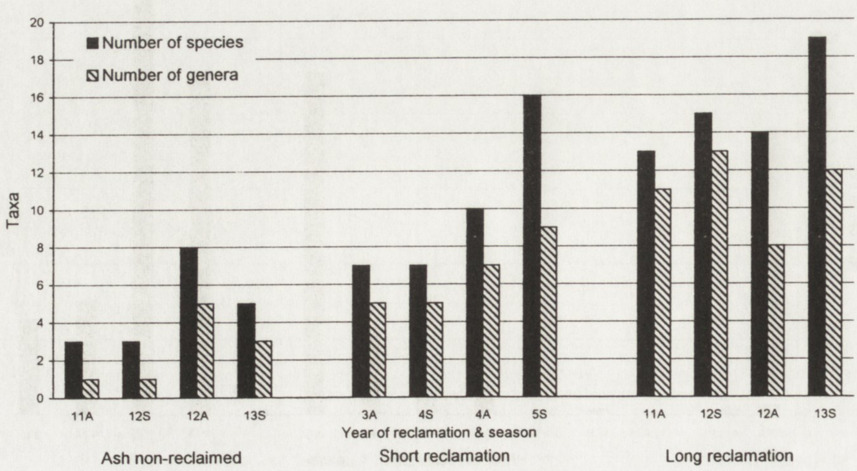

Fig. 2. Number of genera and species in ash non-reclaimed and shortly or long reclaimed in successive years in autumn (A) and in spring (S). Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation

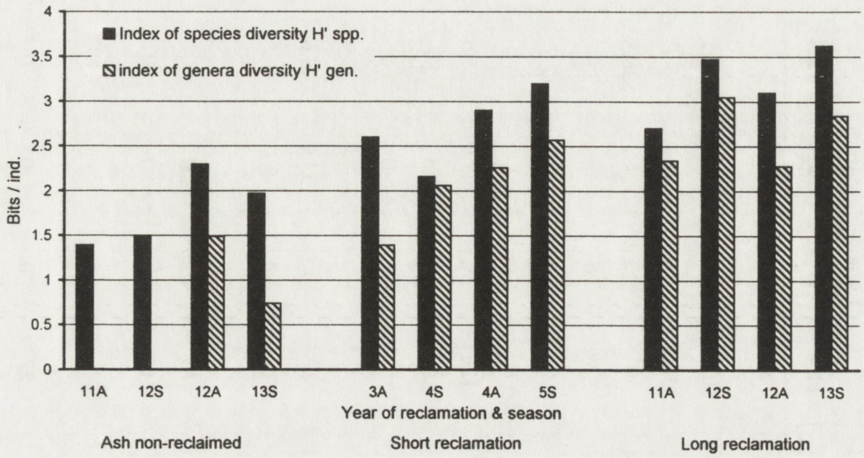

Fig. 3. Diversity index for genera and species in ash non reclaimed and shortly or long reclaimed in successive years in autumn (A) and in spring (S). Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation

4.2.2. TROPHIC GROUPS

Non-reclaimed ash was colonized mainly, and in some samples exclusively, by bacterial-feeding nematodes (81–100%). In site A, there was a small proportion of fungal-feeding nematodes (7–18%). In site SR, the percentage of bacterial-feeding nematodes, although still very high (65–84%), was lower than in site A, but the percentage of fungal-feeding nematodes increased (24–41%). In the site LR, as compared with sites A and SR, omnivorous nematodes were a little more abundant (1–2%), and in one of the spring samples also plant-feeding nematodes were noted (11%) (Fig. 4).

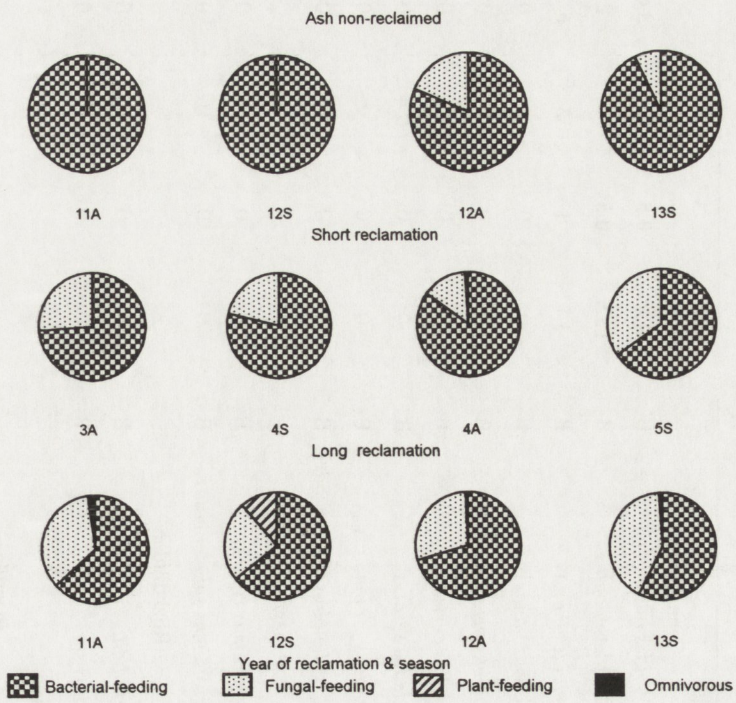

Fig. 4. Percentage of trophic groups in nematode communities inhabiting ash non-reclaimed and shortly or long reclaimed in successive years in autumn (A) and in spring (S). Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation

Table 2. Abundance of species (N 10^3 ind. m^{-2}), dominance structure: eudominant (bold), dominant (normal), subdominant (italic) in successive years of reclamation in ash non-reclaimed and reclaimed shorter and longer in successive years in autumn (**A**) and in spring (**S**). **B** – bacterial-feeding, **F** – fungal-feeding, **P** – plant feeding **O** – omnivores. Numbers: 3, 4, 5, 11, 12 and 13 – years of reclamation.

		Ash				Short reclamation				Long reclamation			
		11 A	**12 S**	**12 A**	**13 S**	**3 A**	**4 S**	**4 A**	**5 S**	**11 A**	**12 S**	**12 A**	**13 S**
Rhabditida													
Cephalobidae													
Acrobeloides buetschlii	**B**	**9.4**	**0.5**	*0.4*	**3.6**	**17.1**	3.6	**37.8**	57.6	**103.5**	**134.6**	**61.9**	13.5
Acrobeloides enoplus	**B**	**13.5**	**0.5**	1	2	5.8	3.6	16.2	12.1	**256.5**	*30*	**33.7**	*8.1*
Acrobeloides minor	**B**	3.1	**1**	**3**	**6.2**	**20.2**	**15**	21.6	**271.4**	0	**224.4**	24.3	**26.5**
Cephalobus nanus	**B**	0	0	0	0	0	0	10.8	*8.1*	*18*	0	0	0
Cephalobus persegnis	**B**	0	0	0	0	0	0	0	40.5	0	0	*2.7*	*2.7*
Cervidellus cervus	**B**	0	0	0	0	0	0	0	*8.1*	0	0	*2.7*	*5.4*
Cervidellus seratus	**B**	0	0	*0.4*	0	*2.2*	3.6	**64.8**	56.7	**126**	78.5	**47.9**	21.6
Chiloplacus propinquus	**B**	0	0	*0*	0	0	0	0	0	0	0	0	*2.7*
Heterocephalobus basilogoodeyi	**B**	0	0	*0*	0	0	0	0	*8.1*	0	*44.9*	0	0
Panagrolaimidae													
Panagrolaimus rigidus	**B**	0	0	*0.4*	0	*1.8*	**7.5**	**29.4**	**113.4**	*27*	*15*	**33.9**	**48.6**
Panagrolaimus subelongatus	**B**	0	0	0	0	0	0	3.6	0	0	0	*5.2*	2.7
Rhabditidae													
Mesorhabditis sp.	**B**	0	0	*0*	0	0	0	0	0	*18*	*44.9*	0	0
Rhabditis sp.	**B**	0	0	0	0	0	0	0	*16.2*	0	0	0	0
Areolaimida													
Plectidae													
Plectus annulatus	**B**	0	0	0	0	0	0	0	0	*27*	0	0	*0*
Plectus pusillus	**B**	0	0	0	*1*	0	0	0	0	0	89.8	*2.7*	*2.7*
Wilsonema auriculatum	**B**	0	0	0	0	0	0	0	0	0	90	0	*10.8*

Table 2 continued

Tylenchida													
Aphelenchidae													
Aphelenchoides clarus	**F**	0	0	0	0	0	0	0	0	0	0	0	*7.2*
Aphelenchoides dubius	**F**	0	0	0	0	0	0	0	*32.4*	0	0	0	0
Aphelenchoides graminis	**F**	0	0	0	0	0	0	0	0	0	0	0	18
Aphelenchoides parietinus	**F**	0	0	0	0	0	0	0	*12.1*	*13.5*	0	*11.2*	0
Aphelenchoides saprophilus	**F**	0	0	*0.4*	*1*	**13**	*1.5*	21.6	*44.5*	0	0	*11.3*	18.9
Aphelenchoides subtenuis	**F**	0	0	*0.4*	0	0	0	0	*32.4*	*13.5*	*11.2*	*2.7*	*7.2*
Aphelenchus avenae	**F**	0	0	0	0	3.6	**7.5**	9	*32.4*	**279**	**224.4**	**61.8**	**45.5**
Tylenchidae													
Ditylenchus sp.	**F**	0	0	0	0	0	0	0	0	*10*	0	*0*	*2.7*
Tylenchus sp.	**P**	0	0	0	0	0	0	0	0	0	*50*	0	0
Belonolaimidae													
Merlinius sp.	**P**	0	0	0	0	0	0	0	0	0	*44.9*	0	0
Tylenchorhynchus dubius.	**P**	0	0	0	0	0	0	0	0	0	*40*	0	0
Paraphelenchidae													
Paraphelenchus pseudoparietinus	**F**	0	0	*0.4*	0	0	0	0	**162**	0	0	0	*5.4*
Dorylaimida													
Tylencholaimidae													
Tylencholaimus sp.	**F**	0	0	0	0	0	0	0	0	0	*45*	0	0
Qudsianematidae													
Eudorylaimus sp.	**O**	0	0	0	0	0	0	*2.1*	0	*10*	0	2.7	0
Dorylaimidae													
Mesodorylaimus clavicaudatus	**O**	0	0	0	0	0	0	0	0	*10*	0	0	*2.7*

5. DISCUSSION

According to Maciak (1978) soil processes are intensified and pH is declining in the process of reclamation. The results obtained in the present study for reclaimed and non-reclaimed ashes support the conclusion that reclamation reduces soil pH. The result of microbiological analyses showed that the abundance of soil microorganisms such as bacteria and fungi, increased in the reclaimed ash as compared with the non-reclaimed ash. However even after more than 10 years of reclamation the number of bacteria (20.6–23.7 10^5 colony forming units (cfu) g^{-1} dry wt soil) and fungi (8.2–15.9 10^4 cfu g^{-1} dry wt soil) was very low. Pochon and Barjac (1958) using the plate method, the same which was applied in this study, estimated that the number of bacteria was 3–950 10^5 cfu g^{-1} dw soil and that of fungi was 0.8–100 10^4 cfu g^{-1} dry wt soil in mineral soils. Therefore the numbers of bacteria and fungi in reclaimed ash were only a little higher than the mineral soil with the lowest number of microorganisms. It may be suggested that physicochemical and microbiological changes in the reclaimed ash influence the abundance and composition of soil fauna, including nematodes. The results of this study on the abundance and structure of nematode communities support this conclusion, as large differences were found in the nematofauna composition and abundance between the reclaimed and non-reclaimed ash.

The source of nematodes in the non-reclaimed ash were small soil particles brought by man, animals, or wind. Nematodes accidentally introduced into a new habitat did not find suitable conditions for survival. Some species such as plant-feeding nematodes faced total lack of food, that is, roots of plants, so they were absent in non-reclaimed ash. Bacterial-feeding and fungal-feeding nematodes had very scarce food resources (numbers of bacteria and fungi was as low as in the mineral soils poorest in microorganisms), thus they occurred in very small numbers. The following species had the best chance of survival in the non-reclaimed ash: a) parthenogenetic, because single individuals present by chance in ash could reproduce, b) with small body size, because they can exploit small pores and find food in them – bacteria not available to larger species and c) with simple food requirements in terms of quality and quantity. This was the case of the species of the genus *Acrobeloides*, thus they may be dominants in non-reclaimed ash. Species of the genus *Acrobeloides* reproduce by parthogenesis (Goodey 1963, Anderson 1968), and are relatively small (body length <0.5 mm). Low food requirements of *Acrobeloides* is known from many laboratory experiments (Sohlenius 1973, Venette and Ferris 1998, Ilieva-Makulec 2001). The results obtained by Nicholas (1962) show that nematodes of the genus *Acrobeloides* are unselective bacterial-feeders. The dominance of nematodes of the genus *Acrobeloides* in soils with small food supply was also observed by Bååth *et al.* (1978) and Sohlenius (1993).

An additional source of nematodes in the reclaimed ash was soil introduced to the ash during reclamation. In the ash mixed with soil, sown with grass and alfalfa mixture, nematodes could find much better conditions than in non-reclaimed ash. For this reason, nematodes could be much more abundant and much more diverse in the reclaimed ash as compared with the non-reclaimed ash. Although bacterial-feeding nematodes dominated even more than 10 years after reclamation, also the proportion of fungal-feeding nematodes was high. This may be indicative of a shift from bacterial dominated to a more fungal dominated decomposition food web.

In the first years of reclamation, the dominant genus among fungal-feeding nematodes was *Aphelenchoides*, and after more than ten years *Aphelenchus avenae* was the dominant. Many authors indicate that nematodes of the genus *Aphelenchoides* might be more tolerant of a high acid concentration than most other nematodes (Hyvönen and Persson 1990, Ruess and Funke 1992, Dmowska 1993). The results of this study provide evidence that *Aphelenchoides* are also tolerant of high pH (even higher than 8).

Plant-feeding nematodes found in this study were mainly of the family Belonolaimidae, suggesting that the species of this family can adapt to specific environmental conditions in ash. The fact that these nematodes were recorded from only one sample in year 12 of reclamation indicates that even after more than 10 years of vegetation growth on ash, habitat conditions are not suitable for plant-feeding nematodes. Nor were they suitable for omnivores, which were scarce even in the ash reclaimed for more than 10 years. Thus the nematode communities were characterized by a low trophic diversity, as they mostly consisted of two trophic groups, whereas typically five trophic groups occur in nematode communities.

Nematode communities inhabiting reclaimed and non-reclaimed ash dumps consisted of a very small number of genera and species. The communities made up of only several genera, as in the case of the non-reclaimed ash, are typical of extreme habitats such as Antarctic soil, where three genera were found (Freckman and Ross 1997), meadows treated with a high dosage of semi-liquid manure, where one genus was recorded (Kozłowska 1986), and a strongly acidified grassland – 5–17 genera (Dmowska 1993).

Although the numbers of genera and species in nematode communities occurring in the ash reclaimed for more than 10 years were higher than in the communities occurring in the non-reclaimed ash or reclaimed for several years, they were still lower than in different grasslands. Valocká and Sabová (1997) observed 43 genera in a natural permanent pasture. Hodda and Wanless (1994) found from 37 to 44 species in chalk grasslands, Yeates (1982) 28 genera in a pasture, Wasilewska (1974) 39 genera in a pasture and 28 genera in a meadow (Wasilewska 1976). Háněl (1995) found as many as 62 genera in meadows on cambisoil.

Diversity indices for genera and species in the ash non reclaimed were very low: H' gen. from 0 to 1.49, and H' spp. from 2.16 to 3.2. Similarly low values were noted for nematode communities in heavily degraded habitats such as the soil sterilized with methyl-bromidae (H' gen. 1.79–2.0) (Yeates and Meulen 1996), a field with conventional tillage treatment that additionally received chemical inputs (H' gen. 2.05–2.36) (Freckmann and Ettema 1993), strongly acidified grasslands (H' spp. 2.58–3.82) (Dmowska 1993), or in extreme habitats, for example, in the soil covered with dwarf shrub heaths in subarctic region (H' gen. 2.04–2.41) (Ruess *et al.* 1998). In the ash longer reclaimed, H' gen. and H' spp. were higher: 2.28–3.05 and 2.69–3.62, respectively. They approached the lowest values noted in some grassland. Háněl (1995) found H' gen. of 3.16–3.23 and H' spp. 3.45–3.62 for nematode communities in meadows on cambisols. Dmowska (1993) found H' spp. 4.6–5.38 for nematode communities in the soil of a plot sown with *Lolium* spp. and H' spp. 3.06–4.24 for nematodes in a subalpine meadow in the Central Pyrenees (Dmowska 2000). According to Wasilewska (1979), H' gen. for nematode communities in different grasslands of Poland (mountain pasture, cultivated meadow, mid-forest meadow, afforested dune) is 4–4.9.

Summing up the results of the analysis of nematode communities inhabiting ash dumps, it may be stated that after several years of ash reclamation nematode communities in terms of all the parameters analysed (number of taxa, diversity indices, number of trophic groups) are more similar to the communities observed in degraded environments than in grasslands. After more than ten years of reclamation, these parameters are higher, but the community structure continue to differ from that observed in communities inhabiting different grasslands.

Similar tendencies were observed by Bielska and Paszewska (1995) in oribatid communities inhabiting the same ash dumps where nematode communities were examined. Oribatid communities in the ash dump reclaimed for 11 years, were characterized by a higher abundance and higher number of species than those in the ash dump reclaimed for three years, but a high proportion of all their communities consisted of the species living in degraded soils.

Almost exclusive occurrence of nematodes of the genus *Acrobeloides* in the non-reclaimed ash, and their high percentage in the reclaimed ash show that these nematodes are colonizers of the habitats in early stages of succession. Nematodes of the genus *Aphelenchoides* should also be included to this group. Species of this genus occurred, together with *Acrobeloides*, in the non-reclaimed ash, and were dominants in the first years of reclamation.

The results obtained in this study show that despite habitat conditions are more suitable for microorganisms and nematodes in the reclaimed than in the non-reclaimed ash, even after more than ten years of reclamation, ash dumps should be classify into degraded habitats, taking into account that the structure of nematode communities, one of the faunal groups that play an important role in functioning of the soil habitat, is similar to that observed in heavily degraded habitats.

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