HUMAN-DOMINATED ECOSYSTEMS AND RESTORATION ECOLOGY: RECOVERING SEVESO

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Introduction

Chemical pollution and habitat fragmentation are the two main factors affecting natural environments: about one-third of the global land surface has been modified since the Industrial Revolution (1). Due to continuing environmental destruction and modification of agricultural, industrial and residential uses of land, it is important to study and develop the remedies.

Seveso is a town (40,000 inhabitants) 16 km north of Milan, that from 10 July 1976 became synonymous of chemically-induced ecological catastrophe because of the large number of people affected by dioxin exposure and of the large area involved. To people aged 40 and over, Seveso evokes chemical catastrophe and the Council of the European Union called "Seveso Directive" the law for the control of major-accident hazards involving dangerous substances (Council Directive 96/82/EC of 9 December 1996, published 14.1.97 Official Journal European Communities No. L 10). A three-year survey on restoration ecology, monitoring the present ecological and biological risk parameters for the Seveso area shows the full ecological recovery of the area as an urban park. This is of particular importance from two main viewpoints, in the light of current ecological science (2): first - it proves that small-medium metropolitan areas, even when chemically heavily polluted, can be successfully recovered reasonably quickly and this will encourage good environmental policies by social scientists and decision makers with political responsibility; second - conservation ecology still predominates in both basic and applied mainstream ecological research, mainly because of the lack of conceptual tools for restoration ecology.

Materials and Methods

Birds were censused using the linear transect method. At least five transects were randomly scattered in each park. The species' richness and diversity (Shannon Index) and a Kilometric Index of Abundance (KIA) for each species and for the whole community were obtained using the number of breeding birds. Small mammals were censused with the removal technique using baited snap-traps in rows of 10 at 10-m intervals. Transects were run for 3 consecutive nights and checked early every morning. Trapped animals were immediately removed and frozen within 8 hours from capture. A trapping index was calculated as the number of animals captured in 100 trapping nights. Medium-sized mammals were censused by night using the spotlight technique. selected routes were run by car at low speed, with the use of a spotlight. The censused area was the strip lighted on each side of the route. Insect belonging to the froud-dwelling, ambulatory community were sampled using the pitfall trapping technique. traps were laid in rows of 5 at 10-m intervals. Sampling was stratified and pitfall traps were operated for 4 weeks and emptied of their contents once every 10 days.

Results and Discussion

After the 40 cm of soil scarification over the 43 hectares most polluted, the scarified area was planted mainly with oak with scattered grassy and bushy areas. The ecosystem is rather young, first reforestation efforts dating back to 1985. We investigated plant and animal ecological parameters in Seveso park, comparing the findings with those of ten urban and suburban parks whose areas ranged from 18.8 to 831.8 ha. The Seveso park (about 43 ha) is totally isolated in the urban context, with a high isolation index (-20.7 km) and no wildlife corridors. The park has been colonized by annelids, insects, amphibians, reptiles, birds and mammals. These last include substantial populations of wood mice, rabbits, house mice and small colonies of hares, cottontails and foxes. Habitat diversity, evaluated by means of the Shannon index, ranged from 1.25 to 3.59, with Seveso at 2.07; the higher the value of this index, the greater the environmental diversity of the area, with more habitat types supporting a more diversified animal community. As expected for a park with a high isolation index, birds predominate, with 22 to 24 species according to season; calculations from the breeding communities reveal high indexes: species diversity, 3.58; species richness, 17; kilometric abundance, 179.7. The positive relationship between number of species on the one hand and areas and isolation on the other may be explained by the theory of insular biogeography. It is also easy to infer that the nearer the source of animals the quicker the colonisation of isolated natural and reclaimed areas. From this point of view, the Seveso park is in a favourable position, as it lies near large non-inhabited areas such as the big Groane park. It is generally accepted that rich bird communities are supported by a complex and well-structured wood vegetation: the results of our analyses support this assumption. Correlation analyses highlighted the importance of deciduous woods with a canopy layer cover exceeding 50% for wrens and robins, and of coniferous and mixed woods with a cover not exceeding 50% for great tits, redstarts and robins. Where these vegetation categories were absent, more fragmented habitat categories offered shelter and nesting sites, such as wooden edges which supported goldfinches, and bushy areas which were important for long-tailed tits and yellow wagtails.

The conclusion we draw is that the Seveso park hosts a variety of plant and animal wildlife whose richness and diversity is comparable with those of similarly sized but older ecosystems and this fact grants for its future. The successful solution of cases like that of Seveso can help to devise the needed tools and to develop the emerging field of restoration ecology, showing the functioning and dynamics of plant and animal communities within the physical environment under development, embracing system-based approaches (3).

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References

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