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March 1978

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# GRANIVOROUS BIRDS IN SUNFLOWER CROPS

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ABSTRACT: Bird communities visiting and causing damage to sunflower crops were studied in Western Switzerland. The greenfinch is the main pest species. A population study of that species was carried out in Changins, near Nyon, and crop protection techniques, including an ultrasonic device, were tested.

## INTRODUCTION

Sunflower crops occur rarely in Switzerland mainly due to climatic conditions. Over the past few years, an experimental field has been regularly grown at the Federal Agricultural Research Station of Changins, near Nyon. Among the numerous problems encountered with this cultivation, damage caused by granivorous birds was one of the most important (Veget, 1966). The loss was estimated to exceed 50% (Vulliod, 1975).

From 1962 to 1966 a preliminary survey was conducted by capturing, banding and releasing birds visiting the crop. Since 1972 more intensive research has been conducted. Birds are captured and recaptured systematically throughout the entire length of the growing season, from the time of seed formation to harvest. This enables a thorough population study of the major avian species - the greenfinch (*Carduelis chloris*). In 1974 a part of the crop was not harvested and the birds were caught until the last of the crop was destroyed. Since 1976 this experimental crop has been grown exclusively for the purpose of studying avian population and pest control.

Also, between 1973 and 1975, a similar bird capture program was run in some other sunflower crops in western Switzerland in an attempt to analyze differences in species composition.

All the data collected are not yet analyzed, especially those concerning the greenfinch population in Changins. Preliminary findings however do help to clarify the problem and test the effectiveness of some protection techniques.

## METHODOLOGY

Nylon mistnets were placed in different points along and inside the crop. In Changins, the nets were set generally on two consecutive days each week from the appearance of granivorous birds (end of July to first half of August) to the middle of October (1972-75) or November (1976-77). In western Switzerland, except in Seigneux, the bird-capture program was conducted only for a few days. During the capture days the nets were checked regularly. Each bird was banded and released after its sex and age were determined. Data of capture and recapture were carefully recorded for each day until 1974 and for each half-day from 1975.

To date, 37,000 birds, 23,000 of them greenfinches, have been banded in Changins. In western Switzerland more than 7,000 have been marked.

## BIRD COMMUNITIES

Since 1962 more than 50 species of birds have been captured in the sunflower crops in Changins, but less than half of these could be classified as partially or completely granivorous. Many species are insectivorous or are visiting the field for reasons other than seed consumption. For example, Motacillidae species during their migration roost at night in sunflowers. Occasionally birds of prey are caught when they attempt to take the small birds trapped in the nets.

Table 1 lists the numbers of birds captured during three years in Changins and gives a percentage breakdown of the species involved (Columbidae percentage is inaccurate as these birds often escape from the nets). In 1973 the field was located east of the Station buildings in an area surrounded by houses, trees and a small forest. In 1975 it was in a more intensively cultivated zone west of the Station. In 1977 the crop was placed along a tree avenue and near some buildings.

Until 1977 the proportion of greenfinches was relatively constant at about 60%. The percentage of other species changed largely according to the location of the crop. For example, in 1973 the percentage of house sparrow (*Passer domesticus*) was double that in 1974 when the field was farther away from buildings. The number of field sparrows (*Passer montanus*) increased when the crop was located in a more cultivated zone. In general migratory bird species were more numerous in 1974 when the location of the field was more conducive to attracting these species during their flight between the Lake of Geneva and the Jura Mountains.

Table 2 compares the results of two short term samplings in Avully and Sézegnin, canton of Geneva, 34 km southwest of Changins (1974) and gives the data of captures made in Seigneux, 63 km northeast of Changins (1975). Only local avifauna is involved as migratory birds are not in Geneva at the end of August. The percentage of goldfinches (*Carduelis carduelis*) and linnets (*Carduelis cannabina*) is higher

Table 1. Birds caught in the experimental sunflower crop in Changins during three different years, n sp. = number of species, N = number of individuals, and % = percentage.

	1 9 7 3			1 9 7 4			1 9 7 7		
	30.7 - 10.10			26.7 - 16.10			15.8 - 8.11		
	n sp.	N	%	n sp.	N	%	n sp.	N	%
Carduelis chloris	1	3164	62.2	1	4690	60.6	1	3750	72.8
Other Carduelis	3	171	3.4	3	582	7.5	4	427	8.3
Genus Fringilla	2	77	1.5	2	410	5.3	2	430	8.4
Passer domesticus	1	1179	23.2	1	995	12.9	1	108	2.1
Passer montanus	1	231	4.6	1	495	6.4	1	106	2.0
Paridae	3	68	1.3	4	80	1.0	3	74	1.5
Columbidae	2	33	0.6	2	43	0.6	2	15	0.3
Motacillidae	5	37	0.7	5	128	1.7	2	16	0.3
Turdidae	8	57	1.1	9	121	1.6	6	66	1.3
Sylviidae	7	47	0.9	7	119	1.5	5	92	1.8
Other species	8	23	0.5	15	73	0.9	14	64	1.2
Total	41	5087	100.0	50	7736	100.0	41	5148	100.0

Table 2. Birds caught in sunflower crops in three different locations in Western Switzerland. n sp. = number of species, N = number of individuals, and % = percentage.

	Avully			Séze <sup>g</sup> gnin			Seigneux		
	27-30.8.1974			27-30.8.1974			15.8 - 9.10.1975		
	n sp.	N	%	n sp.	N	%	n sp.	N	%
Carduelis chloris	1	782	69.6	1	671	69.0	1	933	64.2
Other Carduelis	2	133	11.8	2	268	27.6	2	45	3.1
Other Fringillidae	-	-	-	-	-	-	3	27	1.8
Passer domesticus	1	109	9.7	1	9	0.9	1	250	17.2
Passer montanus	1	70	6.2	1	8	0.8	1	39	2.7
Paridae	2	22	2.0	2	9	0.9	3	64	4.4
Columbidae	1	2	0.2	-	-	-	-	-	-
Motacillidae	-	-	-	1	3	0.3	2	4	0.3
Turdidae	2	2	0.2	-	-	-	4	17	1.2
Sylviidae	2	2	0.2	3	4	0.4	5	47	3.2
Other species	1	1	0.1	1	1	0.1	5	28	1.9
Total	13	1123	100.0	12	973	100.0	27	1454	100.0

than in Changins. The proximity of the village in Avully probably accounts for the relatively high proportion of house and tree sparrows. In Seigneux the percentage of the different species is again slightly different with the proportion of house sparrow varying according to the location of farms near the crop.

These examples show that in western Switzerland the main pest birds of sunflower seeds are the Fringillidae and Ploceidae species. In all the samples the greenfinch (Fringillidae) is largely dominant. Only in one case the house sparrow was more important and in another one, an equal proportion of goldfinches and linnets to greenfinches was noted.

The analyses of the results show small weekly variations in the percentages of the different groups of birds, mainly due to the temporary presence of migratory birds.

GREENFINCHES

The greenfinch is a bird which does not show a great net shyness. It is very easy to recapture it many times. With such a high recapture rate, it is possible to estimate the population density using a simple method as the Lincoln or Peterson Index. Figure 1 shows the fluctuations in the population density of greenfinches visiting the sunflower crop in Changins during the fall of 1973. The estimates are based on consecutive days (black dots) and on non-consecutive days (circles). The data from consecutive days are better in that the results show that rather quickly a constant number of greenfinches regularly visits the field. With small variations from year to year, there are about 2,500 birds until the end of September. After the end of September the estimates give very variable results.

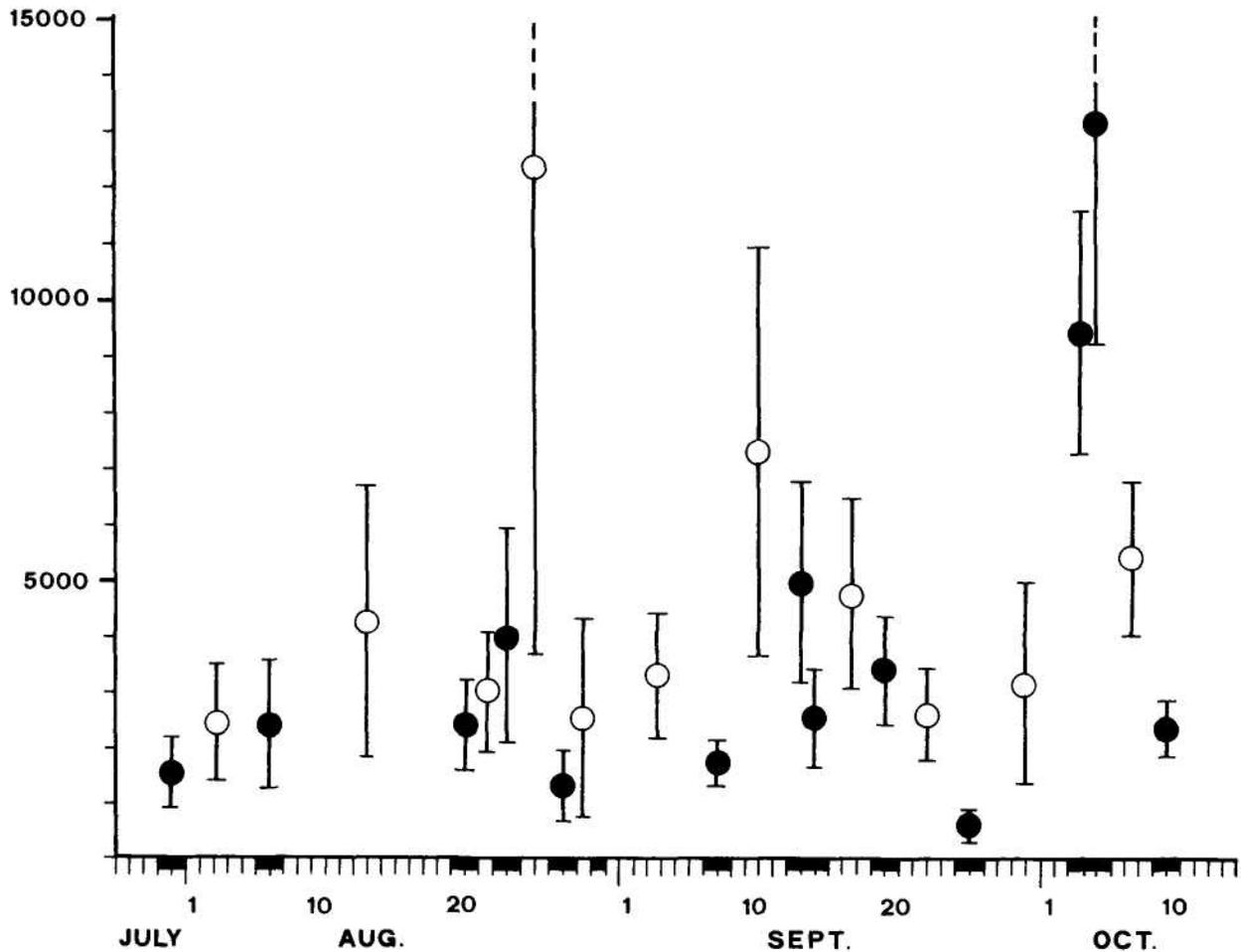


Figure 1. Estimates of the greenfinch population density in the sunflower crop in Changins during autumn 1973, showing dates of captures, estimates based on consecutive days (black dots), estimates based on non-consecutive days (circles), and one standard error.

From the end of July to the end of September only local greenfinches are visiting the crop. During the last days in September the migration of the species begins and day after day the number of individuals changes according to new arrivals or departures. This fact is confirmed by observations made on migration through the Alps, mainly at the Bretolet Pass where the first greenfinches were seen on September 25, and in the Jura. The recovery of banded birds during the nesting period also supports this phenomenon. Birds marked before the end of September were later found nesting in the neighborhood (at most 8 km from Changins), but some of the birds banded after September were recovered nesting in locations farther northeast in Switzerland through to Alsace.

Unfortunately, it is impossible to know what percentage of the local population of greenfinches migrates. Some captures conducted near Changins during wintertime showed that 10% of the wintering birds had been banded during the autumn in the sunflower crops. Those greenfinches which do migrate are recovered all along the Rhone Valley to the Mediterranean and along the coast to the Barcelona region.

Another problem is estimating the distance from which greenfinches can be attracted to an isolated sunflower crop and the amount of surface area necessary to allow a build-up of a population to 2,500 by autumn. According to data on greenfinch population density during nesting period and the productive potential of the species in an environment as diversified as the one which characterizes this part of the Lake of Geneva basin (Glutz, 1962), it is possible to predict that about 10 km<sup>2</sup> is sufficient for 2,500 individuals. This corresponds to the recovery of birds during the nesting period taking into consideration the presence of the lake and the topography of the region.

In the late summer it is possible to distinguish three age classes in the greenfinch: juveniles, the adults born the previous year, and the older adults. As a very large proportion of the local population was banded every year, it is now possible to establish age pyramids of the population (Figure 2). In August, the juveniles represent up to 80% of the individuals. The explanatory hypothesis for such a high percentage is that the species must have three successive clutches a year (Glutz, 1962). The oldest greenfinches recaptured in 1977 were juveniles banded in 1972.

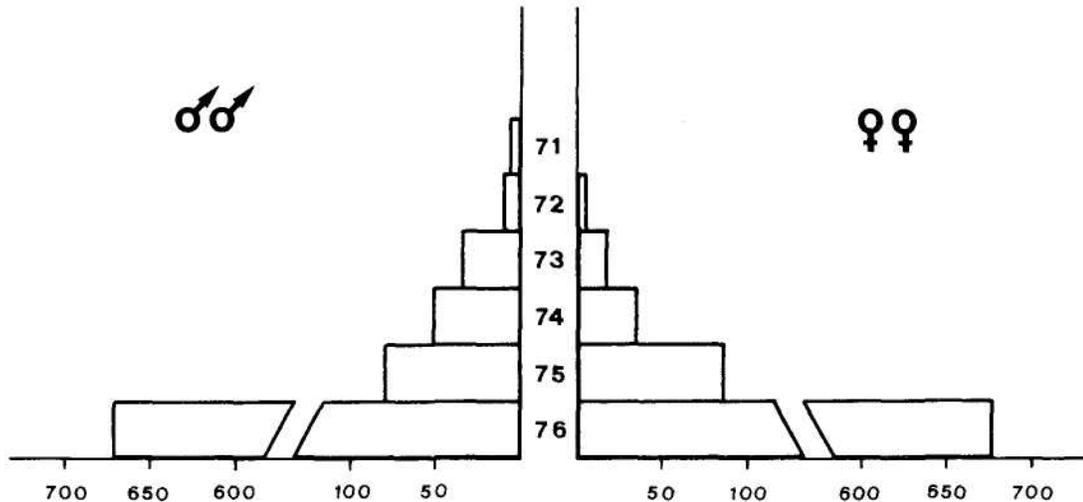


Figure 2. Age pyramid of the greenfinch population in August 1973 in Changins.

#### CROP PROTECTION METHODS

During the first period of experimentation on sunflower crops (1962-66), two methods of protection were tested: gas cannons and plastic birds of prey hanging under balloons. Both were ineffective (Meylan and Murbach, 1966).

In 1977 from mid-August to mid-September an ultrasonic device<sup>1</sup> was tested in the sunflower field. At the end of the experiment, which corresponded with the normal harvesting time, we noticed that the damage was low. About 10% of the seeds were consumed compared to over 50% during the other years. But during the period of the ultrasonic experiment, the number of greenfinches captured and banded and the recapture rate were comparable. Only house and tree sparrows disappeared completely (Table 2). It is only when we stopped the ultrasonic device that we realized it was affecting the behavior of the greenfinches. During the month it was in operation, the birds were visiting the crop singly and for short periods of time. As soon as the ultrasounds were stopped, the greenfinches once again fed gregariously and in a few days the crop was very seriously destroyed.

Different types of protection nets were also tested, including a new plastic one<sup>2</sup>. As long as there were unprotected feeding areas with seeds available, the birds did not go under the net-covered areas and the protection was good. However, when the net-covered areas were the only ones with seeds still available, the birds penetrated through the mesh of the nets. It was noticed that the normal nets with knotted mesh allowed the birds to fly away more easily than the plastic one, in which many dead birds were found trapped in the mesh. The problem with plastic net protection is the incidental take of non-target species. When used more extensively for example, it has been observed that birds of prey in an attempt to capture birds trapped under protection net are caught by the legs and die. Future protection of crops must avoid having deleterious effects on the general avifauna.

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<sup>2</sup>XIRONET, Xiro AG, Case postale 30, CH - 1700 Fribourg 7 (Switzerland)

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