THE IMPORTANCE OF BIRD MONITORING AT AIRPORTS: THE CASE OF FIUMICINO, ROME

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ABSTRACT

According to a simple but effective methodology adopted and tested at Fiumicino Airport (Rome) since 1989, to monitor bird community and scaring devices, the information gathered during the period 1989-90 and the period 1995-96 were compared. The obtained results show a decrease in the presence of Gulls (*Larus cachinnans* and *Larus ridibundus*) of more than 80%; Starlings (*Sturnus vulgaris*) decreased of 74,7% and Lapwings (*Vanellus vanellus*) of 24,2%. These results strongly highlight the importance of a continuous monitoring effort of the avian community at airports, in order to better calibrate and implement the bird-avoidance strategy, and to check the obtained results.

(Keywords: Monitoring, Bird community, Aerodrome bird hazard)

1. INTRODUCTION

There are many methods and strategies to avoid bird presence at airfields (Stenman 1990, Briot et al. 1991, BSCI 1992, Short et al. 1996), in order to reduce the risk of birdstrike.

Anyway – as many times already stated – the correct and effective use of such devices is definitely based on a good and deep knowledge of the avian situation inside the airport.

For this reason at Fiumicino International Airport, in Rome, a specific monitoring methodology was implemented, tested and definitively adopted since 1989 (Montemaggiori 1992). This method, simple, but sufficiently precise, allows to know in detail the qualitative and quantitative situation of the bird community present in the airport during the year, in order to use adequate scaring devices, to evaluate their results and to decide when and against which species to use them.

The aim of this paper is to highlight how, by using this methodology, it is possible to monitor continuously the birds in the airport, analysing the obtained results to better calibrate the scaring methods, and to evaluate their efficacy obtaining more than reasonable results.

2. METHODS

The methodology adopted at Fiumicino Airport to monitor the most dangerous species for air navigation (Gulls, Starling and Lapwings) and the outcomes of the different adopted scaring devices, is based on the daily use of a field form, filled in 3-4 times per day by the trained Safety Office staff. The form presents a first general part (including data about date, name of the compilers, etc.), a meteorological section, a bird monitoring section and a scaring devices monitoring section (**Fig. 1**). For further details on the form, how to fill in it, etc. see Montemaggiori 1995a).

AEROPORTI DI ROMA — **BIRD FORM** — MTS/CSO Safety Office — Date: — Shift — Recorder's Name: — Form

Weather (at the beginning of shift) — Temp°. — ☐ Clear ☐ Rain ☐ Fog ☐ Very Cloudy ☐ Cloudy — Wind — Strength (Kt): ..... Direction (°): — Supervisor's Name:

Bird Monitoring — Presence of birds: (Tick the box) NO YES

No. (1)	Time	Species (A,B,C etc.)	No. Individ. (1-10/11-50/51-100 etc.)	Habitat (Runway/Taxiway/Grass)	Site (2) Coord (3)	Site (2) Square (3)
1						
2						
3						
4						
5						

Notes:

A Herring Gull **B Black-headed Gull** **C Lapwing** **D Starling**

E Hooded Crow — G Kestrel — I Grey Heron
F Swallow — H Pigeon — L Other (Specify).....

Devices situation (Fill in even if no birds present)

a) Human presence

N. (1)	Operator on site	Birds Escape (4)
1	Y N	Y N
2	Y N	Y N
3	Y N	Y N
4	Y N	Y N
5	Y N	Y N

b) Purivox gas cannons (3)

N. (1)	No. cannons in use	On at	Off at
1			
2			
3			
4			
5			

c) Fixed distress call system

N. (1)	On at	Off at	Birds Escape (4)
1			Y N
2			Y N
3			Y N
4			Y N
5			Y N

d) Steffan gas cannons (3)

N. (1)	N. cannon in use	N. groups in use	N. shots exploded	Birds Escape (4)
1				Y N
2				Y N
3				Y N
4				Y N
5				Y N

e) Car with loudspeaker

N. (1)	Car in use on site	Birds Escape (4)
1	Y N	Y N
2	Y N	Y N
3	Y N	Y N
4	Y N	Y N
5	Y N	Y N

N.B. Use only one form per shift

(1) The number corresponds to the situation and MUST coincide in all parts of the form
(2) Site where birds are present
(3) See back of form
(4) If present

Figure 1. Front of the field form used at Fiumicino for the monitoring of birds and scaring devices (Ver. 1995) On the back of the form is shown the runways map with a grid for a precise localisation of the observations.

The form is usually filled in during regular patrolling inspections, or whenever the staff is alerted for presence of birds. The compiled forms (1,100-1,500 per year) are then filed and analysed.

During the period 1989-90, by analysing the data obtained using this methodology, it was possible to draw a complete picture of the avian community of Fiumicino Airport and the general outcome of the different scaring devices then in use (Montemaggiori 1991a, 1992). Such results permitted the elaboration of a precise strategy in order to limit the presence of birds in the airfield creating an hostile habitat, to prevent possible birdstrikes.

The adopted strategy, structured in different phases, included the use of passive and active methods, and the acquisition of more specific scaring devices, which joined the already existing ones fully revised (Montemaggiori 1991b, 1995b) (**Tab. I, Fig. 2**)

Table I. Ecological passive measures and active devices/activities in use at Fiumicino Airport to reduce the presence of birds. In brackets, italic, the name/trademark of the specific devices.

Passive ecological measures	Active scaring devices/activities
- Limit the cultivation of arable land - Avoid crops attractive to birds - Avoid standing or exposed water - Dispose of all food remains - Elimination of attractive trees/bushes - Grass never cut below 30 cm	- Regular car inspections of the runways (4-5 per day) - Gas cannons (*Purivox*) - Remote-controlled sound generators (*Steffan*) - Permanent 'distress call' acoustic system (*Merlaud*) - Mobile 'distress call' system (*Merlaud*) - Remote-controlled high frequency sound generators(*Space control*) - Remote-controlled video system

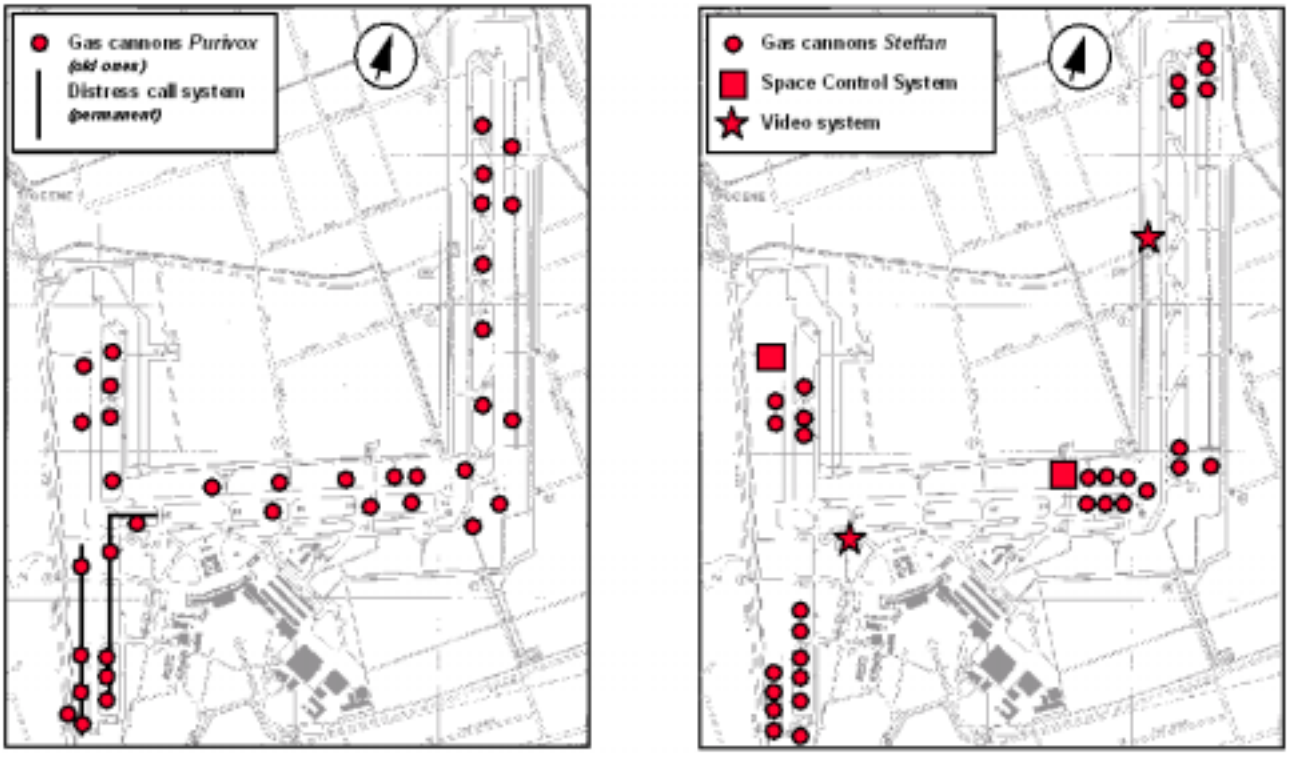

Figure 2. Localisation of the specific active scaring devices at Fiumicino Airport. Left: devices in use before 1989. Right: New devices acquired after 1991, which joined the old ones. All the new devices (right) are remote-controlled from a central office, 24 hours operative, and can be operated from a car which has also a mobile acoustic 'distress call' device (not shown).

All the methods in use were assembled in order to obtain an *unicum* of many systems simultaneously active, which operate in a linked and coordinated way. This is possible also because the operative staff is constantly trained and updated (the use of many scaring methods which operate simultaneously is highly recommended; see, for example, Stenman 1990).

Recently, in order to evaluate the results obtained from the elaborated strategy and the adopted devices, a new survey on the presence of the birds at the airport was conducted for the years 1995-96, by analysing more than 3,000 field forms relative to this period (the same number of forms analysed in the period 1989-90).

The decision to take into account two complete years each time (1989-90 and 1995-96) is to obtain a more reliable picture, by reducing the single seasons bias. Data were then cumulated and, opportunely weighted, they show a unique picture related to the 12 months of the year.

Comparing the results of the periods 1989-90 with the ones of the period 1995-96 it was possible to verify and quantify the changes observed at the airport under the ornithological point of view.

3. RESULTS

Here are presented some illustrative results showing the evolution of the avian community at Fiumicino Airport after the implementation of a coordinated strategy to reduce the presence of birds at the airfield. These results are obtained by comparing the data of the period 1989-90 with the ones of the period 1995-96. All information and data were collected by using the same methodology in both periods, and the analysis adopted the same statistical/mathematical tests.

The comparison concerns quantitative data, micro-habitat preference of the single species, their preferred 24 hours-time of presence, and their localisation within the airfield. As for data concerning the outcome of the different scaring devices, analysis is still in progress.

Only the results concerning some species are shown: Herring Gull (*Larus cachinnans*), Black-headed Gull (*Larus ridibundus*), Lapwing (*Vanellus vanellus*) and Starling (*Sturnus vulgaris*). These are the target species considered really dangerous for air navigation at Fiumicino Airport, according to a previous complete ornithological survey of the area (Montemaggiori 1991a).

Herring and Black-headed Gulls were grouped and are shown as “Gulls”. This is because the trained staff had sometimes problems in identifying correctly the two species, and to be more concise.

In **Fig. 3** is shown the monthly presence of the Herring and Black-headed Gulls (grouped together) at Fiumicino Airport, expressed as monthly total number of observed individuals and as percentage of days of presence within the months.

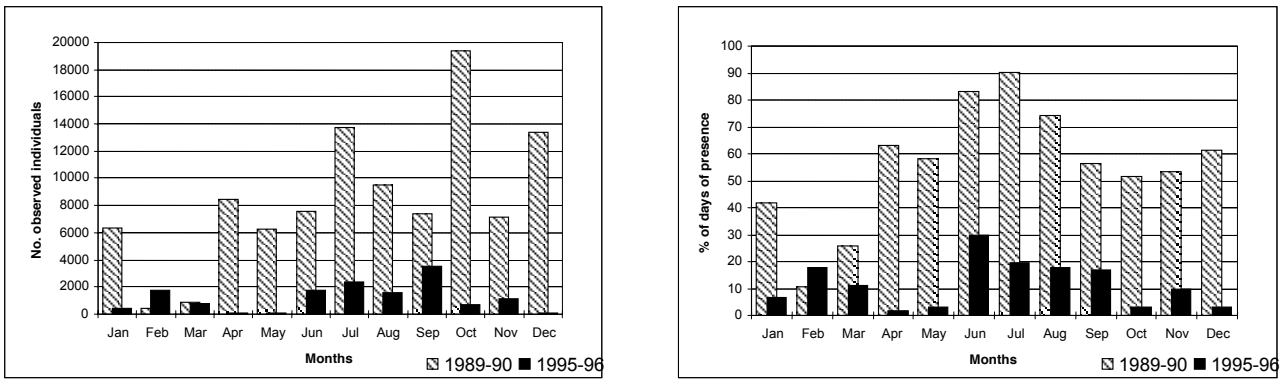

Figure 3. Monthly presence of “Gulls” (*Larus cachinnans* + *Larus ridibundus*) at Fiumicino Airport in the two study periods (1989-90 and 1995-96). Left: monthly total number of observed individuals (annual average). Right: % of days of presence in the months (annual average).

In the same way are shown the monthly presence of Lapwing and Starling (**Figs. 4** and **5**)

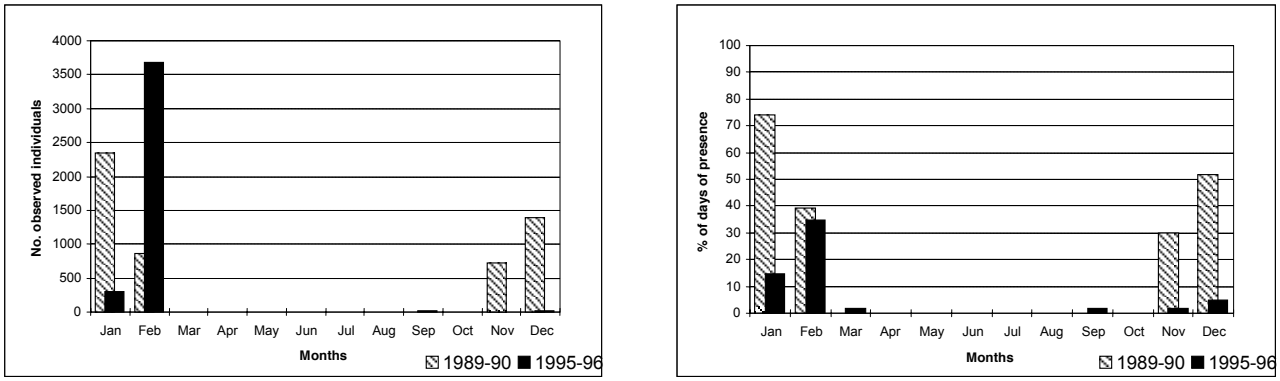

Figure 4. Monthly presence of Lapwing (*Vanellus vanellus*) at Fiumicino Airport in the two study periods (1989-90 and 1995-96). Left: monthly total number of observed individuals (annual average). Right: % of days of presence in the months (annual average).

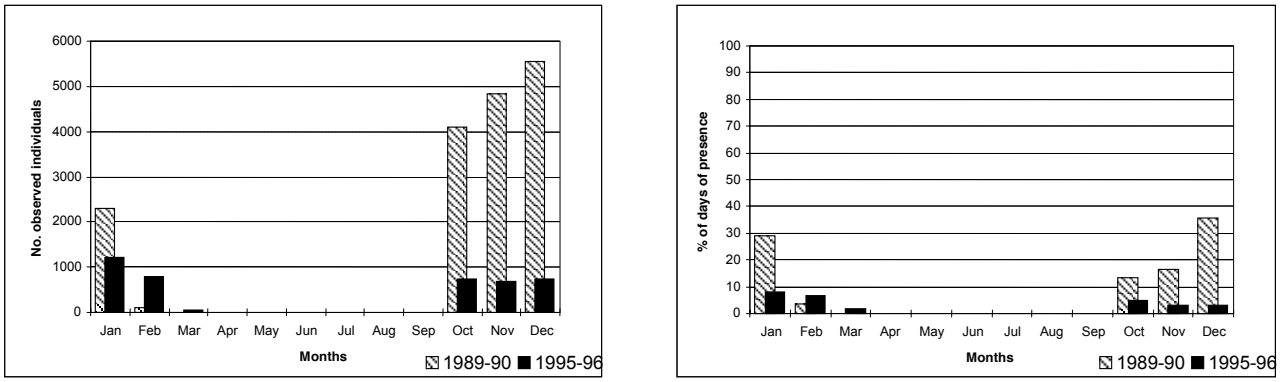

Figure 5. Monthly presence of Starling (*Sturnus vulgaris*) at Fiumicino Airport in the two study periods (1989-90 and 1995-96). Left: monthly total number of observed individuals (annual average). Right: % of days of presence in the months (annual average).

The annual presence of the species in the airport is shown in **Fig. 6**.

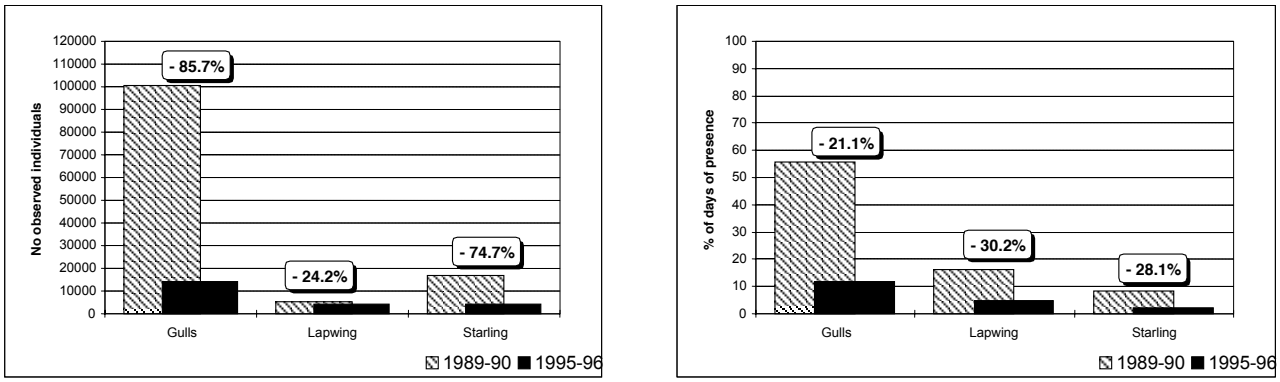

Figure 6. Annual presence of "Gulls", Lapwing and Starling at Fiumicino Airport in the two study periods (1989-90 and 1995-96). Left: annual total number of observed individuals (annual average). Right: % of days of presence in the year (annual average). On the columns is indicated the difference between the two study periods.

The annual micro-habitats preferred by the species which rest at the airfield (runways, taxiway, grass) is presented in **Figs. 7-9**.

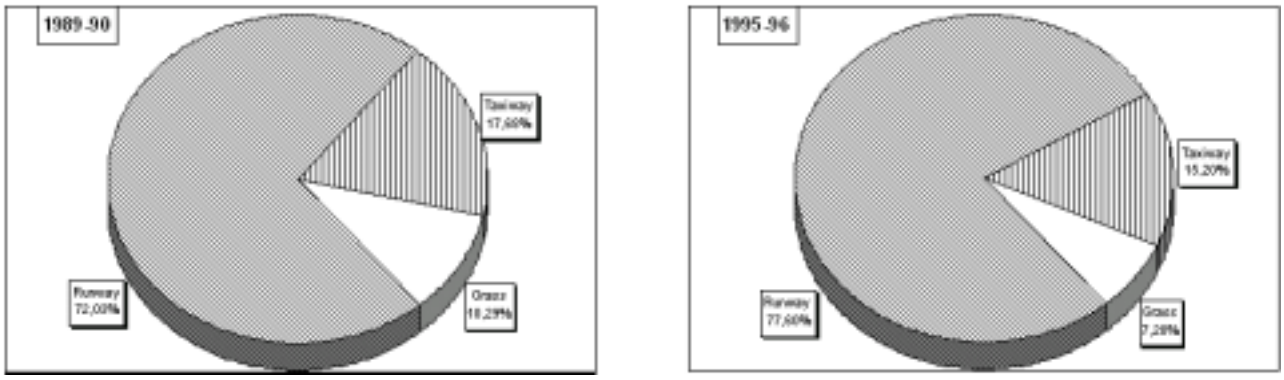

Figure 7. Annual micro-habitat preference of the "Gulls" (Herring + Black-headed) at Fiumicino Airport in the two study periods.

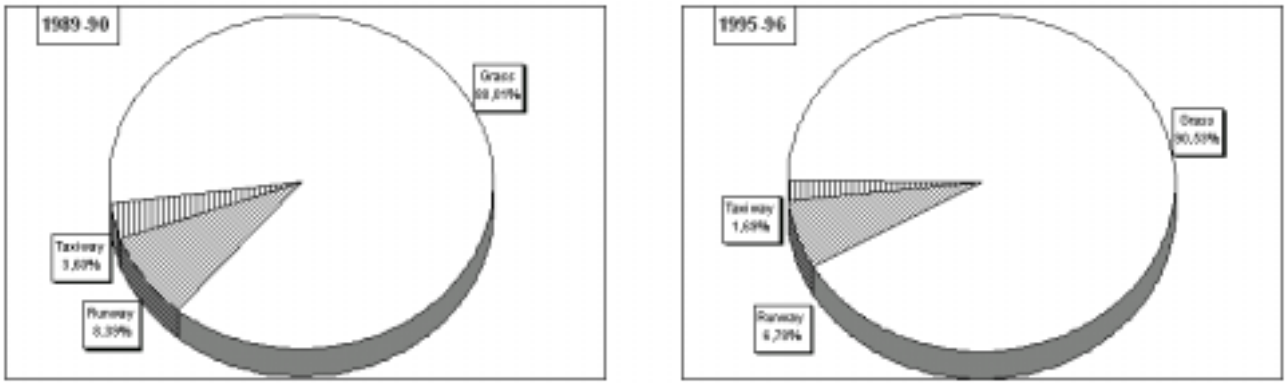

Figure 8. Annual micro-habitat preference of the Lapwing at Fiumicino Airport in the two study periods.

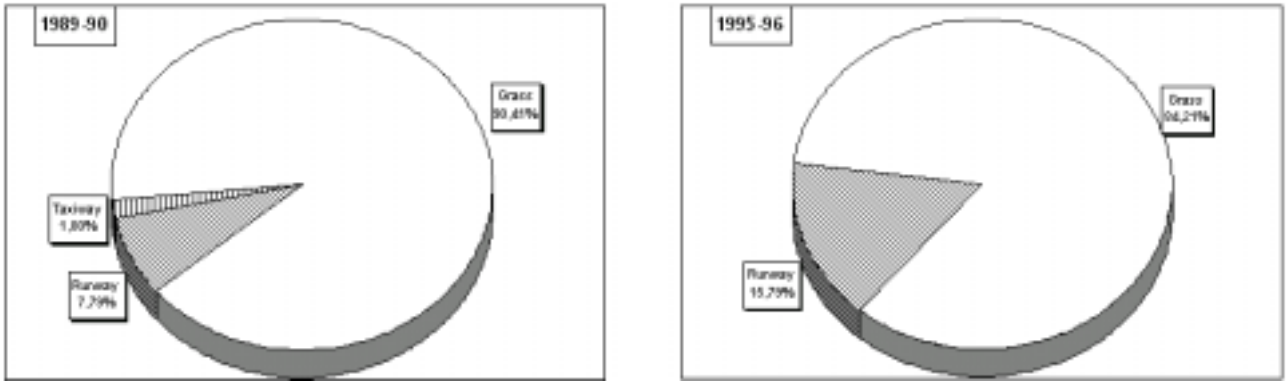

Figure 9. Annual micro-habitat preference of the Starling at Fiumicino Airport in the two study periods.

Figs. 10-12 show the 24 hours-time preferences of the species at the airport, expressed as annual data in the two study periods.

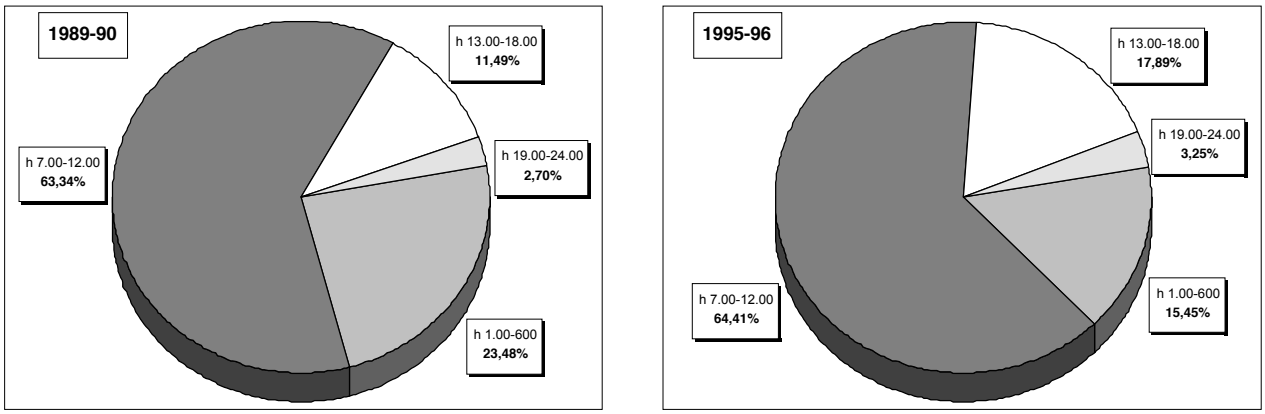

Figure 10. Annual 24 hours-time preference of the "Gulls" (Herring + Black-headed) at Fiumicino Airport in the two study periods expressed as percentage of four 24 hours-times.

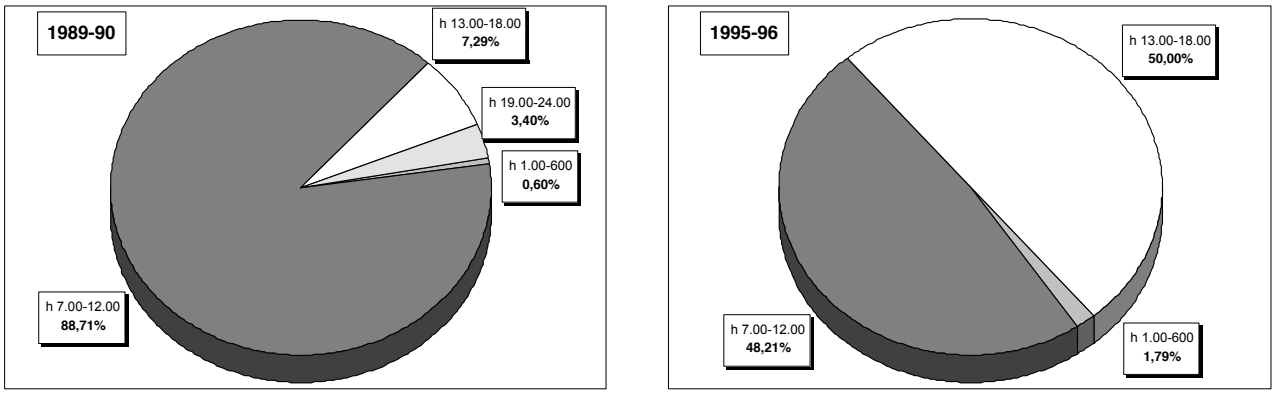

Figure 11. Annual 24 hours-time preference of the Lapwing at Fiumicino Airport in the two study periods expressed as percentage of four 24 hours-times.

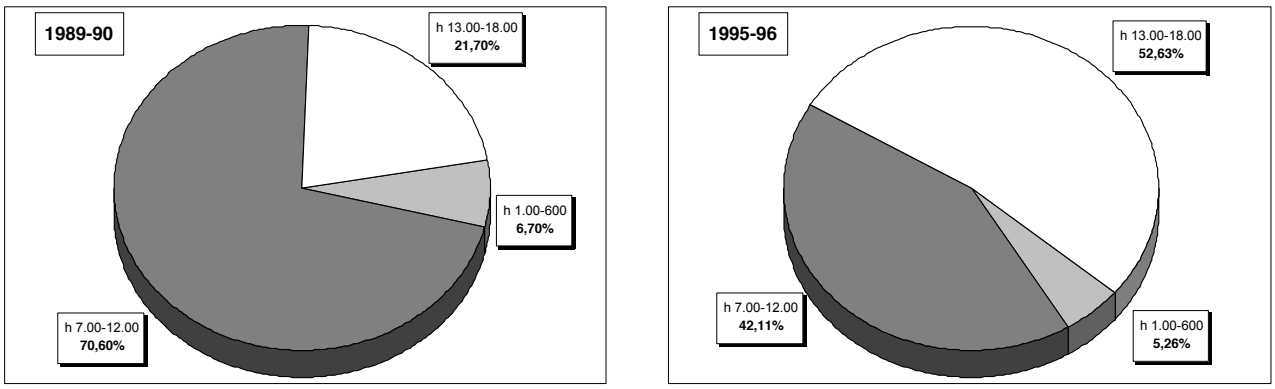

Figure 12. Annual 24 hours-time preference of the Starling at Fiumicino Airport in the two study periods expressed as percentage of four 24 hours-times.

Finally the localisation of the different observations per species along the runways, is shown in the maps of **Figs 13-15**, for the two study periods. The observation's magnitude degree is also presented.

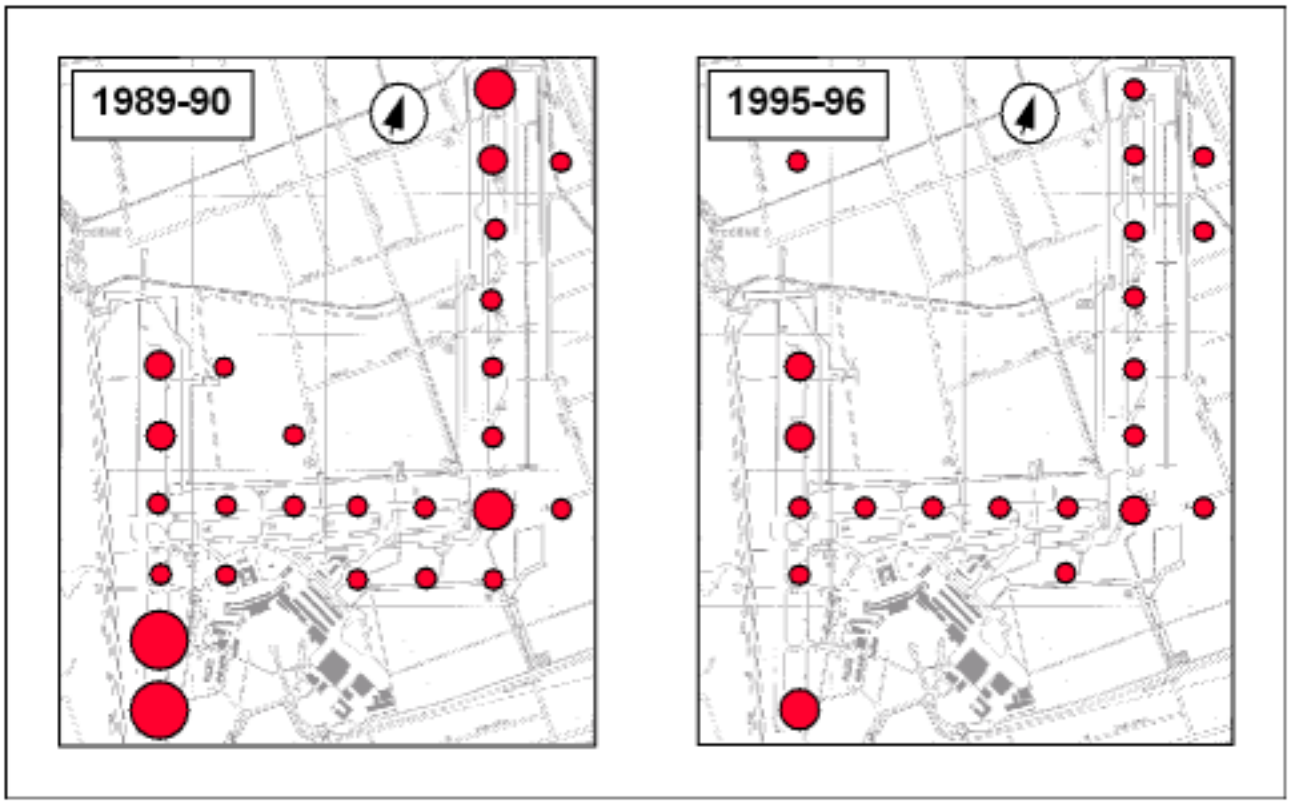

Figure 13. Annual localisation of the "Gulls" (Herring + Black-headed) at Fiumicino Airport in the two study periods. The size of the dots indicates the total number of observations: smallest dot = 1-10 observations; small dot = 11-20 observations; medium dot = 21-30 observations; large dot = >31 observations.

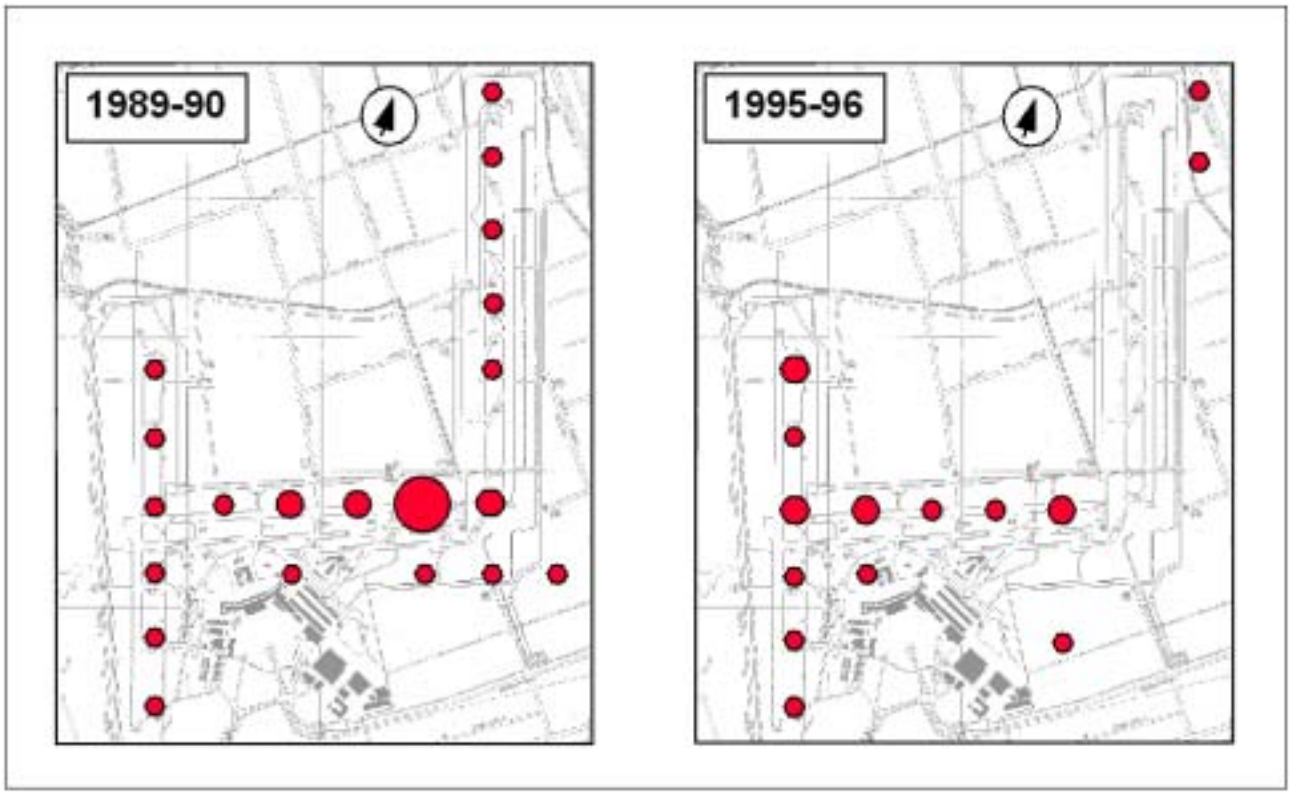

Figure 14. Annual localisation of the Lapwing at Fiumicino Airport in the two study periods. The size of the dots indicates the total number of observations: smallest dot = 1-10 observations; small dot = 11-20 observations; medium dot = 21-30 observations; large dot = >31 observations.

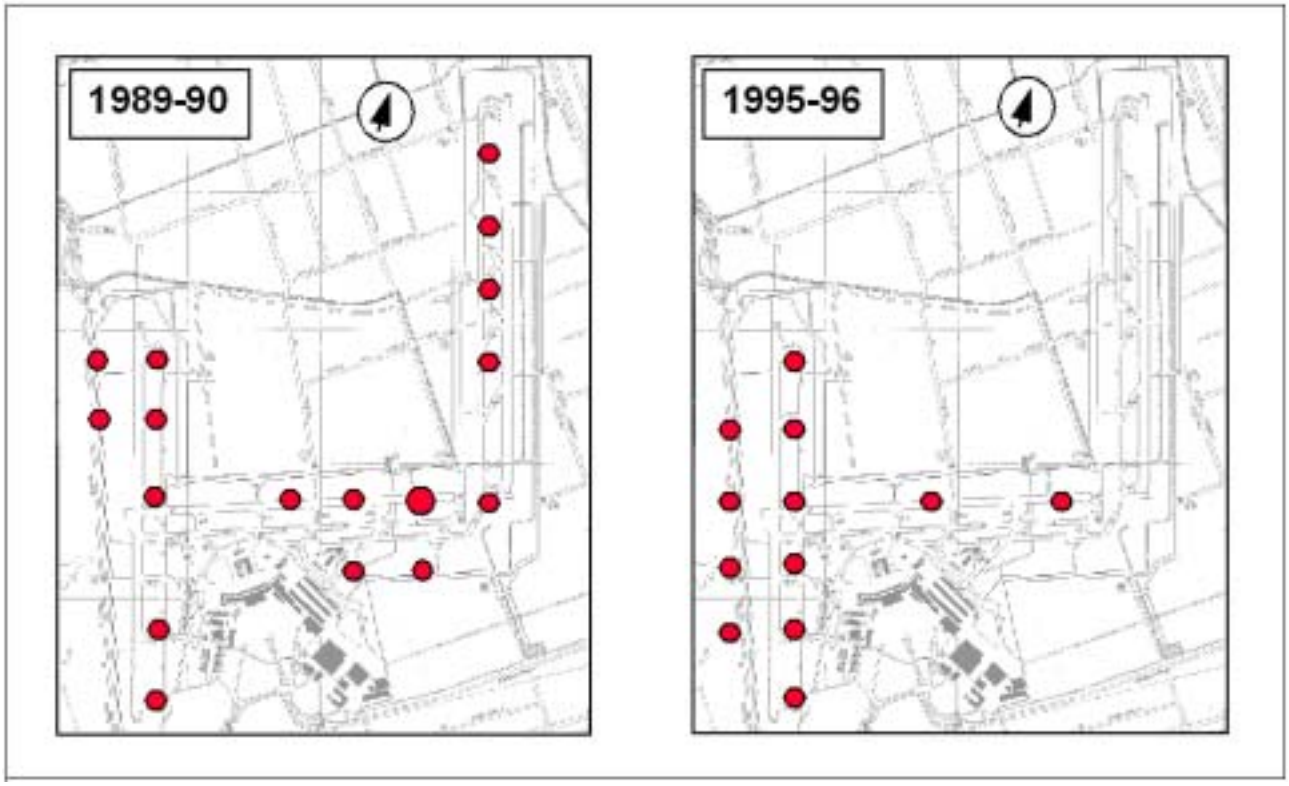

Figure 15. Annual localisation of the Starling at Fiumicino Airport in the two study periods. The size of the dots indicates the total number of observations: smallest dot = 1-10 observations; small dot = 11-20 observations; medium dot = 21-30 observations; large dot = >31 observations.

4. DISCUSSION

By analysing the results obtained with the comparison between the ornithological situation before an after the implementation of a specific and calibrated strategy to reduce the birds presence at the airport, it is possible to underline some interesting differences.

The most evident one is the decrease of the number of birds present during the second period: 1995-96 (**Figs. 3-5**). Gulls, for example, seem to decrease of over 80%; Starlings are 74,7% less and even Lapwings, usually very difficult to eradicate at airfields, show a decrease of 24,2% (**Fig. 6**). This seems to be confirmed by data expressed as percentage of the days of presence at the airfield (**Figs. 3-6** right part).

Birds behaviour does not seem to differ between the two periods, at least considering the preferred micro-habitat (**Figs. 7-9**). Gulls in fact still prefer the runways (**Fig. 7**), while Starlings and Lapwings are definitely attracted by the meadows, their usual habitat (**Figs 8-9**). The rare observations of Gulls in the meadows confirm once again the fact that these species use the airport just as a resting place, and not as a feeding area (the opposite is true for Lapwings and Starlings).

Moreover Gulls seem to be more methodical than Lapwings and Starlings. In fact they have almost identical 24 hours-times of presence within the study period (**Figs. 10-12**). In any case the very rare observations concerning the night period are again a proof that the airport is not used for night resting by the analysed species.

An evident difference can be observed about the more frequented areas by the individuals; particularly it must be underlined the low number of registered observations, during the more recent survey, in the areas once strongly affected by the birds presence (**Figs. 13-15**). This particular result seems to validate the hypothesis that the adopted strategy to reduce birds presence is reasonably working. In fact, by using the results obtained soon after the first survey (1989-90), it was possible to set the new scaring devices in the most critical areas (compare **Figs. 13** and **14** left with **Fig. 2** right). And the fact that such areas resulted almost free from birds during the second survey, can be considered a success.

The detailed analysis of the outcome of each scaring device, still in progress, will give clearer results about this aspect.

Finally, it must be considered that, during the analysis of the field forms, the adopted methodology did not resulted, in some minor cases, perfectly in accordance with the training level and the necessary sensitiveness to the 'birdstrike problem' needed by the Safety Office staff. This comported a careful process of evaluation and weight of the obtained data. In any case the possibility to have some biases, even if very low, still exists. This can happen whenever the people who collect the data are not professional ornithologists.

Specific training courses are regularly held to reduce this kind of problem, and for this reason the field form is regularly updated and simplified, in order to obtain the maximum high quality results with the minimum possible effort.

5. CONCLUSION

To conclude, it seems evidently proved that the monitoring activity of the avian community and the scaring devices present at an airport, is a fundamental step to know in deep details the bird problem, in order to face it in the most effective way and to evaluate the results obtained with a specific strategy.

The case of Fiumicino fundamentally demonstrates that by monitoring continuously the situation, with limited efforts, it is possible to obtain more than reasonable results in the field of birdstrike prevention.

The 'avian phenomenon', as all biological phenomena, is very dynamic, and this is why it must be always kept under control. For this reason it is necessary to repeat cyclically the various phases of monitoring, elaboration, updating and implementation of the strategies, and at the end – throughout further monitoring passages – evaluation of the obtained results. Only in this way it is possible to maintain high safety standards. A simplified diagram of the various steps and of the obtainable results, that can be ideally adopted by all aerodromes, is presented in **Fig. 16**.

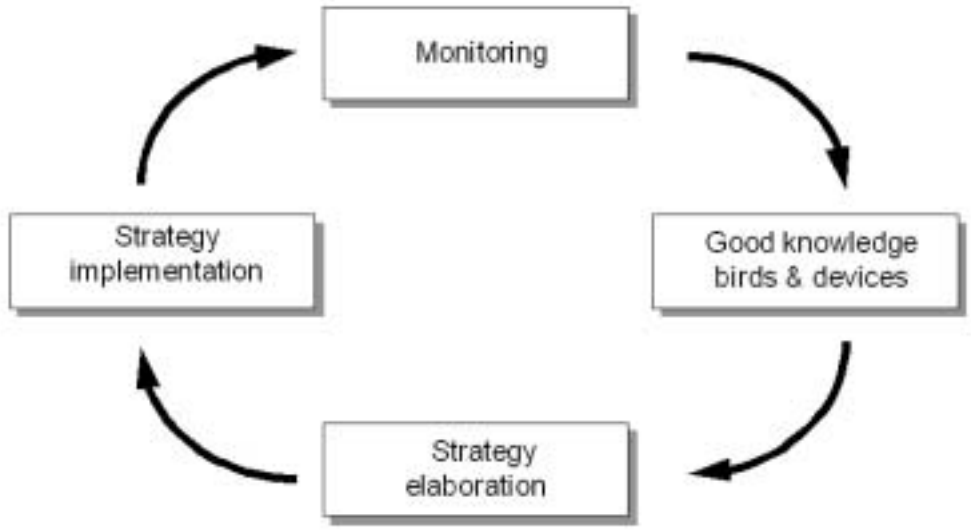

Figure 16. Functioning and ideal links of the different general phases to adopt cyclically in order to maintain a good control level of the bird problem at an airport.

In the near future, the strategy elaborated at Fiumicino Airport foresees further developments of the scaring devices, accurate monitoring campaigns targeted to their efficacy, and the creation of new roles to deal more consciously with the bird-avoidance problem. Moreover, a technical working group already exists in order to develop a software programme to file and to analyse the monitoring data.

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