

Evaluation of bird populations at spanish airports: outline and results. Index

(Pablo Morera, Spain)

EVALUATION OF BIRD POPULATIONS AT SPANISH AIRPORTS :
OUTLINE AND RESULTS

INDEX

- 1.- INTRODUCTION
- 2.- GENERAL CONTEXT OF THE BIRD PROBLEM AT SPANISH AIRPORTS
3. CLASSIFICATION OF SPANISH AIRPORTS ACCORDING TO THEIR BIRD PROBLEM
- 4.- POSITION OF THE SPANISH AIRPORTS AUTHORITY WITH RESPECT TO THE STUDY OF THE BIRD PROBLEM
 - 4.1.- Selection of case studies
 - 4.2.- Methodology
 - 4.3.- Results
 - 4.3.1.- Land use
 - 4.3.2.- Potentially dangerous species
 - 4.3.3.- Flows and resting places
 - 4.3.4.- External areas
 - 4.4.- General problems according to regions
- 5.- SUMMARY AND CONCLUSIONS

EVALUATION OF BIRD POPULATIONS AT SPANISH AIRPORTS :
OUTLINE AND RESULTS

ABSTRACT

The general context of the bird problem at Spanish airports is described. The airports are then classified according to their bird populations, and the methodology and the results of the various studies are explained. The primary conclusions include:

- 1) the distinction between four groups of airports-Inland; Cantabria and Galicia; Mediterranean; and the Canary Islands-,
- 2) the main problems arise from wintering birds,
- 3) agricultural land use and rubbish dumps are two negative factors which affect the majority of the airports and
- 4) these studies are extremely valuable tools for establishing adequate corrective measures.

1.- INTRODUCTION

Accumulated experience on the bird strike hazard at airports has shown the importance of analytical studies that examine the factors causing this risk. As a generalization, the danger may be said to come from the abundance and behaviour of birds, as well as the air traffic itself. Given that the latter as a constant factor, only the number and the behaviour of birds can be considered as variable in the effort to reduce risks. It is thus important to understand the different bird problems, distinguish the species involved, and discover the causes of their behaviour.

The Spanish Airports Authority is aware of this, and has carried out a series of studies on bird populations at the most affected airports.

This paper attempts to (1) Place the airport strike hazard in a wider context that largely explains the birds presence, (2) Classify the national airports in terms of their individual circumstances, and (3) Set out the results obtained in these studies.

2.- GENERAL CONTEXT OF THE BIRD PROBLEM AT SPANISH AIRPORTS

Due to its geographical position and its special characteristics, Spain is one of the largest bird reserves in Europe (fig. 1). In addition to the large number of reproductive species here, many migratory birds come in spring and autumn. Certain areas also serve as wintering zones.

There are three migratory routes that affect airports to varying degrees:

- The Atlantic route, following the North and West coastlines, involving multitudes of marine birds and waders. Its effect is felt at the Cantabrian airports, where numerous species appear in autumn.
- The Mediterranean route, running parallel to the coast, and involving a large contingent of flamingos, birds of prey, ducks, waders and small species. It mainly affects airports near wetlands, like Barcelona, where large numbers of migratory species settle.
- The Inland route, less well-defined than the others. It covers the whole Iberian Peninsula, and is used mainly by Wood Pigeons and Stone Curlews.

The three routes converge on the Gibraltar Strait area, where spectacular numbers of birds are found in the migration periods.

Some species, in contrast to those mentioned above, do not follow fixed routes and may appear anywhere on the Peninsula or the islands during migration. These are known as wide front migrants.

All these birds look for wintering areas with a benign climate and abundant food. Spain is again an excellent refuge, along with the other Mediterranean countries (fig. 2), for large numbers of birds. This situation is patently clear when a cold spell hits Central Europe and many species flee southwards.

In a
that find ideal c

All t
numbers of birds

3.- CLASSIFIC PROBLEM

The
country's socio-e
bases open to ci
coast. The rema
problem in many

These
large-scale exte

1) Inland. This
They are Vi
Cordoba, S
steppeland t

2) Cantabria
migratory r
Coruña, Sar
Snipes and
problems in

3) Mediterrane
airports who
migratory r
Alicante, Sa
Menorca, Pa
and Starlings
also cause se

In addition, Spain is an important breeding ground for many species that find ideal conditions to raise their young in large numbers here.

All these characteristics affect many Spanish airports, where large numbers of birds gather on or around their runways.

3.- CLASSIFICATION OF SPANISH AIRPORTS ACCORDING TO THEIR BIRD PROBLEM

The geographical distribution of Spain's airports derives from the country's socio-economic pattern of development. Of the 38 airports and military bases open to civilians air traffic, almost three-quarters (28) are on or near the coast. The remaining 25 % are inland. This fact determines the type of bird problem in many cases.

These airports may be classified in four categories, depending on large-scale external factors, especially their position and climate.

- 1) Inland. This includes the ten airports without a direct coastal influence. They are Vitoria, Pamplona, Zaragoza, Valladolid, Madrid-Barajas, Badajoz, Cordoba, Sevilla and Granada. Their problems mainly derive from steppeland birds.
- 2) Cantabria and Galicia. Seven airports are squarely on the Atlantic migratory route. These are San Sebastian, Bilbao, Santander, Asturias, La Coruña, Santiago de Compostela and Vigo. Waders, especially Lapwings, Snipes and Golden Plovers, seagulls and Starlings cause most of the problems in winter, and are more noticeable when a cold spell hits Europe.
- 3) Mediterranean. This is the largest and most diverse region. It includes 14 airports whose common denominator is their location on the Mediterranean migratory route. They are Reus, Gerona, Barcelona, Sabadell, Valencia, Alicante, San Javier, Malaga, Almeria, Jerez de la Frontera, Melilla, Menorca, Palma de Mallorca and Ibiza. Black-headed gulls, Stone Curlews, and Starlings are very common migrants and winter visitors. Herring Gulls also cause serious problems at airports located near their breeding grounds

in the northern half of the region.

- 4) Canary Islands. This category includes the seven remaining airports: Lanzarote, Fuerteventura, Las Palmas, Tenerife Norte, Tenerife Sur, La Palma and Hierro. Only seagulls cause serious problems here. Due to their geographical position, these airports are not affected by bird flows due to cold spells in Europe.

4.- POSITION OF THE SPANISH AIRPORTS AUTHORITY IN THE STUDY OF THE BIRD PROBLEM

4.1.- Selection of case studies

On the basis of the reports, the Laboratory Services of the Spanish Airports Authority has classified the 38 Spanish airports according to their risk factor. A total of 19 have bird problems.

The first stage in the search of radical solutions was the commissioning of serious studies of the matter. To date, 11 airports have been or are being studied. These are Vigo, Bilbao, Ibiza, Menorca, Palma de Mallorca, Santander, Tenerife Sur, Barcelona, Sevilla, Malaga and Madrid-Barajas. Three, Asturias, Vitoria and San Sebastian, expect to do so this year.

The five remaining airports, Almeria, Granada, La Palma, Lanzarote, and Tenerife Norte have sporadic problems that are being monitored but do not warrant in-depth studies for the moment.

The airports have been selected in order to combine the necessity for information on the most difficult cases with the desire for a general vision of the problems affecting each of the four regions mentioned in part 3.

4.2.- Methodology

The methodology used in these studies was presented at the last meeting of the European Bird Strike Committee in Copenhagen in 1986 (Ruiz, J. and Morera, P.: Study structure of birds and ecosystems in Spanish airports. It

basically include

a) Classification of collection management their bird

b) Study of composition defined ec

c) Gregarious danger to flock size

d) Bird flow observato variation,

e) Main res determin food, res highest d

f) External flock d attractiv rest area birds aw noted.

4.5.- Results

4.3.1. Land u

Th

basically includes the following aspects :

- a) Classification of airport ecosystems. Special emphasis was placed on the collection of data on the composition and structure of vegetation, and the management of each airport's ecosystem. This permitted an analysis of their bird carrying capacity.
- b) Study of resident communities. Using regular transect census, the composition and density of the bird communities in each of the previously defined ecosystems was evaluated.
- c) Gregariousness. The social behaviour of each species indirectly affects its danger to air traffic. Data was collected on the annual changes in average flock size of the main species.
- d) Bird flows. Areas with an intense bird flow were determined from observatories within or nearby the airport compound. Monthly and hourly variation, height and species involved in these flights were noted.
- e) Main resting places. The areas with the largest clusters of birds were determined using the same technique. Their causes, such as the search for food, rest etc, their seasonal behaviour, including times and months of highest density, and the species involved, were studied.
- f) External areas. These are undoubtedly one of the main factors influencing flock density at airports. Their position, population variations, attractiveness for birds -whether due to their being breeding, feeding or rest areas- and their general influence on the airport- positive, distracting birds away from the airport, or negative, favouring their presence- was noted.

4.3.- Results

4.3.1 - Land use

The airports are grouped in regions or geographical types in Table 1.

Land uses causing the greatest problems are pasture and cropland. The former are particularly common in the Cantabria-Galicia area. During the winter, they tend to flood in this region, in contrast to the others. They are highly attractive for waders, which feed on the large number of invertebrates living here. The case of the large numbers of Lapwings and Golden Plovers at Santander Airport is a good example of this problem.

The pastures in the rest of the regions tend to be drier, but also have large numbers of invertebrates. In the Mediterranean area, snails are very common. They seasonally attract seagulls to the edges of the runways.

Croplands are more usual in the drier Mediterranean and Inland areas. They are usually around the perimeter of the airports, but in some cases such as Palma de Mallorca, Barcelona and Sevilla, crops are grown beside the runways. These attract birds during two periods of the annual cycle :

- During the ploughing process, when the soil is broken up by farm machinery, uncovering small prey eaten mainly by gulls, waders and Cattle Egrets.
- When the crop is ripe, provided that it is attractive to birds, as is the case for sunflower and cereals. Small passerines and pigeons are the main species that gather to feed on these crops.

The last two habitats in Table 1 are woodlands and wetlands. The former are not a problem at the majority of airports, however in Mallorca there is a Starling and Thrush roost. The latter areas, which could include the northern pastures, are not necessarily negative. The lagoons at Vigo and Santander Airports are examples of this. In Barcelona, on the contrary, they are the base for a large Starling roost, and a meeting point for herons, ducks, waders and seagulls.

4.3.2.- Potentially dangerous species

Three groups of species are the cause of the majority of bird problems at Spanish airports (Table 2). Waders affect all northern airports,

especially the
and the Snipe
search of food
spells in Cent

La
regions, altho
Curlews (Bur
notable in th
here, even un

T
Lesser Black
and the resid
coastal areas
inland sites,
areas with lo
continually c
them one of

T
are the Star
former is a
mixes with t
may house c
places are a
danger is he
case at Bare

C
- Pigeon
doveco
airport

- Ducks,

especially the Lapwing (Vanellus vanellus), the Golden Plover (Pluvialis apricaria), and the Snipe (Gallinago gallinago). These three frequent the wet pastures in search of food, and their populations are subject to changes arising from cold spells in Central Europe.

Lapwings and Golden Plovers are also in the Mediterranean and Inland regions, although in smaller numbers and occasionally accompanied by Stone Curlews (Burhinus oedienemus), a less frequent resident species. This species is notable in the Canary Islands because there are very few waders which arrive here, even under the effect of cold spells in northern latitudes.

The second group of birds is the seagulls. The wintering species, the Lesser Blackbacked Gull (Larus fuscus) and the Black-headed Gull (L. ridibundus), and the residents, the Herring Gull (Larus argentatus), are frequent in all the coastal areas and are found at those airports with nearby rubbish dumps, even at inland sites, and those with pasture or cropland. These birds prefer to rest in areas with low vegetation or directly on the runways. This and their habit of continually crossing the airstrips between their feeding and resting places, make them one of the most dangerous species for aircraft.

The third and final group causing general problems at many airports are the Starling (Sturnus vulgaris), and the Spotless Starling (S. unicolor). The former is a wintering species in Spain, which arrives in massive numbers and mixes with the other species, a resident, to form huge flocks. These birds' roosts may house over 100,00 individuals. The airports situated near these roosting places are affected by the movement of the birds at first and last light. This danger is heightened when the roost is within the airport compound, as is the case at Barcelona and Menorca Airports.

Other birds at airports are :

- Pigeons (Columba livia f^a domestica) which enter airports from their dovecots nearby in search of food. They may be found at any type of airport because of human influence on their distribution.
- Ducks, especially the Mallard (Anas platyrhynchos) frequent wetlands

inside airports, but are especially numerous at Barcelona Airport only.

- The most common Heron is the Cattle Egret (Bubuleus ibis). These are found near some airports such as Sevilla, Malaga and Barcelona.
- Steppeland birds are characteristic of the inland region. Two representative species are the Red-legged Partridge (Alectoris rufa) and the Little Bustard (Otis tetrax). Both are found at Sevilla, the only inland airport with sufficient data, however they are known to be present at others such as Madrid-Barajas and Granada.

4.3.3.- Flows and resting places

Flows over runways and the presence of resting places depend on the species at the airport, its land use and the external areas. As mentioned previously, waders mostly frequent pastures, while seagulls prefer to rest on runways and areas with little vegetation.

4.3.4.- External areas

Their type and position determine the species that fly over the airports and their flow timing. They thus contribute in determining which species are to be found at each airport. They may be divided into two categories, according to their influence on airports :

Those with a NEGATIVE influence attract massive numbers of birds to airports. These are mainly zones which permit easy and abundant feeding, such as rubbish dumps, fish driers and croplands. The former two, the most influential, may completely modify the range of species at an airport. This was the case at Sevilla airport which, in spite of being inland, was frequented by Lesser Black-backed Gulls and Black-headed Gulls attracted by the Mairena rubbish dump. This is now closed.

In other cases, rubbish dumps affect flows over runways, their timing and intensity. This has been observed at South-Tenerife, Ibiza and Santander Airports.

It is a widespread problem in Spain, as eight of the eleven airports with data on the subject (Table 1) are affected by rubbish dumps.

The second, positive type of external area is that which distracts birds away from airports. They tend to be wetlands where birds are relatively undisturbed and whose water and food resources make them more attractive. The cases that were studied were the Ibiza salt pans, bordering the southern edge of the airport the mouth of the Guadalhorce River, near Malaga airport; and the El Saltadero dam, between South Tenerife airport and the rubbish dump used by the seagulls there.

These types of places ought to be protected under legislation in order to attract larger numbers of birds.

4.4.- General problems at airports according to regions

The results obtained to date confirm the inclusion of the airports in each of the biogeographical regions mentioned. They also permit the prediction of the problems likely to arise if the airport or nearby ecosystem are altered. Thus, for example, further extension of pasture, especially when it is subject to seasonal inundation, will encourage the arrival of larger numbers of waders.

In the Mediterranean area, problems with seagulls are predictable at airports near bird colonies or croplands, or when coastal storms occur. Wetlands within these areas are very dangerous due to the numbers of birds gathering there, especially in the migratory and winter periods (Table 2).

Steppeland birds are common inland, although the expanse of this region and specific factors at each such as crops, doves, location, etc, give rise to a greater diversity of problem species here (Table 2).

Seagulls are only a problem in the Canary Islands when rubbish dumps are near airports. The rest of the species observed here are resident and low in numbers (Table 2).

Negative factors affecting airports in every region are rubbish dumps

and doves. Both attract large numbers of birds and sometimes radically modify their natural distribution patterns.

5.- SUMMARY AND CONCLUSIONS

The presence of birds at airports may be explained by the following factors :

- The airport position, on a macrogeographic scale, in the context of migratory routes and wintering areas. This gives rise to the classification of Spain's airports into four regions or geographic types -CANTABRIA AND GALICIA; MEDITERRANEAN; INLAND; and CANARY ISLANDS-.
- The main species affecting Spain's airports are those wintering here, closely followed by the residents (Table 2). The most notable groups are seagulls, followed by waders, pigeons and steppeland species. The rest have a more limited, local influence.
- The airport characteristics, especially its physiognomy derived from its land uses. These can encourage the presence or absence of certain species, and determine their numbers. Each airport attractiveness has been analysed and the land uses alluring the largest number of birds have been determined as pastures, croplands and some wetlands, which ought to be replaced by less attractive landscape such as scrub.
- The final factor is the local environment of the airport. Local land uses and the proximity of rubbish dumps or fish driers affect the presence of gulls and other birds. On the other hand, there are external areas such as wetlands that attract birds away from airports and should therefore be encouraged.
- These studies are a fundamental step towards the reduction of the strike hazard at airports, as they provide indispensable information for the planning of adequate corrective measures. These measures, to be carried out on differing time-scales, include the installation of different loudspeaker systems, the use of detonating cartridges and falconry,

changes in the management of airport ecosystems and the long-term elimination of rubbish dumps and conflictive external areas. For more detailed information, refer to the study "Present State of Strike Hazards at Spanish Airports", presented at this congress.

PROBLEM	LAND USES				BIRDS								EXTERNAL AREAS						
	CROPLAND	PASTURES	WOODLAND	WETLANDS	MADERS	GULLS	DOVES	STARLINGS	THRUSHES	HERONS	DUCKS	STEPPE BIRDS	BIRD MOVEMENTS	RESTING PLACES	ROOSTING PLACES	RUBBISH DUMPS	GULLS COLONIES	FAVORABLE PLACES	FISH DRIVERS
CANTABRICO AND GALICIA		X			I	I										X(1)	X		
		X			I														
		X			I	S/I							X			X			
		X			I	I		I								X(2)			
		X	X		I/S I/S	S	I						X	X		X			
MEDITERRANEAN		X			I	S							X	X		X			
		X	X		I	I													
		X			I	I		I					X	X		X			
		X			I	I	S	I					X	X		X			
ISLANDS	X	X			I/S I/S	I(2)						I	X	X		X			
						S													
CANARY ISLANDS																			

APP. 1. Summary of birds problems according to the biogeographical zone, land uses, bird species and external areas

I - WINTER
S - SEASONAL

(1) PLACED INTO THE AIRPORT TERRITORY

(2) ACTUALLY IDENTIFIED PROBLEM

SEASONS: WINTER, SPRING, SUMMER, AUTUMN

Vigo: Larus ridibundus, Larus argentatus, Corvus corone
 Cantabrico and Galicia: Larus argentatus, Corvus corone, Larus ridibundus

SEASONS	NAME	SEASONS		
		SPRING	SUMMER	AUTUMN
Vigo	Larus ridibundus		Larus argentatus	Larus ridibundus
	Larus argentatus		Corvus corone	Corvus corone
	Callipepla gallinago			
	Vanellus vanellus			
Asturias	Callinago gallinago			
	Vanellus vanellus			
	Sturnus spp.			Sturnus spp.
Bilbao	Vanellus vanellus	not studied	not studied	Vanellus vanellus
	Pluvialis apricaria			Pluvialis apricaria
Barcelona	Vanellus vanellus			
	Pluvialis apricaria			
	Larus ridibundus		Sturnus vulgaris	Anas platyrhynchos
	Sturnus vulgaris		Columba livia	Vanellus vanellus
	Columba livia		Columba livia	Pluvialis apricaria
	ff domestica		ff domestica	Larus ridibundus
			Pica pica	Sturnus vulgaris
				Columba livia ff domestica
			Pica pica	
Palma de Mallorca	Larus argentatus		Larus argentatus	Larus argentatus
	Larus ridibundus		Burhinus oediconemus	Larus ridibundus
	Callipepla gallinago		Columba livia	Burhinus oediconemus
	Sturnus vulgaris		ff domestica	

SEASONS AIRPORTS	SEASONS			
	WINTER	SPRING	SUMMER	AUTUMN
Ibiza	Vanellus vanellus Pluvialis apricaria	Larus argentatus	Larus argentatus	Vanellus vanellus
Menorca	Larus argentatus Sturnus vulgaris			Larus argentatus Sturnus vulgaris
Málaga	Larus fuscus Larus ridibundus Sturnus spp. Vanellus vanellus	Bubulcus ibis Larus fuscus Larus ridibundus Columba livia fª doméstica	Bubulcus ibis Columba livia fª doméstica	Bubulcus ibis Sturnus spp. Larus fuscus Columba livia fª doméstica
Sevilla	Otis tetrax Pluvialis apricaria Vanellus vanellus Bubulcus ibis	Bubulcus ibis	Otis tetrax Bubulcus ibis Alectoris rufa	Otis tetrax Pluvialis apricaria Vanellus vanellus Bubulcus ibis
Tenerife	Larus argentatus Larus fuscus	Larus argentatus Columba livia fª doméstica		Larus argentatus

TABLE 2.- Main seasonal problems of different bird species at the studied spanish airports



FIG. 1
MAIN MIGRATION ROUTES OF
WESTERN PALEARCTIC

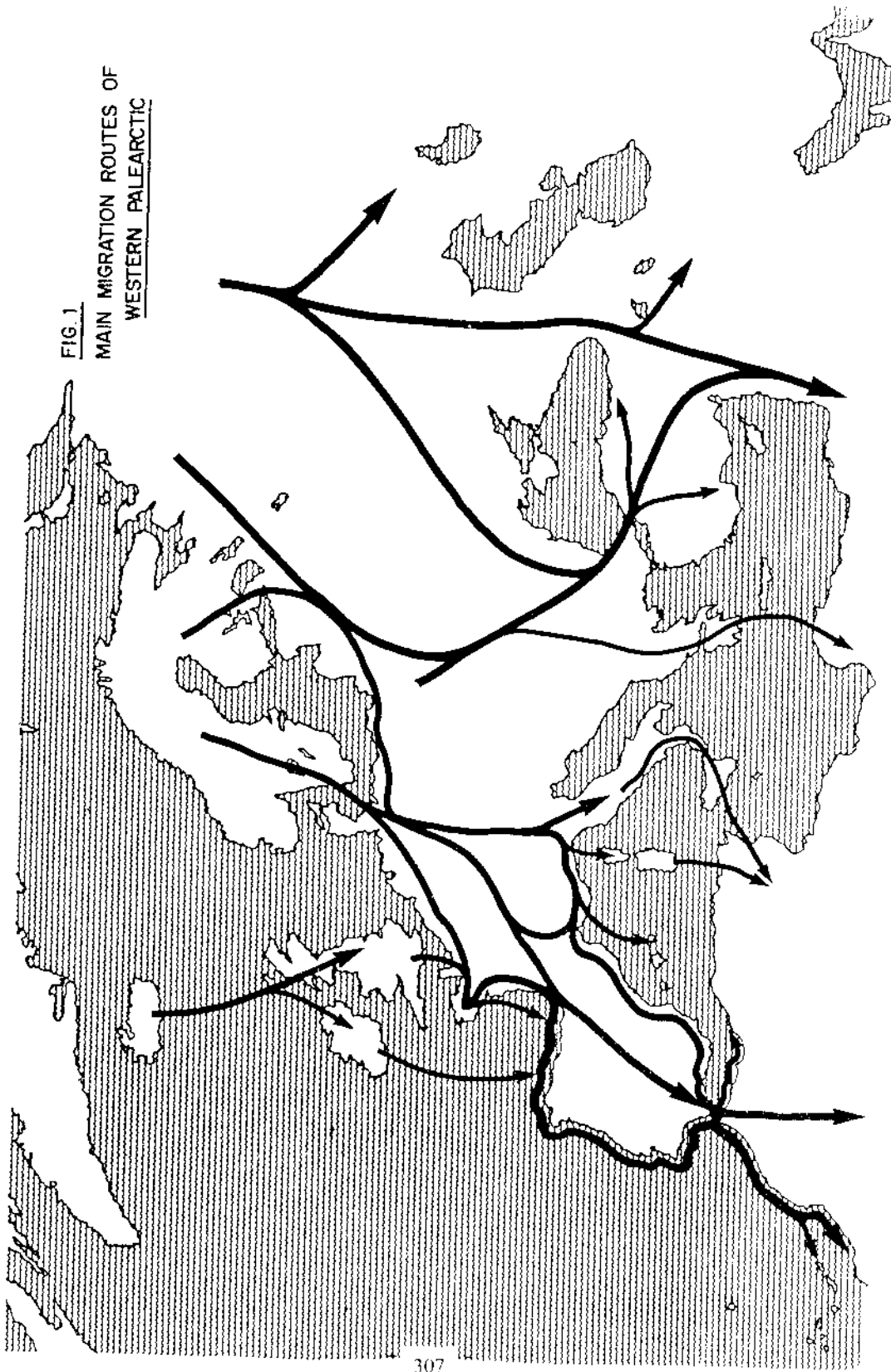
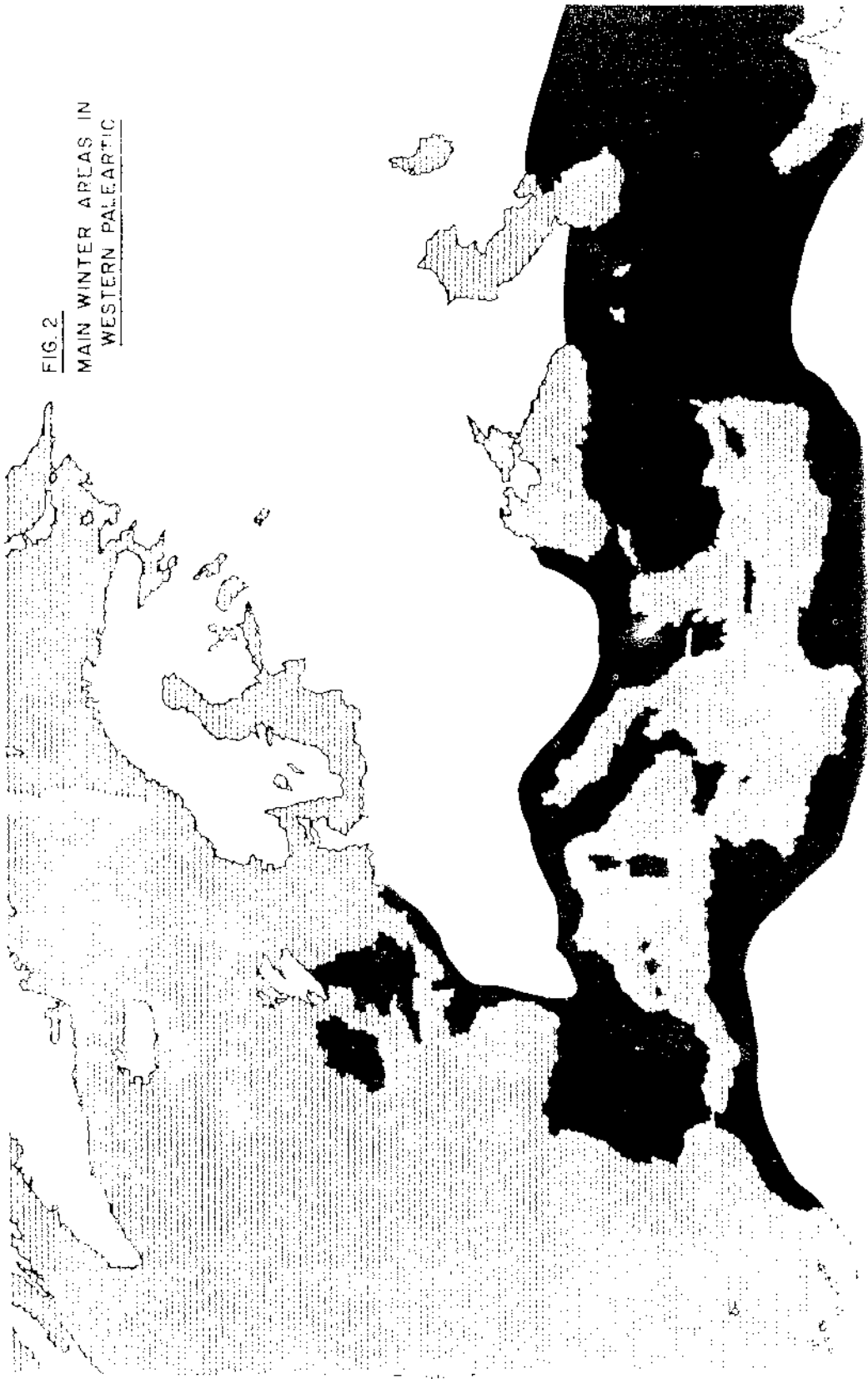


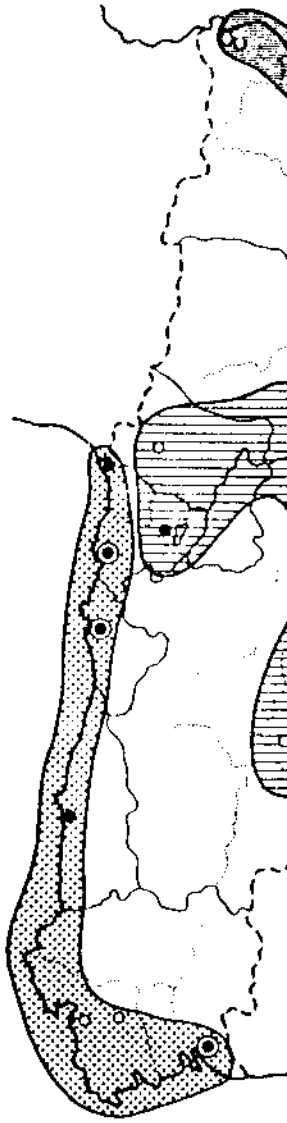
FIG. 2
MAIN WINTER AREAS IN
WESTERN PALEARCTIC



KINDS OF AIRPORTS

CANTABRICO Y GALICIA

MEDITERRANEAN



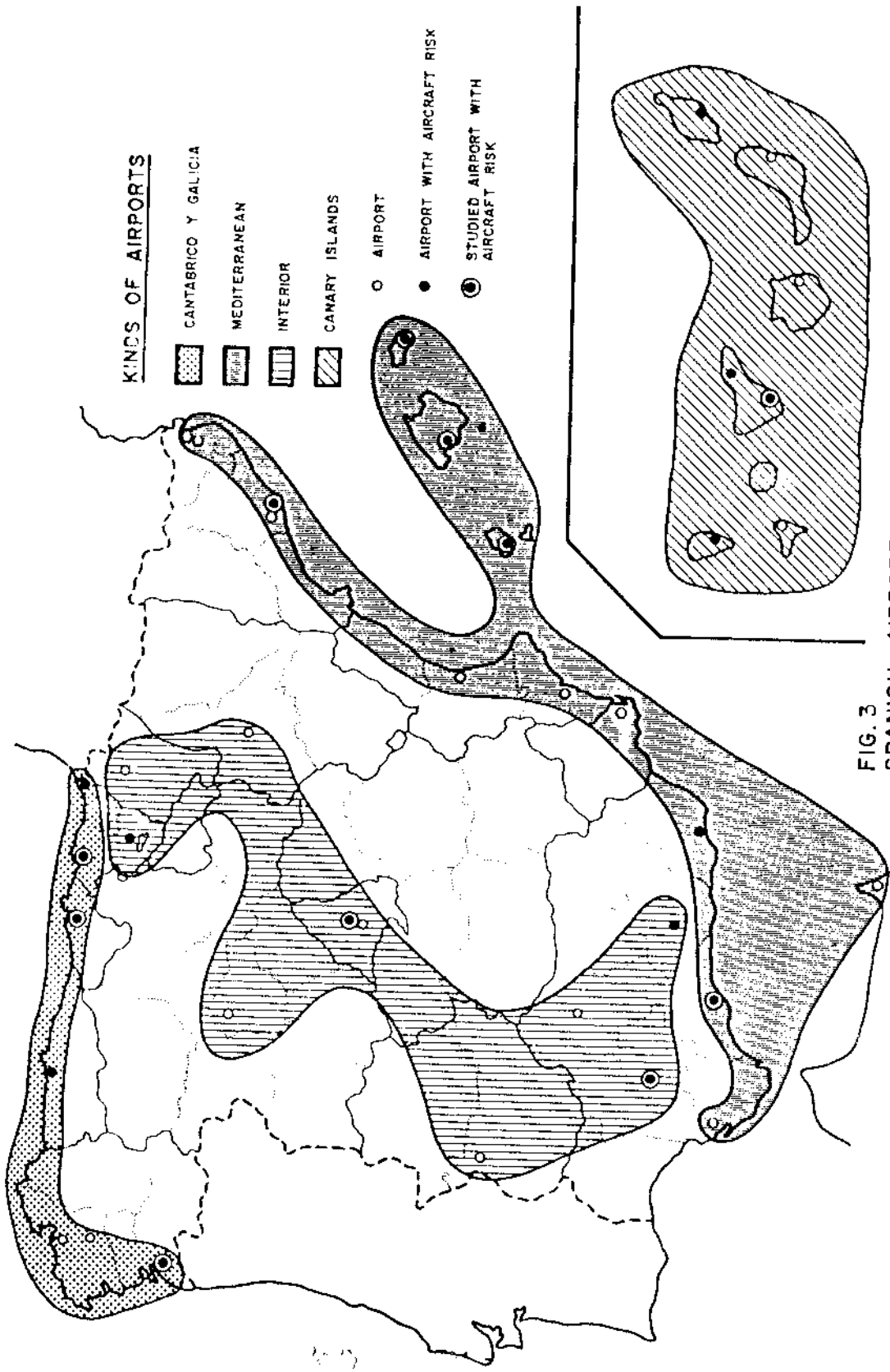


FIG. 3
SPANISH AIRPORTS DISTRIBUTION