

# The status of the Golden Jackal (*Canis aureus* L.) in Greece

Giorgos Giannatos, Yiannis Marinos, Panagiota Maragou and Giorgos Catsadorakis

WWF Greece, 26 Filellinon St., Gr-10558 Athens, Greece

Corresponding author : Giorgos Giannatos, e-mail : giannatos@bid.uoa.gr

**ABSTRACT.** Broadcasted jackal howls were used to survey the status of the golden jackal in Greece. All sites with recent indication of jackal presence were surveyed at selected calling stations, and minimum population estimates were recorded. The results of the survey show that both populations and distribution area of the golden jackal in Greece have been declining steadily during the last three decades. The golden jackal has disappeared from Central and Western Greece and is currently confined in discontinuous, isolated population clusters in Peloponnese, Fokida, Samos isl., Halkidiki and North-eastern Greece. The reduction was more distinct in Southern Greece, which used to be the jackal's main area 20 years ago. The current minimum size of the jackal population in Greece was estimated at 152-162 different territorial groups. The largest population cluster was found in Nestos – Vistonida area, NE Greece. In Southern Greece, the jackal is found in the Mediterranean maquis zone at altitudes below 600m asl. Some individuals were observed up to 1000m asl, but were considered exceptional. In Northern Greece the species was found in areas below 250m asl, while the highest population densities were found in thickets around wetlands up to 10m asl.

**KEY WORDS :** *Canis aureus*, Greece, status, acoustics, vocalization, howling response

## INTRODUCTION

The jackal in Europe is distributed in small and scattered populations, mainly along the Mediterranean and Black Sea coast of the Balkan Peninsula (DEMETER & SPASSOV, 1993 ; KRYSTUFEK *et al.*, 1997). In this area occurs only in Mediterranean-type scrubland and lowland wetlands (DEMETER & SPASSOV, 1993), and being on the top of the food chain it is an important indicator of these ecosystems.

The golden jackal has become by far the most rare canid species in Greece (GIANNATOS & IOANNIDIS, 1989; 1991; KARANDINOS & PARASCHI, 1992) as its population has been declining during the last three decades. The jackal is the only medium-sized carnivore in Greece that has suffered a rapid decline in its distribution and population numbers, and the exact causes for the species' reduction in Greece are generally unknown. No systematic survey has been carried out so far.

The legal status of the species is still obscure and undetermined. It is listed as "vulnerable" in the Red Data Book for Greek Vertebrates (KARANDINOS, 1992) but otherwise it is neither officially declared as a game species nor as a protected one. In general very little information is available on jackal ecology and conservation status in Europe.

In order to elaborate conservation measures for the species and develop an action plan for its conservation, WWF Greece completed a country-wide survey and mapping of the species' population status, distribution, and status changes during the last 25 years. This study summarises the first results of this project.

## MATERIAL AND METHODS

### Survey area

The survey was carried out between May 2000 and June 2001. The survey area included all localities in Greece with recent sightings, confirmed damage, or at least some (even doubtful) evidence of jackal presence. Selection of these areas was based on relevant information collected through questionnaires addressed to Forest Services, Hunting Associations, WWF Greece members, and personal interviews with local people, especially shepherds. After gathering and verifying all collected answers, a total of 264 possible areas of presence were identified. In each of these areas selected survey routes were drawn based on existing road networks, vegetation, and morphology. Calling stations were set along these routes in such a way as to cover completely each area of presence. Each station was located in a site with good visibility and acoustics, and usually – but depending on the terrain – at a high vantage point. Linear distance between successive trial calling stations was between 2-4 km, depending on the topography of the sampling area. Each station's co-ordinates were recorded by GPS.

### Acoustic method

The current population status of the jackal in Greece was assessed by a calling survey method that combined acoustic and visual observations of jackals after stimulation with playback howls. Similar methods have been extensively used to survey social and vocal carnivores (MC CARLEY, 1975 ; HARRINGTON & MECH, 1982 ; CREEL & CREEL, 1996 ; JAEGER *et al.*, 1996 ; MILLS *et al.*, 2001).

A broadcasted group-yip howl by three to four jackals was used at each calling station. The howl was recorded on a mini disc and broadcasted using an Aiwa AMF 65 recorder wired to a 20-Watt caller with 15-Watt chip amplifier. The howls were played from the roof of a vehicle at night at the selected calling stations, always one hour after sunset on calm and dry nights. Windy or rainy nights, which could seriously disturb the observers' hearing capacity or animal responsiveness, were strongly avoided (MC CARLEY, 1975 ; JAEGER et al., 1996). Each howl broadcast lasted for 30-sec and was followed by a 5-minute pause. This set of broadcast and pause was repeated six times, for an overall session time of ca. 30 minutes. The direction of the caller was changed every two to three howls, depending on the landscape structure and the direction of the wind. During and after each howl broadcast, two to three members of the field team recorded the direction and the possible number of the responding jackhals. It was assumed that each response-direction coincided with a territorial group.

In the event of an immediate response from close-quarters, high intensity spotlights (500,000-1,000,000 candle power) were used to survey the area for 360° around the calling station to locate approaching animals. When the response was heard from a great distance, or if no response at all was recorded, the area was surveyed after the 2<sup>nd</sup> or 3<sup>rd</sup> howl broadcast (i.e. 5-10 minutes from the beginning of a session), in order not to scare away possible approaching animals. Observation was facilitated by 7x50 binoculars. In locations with good visibility, approaching animals could be identified from more than 250m by their characteristic gait and shining eyes. In cases of approaching animals we counted all the animals in view.

It was assumed that only territorial groups of jackals were responding to the broadcast playbacks. Identification of different individuals howling in chorus within each group was not possible by hearing alone, especially in cases of groups of more than two animals.

Maximum human hearing distance on windless nights from a vantage point in open terrain with no background noise was determined at 1.8-2 km, whereas the maximum distance for attracting jackals was determined at 1.5 km. In order to experimentally test the maximum distance that the jackals could be heard with accuracy in a relatively open terrain, after the detection of a jackal group one of the observers stayed close to the animals, while the rest of the team drove to distances of 1.5 and 2 km. The jackal howls were broadcasted in both distances. After the jackals responded the two groups communicated to verify audibility. At both distances both the playbacks and the jackal howls were audible to all observers, but at the 2 km distance the broadcast was faint. Maximum audibility was achieved during the night, when it was silent and the animals forage in the open.

The attracting distance was tested in an open area where jackals had been previously located. After the stimulation howling, jackals were observed approaching from distances of 1.5 km down to 50 m from the calling station.

At each calling station the effective area for an audible response from the jackals was estimated to be between 7

and 12.5 km<sup>2</sup>, depending on the different landscape topography of the surveyed area.

At each site the following parameters were also recorded to assess major features of the habitat and jackal-human interactions. 1) Altitude and the most dominant plant species within a 1km radius from the approximate location of the jackals during the point count survey. The radius was selected under the assumption that these locations were within the jackals' home range. 2) The distance from the nearest human settlement.

## RESULTS

### Population status

During the survey 264 possible areas of presence were visited and a positive jackal response was recorded in 131 (50%). The easternmost peninsula of Halkidiki (Mt. Athos) was not surveyed because a research permit was not issued in time. However, from personal observations we can verify that the species was present in almost all areas of the peninsula.

At the majority of calling stations (67%) the jackals responded within the first five minutes. In 45 cases it was possible to attract animals from the responding jackal group. The majority of sightings (85%) involved one to two animals. The largest group observed consisted of five individuals, but such a number was observed only once (Fig. 1). The minimum total number of groups found was 152-162 (Tab. 1).

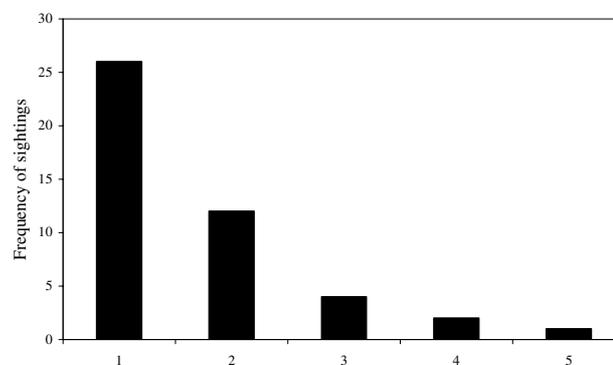


Fig. 1. – Frequency and number of approaching jackal individuals

According to records of the Ministry of Agriculture (Min of Agriculture, unpublished data), the decline of the jackal population started in the 70s and was even more intense in the early eighties. Even by 1980, the harvest was much reduced compared with those of the years 1974 to 1979 (Tab.1).

Information from local observers, verified by the present survey, showed that no jackal groups existed between Fokida and the southernmost jackal population in Northern Greece in Halkidiki. There was only one, but unconfirmed, report of the presence of one jackal group in Central Macedonian Province (Fig. 2).

### Habitat types

Because of distinctive differences and similarities in the habitat types, the jackal distribution in Greece was

divided in two sub-regions : Southern Greece (Peloponnese, Fokida, Samos) and Northern Greece (Halkidiki, Serres, Nestos-Vistonida, Evros) (Fig.2). Based on the predominant habitat types, the jackal presence areas were

divided into two main categories : wetlands, mainly in Northern Greece (Fig. 3a), and other habitat types, mostly Mediterranean maquis (Fig. 3b).

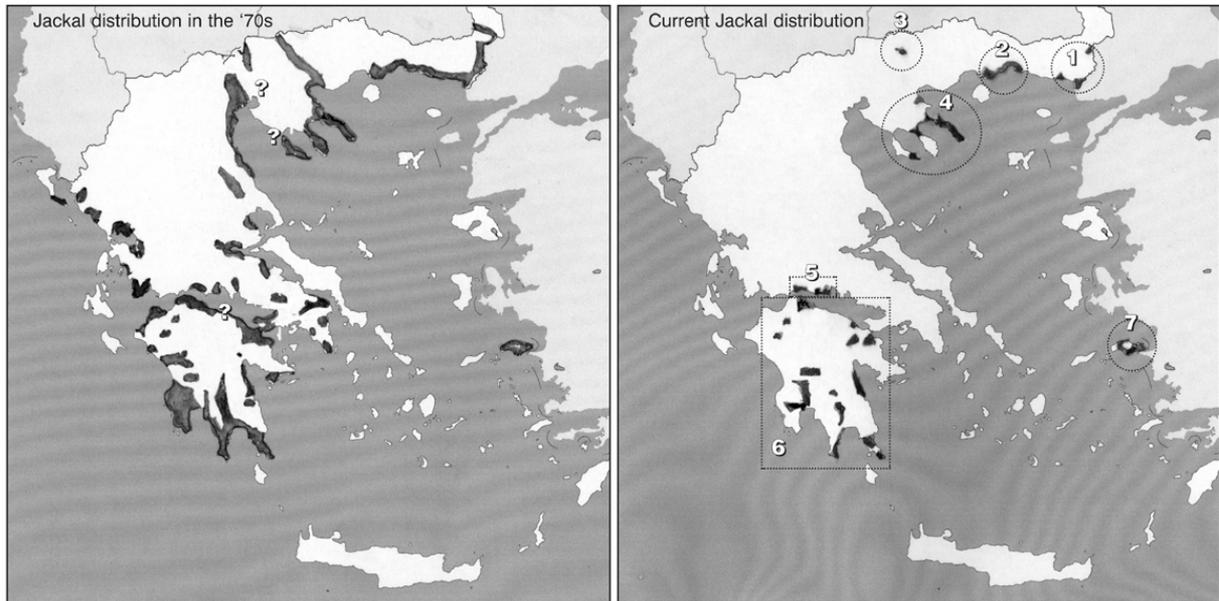


Fig. 2. – The golden jackal distribution in Greece in the 1970s and today. 1) Evros, 2) Vistonida-Nestos, 3) Serres, 4) Halkidiki, 5) Fokida, 6) Peloponnisos, 7) Samos

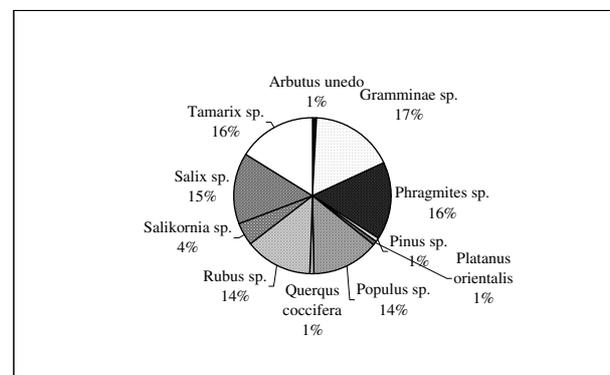
In Southern Greece, jackals were found in more mountainous habitats than in the North (Fig.4). The highest observed group in Northern Greece was in Halkidiki at 250m asl, while in the south (Peloponnese) jackals were observed even at 1050m asl. The largest population cluster in Greece (located in Nestos – Vistonida area) as well as other coastal wetland populations were found in areas at less than 10 m altitude.

TABLE 1

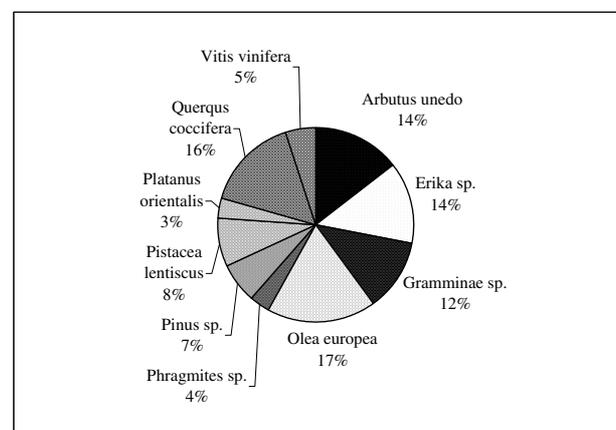
Estimated minimum number of jackal territories in each area in Greece

AREA	Number of jackals killed annually in the 1974 – 1979 period (min-max)	Number of jackals killed in 1980	Minimum number of jackal group territories (2000 -2001 survey data)
Peloponnese	517-1049	192	43 – 45
Fokida	1-8	5	9 –11
Samos	13 –96	0	12
Serres	14 – 63	52	1-2
Halkidiki	33-90	20	26
Vistonida- Nestos	53-122	16	53
Evros	27-74	1	8 – 12
Rest Of Greece	34 - 254	83	1?
<b>TOTAL</b>	<b>903 – 1332</b>	<b>369</b>	<b>152 – 162</b>

The highest jackal population densities were found in the wetlands of Northeastern Greece. If we set the effective area in each survey trial at 7 to 12.5 km<sup>2</sup> the jackal territory densities range from 0.08 to 0.5 groups/km<sup>2</sup>. The



3a



3b

Fig. 3. – The most frequent plant species in the jackal habitats of Northern Greece (3a) and in Southern Greece (3b). highest densities were detected in wetland and riparian

areas, namely in Vistonida – Nestos and in Mornos delta in Fokida, while the lowest were in Mediterranean maquis vegetation areas in Peloponnese.

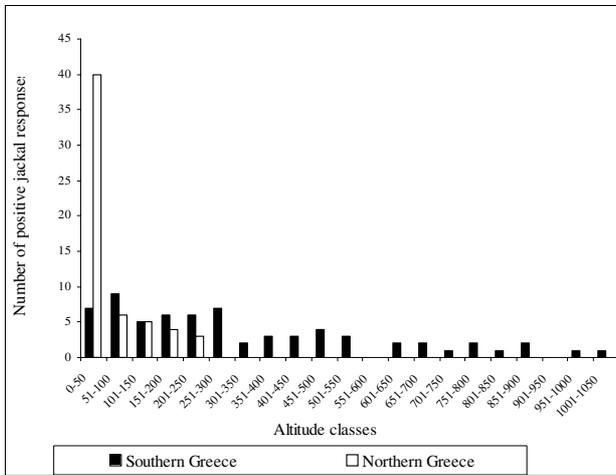


Fig. 4. – Observed jackal groups per altitude intervals

**Jackals and humans**

According to local shepherds, very little damage to livestock is recorded in marginal mountainous areas in Peloponnese, and what does occur is caused mostly by isolated roaming individuals. In Peloponnese, stray dogs and jackals are the only animals that could prey on small, hoofed livestock, since there are no wolves. The shepherds usually know which of the two canids is responsible for the losses. In areas with relatively large jackal populations no complaints about livestock damage were recorded.

The mean distance of the observed jackal groups from the nearest human settlement was found to be 2.61 km (Range : 0.1-4.5 km). (Fig.5).

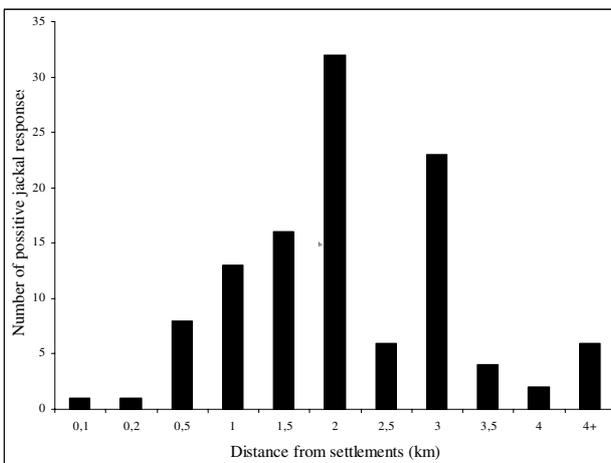


Fig. 5. – Jackal group sighting distances from nearest settlements

**Jackals and other canids**

Some observations :

- In three cases during the survey, wolves approached the jackal-calling stations at a quick trotting pace, presumably to chase off the jackals from the location.

- Dogs barked aggressively whenever jackal howling was heard, and at close quarters some became strongly agitated. In many cases dog groups (three to seven individuals) approached the calling station in a running manner, barking in a hostile way after hearing broadcast jackal howls. The reaction of unleashed dogs was to chase away the jackals instantly.

- Although no actual observations of close fox - jackal interactions were made during the survey, in our current study area in Fokida, foxes occurred permanently only on the fringes of the jackal territories. However, in the winter we have seen a few individual foxes within jackal territories, and in one case a fox approached about 250 m of a jackal group of four (GIANNATOS pers. obs.).

**DISCUSSION**

The results show a very sharp decline of the golden jackal population in South Peloponnese, where, according to the records of the Ministry of Agriculture and the results of our questionnaires and interviews, the jackal population was thriving in the 70s and 80s. The process of disappearance in Peloponnese is ongoing since local extinctions of jackals are still reported. The jackal population in Peloponnese is now estimated at close to 10% of the population level 20-25 years ago.

According to the survey data the jackal population in Samos Isl. has also declined during the last decade, and the species has become rare in parts of the island. However a rapid population recovery was observed in the island recently.

With the exception of Fokida prefecture, jackals have disappeared from all central and western Greece. The species still survives in isolated and mostly fragmented population clusters in a few locations in North-eastern Greece. In Halkidiki, the distribution of the jackal has also been reduced but not as sharply as in Peloponnese. In Evros prefecture the jackals remain only in a few isolated locations. There may be a source population in eastern Evros delta, near the borders with Turkey, but its status is unclear. The only area where the jackal population seems stable or even locally increasing is Nestos-Vistonida and the surrounding lagoons, which host the largest continuous jackal sub-population in Greece. A major threat to the jackal population in this area is the destruction of the coastal marshes due to the building of summerhouses.

The decline of the jackal can be partly attributed to the fact that all wild canid species (namely the jackal, the fox and the wolf) were considered pests during the '70 and '80s, and consequently legally persecuted by every possible means, including poisoning. This poisoning campaign had generally a short-term effect on most of the other canids involved : both foxes and wolves quickly recovered and reoccupied their areas soon after the ban of poisoning in 1980 (Min. of Agriculture). However, this was not the case for the golden jackal whose populations continued to decline alarmingly.

Preliminary data from the field indicate that the relationship of the jackal to other canid species was that of a competitor. Wolves usually dominated jackals, and jackals dominated foxes. The ranges of jackals and wolves in Central and Northern Greece were almost exclusive. According to GENOV & WASSILIEV (1989) and KRISTUFEK & TVRTKOVIC (1990) the wolf presence is a limiting factor for jackal distribution in the Balkan Peninsula. It seems that jackal population density is a factor that could greatly influence the presence of foxes. In our current study area in Fokida, foxes were very scarce in the main jackal territory. This is a high-density jackal area with few hiding places, very different from many other areas that have been surveyed in Greece. In Israel where jackals and foxes co-exist, the jackals may kill or displace foxes (MACDONALD, 1987). In southern Peloponnese an increase of the fox population was observed in areas where the jackals have been decimated. No foxes existed in Samos island (DIMITROPOULOS et al., 1998).

Although jackal-induced damage and general disturbance to humans was minimal, the public attitude to the animal seemed to be from negative to indifferent. This is probably related to the official designation of the species as harmful in Greece until 1990. The jackals in Greece were found only in Mediterranean-type habitats and lowland wetlands, close to human settlements. This indicates possible dependence on human produced food. Jackals as opportunistic foragers have been known to subsist almost entirely on garbage and human waste (MACDONALD, 1979). In conclusion, the existing jackal populations in Greece are discontinuous and clustered. The survival of these populations is dependent on the size of each cluster and the connectivity between them.

The applied survey method proved to be quick, easy and inexpensive. Jackal groups were detected even in areas with very thin presence, in marginal habitats, or even close to fierce competitors such as stray dogs. Absence of response to the acoustic stimuli cannot be translated to absence of jackals. However, the 30 min duration of the trial at each calling station seemed enough to stimulate even the shyest animals. In two areas where the jackal group territories were known, there was an absolute accordance between the actual number of groups and the number recorded during the 2000 – 2001 acoustic survey (GIANNATOS, pers.obs.). The possibility for a lone animal, probably a free-ranging young, to respond is usually lower than that of one belonging to a family group. In known groups we noticed that sub-adults do not always vocalize (GIANNATOS, pers. obs.). It is also possible that responsiveness of the animals could be uneven, since the large groups in high-density areas tend to respond more readily than small groups in low-density areas (JAEGER et al., 1996 ; MOEHLMAN, 1981). The repetition of trials at certain periods of time will help us to understand the situation of the existing groups in different locations (M. JAEGER, pers. comm.). Jackals could become habituated to the sounds and thus not respond to the playbacks. We don't know how often the howls could be repeated while maintaining good results. In known locations in Samos the jackals did not respond when the playbacks were played two nights in a row. However, one

known isolated group consisting of two sub-adults responded every time that the playbacks were played. More research is needed to establish the effective time and conditions for repeatability.

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