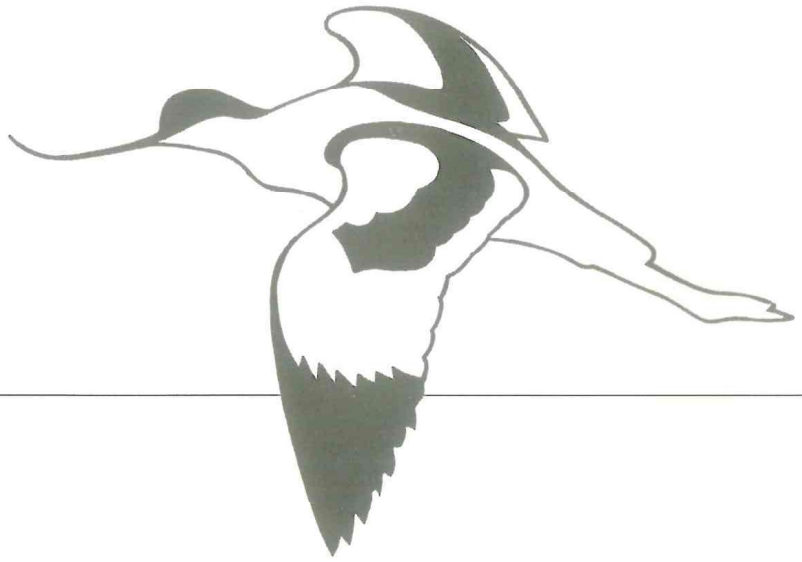
ISSN
0404-4266



AVOCETTA

Journal of Ornithology

CISO
Centro Italiano Studi Ornitologici

Volume 25 2001 N. 2

Avocetta N° 25 (2): 275-281 (2001)

The Golden Eagle *Aquila chrysaetos* in Crete. Distribution, population status and conservation problems

STAVROS XIROUCHAKIS

Natural History Museum of Crete, University of Crete, P.O. Box 2208, Heraklion 71409, Crete, Greece. Email: sxirouch@nhmc.uoc.gr

Abstract - The post 1990 distribution and status of the Golden Eagle *Aquila chrysaetos* was investigated in a four-year study on the island of Crete. Total foraging and breeding range is about 5,200 km^2 (63% of the island's surface) although eagles are regularly sighted over an area of 3,200 km^2. Population comprises of 16 breeding pairs or an estimated 60 birds. The mountains of Lefka Oroi, Idi (Psiloritis) and Dikti support the greatest eagle concentration with a mean population density of 0.63 breeding pairs per 100 km^2. Mean annual productivity was estimated at 0.51 eaglets per territorial pair with a rate of one successful breeding attempt every 2.6 years. The average home range size was 79 km^2 ranging from 45 km^2 to 110 km^2. Site occupancy is irregular in a number of territories due to human persecution which is also suspected to be the reason for territories occupied by single adult birds or mixed pairs of adult and pre-adult individuals (mean = 21%, range = 17-28%). Land use changes threaten the species' long-term survival since the abandonment of terraced agriculture, overgrazing in combination with fire and road construction have caused the degradation of its habitat. Protection of mountain areas, control of poaching, decrease in stocking density and the implementation of hunting controls are the most desirable conservation actions.

Introduction

The Golden Eagle *Aquila chrysaetos* is one of the most numerous and widespread eagles in the world. Its distribution extends across the Holarctic region with major concentrations in the eastern Palearctic and North America. Roughly 15-20% of the species world range lies within the European continent (Watson 1995). Its typical habitat is mountainous regions with low vegetation and suitable cliffs for breeding or wooded peatlands where it nests mainly in trees (Watson and Dennis 1992). In Northern Europe the species' main prey are tetraonids and carrion but across the Mediterranean countries hares, partridges and tortoises constitute the major part of its diet (Delibes *et al.* 1975; Tjernberg 1981; Grubac 1986; Watson *et al.* 1993).

In Greece the Golden Eagle was widespread during the 19th century and the first half of this century over the entire mainland and on many islands both in the Aegean and the Ionian sea (Powys 1860; Harrison and Pateff 1937). At present the species distribution has contracted to mountainous parts of the mainland and Crete (Handrinos and Akriotis 1997). According to the literature Greece harbours two subspecies: *Aquila chrysaetos chrysaetos* in the continental areas and *Aquila chrysaetos homeyeri* in Crete (Cramp and Simmons 1989). However it has been argued that the taxonomic status of the Cretan birds needs further investigation (Handrinos 1987). In the 1980s the total Greek population was estimated at 120-200 pairs or 146-183 pairs while during the 1990s this figure seems to have dropped to 60-80 pairs (Handrinos 1987; Hallmann 1989; Hallmann 1996).

The Cretan population was estimated in the 1970s at about six pairs while more recent estimates suggest 10-12 pairs (Vagliano 1981; Hallmann 1989). However all these data have been derived from studies of incomplete or inadequate methodology such as random sampling in a limited number of sites or occasional visits in typical eagle habitat. A more precise survey might reveal larger numbers than previous estimates. Moreover, as the eagle's population has not been regularly monitored, trends are difficult to assess and interpretation of data from the existing literature is unreliable. The current study aims to update our knowledge on the status of the species on Crete and its main objective has been to determine its current distribution and population size. Conservation problems are also discussed giving emphasis on the eagle- human interactions as well as land use changes and management.

Accepted 19 Mar 2001

Study area and methods

The study area covered the whole of Crete (35° 45' - 34° 45' N latitude and 23° 30' - 26° 30' E longitude) covering 8.261 km^2. Three major massifs occur on the island (from west to east), Lefka Oroi (2,450 m), Mt. Idi or Psiloritis (2,457 m) Mt. Dikti (2,100 m). The rest of the landscape, consists of bare mountains of middle and high altitude and hilly country covered with vineyards and olive groves. The climate is typically Mediterranean with an annual precipitation of 400 mm to 2,000 mm. Mean temperature ranges from 12° C in winter to 27° C in summer. The island's vegetation is dominated (up to 25%) by phrygana and to a lesser extent (about 10%) by dry-leafed maquis. Calamprian Pine *Pinus brutia* and Kermes-oak *Quercus coccifera* are the most common species in the remaining forests (i.e. 5%)

The island was divided into 330 sample units of 5x5 km, namely quadrats of 25 km^2. During September 1995 - August 1996 an intensive survey was conducted in 165 quadrats, which represented 50% of the island's surface and encompassed the most suitable breeding and foraging habitat for the species. Additional data on the species occurrence and site occupancy were collected during 1997-1999 expanding the survey to the rest of the island. Eagle observations made during the present decade and cited in unpublished reports or coming from personal communications was also taken into account. Abandoned territories were located after asking the local people about the species and its status in the area. Their answers were given credence only if they could distinguish a Golden Eagle from the other two big raptors that breed on the island namely the Bearded Vulture *Gypaetus barbatus* and the Griffon Vulture *Gyps fulvus* and in addition had knowledge of their differences in behavior (territorial vs. colonial) and diet (predator vs. scavengers).

Bird sightings were made on foot or from a vehicle with a mean travel speed of 35 km/h but mostly from vantage points with good view over the sampling areas (Bilstein 1978, Fuller and Mosher 1981). Observations were aided by the use of 10x50 binoculars and a 30-60x spotting scope while eagles' locations as well as roosting sites or nests were plotted on 1:50.000 scale maps. Additional notes were taken regarding the birds' behaviour and age. Classification of birds in different age groups was based on plumage patterns. Although most of the studies on moult have been made by working on other races (e.g. *canadensis*, Jolly 1947; *chrysaetos* Tjernberg 1988; Forsman 1999) it was assumed that major conclusions would also apply to *homeyeri*. Each eagle sighted was allocated to one of four age groups: a) juveniles (0-2 years), b) immatures (2-4 years), c) sub-adults (4-5 years old) and d) adults (> 5 years). However individuals of the last two groups were pooled together as they could not be easily distinguished from a distance.

The home range of a territorial pair was considered to be the total area utilized by the birds and it was delineated by spot mapping (Fuller and Mosher 1987). The birds' movements were monitored from prominent outlooks during their hunting forays or territorial displays (e.g. undulating flights). Home range size was estimated using the minimum convex polygon truncating 5% of the outlying observations in an effort to eliminate records of neighbouring birds in overlapping territories (Mohr 1947; Fuller *et al.* 1973; Kenward and Walls 1994).

Productivity (number of young per territorial pair checked) has been calculated indirectly by observing juvenile birds during their post fledging flights accompanied by their parents or chicks in the nest that were about two months old (Steenhof 1987).

Data on the species diet were circumstantial and based on direct observations of hunting eagles or records of kills. Actual impact or potential threat to the species imposed by humans was evaluated mainly in the form of interviews on the spot. A random sample of people through out the island were asked about the interactions between man and the eagles and by this, a degree of public awareness about the presence of the species was also assessed.

The null hypothesis that eagles are sighted in each habitat in exact proportion to its occurrence on the island was tested by a chi-square test with a Yates' correction while seasonal fluctuations in home range size were compared by a student's test for matched pairs (Zar 1984).

Results

The Golden Eagle is widespread and the commonest eagle species on the island. Breeding is confined to ravines, gorges and rocky outcrops of limestone substrate. The greatest number of observations were produced in mountainous areas up to 1,500 m in open landscapes covered by sclerophyllus shrubs and phrygana. This should be regarded as the species' typical habitat although in a number of territories (n = 7) woodland with scattered Kermes oaks and Calambrian pines predominate. The species exhibited a strong preference for mountain regions that are inaccessible to humans (90% of the observations) and a marked avoidance of lowlands where vineyards and olive grooves prevail ($X^2_1 = 13.55, p < 0.05$).

Breeding adults inhabit exclusively upland regions while some juvenile and non-territorial immature

birds are sighted outside the usual range in midland areas or even coastal cliffs and offshore islets. The species' area of occurrence covers about 5,200 km^2 (63% of the island's size) while its breeding range is approximately 1,300 km^2. By eliminating all areas where Golden Eagles are sighted irregularly, an actual distribution of about 3,200 km^2 was obtained where breeding and most of the foraging activity occurs.

Overall 22 Golden Eagle territories were identified (Figure 1). Most of them (n = 18) were found during the first year of intensive fieldwork when 180 days were spent in the field producing 80 days of eagle records. Site occupancy was stable throughout the study in 16 territories. In the remaining six most of the sightings accounted for solitary adults or mixed pairs comprising an adult and an immature bird. Some of latter territories acted as wintering areas and were occupied by immature birds from early October till mid March. Seven additional territories appear to have been abandoned long before the present decade in the late 1960s or early 1970s (Table 1).

Taking into account only the number of territorial birds, the species' breeding population numbers a minimum of 39 birds. However in 1996, apart from 33 adult birds, six immatures and 11 juveniles (including the year's fledglings) were recorded. These figures were a result of frequent surveys in 82% of the species territories and revealed an adult/ immature/ juvenile ratio of 6:1:2. Assuming a stable age distribution and the adult/ pre-adult ratio detected in 1996, non-breeding birds form 50% of the population and thus its total size should be close to 60 individuals.

Greatest concentrations of eagles occurred in the three massifs of the island, where the existence of more intact habitat occurs and land use changes have been less intense. Some 54% of active territories and 62% of the breeding pairs are located in the Lefka Oroi, Psiloritis and Dikti massifs with a mean density of 0.76 territorial and 0.63 breeding pairs per 100 km^2 respectively. However the latter figure drops to 0.30 breeding pairs/100 km^2 if we consider the species total area of occurrence.

Home range size was estimated for eight territories where observations were regular and predictable. These territories showed great stability in their occupancy and produced an adequate sample size for analysis. Mean home range covered an area of 79 km^2 (range = 45-110 km^2) although there was a considerable difference in size among the breeding and the post breeding season (n = 5, $t_4 = 7.6$, $p < 0.01$). Territorial pairs expanded their foraging trips to highland areas during summer and autumn months ($\bar{x} = 79$ km^2) while they remained in the vicinity of their nesting cliff for the rest of the year ($\bar{x} = 53$ km^2).

The number of territories that were occupied by Golden Eagle pairs and also checked for their breeding performance ranged from 7-15 (Table 2). From 43 territory years, a mean annual productivity of 0.51

Table 1. Distribution of Golden Eagle territories and breeding pairs in Crete.

Geographical region	Number of		
	deserted territories	active territories	breeding pairs
Kissamos and Selino area	2	1	1
Lefka Oroi Mt.	0	4	4
Asfendou - Kalikratis area	0	1	0
Krioneritis and Kedros Mts.	0	2	2
Idi (Psiloritis) Mt.	0	3	2
Heraklion area	2	1	0
Asterousia Mt.	1	2	1
Dikti Mt.	1	5	4
Thrypti and Orno Mts.	0	2	1
Zakros - Ziros area	1	1	1
Total	7	22	16

Table 2. Productivity of the Golden Eagle in Crete.

Breeding parameters	1996	1997	1998	1999
Number of territorial pairs monitored	15	7	10	11
Number of fledglings	7	4	5	6
Number of fledglings/ monitored pair/ year	0.47	0.57	0.50	0.54

eaglets per territorial pair was calculated (range = 0.47-0.57 young/pair/year). Five territories that were monitored during the entire study period (20 territory years) produced 13 fledglings, revealing a rate of one successful breeding attempt every 2.6 years.

Hunting was observed on 11 occasions. Golden Eagles were sighted attacking Chukar Partridges *Alectoris chukar* (n = 3), Rock Doves *Columba oenas* (n = 3) Wood Pigeons *Columba palumbus* (n = 1), Alpine Choughs Phyrrocorax graculus (n = 1), Brown Hares *Lepus europeus* (n = 2) and livestock (n = 1). A successful kill was documented twice when an eagle left its perch and caught a hare and a Chukar Partridge respectively. In another case a fresh hare carcass with the signs of an eagle kill was found.

More than 100 people, all inhabitants of upland areas, were asked about the presence of the species in their locality. Only the information provided by 80 of them was regarded as reliable. 65 (81%) of the people interviewed were aware of the species while 25 (31%) also admitted of having killed at least one Golden Eagle in their lifetime. The main reason for their actions was the hunting behavior of the species; the killing of lambs or just its reputation for doing so. Birds were usually killed from a distance while roosting or soaring near cliff faces, almost always with the use of firearms. Most of the lambs losses had taken place during and after the lambing season (November-February) and was greater in the vicinity of an eagle's nesting cliff. Most accounts of eagle kills had taken place during earlier decades. In the 1960s and the 1970s livestock suffered greater damage as free ranging flocks were the usual sheep farming method. In the last two decades predation by eagles have been less common and livestock losses less numerous, but this can not be properly evaluated since a lot of confusion exists about the actual number of free ranging animals. However only seven (11%) of the farmers spoken reported occasional losses and none significant ones.

Discussion

Golden eagles are distributed almost throughout the island. However regular eagle sightings are distributed over an area of 3,200 km^2, which is close to the area above the 500 m contour line (i.e. 3.664 km^2). All habitats within this area share a number of common features such as the open terrain, patches of natural vegetation, low levels of disturbance and the presence of medium to small birds and mammals. The species population ranged between a minimum of 16 breeding pairs and a maximum of 22 depending on site occupancy. Nevertheless both estimates differ much from the figure given by Vagliano (1981) where six territories were found and the existence of three more was suspected. One could deduce, that if previous estimates were accurate, that the population of the species has increased.

Golden Eagles forage over an area of a few tens of square kilometers but they usually hunt in a relatively small part of their home range (Cramp and Simmons 1980). In both American and European studies home range sizes reported range from 40-170 km^2 and depend greatly on the amount of available prey (Dixon 1937; Beecham and Kochert 1975; Clouet 1988; Collopy and Edwards 1989). In areas of high population density such as the Swiss Alps smaller home ranges have been recorded such as 22-48 km^2 (Haller 1982). The figures calculated in Crete are also a product of habitat quality. Good habitat in terms of prey abundance is limited and not evenly distributed through out the species range. A substantial part of the eagle's population occupies degraded rangelands with very low availability of natural food but with a high density of domestic ungulates. The numerous semi feral sheep and goats that live on their own in all of the island's mountains could very well support the species with prey and carrion but available data are not enough to substantiate this.

The productivity observed in the Cretan population does not differ from comparable figures reported in other regions of Europe. Productivity ranging from 0.48-0.53 young per territorial pair per year has been recorded in the Pyrenees and the Alps (Clouet 1988; Haller 1996). The reasons for a reduced productivity in Golden Eagles have been attributed to poor food supply or the territorial interference hypothesis (Haller 1996; Watson 1997). In the latter case non-territorial unpaired birds interact with breeding individuals causing reduced breeding success. This has been considered the major limiting factor in the Alps where floaters can compose up to 30% of the population (Clouet and Couloumy 1994). In Crete, data on the available food supply are lacking while surplus birds in the population are not sufficiently abundant to sustain the latter argument. On the contrary, during the entire study, the percentage of territories that were occupied by single adult birds or mixed pairs with pre-adult individuals was 22% (range = 18-27%).

A major component of the species' diet in mainland Greece are tortoises as well as in many other Balkan countries (Grubac 1986; Hallman 1989). However Brown Hares *Lepus europeus*, Red Squirrels *Sciurus vulgaris*, Martens (Martes spp), European Susliks *Spermophilus cittelus* and Red Foxes *Vulpes vulpes* as well as domestic or feral cats and dogs are also taken (Handrinos 1987; Hallman 1989). In Crete Brown Hares and Chukar Partridges are regarded as the main prey items (Vagliano 1981). Direct observations

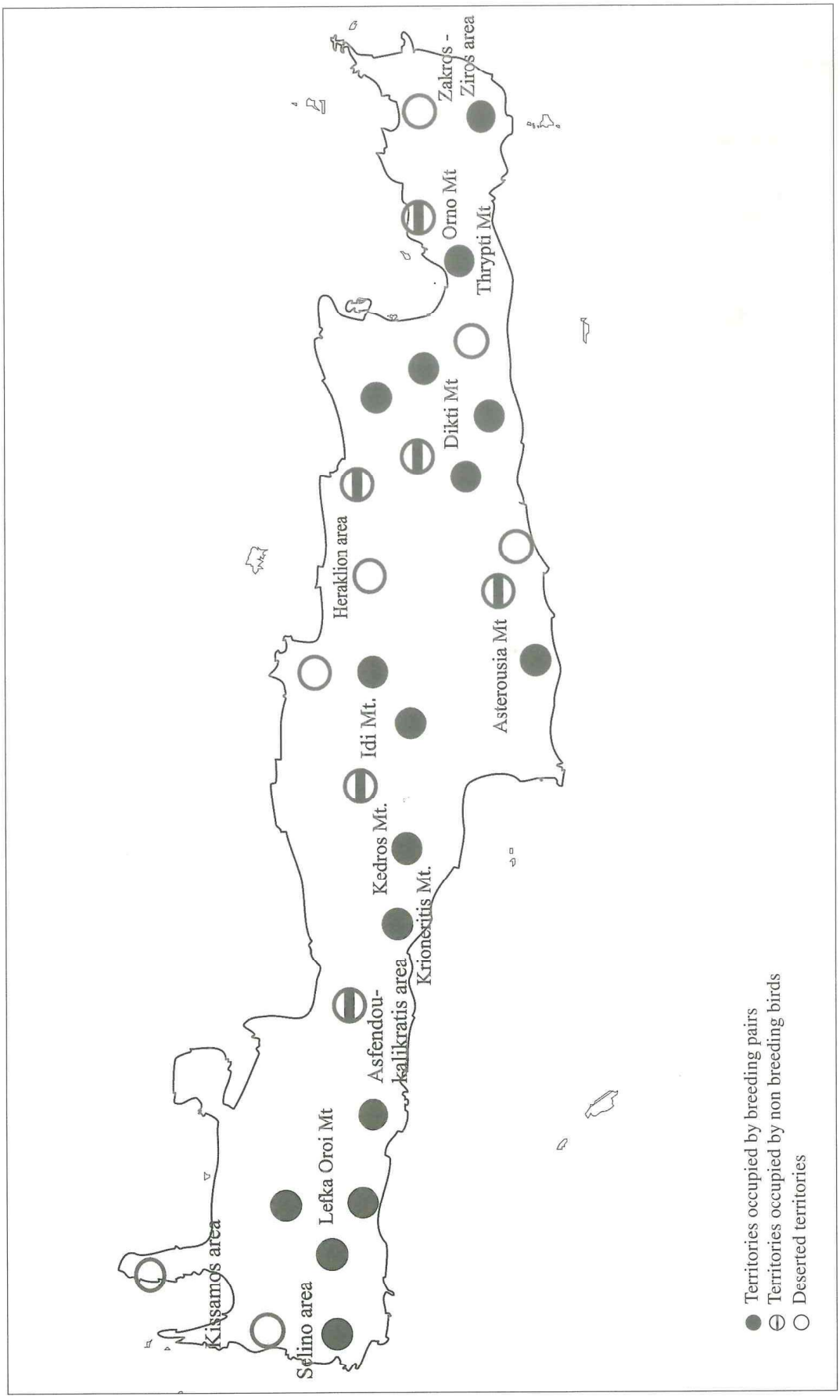


Figure 1. Golden Eagle territories in Crete.

during this study are only indicative and cannot evaluate the significance of any prey species in the eagle's diet. However medium size birds and mammals seem to be its preferred prey.

Much of the debate still concerns the impact of the species on livestock. However the issue is not whether the species kills domestic animals since Golden Eagles carrying freshly killed lambs have been documented by reliable sources, but to what extent does this occur; under what circumstances and what is the respective financial loss. However according to most of the people asked, natural causes take a higher toll from the stocks than the eagles. The relatively high percentage of people knowing the species and who reported having killed one is attributed to the fact that the majority of the people asked have been practicing sheep farming within the species range. However the number of birds found stuffed in local restaurants, hotels and houses reveal that shooting pressure is also a product of trophy hunting.

Apart from human persecution, land use changes could impose more serious threats to the species. In Crete historical reviews of land use practices have shown that the inhabitants of the island, after destroying most of the forests during the Minoan period, concentrated on livestock husbandry and agriculture. The only conservation measure that was undertaken was terracing which controlled erosion and enhanced soil formation (Lyrintzis 1996). Game species were greatly benefited by this practice since the main crops in terraces were cereals. However, as the human population increased after World War II people were orientated towards other sectors of the economy such as tourism and modern farming. Terraced agriculture was finally abandoned (Lyrintzis and Papanastasis 1995). In addition the entry of Greece to the European Union and the consequent subsidy policy for stock raising resulted in a dramatic increase of animal numbers, which have reached nearly 1.3 million (Hellenic Statistical Service). Overgrazing in combination with fire and the high stocking density have caused the degradation of rangelands. Natural vegetation has declined; the indigenous Mediterranean sclerophyllus-evergreen forests of oaks (Quercus spp.) and pines (Pinus spp.) have been replaced by matorrals and phrygana. At present soil erosion is apparent in many parts of the island and there are strong signs of an accelerating desertification process (Hill *et al.* 1993). Game species such as the Brown Hare and Chukar Partridge have become rare resulting in a reduced food supply for the eagles.

The species natural wariness and the inaccessibility of its habitat seem the only protection measures so far. No official management has ever been undertaken and this is quite difficult as long as the species is regarded as a pest. However protection of mountain areas and the implementation of hunting rules are the most desirable actions for its conservation. Land use should remain as it is although a decrease of stocking rates is urgently needed. The control of poaching of game species such as the Chukar Partridge, the Rock Dove and the Brown Hare would be the most effective measure to relieve any pressure from eagles on livestock. Public awareness and educational programs are urgently needed to change the attitude in upland communities and increase understanding of the ecological value of the species as the island's top predator. Safeguarding of nesting sites is also essential and population monitoring and research on the species taxonomy, biology and impact on livestock is of high priority.

Acknowledgements - I am grateful to G. Giannatos, G. Andreou and C. Grivas for fieldwork assistance, Miss A. Belardinelli for translating the abstract, Mr S. Roberts for improving the English text and two anonymous referees for reviewing the manuscript. This work was partially funded by the University of Crete.

Riassunto - Dal 1996 al 1999 la distribuzione e lo status dell'aquila reale sono stati studiati sull'isola di Creta. L'area occupata dalle aquile per l'alimentazione e la riproduzione è di circa 5,200 km^2 (il 63% della superficie totale dell'isola), sebbene questi uccelli siano avvistati con continuità in un'area inferiore (3,200 km^2). La popolazione dell'isola è costituita da 16 coppie riproduttive, contando anche i non riproduttori si raggiungono i 60 individui. Le montagne di Lefka Ori, Psiloritis e Dikti supportano la più alta densità di aquile (densità media di 0.63 coppie per 100 km^2). La produttività media annuale èstimata essere di 0.51 nidiacei per coppia. L'estensione media dell'home range individuale è di 79 km^2 (range 45-110 km^2). La persecuzione umana in certe zone rende irregolare la distribuzione della specie, ed è probabilmente responsabile dell'occupazione di territori da parte di adulti singoli, o di coppie miste adulti-subadulti (fenomeno che si verifica nel 21% dei casi, range 17-28%). Le modalità di sfruttamento del territorio da parte dell'uomo stanno cambiando e minacciano la sopravvivenza a lungo termine della specie su Creta. L'abbandono dei terreni terrazzati, l'intensificarsi della pastorizia, gli incendi e la costruzione di strade certamente minacciano l'habitat di elezione della specie. Per proteggere la specie sono auspicabili una maggior sorveglianza delle aree montagnose utilizzate per la riproduzione, il controllo del bracconaggio, una limitazione delle aree adibite al pascolo ovino e regole più ferree in materia di caccia.

References

Beecham J. and Kochert M. 1975. Breeding biology of the Golden Eagle in Southern Idaho. Wilsonn Bulletin 87: 506-513.

Bilstein K.L. 1978. Behavioural ecology of Red-Tailed Hawks (*Buteo jamaicanensis)*, Rough-legged Hawks (*Buteo lagopus*), Northern Harriers (*Circus cyaneus*), American Kestrels (*Falco sparverius*) and other raptorial birds wintering in South central Ohio. Ph. D. Diss., Ohio State Univ., Columbus pp. 364.

Clouet M. 1988. L'aigle royal in Grand Rapaces et corvides des Montagnes d'Europe" Acta Biol. Mont. 8 : 121-130.

Clouet M. and Couloumy C. 1994. L'Aigle royal, *Aguila chrysaetos.* In: Yeatman-Berthelot and Jarry G. Edits. Nouvel atlas des Oiseaux nicheurs de France. Societe Ornithologique de France, Paris , France Pp. 196-197.

Collopy M. W. and Edwards T. C. 1989. Territory size, activity budget, and role of undulating flight in nesting Golden Eagles. J. Field Ornith. 60: 43-51.

Cramp S. and Simmons K. E. L. 1980. Edits. The birds of Western Palearctic. Oxford University Press, Vol. II.

Delibes M., Calderon J. and Hiraldo F. 1975. Seleccion de la presa y alimentacion en espana del aguila real. Ardeola 21: 285-302.

Dixon J. B. 1937. The Golden Eagle in San Diego County California. Condor 39: 49-58.

Forsman D. 1999. The Raptors of Europe and Middle East: A Handbook of Field Identification. AD Poyser Ltd. London.

Fuller M. R. and Mosher J. A. 1987. Raptor survey techniques. In: Pendleton B.A.G, Misslap B.A, Cline K.W. and Bird D.M. Edits. Raptor management techniques manual. Natl. Wildl. Fed., Washington, DC, pp. 37-65.

Fuller M., Nicholls T. and Tester J. 1973. Raptor conservation and management applications of bio-telemetry studies from Cedar Creek natural history area. In: Hamerstrom F.N., Harrell E.B. and Olendorff R.R. Edits. Management of Raptors. Raptor Research. Foundation. Vermillion, South Dakota pp. 33-44.

Grubac B. 1986. The Golden Eagle *Aquila chrysaetos chrysaetos* in South-eastern Yugoslavia. Larus 38/39: 95-135.

Haller H. 1982. Raumorganisation und Dynamik einer population des Steinadlers *Aquila chrysaetos,* in den Zentralalpen. Ornith. Beob. 79: 163-211.

Haller H. 1996. Der Steinadler in Graunbunden. Langfristige Untersuchungen zur Populationiokologie von *Aquila chrysaetos* in Zentrum der Alpen. Ornith. Beob., Beiheft 9.

Hallmann B. 1989. Status and distribution of the *Aquila* in Greece. Biol. Gallo-hellenica 15: 171-176.

Hallman B. 1996. Greece's Endangered Birds of Prey. Eleventh hour for 10 species. Report to the WWF Hellas, pp. 72.

Handrinos G. 1987. The Golden Eagle in Greece. Actes 1er Coll. Intern. Aigle Royal en Europe, Arvieux, June 1986: 18-22.

Handrinos G. and Akriotis T. 1997. The Birds of Greece. Helm - A and C Black ltd., London.

Harrison J. M. and Pateff P. 1937. An ornithological survey of Thrace, the islands of Samothraki, Thasos and Thasopoulo in the North Aegean, and observations in the Struma Valley and the Rhodope Mopuntains, Bulgaria. Ibis 14: 582-625.

Hill J., Hostert P., Tsiourlis G., Kasapidis P. Udelhoven T. and Diemer C. 1998. Monitoring 20 years of increased grazing impact on the Greek island of Crete with earth observation satellites. J. Arid Envir. 39: 165-178.

Jollie M. 1947. Plumage changes in the Golden Eagle. Auk 64: 549-576.

Kenward R. and Walls S. 1994. The Systematic Study of Radio-Tagged Raptors: I. Survival, Home range and Habitat-use. In: Meyburg B.-U. and Chancellor R.D., Edits. Raptor conservation today, pp: 303-315.

Lyrintzis G. and Papanastasis V. 1995. Human activities and their impact on land degradation - Psiloritis mountain in Crete. A historical perspective. Land Degrad. Rehab. VI (2): 79-93.

Lyrintzis G. 1996. Human impact trend in Crete: the case of Psiloritis Mountain. Envir. Conser. 23 (2): 140-148.

Mohr 1947. Table of equivalent populations of North American mammals. Am. Midl. Nat. 37: 223-249.

Powys H. L. T. 1860. Notes of the birds observed in the Ionian islands and the provinces of Albania proper, Epirus, Acarnania and Montenegro. Ibis 2: 1-10, 133-140, 228-139, 338-357.

Steenhof K. 1987. Assessing raptor reproductive success and productivity. In: Pendleton B.A.G, Misslap B.A, Cline K.W. and Bird D.M. Edits. Raptor management techniques manual. Natl. Wildl. Fed., Washington, DC, pp 157-170.

Tjernberg M. 1981. Diet of the Golden Eagle *Aquila chrysaetos* during the breeding season in Sweden. Holarctic Ecology 4: 12-19.

Tjernberg M. 1988. Age determination of Golden Eagles *Aquila chrysaetos* (in Swedish). Var Fagelvarld 47: 321-334.

Vagliano 1981. Contribution au statut des rapaces diurnes et nocturnes nicheurs en Crete.In: Rapaces Mediterraneens, Annales du CROP. 1. Aix en Provence, pp. 14-16.

Watson 1995. Golden eagle *Aquila chrysaetos.* In: Tucker GM. and Heath Edits. Birds in Europe: their conservation status. Birdlife International Conservation Series No.3, Cambridge UK, pp. 180-181.

Watson J. 1997. The Golden Eagle. T and A.D. Poyser, London, U.K.

Watson J. and Dennis R. 1992. Nest site selection by Golden Eagles in Scotland. Brit. Birds 85: 469-481.

Watson J., Leitch A.F. and Rae S.R. 1993. The diet of the Golden Eagle *Aquila chrysaetos* in Scotland. Ibis 135: 387-393.

Zar J. 1984, Biostatistical analysis. Prentice Hall, New Jersey.