

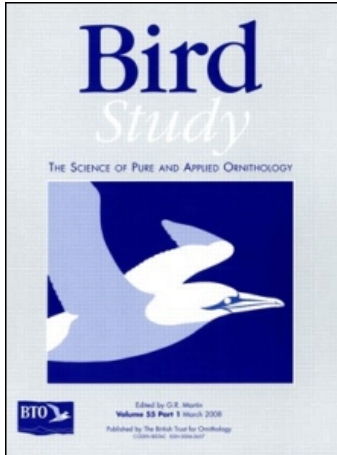
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Density, habitat selection and breeding biology of Common Buzzards *Buteo buteo* in an insular environment

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Capsule Taller and sheltered cliffs located in rugged areas are selected for breeding and only some life history traits fit the predictions of the so-called ‘insular’ syndrome.

Aims To analyse the density and nesting habitat preferences of Buzzards on the island of Tenerife, and describe the life history traits of this population.

Methods Density was studied by intensive field searching for all established pairs in a well-defined area. Habitat features of breeding territories were compared with randomly selected sites using univariate and multivariate analysis (GLM). Breeding biology was described based upon a total of 57 breeding attempts.

Results Density was positively correlated with estimated surface of forested areas. The best model explaining characteristics of territory used for nesting reflected land ruggedness, nest shelter and distance to the nearest Barbary Falcon breeding site. Mean clutch size was 2.60 ± 0.82 , productivity was 1.68 ± 0.97 and the percentage of successful pairs was 84.2%.

Conclusions Buzzards mainly use cliffs to nest, especially taller and sheltered ones, located in rugged areas and in sympatry with Barbary Falcons. Characteristics of breeding territory did not predict productivity. All reproductive rates were similar to those reported for some continental populations except nesting success, which was higher.

Northern European populations of Common Buzzards *Buteo buteo* are essentially migratory with wintering areas in subtropical Africa, while southern and insular populations tend to be sedentary (Ferguson-Lees & Christie 2001). This species' biology has been well studied in Europe, where attention has focused on density (Goszczyński 1997, Selås 2001, Sergio *et al.* 2002), habitat selection (Jędrzejewski *et al.* 1988, Hubert 1993, Cerasoli & Penteriani 1996, Penteriani & Faivre 1997, Sergio *et al.* 2005) and reproduction (Tubbs & Tubbs 1985, Austin & Houston 1997, Krüger 2004). In these environments Buzzards are habitat selective at the micro and landscape scales. Features that allow secure positions for nests (high above ground), near profitable foraging habitats (usually with

low and highly diversified vegetation) and, at least locally, remote from humans, are usually selected (Penteriani & Faivre 1997, Sánchez-Zapata & Calvo 1999, Zuberogoitia *et al.* 2004, Sergio *et al.* 2005).

The sedentary Buzzards of the Macaronesian archipelagos have been traditionally included in the endemic subspecies *B. b. rottschildi* in the Azores, *B. b. harterti* in Madeira, *B. b. insularum* in the Canaries and *B. b. bannermani* in the Cape Verde Islands, although the status of some of these taxons is considered dubious (Ferguson-Lees & Christie 2001). Genetic and morphological studies suggest that there are no differences between Canarian and Madeiran birds and the rest of the *B. buteo buteo* group (Kruckenhauser *et al.* 2004). Despite the expected differences in the life history traits of these insular populations compared with continental birds

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(the so-called ‘insular syndrome’ characterized by smaller clutch sizes, later laying dates and higher productivity and adult survival; see Williamson [1981]), data on density, diet, laying dates, clutch sizes and breeding success of insular populations are scarce (Bannerman & Bannerman 1965, 1966, Naurois 1973, Martín & Lorenzo 2001, Palacios 2004). Furthermore, detailed information of this nature is potentially of value in the conservation and management of raptor populations.

The Canarian populations of Buzzards have been classified as ‘near endangered’ (Barone & Atienza 2004). This raptor currently breeds on all the Canarian islands with the exception of Lanzarote, and occupies a variety of habitats. During the 1980s the breeding population was estimated at 430–445 pairs (Quilis *et al.* 1993). Although more recent quantitative data are not available, this population seems to be stable or slightly increasing on some islands (Martín & Lorenzo 2001, Palacios 2004, 2005), as occurs also in the majority of its European breeding range (Bijlsma 1997).

The main aims of this study were to study density and nesting habitat preferences of Buzzards on the island of Tenerife, and to describe their life history traits. We briefly discuss our findings in the context of previously published results from continental populations.

MATERIAL AND METHODS

Study area

The Canary Islands are a volcanic archipelago located 100 km off the Atlantic coast of northwest Africa (27°37′–29°25′N and 13°20′–18°19′W). They consist of seven major islands and a number of small islets and offshore rocky outcrops. The island of Tenerife, the largest one of the group (2034 km²; highest point 3718 m asl), is situated in the central part of the archipelago (Fig. 1). Its vegetation and landscape are influenced by humid north-easterly winds, altitude and orientation. Lower altitude coastal zones are covered by sparse xeric

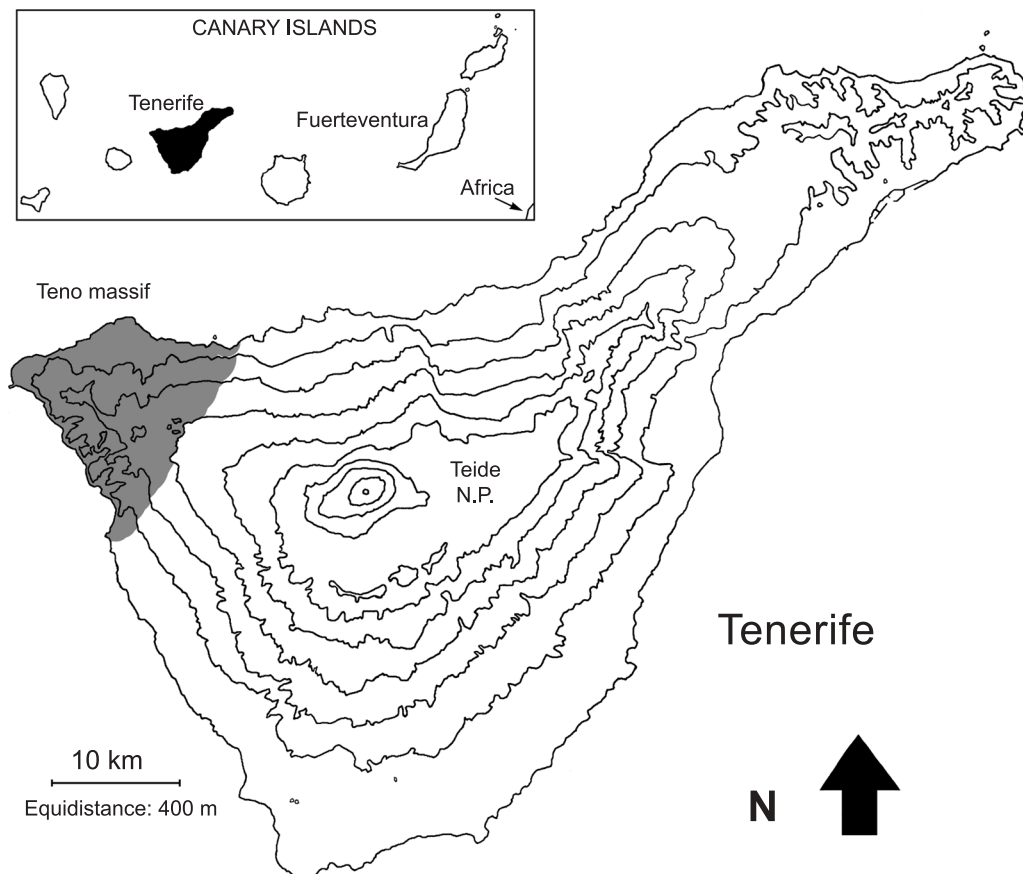


Figure 1. Location of Teno massif (study site for the density analysis) in northwest Tenerife.

vegetation dominated by several succulent species of shrub. Different types of forest associated with climate characteristics (thermophilous, laurel and pine woodland) appear at altitudes between 300 and 2000 m. In the high central part of the island subalpine shrub species dominate the landscape. The northwest of the island is dominated by a well-conserved mountainous area known as Teno (hereafter the Teno massif), which covers some 140 km² that greatly vary in altitude (0–1350 m asl; Fig. 1) with a great diversity of vegetation. Its southwest coastline is characterized by a 12 km-long chain of cliffs up to 500 m in height. The majority of the massif's surface area is protected by Canarian environment legislation as Parque Rural and many people living here still work in traditional agriculture and goat herding.

Data collection

During the breeding seasons (February–May) of 2006 and 2007 suitable sites were searched for established pairs of Buzzards. Adult birds were observed from a distance in an attempt to find their nest sites. The presence of an established pair was assumed when displaying or perched adults were present and when nest sites, recently used perching sites, territorial defensive behaviour, and/or juveniles were also observed. To study the relationship between Buzzard nest density and habitat characteristics, an intensive survey was carried out in the northwest of the island in February 2007 (Teno massif, see Fig. 1). In this area, all occupied nest sites were mapped by observing adult behaviour (nest building, incubation, etc.). When it was impossible to see a nest due to the terrain, the most-used cliff face or the central point where breeding behaviour (calling, copulation, food or nest material delivered, etc.) took place was employed as the nesting site. Wherever possible, each occupied territory (both in Teno and the rest of the island) was checked at least three times (pre-laying, incubation and chick-rearing periods) to determine breeding outcome. Clutch size was estimated on the basis of a sample of nests (all of them located in cliffs) that could be inspected from a higher position at a distance of between 50 and 200 m using binoculars or a telescope. Locations of Barbary Falcon *Falco peregrinus pelegrinoides* nesting sites were also noted during field work and in previous studies of this species (Rodríguez *et al.* 2007), and they were taken into account during the analysis. This species is a potential competitor of Buzzards for nesting sites in Tenerife (pers. obs.), but it

could also be positively influencing the distribution of Buzzards, since kleptoparasitism on this species have been recorded (Siverio *et al.* 2008, pers. obs.).

Data analysis

The degree of regularity of nest site dispersion in Teno massif was estimated as the G-Statistic: the ratio between geometric and arithmetic means of the squared nearest-neighbour distances (NND; see Table 1). Values approaching 1 (> 0.65) indicate a high degree of regularity in the spatial distribution of nests, while those close to 0 indicate randomness (Brown 1975). Deviation from randomness towards regularity in nest spacing was evaluated by means of the test proposed by Clark and Evans (1954).

To evaluate the effect of cliff availability, forested areas and human occupation on the density of Buzzards in the Teno massif, a Spearman's rank correlation was calculated between the number of pairs present in each 2.5-km Universal Transverse Mercator (UTM) square and the percentage of cliffs (> 50 m high), forest and centres of human occupation. These variables were obtained by dividing the 2.5-km squares into 25 cells of 500 × 500 m (sea cells were not considered). The proportions of cells with presence of cliffs, forest and buildings from the total of 25 cells were assigned to each 2.5-km square (see Gainzarain *et al.* [2000] for similar procedure).

Twenty variables were used to describe nesting cliffs and surrounding areas that included distance to Barbary Falcon nesting sites (Table 1). To analyse factors affecting the selection of nesting habitat, we compared the variable values estimated for Buzzard territories with those from 38 randomly selected cliffs ($n = 29$) or trees ($n = 9$). To obtain random locations, we generated random coordinates representing points on the map. All points situated in the sea or in non-potential breeding habitat (houses, banana plantations, flat terrain without vegetation, etc.) were excluded from the analysis. We used 'valid' points to locate the nearest rock face or tree more than 7 m high (i.e. 1 m + the minimum nest height recorded in this study) that we judged capable of supporting a hypothetical Buzzard nest (Sergio *et al.* 2005). Habitat variables were measured in the field (using an altimeter or scaled photographs), or obtained from geographic information system aerial photographs and 1:25 000 scale maps with 10-m contour lines (Spanish National Institute of Geography).

Table 1. Variables used in the description of breeding territories and nests of the Common Buzzard *Buteo buteo* on the island of Tenerife.

Variable	Description
Territories	
ALT	Altitude in metres above sea level, from the top of the cliff or tree
ORI	Orientation index, with highest scores for the most sheltered orientations with respect to dominant winds: 1, NE; 2, N and E; 3, NW and SE; 4, W and S; 5, SW
HEIGHT	Maximum height in metres of the cliff or tree
DOMINANCE	Average difference of altitude – measured on the map – between the top of the cliff and the end point of three imaginary lines of 1 km that, from the cliff top or tree, progress forward forming a right angle and its bisection
STEEPNESS	Difference in altitude between the highest and the lowest point within a 500-m circle around the cliff
NND	Distance in metres to the next nearest occupied Buzzard territory
DISTFALCO	Distance in metres to the nearest Barbary Falcon nesting site
DISTCOAST	Distance in metres to the nearest point of the coast
DISTROAD	Distance in metres to the nearest paved road
DISTNPROAD	Distance in metres to the nearest unpaved road
DISTPATH	Distance in metres to the nearest path
DISTHOUSE	Distance in metres to the nearest inhabited house
%FOREST ^a	Percentage of land covered by trees
%SHRUB ^a	Percentage of land covered by shrubs
%OTHERS ^a	Percentage of land affected by human activity (agriculture, houses, roads, etc.)
%SEA ^a	Percentage of sea
Nests	
NESTALT	Nest altitude in metres above sea level
NESTHEIGHT	Height of nest above ground
RELNESTPOS	Relative height (%) nest/cliff, calculated as NESTHEIGHT/HEIGHT × 100
NESTORI	Orientation index as for ORI
TYPE	All nests were divided in three categories: ledge, cavity or tree

Note: ^avariable measured in a 9-km² circle.

We recorded the following breeding parameters: (a) clutch size; (b) fledging rate as the number of fledging chicks/successful nests; (c) productivity as the number of fledged young/territorial pairs; (d) hatchability as the percentage of eggs that hatched out of the total; (e) breeding success as the percentage of laid eggs that produced fledged young; and (f) nesting success as the percentage of breeding attempts with at least one fledged chick. Estimated laying dates per 10-day period were back-calculated using chicks' estimated ages and by considering 50–55 days and 34 days as standard fledging and incubation periods, respectively (Cramp 1998). We estimated chicks' ages by comparing their feather development with chicks from nine broods correctly aged during this study. Potential differences in breeding rates between the two years were tested by means of the *G*-test and Mann–Whitney *U*-test.

Principal component analysis (PCA) with varimax rotation was used to reduce the number of independent variables from 15 to 4 factors (Eigenvalues > 1) that retained 68.6% of the original variance (Table 2). The first principal component (PC1) was clearly interpreted as a gradient of altitude. Given that humans' settlements are mainly located in coastal

Table 2. Importance of habitat variables of Common Buzzard *Buteo buteo* on the island of Tenerife with respect to each varimax-rotated factor of the principal components analysis (PCA). Factor loadings values larger than 0.5 are indicated in bold.

Variable	Factor loadings			
	PC1: Altitudinal gradient	PC2: Land ruggedness	PC3: Foraging ground	PC4: Climatic protection
ALT	0.855	-0.002	0.199	-0.225
ORI	0.080	-0.104	0.135	0.795
HEIGHT	-0.027	0.776	0.142	0.325
DOMINANCE	0.087	0.766	0.149	-0.414
STEEPNESS	0.048	0.865	0.108	-0.027
DISTFALCO	0.289	-0.404	-0.109	-0.522
DISTCOAST	0.733	-0.331	0.311	-0.264
DISTROAD	0.794	0.205	-0.019	0.187
DISTNPROAD	0.199	0.286	0.647	0.136
DISTPATH	0.191	0.138	0.471	-0.057
DISTHOUSE	0.799	0.003	0.144	0.046
%FOREST	0.836	0.038	-0.388	-0.117
%SHRUB	-0.066	-0.028	0.894	0.144
%OTHERS	-0.721	-0.067	-0.399	-0.116
%SEA	-0.534	0.350	-0.273	0.318
Eigenvalue	4.221	2.491	2.064	1.511
Explained variance	28.1	16.6	13.8	10.1

areas, and contrarily, forests, at high altitudes, ALT, DISTCOAST, DISTROAD, DISTHOUSE and %FOREST loaded positively, while %OTHERS and %SEA loaded negatively. PC2 was related to land ruggedness, with HEIGHT, DOMINANCE and STEEPNESS variables loading positively. PC3 was related to human-transformed areas currently abandoned and where shrubs grow abundantly; DISTNPROAD and %SHRUB loaded positively. Finally, PC4 reflected the shelter of territories (ORI loaded positively), as well as the distance to the nearest Barbary Falcon nest site (DISTFALCO loaded negatively; see Table 2).

We built GLMs using the four principal components to explain breeding habitat characteristics (with binomial errors and a logit link function; LOGISTIC procedure in SAS version 9.2) and to explore the relationship between productivity (number of young fledged) and breeding habitat features (with Poisson errors and a log link function; GENMOD procedure). For those territories with data from both study years, we randomly selected one of the two, thereby ensuring data independence. The AIC was employed to select the best model (the lower the AIC, and the lower number of variables, the better the model). Models with differences in AIC < 2 were considered as equally probable (Burnham & Anderson 2002).

RESULTS

Density

A total of 30 breeding pairs and one trio of adult Buzzards were recorded occupying natural cliffs and trees in the Teno massif during 2007. The total density in the area was 23.13 pairs per 100 km² (31 breeding territories). However, if we consider only suitable breeding habitat for Buzzards (i.e. excluding coastal plains with bushes, land covered by banana plantations and human settlements), the total density reached 27.51 pairs per 100 km². The mean NND was 1081 ± 547 m (range 523–2486 m, $n = 31$) in Teno and 2229.15 ± 1066.76 (range 1000–4478 m, $n = 13$) outside this massif. Statistical differences were found between NND in Teno and the rest of Tenerife ($U = 61.0$, $P < 0.001$). The G -statistic value (0.65) indicated a degree of regular distribution of breeding territories in Teno that deviated significantly from randomness ($\chi = 0.42$, $P < 0.001$).

In Teno, the number of breeding pairs in each 2.5-km square ranged between 0 and 4. Of the three variables considered, only the percentage of forest land was

significantly correlated with Buzzard density ($r_s = 0.542$, $P = 0.002$, $n = 30$).

Habitat selection and nest-site characteristics

According to univariate analyses, Buzzards select tall cliffs and rugged areas. Furthermore, distance to the nearest Barbary Falcon breeding pair of occupied Buzzard territories is shorter than the random sites (t -tests, $P < 0.001$, after sequential Bonferroni correction; Table 3). Similar results were reached through the logistic regression models. According to AIC weights, the best model explaining differences between breeding and not breeding territories included land ruggedness (PC2) and climatic protection and distance to Barbary Falcons breeding pairs (PC4) (Table 4). Both principal components (PC2 and PC4) were statistically significant in the model ($P = 0.0013$ and 0.0074 , respectively).

Studied nests were mainly located in the highest parts of cliffs and oriented to medium scores of orientation index (see Table 5 for physical characteristics of nests). NESTHEIGHT was positively related to HEIGHT ($r = 0.914$, $P < 0.001$, $n = 38$). Except for two located in trees (*Pinus canariensis* and *Visnea mocanera*), all nests were located on cliffs (ledges 55.2% and cavities 42.1%). Of 22 breeding pairs monitored during both breeding seasons, only eight (36.3%) used a different nest in the second year.

Breeding biology

The first detected copulations and aerial displays took place in late December, and most clutches (38.1%) were laid in the first ten days of March (Fig. 2). Clutch size ranged from one to five eggs, the majority being of two ($n = 11$, 44%) and three ($n = 11$) eggs, and only single clutches of one, four or five eggs were detected. No significant relationships were found between clutch size or productivity and the timing of laying, and no significant differences were detected between years in any of the breeding parameters analyzed (Table 6).

The most parsimonious models analysing the effect of habitat features on number of young fledged (productivity) did not obtain the lowest AIC values. They included the PC1 and PC3, and PC3 and PC4 respectively (Table 4). However, neither of principal components was present in all competing models and they were not statistically significant at any competing models ($P < 0.29$); suggesting that the

Table 3. Mean values \pm sd of variables used in the description of breeding territories of the Common Buzzard *Buteo buteo* on the island of Tenerife. Statistical results of univariate *t*-tests between the two samples.

Variable	Occupied territories		Random sites		<i>P</i>
	Mean \pm sd (<i>n</i>)	Range	Mean \pm sd (<i>n</i>)	Range	
ALT ^b	648.6 \pm 313.3 (35)	170–1492	863.0 \pm 674.4 (38)	75–2670	0.730
ORI ^a	3.3 \pm 1.2 (34)	1–5	2.5 \pm 1.3 (38)	1–5	0.010
HEIGHT ^c	106.7 \pm 64.7 (35)	10–268	46.7 \pm 35.5 (38)	7–150	< 0.000*
DOMINANCE ^a	145.0 \pm 166.8 (35)	–172–480	113.3 \pm 113.0 (38)	–75–487	0.343
STEEPNESS ^a	411.0 \pm 125.8 (34)	190–630	275.7 \pm 134.9 (38)	110–685	< 0.000*
DISTFALCO ^c	2320.4 \pm 1684.5 (38)	100–6045	4300.7 \pm 2454.9 (38)	10–10780	0.001*
DISTCOAST ^c	3263.8 \pm 2690.7 (38)	215–11367	5275.1 \pm 4121.2 (38)	7–18450	0.025
DISTROAD ^b	559.2 \pm 628.4 (38)	62–3430	794.7 \pm 802.0 (38)	35–3788	0.355
DISTNPROAD ^b	294.7 \pm 203.8 (38)	33–934	316.2 \pm 332.9 (38)	15–1765	0.661
DISTPATH ^b	221.0 \pm 177.1 (38)	5–692	187.0 \pm 234.1 (38)	5–1100	0.182
DISTHOUSE ^b	701.9 \pm 592.8 (38)	110–2930	1627.7 \pm 1802.4 (38)	70–6550	0.067
%FOREST ^d	17.7 \pm 19.9 (38)	0–93.0	25.5 \pm 31.1 (38)	0–100.0	0.508
%SHRUB ^d	53.4 \pm 25.9 (38)	3.09–94.4	45.6 \pm 29.4 (38)	0–98.5	0.183
%OTHERS ^d	23.7 \pm 20.8 (38)	0–77.9	25.4 \pm 26.5 (38)	0–85.8	0.947
%SEA ^d	5.2 \pm 10.0 (38)	0–33.7	3.5 \pm 10.3 (38)	0–40.5	0.258

Note: ^a*t*-test carried out on untransformed variables; ^b*t*-test carried out on the log-transformed variable; ^c*t*-test carried out on the square-root transformed variable; ^d*t*-test carried out on the arcsin-transformed variable; ^e*t*-test carried out on the ranked variable; *significant using the sequential Bonferroni correction.

Table 4. Competing GLMs explaining territory occupation (with binomial errors and a logit link function) and productivity (with Poisson errors and a log link function) of Common Buzzard *Buteo buteo* in Tenerife (Canary Islands). For each model, the AIC, the difference between the current model and the best model (Δ AIC), and the Akaike weights (*w*) are given. Variables retained in all competing models are in bold.

Model/variables	AIC	Δ AIC	<i>w</i>
Occupation models			
PC2 + PC4	91.19	0.00	0.36
PC1 + PC2 + PC4	91.77	0.58	0.27
PC2 + PC3 + PC4	92.29	1.10	0.21
PC1 + PC2 + PC3 + PC4	92.85	1.65	0.16
Null model	107.36	16.17	–
Productivity models			
PC1 + PC3 + PC4	165.01	0.00	0.32
PC1 + PC2 + PC4	166.13	1.12	0.18
PC1 + PC3	166.18	1.17	0.18
PC3 + PC4	166.24	1.23	0.17
PC1 + PC2 + PC3 + PC4	166.53	1.52	0.15
Null model	169.76	4.75	–

Table 5. Physical characteristics of Common Buzzard *Buteo buteo* nests observed on the island of Tenerife during the present study (*n* = 38).

	Minimum	Maximum	Mean \pm sd
NESTALT	113	1485	590.32 \pm 310.40
NESTHEIGHT	6	175	67.82 \pm 49.97
RELNESTPOS	18.57	90.0	59.59 \pm 19.26
NESTORI	–	–	3.13 \pm 1.07

analysed habitat features did not significantly influence productivity.

DISCUSSION

The average density estimated as pairs per 100 km² (23.13) or mean NND (1081 \pm 547) of Buzzards in the Teno massif is similar to that of continental populations (see Sergio *et al.* [2002] for a review). Density in Tenerife is positively related to forest distribution, as occurs also in some populations in Central and Southern Europe (Goszczyński 1997, Sánchez-Zapata & Calvo 1999, Sergio *et al.* 2005). This pattern may be related to the typical situation of human settlements and cultivation in flat areas in the island, with forests left to occupy the abrupt rocky areas where Buzzards usually establish their nests. Habitat expansion is a regular feature of island bird populations (Williamson 1981, Thibault *et al.* 1992). Contrary to continental populations, where Buzzards almost always breed in forest patches, or in areas with some degree of tree cover (Ferguson-Lees & Christie 2001), in the Canary Islands this species occupies a wide range of habitats for nesting from sea level up to 1500 m asl, including sparse scrubland without trees (e.g., in the island of Fuerteventura) and deeply forested areas (Martín & Lorenzo 2001, present study).

Cliff nests, generally less accessible than tree nests and often distant from human population centres and

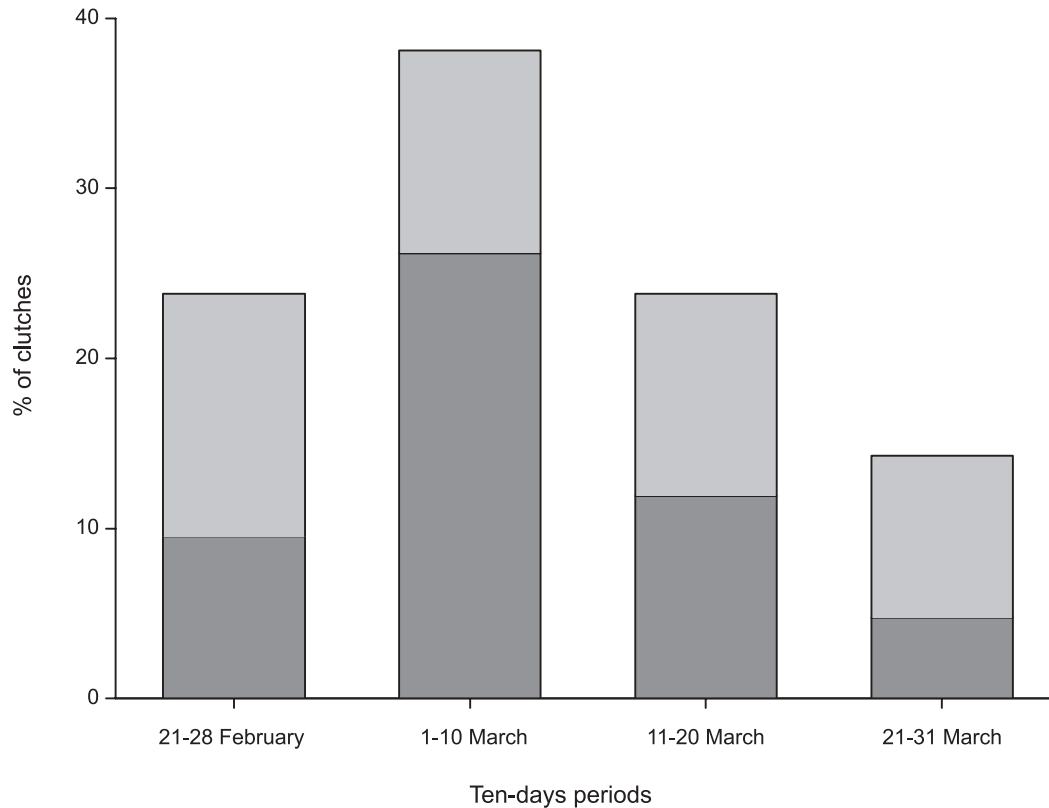


Figure 2. Distribution of estimated laying dates ($n = 42$) in Common Buzzards *Buteo buteo* during the 2006 (dark grey) and 2007 breeding seasons on the island of Tenerife.

Table 6. Reproductive parameters of Common Buzzards *Buteo buteo* during 2006–2007 on the island of Tenerife. Data are presented as means \pm sd (n).

Parameters	2006	2007	Total
Mean clutch size	2.36 \pm 0.63 (14)	2.91 \pm 0.94 (11)	2.60 \pm 0.82 (25)
Fledging rate	2.10 \pm 0.55 (20)	1.93 \pm 0.78 (27)	2.00 \pm 0.69 (47)
Productivity	1.68 \pm 0.99 (25)	1.68 \pm 0.98 (31)	1.68 \pm 0.97 (56)
Hatchability	81.82 (33)	82.76 (29)	78.46 (62)
Breeding success	76.67 (30)	65.63 (32)	70.97 (62)
Nesting success	80.0 (25)	87.5 (32)	84.21 (57)

roads, are probably preferred by Buzzards where they are available (Thibault *et al.* 1992, Sergio *et al.* 2002, present study). Buzzards could select steep slopes that maybe favour their soaring flight (Selås 1997, and references therein). Our results indicate that Buzzards select nesting sites with high gradient slopes which may be related to their soaring activities, lack of human disturbance and/or to the fact that this type of terrain has a greater variety of microhabitats. Another important factor in assessing the quality of nesting sites in raptors is protection from inclement weather (Newton 1979). In Tenerife Buzzards may be selecting sheltered orientations (driest and sunniest) for nesting according to

univariate test comparing the orientation index of occupied and non-occupied territories ($P = 0.01$, but not significant after applying sequential Bonferroni correction). Furthermore, PC4, which is highly and positively related to territory orientation index, was included in all competing logistic regression models (Table 4).

In some continental areas, competition between Buzzards and other raptor species for breeding sites or hunting habitat has been reported (Kostrzewa 1991, 1996, Krüger 2004, Sergio *et al.* 2005). Experimental evidence suggests that the presence of Northern Goshawks *Accipiter gentilis* could reduce productivity in

Buzzards (Krüger 2002). In Tenerife, Barbary Falcons and Common Buzzards have similar insular distribution patterns, although Buzzards are absent from highest altitudes of El Teide National Park (Lorenzo 2007, Rodríguez *et al.* 2007), and both species have successfully occupied nest-sites less than 200 m apart (pers. obs.). Results of the univariate tests in our study showed that Buzzard nesting sites are significantly closer to Barbary Falcon nests than random sites. Further studies are required to evaluate causes of this apparent relationship between these two species, since some cases of kleptoparasitism by Buzzards on this falcon have been observed recently in Tenerife (Siverio *et al.* 2008, pers. obs.).

In several European populations annual breeding density and productivity are greatly influenced by food resource availability and variations in the weather (Spidsø & Selås 1988, Kostrzewa & Kostrzewa 1990, Graham *et al.* 1995, Goszczyński 1997, Selås 2001, Löhmus 2003). Due to the climatic stability of most of the Canary Islands (Marzol-Jaén 2000) and its expected low annual variation in the population size of its main prey species (rabbits, rats and lizards; pers. obs.), it is likely that no large variations in breeding density or breeding rates occur between years.

Breeding parameters such as clutch size and fledging rate in our population are similar (within the range) if compared to continental populations (see review in Sergio *et al.* [2002]). However productivity and nesting success estimated in Tenerife are higher than those reported for some European populations (Sergio *et al.* 2002). Climatic stability (Marzol-Jaén 2000) could be responsible for the fact that the majority of pairs raised at least one chick until fledging. In a community study analysing 'insular' characteristics of Corsican raptors (Mediterranean), some species (including the Common Buzzard) apparently did not show different breeding traits with respect to the nearest continental populations suggesting that other factors such as, for example, diet diversity could be also regulating breeding traits (Thibault *et al.* 1992).

Although nesting sites of Buzzards in Tenerife seem to be secure against humans, foraging grounds are usually situated in flat terrain so they are vulnerable to urban development. This fact, together with the other threat factors reported for this population, such as shooting, collisions and poisoning (Lorenzo 2007, pers. obs.), suggest that detailed studies focusing on population dynamics, particular aspects of reproduction, habitat use and causes of adult mortality will be useful tools for detecting population trends at devising management strategies.

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