Aspects of the biology of Hooded Crow *Corvus cornix* Linnaeus, 1758 in northern Umbria (central Italy) from the register of the ornithological collection "A.M. Paci"

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Abstract

The data extrapolated from a sample of specimens of Hooded Crow *Corvus cornix* belonging to a private ornithological collection are analyzed and commented. The discovery of the register, in which the information on the 61 preparations was noted, provided the possibility of presenting information on the biology of this corvid for Umbria, as well as providing confirmation of what was already known in literature. In conclusion, the importance is reconfirmed of timely handing over old private collections that are often very interesting, especially if they have also monospecific series, to museum structures ensuring their good conservation and allowing their public use before unforeseen events of various kinds may cause their dismemberment and disappearance.

Keywords: Hooded Crow *Corvus cornix*, biology, Umbria (Central Italy).

Aspects de la biologie de la Corneille mantelée *Corvus cornix* Linnaeus, 1758 dans le nord de l'Ombrie (Italie centrale) d'après le registre de la collection ornithologique "A.M. Paci"

Résumé

Les données extrapolées à partir d'un échantillon de corneille mantelée *Corvus cornix* appartenant à une collection ornithologique privée sont analysées et commentées. La découverte du registre dans lequel étaient consignées les informations sur les 61 préparations, a permis de présenter des informations sur la biologie de ce corvidé pour l'Ombrie, ainsi que de confirmer ce qui était déjà connu dans la littérature. En conclusion, nous réitérons l'importance de remettre les anciennes collections privées, souvent très intéressantes en particulier pour les séries monospécifiques, tant qu'il est encore temps, à des muséums qui garantissent leur bonne conservation et permettent leur utilisation par le public, avant que des événements imprévus de toutes sortes n'entraînent leur détérioration et leur disparition.

Mots clés : Corneille mantelée *Corvus cornix*, biologie, Ombrie (Italie centrale).

Aspetti della biologia della Cornacchia grigia *Corvus cornix* Linnaeus, 1758 nell'Umbria settentrionale (Italia centrale) dal registro della collezione ornitologica "A.M. Paci"

Riassunto

Vengono analizzati e commentati i dati estrapolati da un campione di esemplari di Cornacchia grigia *Corvus cornix* appartenuto a una collezione ornitologica privata. Il ritrovamento del registro in cui erano annotate le informazioni dei 61 preparati, ha fornito la possibilità di presentare informazioni sulla biologia di questo corvide per l'Umbria, oltre a restituire conferme su quanto già noto in letteratura. In conclusione, viene ribadita l'importanza di cedere per tempo vecchie collezioni private, spesso molto interessanti se comprendono anche serie monospecifiche, a strutture museali che ne assicurino una buona conservazione e ne permettano la pubblica fruizione, prima che imprevisti di varia natura ne determinino lo smembramento e la scomparsa.

Parole chiave: Cornacchia grigia *Corvus cornix*, biologia, Umbria (Italia centrale).

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1. Introduction

In Italy *Corvus cornix* is widely distributed throughout the peninsula with the subspecies *cornix* typical of its central-northern part and with the *sharpii* present in the south and on the islands, even if the exact limit of separation between the two peninsular populations is not yet well defined (Brichetti & Fracasso, 2011).

In Umbria, it is very common and distributed throughout the entire regional territory from the plains up to over 1500 meters, preferring open areas. The shortage of natural predators, the lack of hunters' interest towards it and its ecological plasticity determined its full success in the conquest of every suitable habitat, undoubtedly favored by the agricultural upheaval occurred especially in the plains during the transition from the traditional to the intensive cultivation regime.

This massive expansion soon impacted agricultural and hunting interests due to its diet varying with the change in food availability and periodically affecting agricultural production and small game in reproduction. Mainly sedentary and characterized by only modest movements, the species is huntable and controllable with special authorizations issued by the public administration's wildlife-hunting service; however, despite this, it is locally showing a substantial stability thanks to its excellent ability to exploit a great variety of environments and trophic resources (Paci, 2005; Lombardi, 2019).

However, this was not always the case since in historical times it was considered "[...] *common and stationary in the mountains, elsewhere winter migratory and not very abundant"* (Silvestri, 1892, 1893). This condition remained practically unchanged throughout the 1970s when, specifically in northern Umbria, it was considered "[...] *progressively increasing since the second half of the 1970s, previously known only with sporadic sightings in the high hills and therefore considered rare. Its expansion into the plains coincided with that of monoculture and was further favored by the establishment of protected areas and by the recent creation of large landfills"* (Paci, 1992).

Following the rapid increase of the Hooded Crow in the lowland agricultural areas, starting from 1980 and throughout the decade one of the authors (A.M. Paci) practiced rifle hunting of this very elusive species, managing to collect several specimens and to archive the related information in his private collection. The ornithological collection "A.M. Paci", established almost entirely in the twenty-year period 1976 -1995, in the short period of its life suffered losses and splits which reduced it to a residual nucleus today mostly deposited in museums (Laurenti & Paci, 2017), including the Natural History Gallery (GSN) of the University of Perugia (Cecchetti, 2023). The interesting series of specimens of *C. cornix* is among the missing finds but, during the research for a master's degree thesis about the scientific collections preserved in the GSN (Cecchetti, 2023), the paper notes relating to all the collected Hooded Crow skins were found (**Tab. 1 in appendix**). Based on these recovered data, this contribution aims to present some aspects relating to the biogeography, morphometry, and diet of this corvid within a limited area in Umbria.

2. Study area and methods

2.1. Locality

The sample of 61 specimens comes from an area of approximately 47,5 Km^2 falling in a district of northern Umbria (province of Perugia, central Italy) today generically defined as Upper Umbria but which, in the recent past, was divided into two districts: High Tiber Valley and the Gubbio-Gualdo Tadino area (**Fig. 1**). In the first district, the 4 collection locations are included in the municipalities of Umbertide (loc. Molino Vitelli, x43.31588 y12.27095), Montone (San Lorenzo, x43.33054 y12.32939) and Lisciano Niccone (Reschio, x43.27542 y12.20587; Vallaccia, x43.26207 y12.19800). The adjacent locality Pieve d'Agnano (x43.30534 y12.39265), in the municipality of Gubbio, belongs to the second district (**Fig. 1**). The great majority of the finds (n. 58) refer to the territory of the municipality of Lisciano Niccone (314 m a.s.l.) and were collected during the 1988/89 hunting season between October and March.

2.2. Capture

From 1980 to 1984, a stuffed cat (in open areas) and a plastic shape of an eagle owl (near dormitories) were

Fig. 1 - The study area with the sampling locations: Pieve d'Agnano (square), San Lorenzo (polygon), Molino Vitelli (star), Reschio (circle), Vallaccia (triangle).

initially used as lures (Simonetta, 1972), exploiting the mobbing for food competition or against nocturnal predation that crows usually activate in the respective cases; subsequently, stuffed crow molds were preferred (in numbers varying between 7 and 39, depending on temperature and weather conditions), sometimes supplemented by 1-2 live individuals and arranged early in the morning (after leaving dormitories) or in the late afternoon (waiting for pre-roost) set up in pasture (preferably on harvested maize fields) taking advantage of the high degree of conspecific tolerance typical of these corvids during foraging activities in presence of abundant food sources (Miller *et al*., 2014). As an acoustic call specific made in USA plastic or wooden whistles were very effective, with which cries of alarm in presence of the owl silhouette or calls of contact in the grazing areas were reproduced (Simonetta, 1972; Parmegiano Palmieri, 2004).

2.3. Biometries, sexing, age ratio

The following measurements were taken on fresh specimens, referring to Marchetti (1975), Arnhem (1979) and Svensson (1984): bill-tail (Bt, n. 53), wing (Wg, n. 53), bill-to-plumage (Bl, n. 53), tail (Ta, n. 53), tarsus (Ts, n. 53); furthermore, the analysis of the gonads (n. 61) and the stomach contents (n. 61) was performed, the wingspan between the opposite tips of the longest remiges (Ws, n. 53) and the weight (Wt, n. 61) were measured. For the wing measurement, the *flat wing* method was chosen which allowed homogeneous measurements both on fresh subjects and on skin specimens (Svensson, 1984); for the measurement of the tarsus, the *minimum tarsus* method was adopted (Caravaggi *et al*., 2022). The immatures of the first winter were separated from the adults through the analysis of the internal part of the *greyish-pink* (blackish in adults) upper mandible (Svensson, 1984; O'Donoghue *et al.,* 1998) and, based on their partial molt with two distinct generations of feathers (type 2 molt strategy), of the unmolded wing and tail feathers, *opaque brown decidedly contrasting with the shiny black mutated plumage* (completely shiny black in adults, see **Fig. 2**) with evident state of abrasion on the tips of the flight feathers and rectrices *sometimes observable already in autumn* (Svensson, 1984 ; Jenni & Winkler, 1994).

2.4. Statistical analysis

The six morphometric criteria, bill-tail length, wing length, wingspan between the opposite tips of the longest remiges, tail length, bill-to-plumage length, tarsus length (expressed in mm) and weight (expressed in g), were analyzed using 2-way analysis of variance, with sex (male and female) and age (adult and immature) as factors and the interaction sex age. Where there was a significant interaction ($p < 0.05$), two t-tests (one test for each sex) were performed between the two age groups (adult and immature).

Fig. 2 - *Corvus cornix*, adult female (photo from Paci *et al.* 2017; coll. A.M. Paci, n. AMP151-192).

Criterion*	Bt	Wg	Ws	Ta	Bl	Ts	Wt
Immature N=36 for all criteria except Wt (N=38)							
mean	456,3	293,4	882,4	171,9	52,9	57,3	444,5
sd	16,2	20,9	35.0	7,3	4,5	2,8	52,5
min	425	230	815	150	44	50	310
max	485	324	948	190	63	61	530
Adult N=17 for all criteria except Wt (N=23)							
mean	469,7	311.0	917,6	183.0	53,4	57,8	425.0
sd	17,7	11,5	28,5	10,1	4.0	2,3	76,2
min	445	298	860	166	48	51	315
max	500	340	970	205	63	61	570
Male N=20 for all criteria except Wt (N=25)							
mean	475,7	314,3	929.0	180,6	56,4	58,7	490,2
sd	14,9	9,8	19,8	10,6	2,6	1,8	26,9
min	448	300	890	165	52	55	440
max	500	340	970	205	63	61	570
Female N=33 for all criteria except Wt (N=36)							
mean	451,5	289,9	872,2	172,4	51.0	56,6	400,3
sd	12,3	19,1	26,6	7,8	3,9	2,8	53,1
min	425	230	815	150	44	50	310
max	485	317	920	190	58	61	505
Male Immature N=12 for all criteria except Wt (N=14)							
mean	469,8	311,1	921,3	175,1	56,8	58,8	485,7
sd	13,4	7,6	17,6	7.0	2,1	1,7	23,6
min	448	300	890	165	55	57	450
max	485	324	948	185	63	61	530
Female Immature N=24 for all criteria							
mean	449,5	284,6	862,9	170,4	51.0	56,5	420,4
sd	13,1	19,8	23,1	7,1	4,1	3.0	49,8
min	425	230	815	150	44	50	310
max	485	304	915	190	58	61	505
Male Adult N=8 for all criteria except Wt (N=11)							
mean	484,4	319.0	940,6	188,8	55,8	58,6	495,9
sd	13,2	11,4	17,8	9,9	3,3	2,1	30,8
min	460	303	920	175	52	55	440
max	500	340	970	205	63	61	570
Female Adult N=9 for all criteria except Wt (N=12)							
mean	456,7	303,9	897,1	177,9	51,2	57.0	360.0
sd	8,3	5,7	18,4	7,4	3,5	2,3	33,6
min	445	298	860	166	48	51	315
max	470	317	920	190	56	59	430

Tab. 2 - Description of morphometric criteria and weight by sex and age class*: Bt: bill-tail length (mm), Wg: wing length (mm), Ws: wingspan (mm), Ta: tail length (mm), Bl: bill (mm), Ts: tarsus length, Wt: weight (g).

2.5. Diet

The residues extracted from the stomachs, relating exclusively to the autumn-winter diet, were separated only qualitatively and then grouped into 4 main categories: cereals, invertebrates, small mammals, plant residues. These values are presented together with those ones of the spring-summer diet deduced from the report of damages to crops/livestock received by the Provincial Administration of Perugia in 2004 (Paci, 2005) from 20 farms distributed in the High Tiber Valley, extrapolated from a total relating to 62 farms distributed across the entire provincial territory. These data were grouped into four main categories: domestic livestock, cereals, sunflower, other crops.

3. Results (Tab. 2)

No significant interaction was found for the morphometric criteria: bill-tail length (p=0.3316), wing length (p=0.2102), wingspan (p=0.2350), tail length (p=0.1828), bill length (p=0.5287) and tarsus length (p=0.6811). A significant interaction was found for weight (p=0.0013). This interaction is due to the fact that in males, there is no difference in weight between adults and immatures (mean±standard deviation 495.9±30.8 g vs. 485.7±23.6 g, p=0.3580), while in females the weight is lower in adults than in immatures (360.0±33.6 g vs. 420.4±49.9 g, p=0.0006).

All morphometric criteria and the weight are greater in males than in females: bill-tail length (475.7±14.9 mm *vs* 451.5±12.3 mm, p<0.0001), wing length (314.3±9.8 mm *vs* 289.9±19.1 mm, p<0.0001), wingspan (929.0±19.8 mm *vs* 872.2±26.6 mm, p<0.0001), tail length (180.6±10.6 mm *vs* 172.4±7.8 mm, p=0.0013), bill length (56.4±2.6 mm *vs* 51.0±3.9 mm, p<0.0001), tarsus length (57.8±1.8 mm *vs* 56.6±2.8 mm, p=0.0135) and weight (490.2±26.9 g *vs* 400.3±53.1 g, p<0.0001).

The following morphometric criteria are greater in adults than in immatures: bill-tail length (469.7±17.7 mm *vs* 456.3±16.2 mm, p=0.0058), wing length (311.0±11.5 mm *vs* 293.4±20.9 mm, p=0.0038), wingspan (917.6±28.5 mm *vs* 882.4±35.0 mm, p<0.0001) and tail length (183.0±10.1 mm *vs* 171.9±7.3 mm, p<0.0001), and no difference was found, in adults *vs* immatures, for bill length (53.4±4.0 mm *vs* 52.9±4.5 mm, p=0.7012) and tarsus length (57.8±2.3 mm *vs* 57.3±2.8 mm, p=0.8051).

Regarding autumn-winter nutrition (**Tab. 3, Fig. 3**), the analysis of the 61 stomachs collected between October and March revealed an absolute absence of food and other materials in 17 (27,86%) of them; 28 (63,63%) of the 44 stomachs with food also contained pebbles (grit), usually ingested to ensure a good digestion and the necessary calcium intake. There were 63 food residues found relating to Cereals 49,20% (*Zea mays* n. 20, Poaceae indet. n. 11), Invertebrates 30,16% (little Coleoptera sp. n. 13, little Helicidae sp. n. 5, *Lumbricus* sp. n. 1), Small mammals 14,29% (small mammals

Autumn-Winter

Zea mays (45,45%)
Coleoptera sp. (29,54%)
Poaceae indet. (25%)
Small Mammal indet. (13,63%)
Helicidae sp. (11,36%)
Juniperus sp. (4,54%)
Erinaceus europaeus (2,27%)
Crocidurinae sp. (2,27%)
Soricinae sp. (2,27%)
Vitis vinifera (fruit) (2,27%)
Vegetable indet. (2,27%)
Lumbricus sp. (2,27%)

Tab. 3 - Percentage of food in 44 stomachs.

Cereals	49,20%
Invertebrates	30,16%
Small mammals	14,29%
Plant residues	6,35%

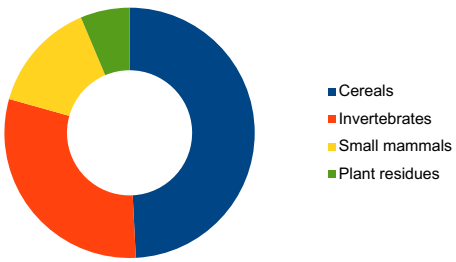

Fig. 3 - Composition of the autumn-winter diet

Spring-Summer

Farmyard animals (80%)
Zea mays (40%)
Helianthus annuus (14,51%)
Newborn lambs (10%)
Vegetables crops (10%)
Avena sativa (5%)
Phaseolus vulgaris (5%)
Medicago prativa/Onobrychis viciifolia (5%)

Tab. 4 - Percentage of damage in 20 farms.

Domestic livestock	48,65%
Cereals	24,32%
Sunflower	16,21%
Other crops	10,82%

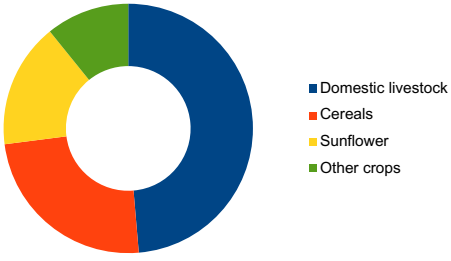

Fig. 4 - Composition of the spring-summer diet.

indet. n. 6, *Erinaceus europaeus* n. 1, Crocidurinae sp. n. 1, Soricinae sp. n. 1), Plant residues 6,35% (*Juniperus* sp. n. 2, *Vitis vinifera* fruit n. 1, Vegetable indet. n. 1).

Regarding spring-summer feeding (**Tab. 4, Fig. 4**), 37 damage events were reported between April and July relating to Domestic livestock 48,65% (farmyard animals n. 16, newborn lambs n. 2), Cereals 24,32% (*Zea mays* n. 8, *Avena sativa* n. 1), Sunflower 16,21% (*Helianthus annuus* n. 6), Other crops 10,82% (vegetable crops n. 2, *Phaseolus vulgaris* n. 1, *Medicago prativa*/*Onobrychis viciifolia* n. 1).

4. Discussion and Conclusion

While the examination of the six morphometric criteria between males and females shows that all of them are significantly larger in males than in females (**Tab. 2, Fig. 5**), the comparison between immatures and adults is more nuanced. Only four criteria, bill-tail length, wing length, wingspan and tail length are larger in adults than in immatures, while no significant difference is found for bill length and tarsus length (Giammarino *et al*., 2012). If the small sample size (36 immatures and 17 adults) can explain the lack of statistical power, it is possible to state that the development of the bill and tarsus ends earlier than that of other characters (Slagsvold, 1983; Rofstad & Sandvik, 1987). They also highlight the significant difference in weight in favor of immature females compared to adult ones, probably due to the former greater ability to accumulate fat in the cold months as already noted by Slagsvold (1982).

The age ratio / sex ratio composition of the collected specimens may reflect, depending on the collection method, ethological aspects put into practice for

Fig. 5 - *Corvus cornix*, comparison between an adult male (on the left) and an immature female (coll. A.M. Paci, n. AMP73-114 and n. AMP150-191)

Fig. 6 - Hooded Crow (by G. Bellezza)

effectiveness or opportunism by *Corvus cornix*. With the exclusion of the first two specimens of the collection (samples AMP64 and AMP73-114), both adults attracted respectively with the cat and the eagle owl, 64.41% of the finds obtained using crow molds refer to immature ones, of which 40.68% ♀♀ and 23.73% ♂♂. In general, it was noted that the attacks against the first two lures were largely carried out by adults, probably more aggressive and experienced in the fight against food competitors or predators; vice versa, as per **Tab. 1 in appendix**, the grazing molds had a particular power of attraction towards young birds, less experienced in identifying sources of supply, and towards adult females with limited fat reserves, probably subordinate to males (larger) or chased away by territorial pairs (more aggressive) during the search for food (Houston, 1977). These individuals were, therefore, more inclined to believe in the false call of a large feeding group of their peers which signaled them, particularly during days with fog or bad weather (cold, rain), the presence of a safe food source and at the same time greater protection from dangers (Miller *et al.,* 2015). Regarding the empty stomachs, 11 out of 15 belonged to immatures, two to adult females (samples CC43 and CC44) probably debilitated considering their weight less than 350 g, two to adult males (samples CC40 and CC45) in good condition and probably only very hungry. The annual trophic picture, although limited by the few and underestimated data available, confirms the Hooded Crow as a great opportunist and generalist (Fasola *et al.* 1986, Barbero *et al.* 1993), a consumer mainly of cereals and invertebrates (Cramp & Perrins 1994) but very capable of exploiting any environment and any resources that the territory and the period make usable. In general, the results present a dietary spectrum (**Tabs. 3, 4**) that agrees with the one found by Fasola *et al.* (1986) for the central Po Valley, where the vegetal component was particularly important in autumn-winter and the animal component during the good season. As stomach contents during the reproductive period were not examined, as on the contrary Fasola *et al.* (1986) and Barbero *et al.* (1993) did, but having used instead the data of damage cases reported by farmers, we can add these data too to stress that with the arrival of spring the trophic range shows an important exploitation of anthropogenic resources (poultry and sheep farming, crops agricultural and horticultural). A large protein intake certainly comes from eggs (Zduniak, 2006; Romano, 2009) and chicks (Cramp & Perrins 1994), integrated in a very low percentage from newborn lambs, probably debilitated or dying (Houston 1977), that the crows would attack directly at the head pecking out eyes and tongue (Houston, 1977; Assessorato Difesa

dell'ambiente, 2015) according to the breeders' reports. The consumption of *Zea mays* is also important, and in autumn-winter it becomes the most exploited food source (maize is however appreciated and consumed in every season: on newly sown land in May-June, on the cob in milky-waxy form in July-August, on harvested fields in October-February). Furthermore, during the cold season the protein contribution comes from insects, then from small mammals and gastropods, while the minimal presence of earthworms would confirm the little interest of *C. cornix* in them (Fasola *et al*., 1986; Brichetti & Fracasso, 2011). The presence of the remains of *Erinaceus europaeus* and of the two shrews, excluding direct predation on these taxa (Korpimäki & Norrdahl, 1989; Cramp & Perrins, 1994; Amori *et al*., 2008; Zduniak *et al.,* 2008), betrays the consumption of already dead animals, whereas the first was perhaps hit by a vehicle while the latter was preyed and then abandoned by carnivores. In conclusion, while confirming known aspects of the biology of the species, the contribution adds new details for Umbria. Furthermore, it underlines the scientific importance of having large series of skins available, with a recommendation to timely deposit old private naturalistic collections in secure museum facilities, so that they are protected and used for the benefit of the entire community, avoiding that unpredictable events can irreparably ruin and/or disperse them.

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Appendix, Tab.1 - The list of Hooded Crows from the Paci collection: the biometric codes are explained in the following section; the acronyms MON and GSN stand for *Museo Ornitologico Naturalistico* and *Galleria di Storia Naturale* respectively; the initials AMPp.c. stand for an *Andrea Maria Paci private collection.*

Collection code	Type of preparation	Current location	Species	Locality	Date	Sex	Age	Bt	Wg	Ws	Ta	Bl	Ts	Wt	Stomach contents
AMP64	Taxidermy mount	MON Pietralunga	*Corvus cornix*	Molino Vitelli (Umbertide, PG)	October 1980	♀	Ad.	450	300	880	185	48	57	360	nothing
AMP73-114	Taxidermy mount	GSN Casalina	*Corvus cornix*	Pieve d'Agnano (Gubbio, PG)	October 1984	♂	Ad.	495	340	960	205	63	61	570	nothing
CC01	Study skin	Missing	*Corvus cornix*	San Lorenzo (Montone, PG)	January 1985	♂	Imm.	485	311	935	173	63	59	530	nothing
CC02	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♂	Imm.	\	\	\	\	\	\	480	Coleoptera, grit
CC03	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♀	Ad.	\	\	\	\	\	\	345	small mammal (*Erinaceus europaeus*)
CC04	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♀	Ad.	\	\	\	\	\	\	375	Coleoptera, grit
CC05	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♂	Ad.	\	\	\	\	\	\	495	*Juniperus, Zea mays*, grit
CC06	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♀	Ad.	\	\	\	\	\	\	380	Cereals indet., grit
CC07	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♂	Ad.	\	\	\	\	\	\	475	Cereals indet., Coleoptera
CC08	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♂	Imm.	\	\	\	\	\	\	490	*Zea mays*
CC09	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	October 1988	♂	Ad.	\	\	\	\	\	\	485	Cereals indet.
CC10	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	October 1988	♀	Ad.	470	298	895	177	55	58	430	Cereals indet., grit
CC11	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	October 1988	♀	Imm.	450	294	830	170	47	56	410	Helicidae, Coleoptera
CC12	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	October 1988	♂	Imm.	450	300	910	165	55	59	470	Helicidae, Coleoptera, grape, grit
CC13	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♀	Imm.	435	230	840	170	44	52	310	nothing
CC14	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♀	Imm.	460	295	890	175	50	58	435	*Zea mays*, grit
CC15	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Imm.	470	310	935	170	58	61	480	Coleoptera, grit
CC16	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♀	Ad.	460	303	910	190	50	59	330	*Juniperus, Zea mays*
CC17	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Imm.	448	303	900	170	57	57	470	*Zea mays,* grit
CC18	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♀	Imm.	443	250	890	170	51	57	460	Cereals indet., small mammal

CC19	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♀	Imm.	455	292	860	190	48	50	400	*Zea mays*
CC20	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Imm.	470	311	915	180	57	57	470	small mammal (Crocidurinae sp.), grit
CC21	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Ad.	475	316	920	185	55	57	500	Cereals indet., Coleoptera, grit
CC22	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Imm.	475	320	948	185	56	58	485	*Zea mays*, grit
CC23	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	November 1988	♂	Imm.	480	320	890	185	56	57	475	nothing
CC24	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	440	275	815	165	52	60	415	*Zea mays*, grit
CC25	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	465	296	870	175	53	54	460	small mammal (Soricinae sp.)
CC26	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	445	288	880	170	51	57	450	Cereals indet.
CC27	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	485	302	915	170	55	61	505	Coleoptera, small mammal, grit
CC28	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	460	288	860	183	51	51	440	*Zea mays*, Coleoptera, grit
CC29	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	455	295	875	170	53	59	440	*Zea mays*, grit
CC30	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	435	296	835	165	50	57	465	*Zea mays*, Helicidae, Coleoptera, grit
CC31	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	440	288	850	165	48	56	380	Cereals indet., grit
CC32	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	460	291	850	170	56	60	450	nothing
CC33	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	November 1988	♀	Imm.	450	286	860	168	53	57	440	nothing
CC34	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	December 1988	♂	Imm.	475	303	917	173	56	60	470	Cereals indet., *Zea mays*, grit
CC35	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	December 1988	♀	Imm.	460	304	875	173	57	59	440	Cereals indet.
CC36	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♀	Imm.	440	296	880	175	51	59	390	nothing
CC37	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	December 1988	♀	Imm.	450	293	850	170	45	56	420	nothing
CC38	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♀	Ad.	465	305	914	173	48	51	390	Cereals indet., *Lumbricus* sp, Coleoptera, small mammal, grit
CC39	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♂	Ad.	480	314	930	175	54	57	500	Helicidae, Coleoptera, grit

CC40	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♂	Ad.	495	328	970	190	54	60	490	nothing
CC41	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♀	Ad.	445	298	860	166	48	57	360	small mammal
CC42	Study skin	Missing	*Corvus cornix*	Vallaccia (Lisciano Niccone, PG)	December 1988	♂	Ad.	500	319	950	190	55	55	490	vegetable, small mammal, grit
CC43	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Ad.	460	305	895	180	56	58	315	nothing
CC44	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Ad.	450	317	920	180	50	58	340	nothing
CC45	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Ad.	490	322	940	185	57	59	510	nothing
CC46	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Imm.	470	315	935	185	56	57	485	*Zea mays*, grit
CC47	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Imm.	485	324	935	170	56	61	515	nothing
CC48	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Imm.	450	298	890	165	56	60	430	*Zea mays*
CC49	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Imm.	425	283	860	150	47	55	310	*Zea mays,* grit
CC50	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Ad.	480	303	930	200	56	60	500	*Zea mays*, Helicidae
AMP190	Taxidermy mount	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Ad.	450	304	905	170	50	57	380	*Zea mays,* Coleoptera, grit
CC51	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Imm.	480	305	930	170	55	61	530	*Zea mays*, grit
CC52	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♂	Ad.	460	310	925	180	52	60	440	small mammal, grit
AMP150-191	Taxidermy mount	GSN Casalina	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Imm.	435	230	840	170	44	52	315	*Zea mays*
AMP151-192	Taxidermy mount	AMP p.c.	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	January 1989	♀	Ad.	460	305	895	180	56	58	315	*Zea mays*
CC53	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	February 1989	♀	Imm.	460	290	885	170	56	58	420	nothing
CC54	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	February 1989	♀	Imm.	435	285	850	170	58	57	435	nothing
CC55	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	February 1989	♀	Imm.	455	286	860	170	47	55	470	*Zea mays*, grit
CC56	Study skin	Missing	*Corvus cornix*	Reschio (Lisciano Niccone, PG)	March 1989	♂	Imm.	450	311	905	175	57	58	450	nothing