

The humble Stonechat *Saxicola rubicola* and the species neglected by ornithological research in Italy.

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Abstract - The query of one of the major online scientific research databases returned quite worrying data, because a large group of species breeding in Italy, 47 out of 270 (17%) has never been studied and this number grows further (56 species, 20.7% of the total) if we consider that 9 species with published papers have 0 h-index (i.e. do not yet have any citations). These species neglected by Italian ornithological research have been called 'zero species'. Bird species without indexed studies are 87.2% native and mostly migratory (66.0%). They live mainly in wetlands (36.2%) and forest habitats (27.7%) and generally have an increasing population trend (44.7%). Furthermore, the majority of these species are classified as least concern by the Italian Red List (44.7%), with a lower percentage of threatened species (34.0%). Zero species are more unprotected than protected ones (61.7% vs 38.3%). Finally, 42.6% of them belong to passerines and have a very restricted geographical range (83.0%). Some examples of zero species are reported and discussed, such as the Stonechat *Saxicola rubicola*, the Common redpoll *Acanthis flammea* or the Red Kite *Milvus milvus*, highlighting some of their interesting traits that could stimulate research aimed at conservation.

Keywords: Italian ornithology, bird database, zero species, web research.

All ornithologists know the Stonechat *Saxicola torquatus* (following Baccetti et al. 2021; or *Saxicola rubicola* following the most recent taxonomy of Gill et al. 2024) well. It is a common and widespread species that keeps us company on our excursions and we often find ourselves nearby while doing ringing stations or point-counts stations. In these cases, it ends up among the catches of the nets or in the lists of the species contacted, but the story ends there.

I am sure that, like me, every ornithologist has at

least once stopped to observe and photograph it. It is a very obvious species for its habit of using fence posts as observation points to increase feeding efficiency or for territorial songs in spring (Greig-Smith 1983). In Italian, this species is called "Saltimpalo", i.e. "jumping from pole to pole" for this habit.

It appears to have linear territories because the territorial males follow one another from pole to pole – or from prominent shrubs and tall thistles – but obviously this is a false impression due to the fact

that its roosts line the roads and paths along which we walk or drive. But if we wanted, the composition and breadth of its territories could be delimited with little effort in the agricultural mosaics in which it generally lives.

I recently analysed the research trends of Italian ornithology (Sarà 2023) based on the check-list of breeding species in Italy (Lardelli et al. 2022) and among the various information that has emerged, 47 species stand out that have never aroused interest in research, and on which an article has never been written.

These are the 17.4% of the breeding species in the period 2010-16 covered by the Atlas and this number grows to 56 species (the 20.7%, cf. Sarà 2023) if we consider that 9 other species with published articles in indexed journals do not yet have any citations; then their h-index, i.e. the metric with which the impact of research is measured, is equal to zero.

We can call these species neglected by Italian ornithological research like “zero species”, according to the pertinent definition that was suggested to me (Battisti in litteris).

It goes without saying that the Stonechat is among these 47 zero species. This pushed me to check what is known about it in other European countries or rather what level and interest of research the Stonechat was subjected to.

I once again did a search on the Scopus web database and obtained a first list of 159 papers that according to the criteria used in Sarà (2023), that briefly were: restricting to Agricultural and Biological Sciences and to Environmental Science as subject areas and exclude documents containing check-lists of any kind, was reduced to a second one of 129 papers. A few Italian references were omitted in this ‘cleaning’ step because came from a list of ringing captures and from records in the bird rarity reports of the Italian Ornithological Commission (e.g. Caspian Stonechat *Saxicola torquatus hemprichii* in Fulco & Liuzzi 2022).

Once again the Stonechat was confirmed as zero species, with no papers in the areas of Agricultural,

Biological and Environmental Sciences produced in Italian territories.

The research groups that use the Stonechat as a model species for their studies and signed the selected 129 papers are predominantly German, English with a good presence of researchers from Central European countries and North America. Twelve documents even involved African populations but were mostly signed by European ornithologists. The first contribution on the Stonechat dates back to 1941 (Ticehukst 1941) and deals with the geographic variation of two East Palearctic subspecies. The phylogeny and classification of Stonechats has then interested research up to the present day. Currently, genetic research (Wink et al. 2002, Zink et al. 2009) suggests that the Stonechat should best be considered a species complex comprising several lineages; some of which are evolving independently and each may have achieved the status of separate species. This is what is indicated by the new taxonomic framework that recognizes *S. torquatus* as the correct name of the African taxon, while *S. rubicola* lives in Europe, *S. maura* in the central Palearctic and *S. stejnegeri* in the eastern Palearctic (Wink et al. 2002, Zink et al. 2009, Opaev et al. 2018).

Regardless of whether these taxa are considered subspecies of *S. torquatus*, or are described as good species, what is intriguing and has stimulated a substantial part of the research, is the fact that each geographic population of Stonechat has a different phenotype that corresponds to a pattern of life history and migratory behaviour different from others. The local differentiation of migratory behaviour ranges from partial migration in Spain, France, and Britain of the west European *hibernans* Stonechats, to the obligate short-distance (i.e. ≤ 1,000 km) migration of *rubicola* Stonechats in central and east Europe, to full residency in the Italian and other south European *rubicola* populations. In contrast, central Palearctic *maura* populations, as for instance those from Kazakhstan, are long-distance migrants with winter quarters up to 5,000 km away (Gwinner et al. 1994, Helm et al. 2006). This

pattern was considered ideal for analysing whether populations with different phenotypes and living at different latitudes adapt their metabolic activity to local environmental conditions or whether such birds are genetically different in their energy metabolism (Wikelski et al. 2003). The results demonstrate that metabolic rates between populations of Stonechat differ depending on latitude and/or migratory disposition. Overall, the resting metabolic rate was lower in resident *torquatus* from Kenya than in the mostly resident *hibernans* birds from Ireland; while the resting metabolic rates of both these stationary populations were lower than those of migratory birds of the *rubicola* (Austria) and *maura* (Kazakhstan) populations (Wikelski et al. 2003). Likewise, the variation in body size was consistent with that of metabolic rate, with *torquatus* larger than *hibernans* and both resident populations larger than migratory ones (Wikelski et al. 2003).

Also during the migratory season, Stonechats present another peculiar trait of their life history which has stimulated another line of research. Upon arrival on winter grounds, these birds form heterosexual pairs followed by vigorous territorial defence. The research by Gwinner et al. (1994) demonstrated that the function and physiological control mechanisms of this behaviour are different from territoriality during the breeding season.

The migratory plasticity of these small birds (Helm et al. 2005, Doren et al. 2017) corresponds to the flexibility in their habitat selection (Gailly et al. 2020), and this brings us to the third main line of research on Stonechat: changes in ecology and breeding biology in relation to environmental variations and changes in land use, which has interested many other European ornithologists (e.g. Birrer et al. 2007, Revaz et al. 2008, Denac & Kmecl 2021).

Finally, it is worth mentioning that the Stonechat became the “Bird of the Year” in Hungary in 2021, and has therefore stimulated a review to summarize the status of the species in that country and to emphasize its conservation priorities (Csörgő et al. 2022).

So far this brief and necessarily incomplete summary of the research on Stonechat. In Italy, its geographical distribution range from the islands to the Alps, in an altitudinal range between 0 and approximately 2000 m a.s.l. and in a variety of ecotones and agricultural habitats, makes it an ideal ecological indicator for monitoring changes in land use. Another research direction could concern the segregation of the ecological niche with the Whinchat *Saxicola rubetra* in all the pre-Alpine and Apennine valleys where they live in sympatry. Furthermore, according to the Italian red list the Stonechat is classified as ‘endangered’ (Gustin et al. 2019) and its populations are in decline (Lardelli et al. 2022, Rete Rurale Nazionale & LIPU 2023) and this makes it a species to pay attention to.

I chose the Stonechat as an example of zero species, trying to understand whether it was a trivial species and therefore not worth focusing one’s research interests on, or whether it presented biological and ecological peculiarities neglected in our country. Scientific literature has instead given back us a species with an interesting biological and evolutionary profile. In fact, there are no trivial species, but only species that are neglected for various reasons.

The composition of this block of 47 zero species is reported in Tab. 1 and the list of their main attributes is in Tab. 2, together with their frequency per attribute.

Bird species without indexed studies are 87.23% native and mostly migratory (65.96%). They live mainly in wetlands (36.17%) and forest habitats (27.66%) and generally have an increasing population trend compared to the previous Atlas of 1979-1992 (44.68%). Furthermore, the majority of these species are classified as least concern by the Italian Red List (44.68), with a lower percentage of threatened species (34.04). According to this, there are more unprotected zero species than protected ones (61.70% vs 38.30%). Finally, 42.55% of them belong to passerines and have a very restricted geographical range (82.98%).

Table 1. Check-list of the 47 species of Italian breeding birds not yet present in the indexed ornithological literature; i.e. the total number of papers per species in the Elsevier Scopus database is equal to zero. The list is arranged following Baccetti et al. (2021) and their main attributes are coded as in Table 2.

Common name	Scientific name	ORIGIN	PHENOLOGY	HABITAT	TREND	REDLIST GROUP	PROTECTION	GUILD	RANGE SIZE
Black Swan	<i>Cygnus atratus</i>	I	MIG	WET	STA	NA	NO	ducks&geese	VR
Mute Swan	<i>Cygnus olor</i>	I	MIG	WET	INC	LC	YES	ducks&geese	VR
Greylag Goose	<i>Anser anser</i>	I	MIG	WET	INC	LC	NO	ducks&geese	VR
Egyptian Goose	<i>Alopochen aegyptiaca</i>	I	MIG	WET	INC	NA	NO	ducks&geese	VR
Common Shelduck	<i>Tadorna tadorna</i>	N	MIG	WET	INC	THR	YES	ducks&geese	VR
Marbled Duck	<i>Marmaronetta angustirostris</i>	N	MIG	WET	STA	THR	YES	ducks&geese	VR
Red-crested Pochard	<i>Netta rufina</i>	N	MIG	WET	INC	THR	YES	ducks&geese	VR
Ferruginous Duck	<i>Aythya nyroca</i>	N	SED	WET	DEC	THR	YES	ducks&geese	VR
Tufted Duck	<i>Aythya fuligula</i>	N	MIG	WET	INC	THR	NO	ducks&geese	VR
Stock Dove	<i>Columba oenas</i>	N	MIG	FOR	INC	NA	NO	doves&pigeons	VR
Laughing Dove	<i>Spilopelia senegalensis</i>	N	MIG	AGR	STA	LC	NO	doves&pigeons	VR
Alpine Swift	<i>Tachymarptis melba</i>	N	MIG	GEN	INC	LC	NO	other	VR
Great Spotted Cuckoo	<i>Clamator glandarius</i>	N	MIG	AGR	INC	THR	NO	other	VR
Spotted Crake	<i>Porzana porzana</i>	N	MIG	WET	DEC	THR	YES	grebes&rails	VR
Little Crake	<i>Zapornia parva</i>	N	MIG	WET	INC	THR	YES	grebes&rails	VR
Glossy Ibis	<i>Plegadis falcinellus</i>	N	MIG	WET	INC	THR	YES	herons/egrets/ others	VR
Eurasian Dotterel	<i>Eudromias morinellus</i>	N	MIG	MON	DEC	NA	YES	medium/small waders	VR
Black-tailed Godwit	<i>Limosa limosa</i>	N	MIG	WET	DEC	THR	NO	medium/small waders	VR
Collared Pratincole	<i>Glareola pratincola</i>	N	MIG	WET	STA	THR	YES	medium/small waders	VR
White-winged Tern	<i>Chlidonias leucopterus</i>	N	MIG	WET	INC	NA	NO	seabirds	VR
Ural Owl	<i>Strix uralensis</i>	N	SED	FOR	STA	LC	YES	owls&nightjars	VR
Booted Eagle	<i>Hieraetus pennatus</i>	N	MIG	FOR	INC	NA	YES	birds of prey	VR
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	N	SED	GEN	INC	LC	YES	birds of prey	U
Red Kite	<i>Milvus milvus</i>	N	SED	FOR	STA	THR	YES	birds of prey	VR
Long-legged Buzzard	<i>Buteo rufinus</i>	N	MIG	GEN	INC	NA	YES	birds of prey	VR

Species overlooked by Italian research

Grey-headed Woodpecker	<i>Picus canus</i>	N	SED	FOR	STA	LC	YES	woodpeckers	VR
Eurasian Three-toed Woodpecker	<i>Picoides tridactylus</i>	N	SED	FOR	DEC	LC	YES	woodpeckers	VR
Willow Tit	<i>Poecile montanus</i>	N	SED	FOR	STA	LC	NO	passerines	VR
Melodious Warbler	<i>Hippolais polyglotta</i>	N	MIG	AGR	INC	LC	NO	passerines	U
Red-rumped Swallow	<i>Cecropis daurica</i>	N	MIG	AGR	INC	THR	NO	passerines	VR
Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>	N	SED	GEN	INC	LC	NO	passerines	U
Western Bonelli's Warbler	<i>Phylloscopus bonelli</i>	N	MIG	FOR	STA	LC	NO	passerines	R
Western Orphean Warbler	<i>Sylvia hortensis</i>	N	MIG	GEN	DEC	THR	NO	passerines	VR
Ashy-throat/ Vinous-throated parrotbill	<i>Sinosuthora webbiana/ alphonsiana</i>	I	SED	WET	INC	NA	NO	passerines	VR
Wallcreeper	<i>Tichodroma muraria</i>	N	SED	GEN	DEC	LC	NO	passerines	VR
Fieldfare	<i>Turdus pilaris</i>	N	MIG	GEN	DEC	LC	NO	passerines	VR
Ring Ouzel	<i>Turdus torquatus</i>	N	MIG	FOR	STA	LC	NO	passerines	VR
Collared Flycatcher	<i>Ficedula albicollis</i>	N	MIG	FOR	INC	LC	YES	passerines	VR
European Stonechat	<i>Saxicola torquatus</i>	N	SED	AGR	DEC	THR	NO	passerines	C
Common Firecrest	<i>Regulus ignicapilla</i>	N	MIG	FOR	DEC	LC	NO	passerines	U
Red Avadavat	<i>Amandava amandava</i>	I	SED	WET	DEC	NA	NO	passerines	VR
White Wagtail	<i>Motacilla alba</i>	N	MIG	AGR	STA	LC	NO	passerines	VC
Hawfinch	<i>Coccothraustes coccothraustes</i>	N	SED	FOR	STA	LC	NO	passerines	VR
Common Rosefinch	<i>Carpodacus erythrinus</i>	N	MIG	MON	INC	NA	NO	passerines	VR
Common Redpoll	<i>Acanthis flammea</i>	N	SED	GEN	DEC	THR	NO	passerines	VR
Red Crossbill	<i>Loxia curvirostra</i>	N	SED	FOR	STA	LC	NO	passerines	VR
Rock Bunting	<i>Emberiza cia</i>	N	SED	MON	STA	LC	NO	passerines	R

Table 2. The main attributes of the 47 zero species and their consistency by attribute. In bold the highest frequency class per attribute (mod. from Sarà 2023).

Species attribute	Factor coding	N	F%
Origin	N = native	41	87.23
	I = introduced	6	12.77
Phenology of breeding	MIG = mostly migrant	31	65.96
	SED = mostly sedentary	16	34.04
Main habitat occupied for breeding in Italy	AGR = agricultural area	6	12.77
	FOR = forest	13	27.66
	GEN = generalist,	8	17.02
	MON = mountain	3	6.38
	SEA = marine	0	0
	WET = wetlands	17	36.17
Population trend respect to the previous Atlas (1979-1992)	INC = increase	21	44.68
	STA = stable	14	29.79
	DEC = decline	12	25.53
Degree of threat according to the IUCN Red List of birds breeding in Italy	THR = Threatened (if assessed as CR, EN, VU)	16	34.04
	LC = Least concern (if assessed as NT, LC)	21	44.68
	NA = Not assessed (if assessed as NA or DD)	10	21.28
National interest relative to population management	P = protected (if species subject to national Action Plans and/or included in Annex 1 of the Birds Directive 2009/147/EC and/or protected by the national law on hunting L. 157/92)	18	38.30
	NP = Not protected (if it is not included in the previous category and allowed hunting for L.157/92).	29	61.70
Functional grouping	gamebird	0	0
	ducks/geese	9	19.15
	herons/egrets/storks/pelicans	1	2.13
	birds of prey	4	8.51
	seabirds	1	2.13
	doves/pigeons	2	4.26
	grebes/rails	2	4.26
	waders	3	6.38
	owls/nightjars	1	2.13
	crows	0	0
	other passerines	20	42.55
woodpeckers	2	4.26	
others	2	4.26	

	VR = Very Rare (1 < n UTM < 500)	39	82.98
	R = Rare (501 < n UTM < 1000)	2	4.26
Geographic range size	U = Uncommon (1001 < n UTM < 1500)	4	8.51
	C = Common (1501 < n UTM < 2000)	1	2.13
	VC = Very common (2001 < n UTM < 3500)	1	2.13

The reasons for this taxonomic bias follow those highlighted recently (Sarà 2023) for the entire group of 270 breeding species (Lardelli et al. 2022). Certainly the presence of small populations and/or very restricted ranges (e.g. Booted Eagle *Hieraetus pennatus*, Long-legged Buzzard *Buteo rufinus*, Laughing Dove *Spilopelia senegalensis*, Marbled Duck *Marmaronetta angustirostris*, Spotted Crake *Porzana porzana*, Little Crake *Zapornia parva*, Eurasian Dotterel *Charadrius morinellus*, in Tab. 1), makes it difficult to reach the study areas or collect a sufficient sample of data, and are therefore among the main reasons why these species have been neglected.

But, similarly to the Stonechat, there is a group of threatened species present with populations spread across vast sectors of Italy which would deserve a greater research effort aimed at their conservation. This is the case of at least four species of ducks (Red-crested Pochard *Netta rufina*, Ferruginous Duck *Aythya nyroca*, Tufted Duck *Aythya fuligula*, Common Shelduck *Tadorna tadorna*), the Common Redpoll *Acanthis flammea* or the Red Kite *Milvus milvus*.

The Common Redpoll would be a truly remarkable case study. It is an alpine species that nests in open woods and scrub up to the treeline on cool, moist slopes, and currently presents an altitudinal shift towards the valley floors (Ruggieri 2022). In a general scenario of altitudinal movements towards high altitudes induced by climate change (e.g. Parmesan 2006, Reif & Flousek 2012), the downward range expansion of the Common Redpoll is certainly a notable but not unique exception. It would be interesting to investigate the factors that cause this process in the populations of the Italian Alps. Downward shifts are in fact not unusual

random responses due to stochastic fluctuations in population distributions, but represent an indirect biotic response to both climate warming and habitat modification, often involving competitive release (Lenoir et al. 2010, Tellería 2020).

Just because a species has no indexed papers does not mean it has never been the subject of any study. In Italy there are several non-indexed national and regional journals that publish scientific articles more or less regularly, in addition to grey literature published outside the traditional editorial and distribution channels (Sarà 2023). Even if peer-to-peer review of articles and publication in indexed journals ensures a rigorous quality assessment process, solid scientific methods and results, the documents used to inform policies are not necessarily those published in renowned journals indexed or highly cited in academia, because this is not strictly necessary in terms of management and conservation policies and actions (Haddaway & Bayliss 2015). However, the poor communication between academic researchers and wildlife managers produces the so-called 'academia-management divide' (e.g. Shah et al. 2007, Arlettaz et al. 2010) limiting conservation progress and innovation (Greggor et al. 2016).

A good example of this situation is offered by the Red Kite, a zero species subject to local research which has reported only scattered results on annual wintering and breeding counts, or on a reintroduction project, often presented in local thematic conferences (e.g. Fulco et al. 2017 and references in Fulco 2022). Knowledge about this species is considerable but empirical, subjective, and many key issues critical to its conservation (e.g. factors influencing population trends and habitat preferences, wintering roosts

choice and dynamics, causes limiting populations, etc.) are simply listed without the use of the scientific method based on hypothesis testing. The conservation status of this species can only improve through clearly identified management needs and demonstrable impacts of the potential threats on the viability of populations. Not only in the case of the Red Kite, effective conservation action planning could only work best producing strong scientific evidence and through collaboration between academic researchers and wildlife managers (Greggor et al. 2016).

It is worth underlining that the fact of neglecting species and therefore the occurrence of zero species, is not an explicit desire of our scientific community, but it is a by-product of a phenomenon pervasive in all scientific literature; the so-called taxonomic chauvinism, whereby some animal groups or species are better and more studied than others (Bonnet et al. 2002), for reasons recently reviewed in Sarà (2023). Nonetheless we can consider the number of zero species as a quantitative indicator of the ornithological research investment in our country. In fact, if we take British ornithology as a point of comparison, one of the leading countries in this field, we see that the number of zero species is only 1.8% (4 out of 225, McKenzie & Robertson 2015), ten times less than in Italy. This in our country is certainly determined by the political world's disinterest in ecological research and by the limited research resources and jobs made available by national and regional agencies and bodies. All this translates into obvious logistical difficulties and above all into the poor transformation of university training courses into specialized and above all paid jobs. However, all this is changing, and today more than ever it is possible to combine a passion for birds with interests in research applied to environmental conservation. At least this is what the large turnout of young students and promising researchers present at the latest Italian ornithology congress (Varese, 5-9 September 2023) tells us. And to these new generations of ornithologists, I point out the message that the humble Stonechat gives us.

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