

The hybrid zone between the Pied Crow (*Corvus albus*) and the Somali Crow (*Corvus edithae*) in Eritrea

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Abstract - The genus *Corvus* includes some well-documented cases of hybridization between species. Hybrids are usually concentrated in narrow hybrid zones located along the borders of the parental species' ranges. However, the hybrid zone between the Somali Crow (*Corvus edithae*), an all-black endemic of the Horn of Africa, and the Pied Crow (*Corvus albus*), a conspicuously black-and-white species widespread across much of sub-Saharan Africa, has received little attention. Between 1999 and 2019, we conducted field observations in coastal and insular Eritrea, where both species are common, except in towns and large villages, from which they are largely excluded by the invasive House Crow (*Corvus splendens*). We recorded hybrids between Somali and Pied Crows at eight sites across a narrow area spanning over 300 km along the Danakil Desert coastline and on the Dahlak and Hawakil archipelagos of Eritrea. Additionally, we updated the known distribution of these hybrids in northeastern Africa by combining our field data with a review of scientific literature, as well as recent online photographs and reports from birdwatchers.

Key words: Eritrea, Horn of Africa, House Crow, hybrids, Pied Crow, Somali Crow.

Riassunto - La zona di ibridazione tra il corvo bianco e nero (*Corvus albus*) e il corvo di Somalia (*Corvus edithae*) in Eritrea.

Il genere *Corvus* include alcuni casi ben documentati di ibridazione tra specie. Gli ibridi sono generalmente concentrati in zone di ibridazione ristrette situate lungo i confini degli areali delle specie parentali. Tuttavia, la zona di ibridazione tra il corvo di Somalia (*Corvus edithae*), una specie tutta nera endemica del Corno d'Africa, e il corvo bianco e nero (*Corvus albus*), una specie vistosamente bicolore diffusa in gran parte dell'Africa subsahariana, ha ricevuto relativamente poca attenzione. Tra il 1999 e il 2019, abbiamo condotto osservazioni sul campo nella zona costiera e insulare dell'Eritrea, dove entrambe le specie sono comuni, tranne che nelle città e nei villaggi più grandi, da cui sono in gran parte esclusi dall'invasiva cornacchia delle case (*Corvus splendens*). Abbiamo osservato ibridi tra il corvo di Somalia e il corvo bianco e nero in otto località situate in una zona ristretta che si estende per oltre 300 km lungo la costa del Deserto della Dancalia e negli arcipelaghi delle Dahlak e delle

Hawakil in Eritrea. Inoltre, abbiamo aggiornato la distribuzione conosciuta di questi ibridi in Africa nordorientale combinando i nostri dati di campo con una revisione della letteratura scientifica e con fotografie e rapporti recenti di birdwatcher disponibili online.

Parole chiave: Corno d'Africa, cornacchia delle case, corvo bianco e nero, corvo di Somalia, Eritrea, ibridi.

INTRODUCTION

Hybridization, the interbreeding of different species, is relatively common in birds, with hybrids documented in 10-20% of avian species (Ottenburghs, 2023). Hybrid zones are particularly informative: these are areas where genetically differentiated populations meet and interbreed, providing natural laboratories for studying speciation, gene flow, and reproductive isolation (Gompert *et al.*, 2017). Among birds, some of the most thoroughly investigated hybrid zones involve members of the genus *Corvus* (Kryukov, 2019). In some cases, hybridizing populations within these zones can be distinguished by their plumage. For example, the Carrion Crow (*Corvus corone*) and the Hooded Crow (*Corvus cornix*) in Eurasia are easily identifiable by their distinct pied and all-black plumage patterns (Kryukov, 2019). However, recent studies have shown that genetic introgression can extend well beyond the geographic limits of visibly intermediate individuals. Although the hybrid zone between Carrion and Hooded Crows in western Europe is relatively narrow, genetic introgression spreads across a much wider area (Poelstra *et al.*, 2014).

A seemingly similar, though far less studied, hybrid zone exists between two African species: the Somali Crow (*Corvus edithae*) and the Pied Crow (*Corvus albus*). The Somali Crow is restricted to parts of the Horn of Africa, while the Pied Crow is broadly distributed across sub-Saharan Africa, from the Sahel to South Africa and Madagascar (Madge & Burn, 1999). Although initially described as a distinct species (Lort Phillips, 1895), the Somali Crow was later considered a subspecies of either the Northern Raven (*C. corax*) (Meinertzhagen, 1926) or of the Brown-necked Raven (*C. ruficollis*) (Mayr & Greenway, 1962) due to similarities in plumage. However, remarkable differences in size and behavior suggested instead a close relationship with the Pied Crow, leading to the reinstatement of the Somali Crow as a separate species (Blair, 1961; North, 1962; Londei, 1995, 2005). This taxonomic opinion was later supported by molecular data, which confirmed that the

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Somali Crow is genetically distinct from the Brown-necked Raven and more closely related to the Pied Crow (Jønsson *et al.*, 2012).

Initially, the existence of hybrids was not recognized. Three individuals collected in 1824 near Massawa (Eritrea) during the expedition of Hemprich and Ehrenberg, and now kept in Heine's collection in Berlin, were described as a new species (*Corvus phaeocephalus*) by Cabanis in 1851 (Steinheimer, 2009). Later, Zedlitz (1911) interpreted an oddly colored crow from Dahlak Kebir Island (Dahlak Archipelago, Eritrea) as a molting Pied Crow. It was primarily through the work of Blair (1961), who studied corvids in south-eastern Ethiopia, that the hybrid nature of such intermediate specimens became evident. According to Poelstra *et al.* (2014: Supplementary Figure S1B), these crows may have an intermediate position between a polymorphic species and two almost completely isolated species, although the direction of their evolution is still to be ascertained.

Although knowledge of the contact zone between the Pied Crow and the Somali Crow has gradually expanded since the 1960s (Alarmogod, 1987; Ash & Atkins, 2009), extensive areas of their potential overlap, particularly in Eritrea and Somalia, have remained largely unexplored due to prolonged political instability. However, following Eritrea's independence from Ethiopia in 1993, access to many coastal and island regions has improved, enabling us to investigate the contact zone between the Somali Crow and the Pied Crow, and to assess the presence and distribution of hybrids in this part of the Horn of Africa. In addition, we aimed to update the distribution of hybrids across other areas of contact between the two species in eastern Africa, providing a broader perspective on the extent of hybridization within the region.

METHODS

Most of the data on the distribution of Pied and Somali Crows in the Danakil region of Eritrea, and particularly on the presence of their hybrids, were collected during two field surveys conducted in November 2005 and January 2006. Additional records from the Dahlak archipelago were gathered opportunistically between 1999 and 2008, with one further observation in 2019. Hybrids were identified by their plumage patterns, intermediate between the two parental species (Fig. 1). The number of House Crows (*Corvus splendens*) present in each of four large human settlements was estimated at between a few dozen and a few hundred. However, for simplicity, their abundance was standardized to 40 individuals per settlement in Fig. 2. The extent of each settlement where crows were observed was measured using the polygon tool of Google Earth[®], delineating the smallest concave polygon encompassing all visible buildings.

To review the known hybrid sites, we examined both published scientific literature and birdwatcher reports, including photographs shared online. A map illustrating the distribution of Pied and Somali Crows, as well as their areas of overlap (Fig. 3), was generated using the GIS software QGIS (QGIS.org, 2023). This map was drawn starting from gridded data at a 1-degree resolution for Sudan (Nikolaus, 1987), 0.5-degree resolution for Ethiopia and Eritrea (Ash & Atkins, 2009), and Somalia (Ash & Miskell, 1998). For Kenya, data were obtained from the African Bird Atlas Project (2025). Uganda, which remains comprehensively

under-surveyed, was assumed to be entirely inhabited by Pied Crows, consistent with Stevenson & Fanshawe (2020). Additional records on the presence of the Pied Crow in the Danakil area of Ethiopia came from Alembhrhan Assefa (*in litteris*), who studied birds at refuse dumps (Tesfahunegn & Assefa, 2023). Locations where hybrids were observed were plotted as discrete points on the map, except for the broader hybrid zones described in Blair (1961) and Alamargot (1987), which were georeferenced and mapped (Fig. 3) using QGIS.

RESULTS

Our findings indicate that both Pied and Somali Crows are widespread along the coast of southern Eritrea, often in close association with human dwellings. However, they are also present on tiny, uninhabited islands, typically as single pairs (Fig. 2). For instance, a breeding pair of Pied Crows was observed on the uninhabited Madote Island (15.5795, 39.7629), which measures just 0.04 km². In contrast, the two species were absent from the largest surveyed towns and villages, all with areas exceeding 0.5 km² (Massawa, Foro, Thiò, and Assab), where large flocks of House Crows appeared to dominate (Fig. 2). On 8 January 2006, we observed a flock of House Crows relentlessly mobbing three Pied Crows on the outskirts of the large village of Foro.

The zone of sympatry of the two species and their hybrids extends across a narrow 300 km stretch of land between Entufash Island (Dahlak Archipelago), in the north, and Edd (Danakil coast), in the south. Hybrids between the two species were observed in eight locations, both along the mainland coast and on islands (Fig. 2, Tab. 1).

At a broader regional scale, reports of hybrids have been documented in four countries (Fig. 3):

- Eritrea: Dahlak Kebir island (15.612, 40.014) (Zedlitz, 1911; Londei, 2005; De Marchi *et al.*, 2009); Ghelalo, (15.122, 40.068) (Renzulli, 2022); Hirhigo (15.538 39.452) (Steinheimer, 2009); Thio (14.691 40.959) (Smith, 1955; Ash & Atkins, 2009).
- Ethiopia: Adama (8.527, 39.267) (Londei, 1995; Geremew, 2022); around Alemaya (9.337, 42.206) (Blair, 1961; Ash & Atkins, 2009); around Sagure (7.815, 39.124) (Friedmann, 1937; Alamargot, 1987; Londei, 1995; Ash & Atkins, 2009); around Goba (7.029, 39.967) (Blair, 1961; Ash & Atkins, 2009); Jijiga (9.351, 42.809) (Ash & Atkins, 2009); 20 km south of K'och'ara (9.153, 43.135) (Ash & Atkins, 2009); around Mount Gugu (8.564, 40.206) (Blair, 1961; Ash & Atkins, 2009); around Negelle (5.333, 39.567) (Alamargot, 1987); around Sude-Robi and Galama Mountains (and Dangasela near Alagido) (8.007, 39.531) (Kleinschmidt, 1906; Blair, 1961; Ash & Atkins, 2009); Dodola (6.967, 39.183) (Londei, 1995).
- Somalia: Baraawe (1.1160, 44.0300) (Ash & Miskell, 1998); Jazeera (1.9500, 45.1810) (Ash & Miskell, 1998); Muqdisho (2.06, 45.30) (Ash & Miskell, 1998); Gerisa (10.6039, 43.4346) (Redman, 2012); Ruqi (9.9711, 43.4284) (Abdi, 2019), Tog Wajaale (9.601, 43.333) (Ash & Miskell, 1998; Mills *et al.*, 2015; Ash & Atkins, 2009).
- South Sudan: Jebel Kathangor (5.741, 33.995) (Nikolaus, 1987).

We did not find any evidence that hybrids were ever observed in southern Ethiopia, northern Kenya, and parts of northeastern Somalia (Fig. 3).



Fig. 1 – Three hybrids photographed on Dahlak Kebir Island (top, between two individuals featuring parental phenotypes), in the village of Alula on the Danakil coast (center), and on Dur Ghella Island (bottom). / Tre ibridi fotografati sull'isola di Dahlak Kebir (in alto, tra due individui con fenotipi parentali), nel villaggio di Alula sulla costa della Dancalia (al centro) e sull'isola di Dur Ghella (in basso).

Tab. 1 – Localities in Eritrea where hybrids of Somali Crow and Pied Crow were observed between 1999 and 2008 (numbers as in Fig. 2). / Località in Eritrea dove sono stati osservati ibridi tra il corvo di Somalia e il corvo bianco e nero tra il 1999 e il 2008 (numeri come in Fig. 2).

#	Locality	Date	Latitude	Longitude	Somali Crow	Pied Crow	Hybrids
1	Entufash Island	06/03/2004	16.0463	39.7666	0	1	1
3	Dur Ghella Island	29/11/2008	15.7766	39.7962	0	1	1
5	Dahlak Kebir Island (military base)	18/03/2006	15.7316	39.9474	4	4	4
9	Shumma Island	00/00/1999	15.5380	39.9956	0	1	1
11	Rakh Howtha Island	05/01/2004	15.2716	40.1009	0	1	1
13	Dase Island	05/01/2004	15.2406	40.1266	0	2	2
21	Aluli	06/01/2006	14.9881	40.4191	10	5	5
25	Edd	01/11/2005	13.9300	41.6894	12	1	1

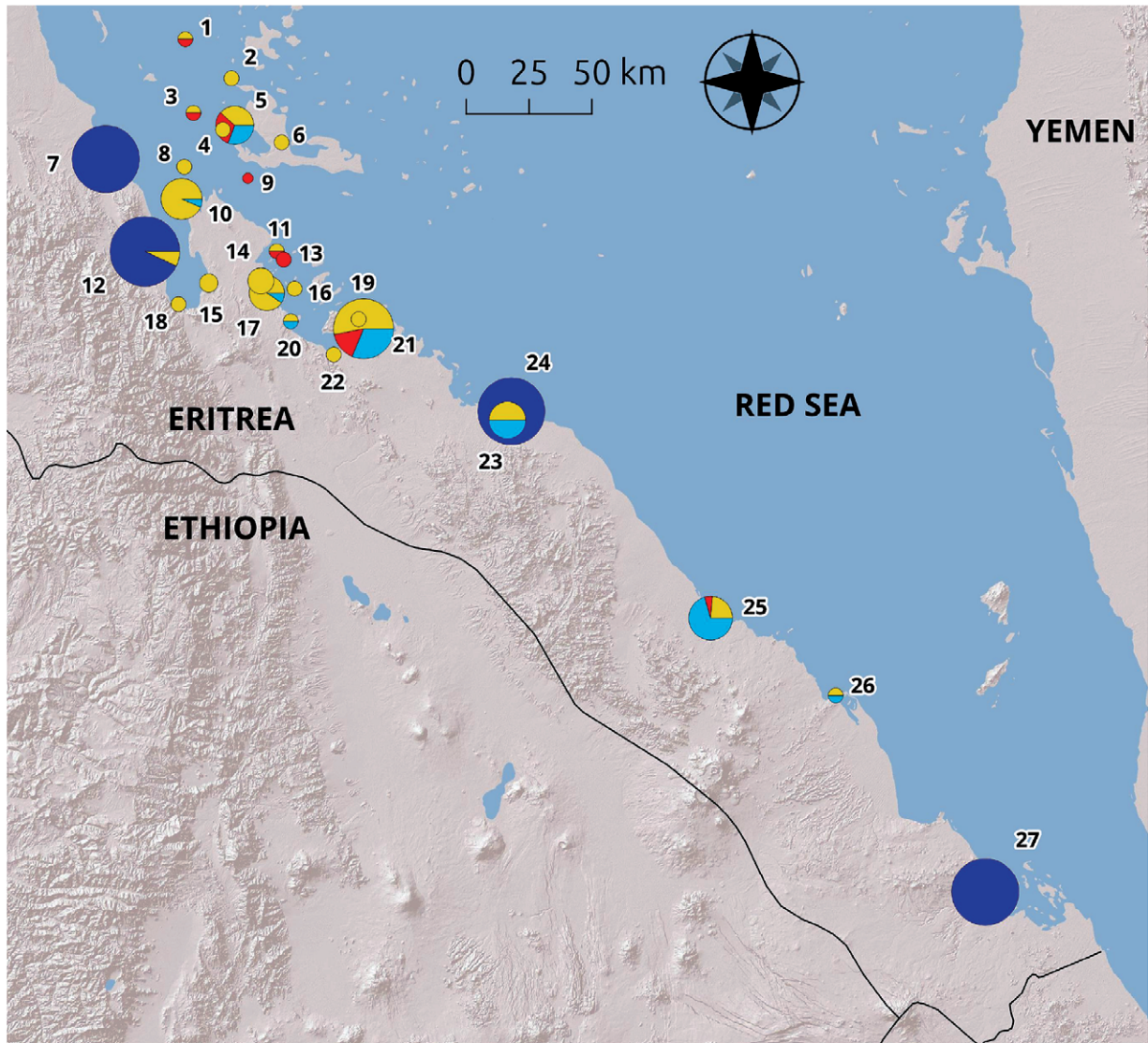


Fig. 2 – New records (between 1999 and 2019) of House, Somali, Pied Crows, and hybrids between Somali and Pied Crows. N.B. This map is not an authority on international borders. / Nuovi record (tra il 1999 e il 2019) di cornacchia delle case, corvo di Somalia, corvo bianco e nero e di ibridi tra corvo di Somalia e corvo bianco e nero. N.B. Questa mappa non è un'autorità in materia di confini internazionali.
 ■ Pied Crow; ■ Somali Crow; ■ Hybrids; ■ House Crow. / ■ Corvo bianco e nero; ■ corvo di Somalia; ■ ibridi; ■ cornacchia delle case.
 1. Entufash Island; 2. Dar Ottun Island; 3. Dur Ghella Island; 4. Entedebir Island; 5. Dahlak Kebir Island (military base); 6. Dahlak Kebir Island (Du Bellu village); 7. Massawa Island; 8. Madote Island; 9. Shumma Island; 10. Dissei Island; 11. Rakh Howtha Island; 12. Foro; 13. Dase Island; 14. Boholo; 15. Abdur; 16. Dahaila Seghir Island; 17. Gallalho. 18. Irafale; 19. Abbaguba Island; 20. Akelo; 21. Aluli; 22. Mersa Fatima; 23. Checkpoint of Thio; 24. Thio; 25. Edd; 26. Barasole; 27. Assab.

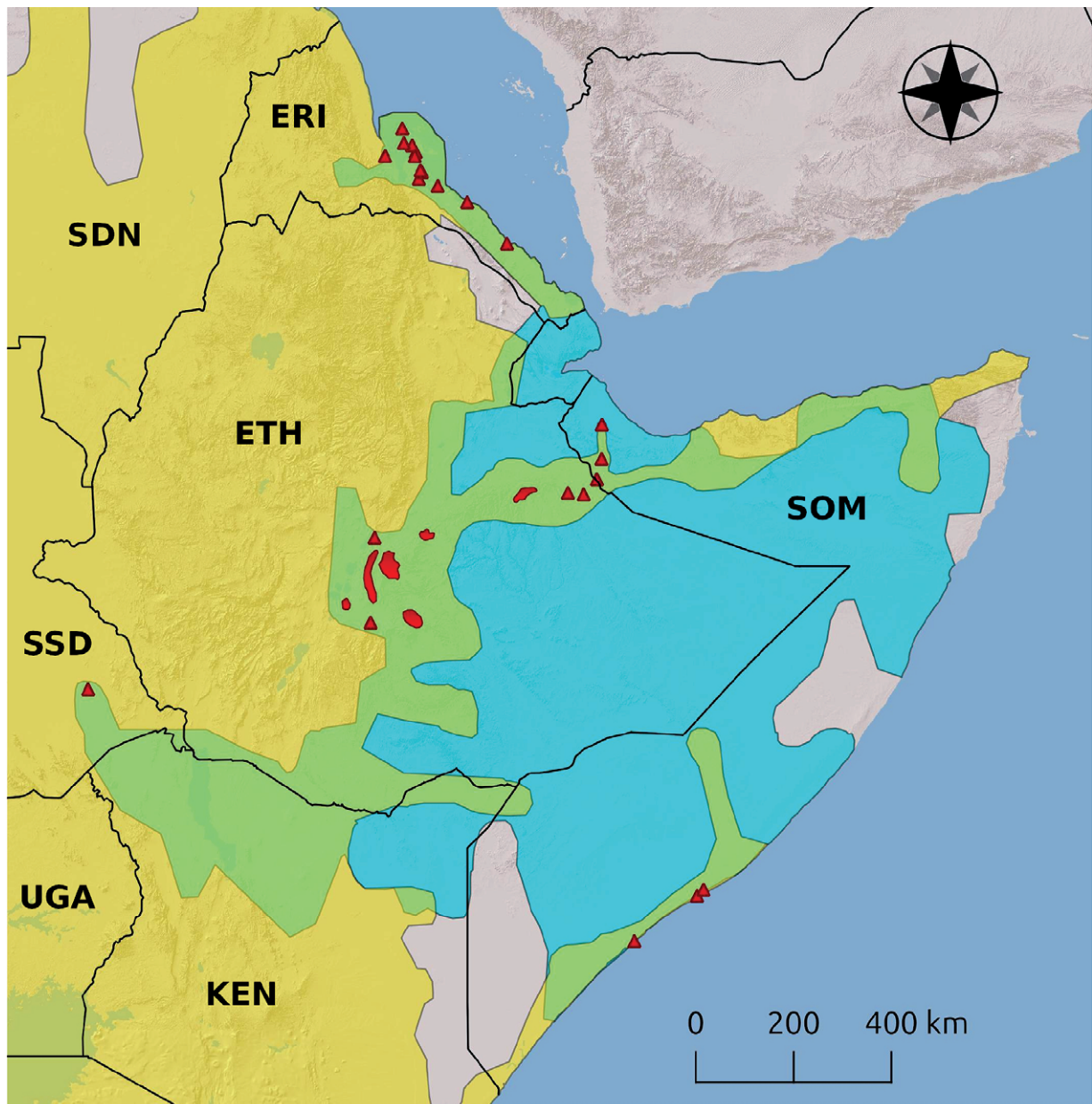


Fig. 3 – Distribution of Pied Crow, Somali Crow, and areas of sympatry of the two species. Red triangles are single localities with hybrids, while red polygons are extended areas of presence of hybrids as recorded by Blair (1961) and Alarmogod (1987). N.B. This map is not an authority on international borders. / Distribuzione del corvo bianco e nero, del corvo della Somalia e aree di simpatria delle due specie. I triangoli rossi indicano singole località di presenza degli ibridi, mentre i poligoni rossi sono aree estese di presenza degli ibridi come riportato da Blair (1961) e Alarmogod (1987). N.B. Questa mappa non è un'autorità in materia di confini internazionali.

■ Pied Crow; ■ Somali Crow; ■ Hybrids; ■ Area of sympatry. / ■ Corvo bianco e nero; ■ corvo di Somalia; ■ ibridi; ■ area di simpatria.

DISCUSSION AND CONCLUSIONS

Our observations of hybrids between Pied and Somali Crows across eight sites spanning over 300 km (Fig. 2) indicate that hybridization in Eritrea is more widespread than previously suggested. Earlier reports were restricted to just four locations: Hirghigo (Steinheimer, 2009), Dahlak Kebir Island (Zedlitz, 1911; Londei, 2005; De Marchi *et al.*, 2009), Thio (Smith, 1955), and Ghelalo (Renzulli, 2022). The proportion of hybrids varies markedly between sites: for instance, both crows on Dase Island, in the Hawakil Bay, were hybrids, while in Edd, along the Danakil coast, only

one out of 17 was a clear morphological hybrid. Unfortunately, the limited sample size precludes any statistical analyses of potential factors influencing the frequency of hybrids, such as insularity or settlement size.

The presence of a large crow population on Dahlak Kebir Island (Londei, 2005; De Marchi *et al.*, 2009) and of only isolated pairs on small islands of the Dahlak archipelago suggests that the large Dahlak Kebir Island (660 km²), with its several villages, might serve as a source population for the colonization of nearby smaller islands. Moreover, the Shumma and Assarca Islands, situated

between Dahlak Kebir Island and the mainland (Buri Peninsula), would act as “stepping stones”, reducing the longest non-stop flight to only about 6 km as the crows fly, potentially facilitating gene flow between coastal and island populations.

Unlike the well-documented stability of the hybrid zone between Hooded and Carrion Crows in Europe (Poelstra *et al.*, 2014), comparable long-term data are lacking for Eritrea. Smith’s observation (1957) that Somali Crows were absent along the coast north of Thio suggests that this species has expanded its range northward by over 100 km in fifty years (Fig. 2). However, the earlier collection of three hybrids made in 1824 by Hemprich and Ehrenberg in Hirhigo, a village situated about 7 km south of Massawa, suggests otherwise. Our data might represent the starting point for further surveys aimed at clarifying whether any major range variation is occurring in the two hybridizing species. Certainly, a significant change has been produced by the allochthonous House Crow, which has now colonized all settlements larger than 0.5 km² along the coast of Eritrea (Fig. 2).

The House Crow is an invasive species native to peninsular India and nearby regions. This species was released in Aden, on the southern coast of Yemen, in the 1840s (Jennings, 2010) and in 1891 on the island of Zanzibar, at that time a British protectorate, to help eliminate organic waste (Long, 1981). Later, the species spread via maritime routes along the coasts of East Africa, the Persian Gulf, and the Red Sea (Jennings, 2010). In Eritrea, House Crows were first recorded in Massawa in 1968 (Ash & Atkins, 2009). Our observation of three Pied Crows being aggressively chased by a flock of House Crows on the outskirts of Foro suggests that the rarity or absence of Pied and Somali Crows in larger settlements may be due to active exclusion through aggressive social behavior rather than to indirect competition for resources. Indeed, House Crows are known to have a strong negative impact on local bird communities (Ryall, 1992).

Our review shows that hybrids have been reported in most regions of the Horn of Africa, except in much of Somalia, likely due to a lack of recent fieldwork caused by political instability, as well as in southern Ethiopia and northern Kenya (Fig. 3). The absence of hybrids in northern Kenya (Fig. 3) may support the hypothesis of Londei (2008) that Pied and Somali Crows do not hybridize shortly after contact, possibly due to differences in plumage and behaviour. Indeed, the range expansion of Pied Crows to northern Kenya is recent (Londei, 2008), coinciding with the establishment of permanent settlements and waste dumps providing abundant food. In contrast, some coastal and island settlements in Eritrea have been continuously inhabited for centuries, and hybrids were observed as early as 1824 (Steinheimer, 2009).

The relatively small zones of sympatry between the two species in central Ethiopia and in Eritrea may result from plumage differences that limit interbreeding through assortative mating, as suggested by Londei (2005) for Dahlak Kebir Island.

A limitation of our study is the likelihood that many hybrids go undetected when the differences between the hybrid plumage and those of the parental species are negligible. As a result, hybrids may be present even outside

the morphological hybrid zones, as demonstrated in the case of Carrion and Hooded Crows (Poelstra *et al.*, 2014).

In summary, our observations expand the known extent of hybridization between Pied and Somali Crows in the Horn of Africa and bordering areas, revealing a more complex and geographically widespread pattern than previously recognized. The discovery of hybrids at multiple new sites underscores the dynamic nature of the contact zone and highlights the need for continued and systematic monitoring. The apparent variation in hybrid frequency across sites and the potential competitive exclusion by invasive House Crows all point to a multifactorial system worthy of manifold investigation. Combining genetic analyses with broader geographical sampling, behavioral observations, and long-term monitoring will be essential to elucidate the mechanisms governing this hybrid zone’s dynamics and species distributions. In the broader context, the Eritrean case offers a valuable opportunity to understand how hybridization and invasive synanthropic species interact to shape avian biodiversity in the Horn of Africa.

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REFERENCES

- Abdi A., 2019 – Pied x Somali Crow (hybrid) (photo). <<https://macaulaylibrary.org/asset/171240531>>
- African Bird Atlas Project, 2025 – <www.birdmap.africa/>
- Alamargot J., 1987 – Pied crows *Corvus albus* with atypical plumage. *Walia*, 10: 7-12.
- Ash, J. & Atkins J., 2009 – Birds of Ethiopia and Eritrea: an atlas of distribution. London: *A&C Black*.
- Ash J. & Miskell J., 1998 – Birds of Somalia. Mountfield: *Pica Press*.
- Blair C. M. G., 1961 – Hybridization of *Corvus albus* and *Corvus edithae* in Ethiopia. *Ibis*, 103: 499-502.
- De Marchi G., Chiozzi G. & Semere D., 2009 – Wings over the Red Sea: the birds of the Eritrean islands. *Natura*, 99: 1-128.
- Friedmann H., 1937 – Birds collected by the Childs Frick expedition to Ethiopia and Kenya colony. Part 2 - Passeres. Washington: *Smithsonian Institution*.
- Geremew A., 2022 – Corvo Bianco e Nero *Corvus albus* (photo). <www.inaturalist.org/observations/130531277>
- Gompert Z., Mandeville E. G. & Buerkle C. A., 2017 – Analysis of population genomic data from hybrid zones. *Annual Review of Ecology, Evolution, and Systematics*, 48: 207-229.
- Jennings M. C., 2010 – Fauna of Arabia, vol. 25. King Abdulaziz City for Science and Technology, Riyadh, Kingdom of Saudi Arabia; *Saudi Wildlife Commission, Riyadh; and Senckenburg Forschungsinstitut und Naturmuseum, Frankfurt*.
- Jönsson K. A., Fabre P. H. & Irestedt M., 2012 – Brains, tools, innovation and biogeography in crows and ravens. *BMC Evolutionary Biology*, 12: 1-12.
- Kleinschmidt O., 1906 – Beiträge zur Vogelfauna Nordostafrikas mit besonderer Berücksichtigung der Zoogeographie. *Journal für Ornithologie*, 54: 78-99.

- Kryukov A. P., 2019 – Phylogeography and hybridization of corvid birds in the Palearctic Region. *Vavilov Journal of Genetics and Breeding*, 23: 232-238.
- Londei T., 1995 – Field notes on corvids in Ethiopia. *Bulletin of the British Ornithologist's Club*, 115: 164-166.
- Londei T., 2005 – The hybrid population of Pied Crow *Corvus albus* and Somali Crow *C. edithae* on Dahlak Kebir Island, Eritrea: a case of assortative mating? *Bulletin of the African Bird Club*, 12: 37-39, 98 (corrigenda).
- Londei T., 2008 – The Pied Crow *Corvus albus* and Somali Crow *Corvus edithae* do not hybridise as soon as they meet. *Scopus*, 27: 1-5.
- Lort Phillips E., 1895 – *Bulletin of the British Ornithologist's Club*, 4: 36.
- Madge S. & Burn H., 1999 – Helm identification guide: crows & jays. London: *Christopher Helm, A&C Black*.
- Mayr E. & Greeway J. C., 1962 – Check-list of birds of the world. A continuation of the work of James L. Peters. Cambridge: *Museum of Comparative Zoology*.
- Meinertzhagen R., 1926 – Introduction to a review of the genus *Corvus*. *Novitates Zoologicae*, 33: 57-121.
- Mills M. S., Cohen C., Francis J. & Spottiswoode C. N., 2015 – A survey for the Critically Endangered Liben Lark *Heteromirafra archeri* in Somaliland, north-western Somalia. *Ostrich*, 86: 291-294.
- Nikolaus G., 1987 – Distribution atlas of Sudan's birds with notes on habitat and status. *Bonner zoologische Monographien*, 25: 1-322.
- North M. E. W., 1962 – Vocal affinities of *Corvus corax edithae*, “Dwarf Raven” or “Somali Crow”? *Ibis*, 104: 431.
- Ottenburghs J., 2023 – How common is hybridization in birds? *Journal of Ornithology*, 164: 913-920.
- Poelstra J. W., Vijay N., Bossu C. M., Lantz H., Ryll B., Müller I., Baglione V., Unneberg P., Wikelski M., Grabherr M. G. & Wolf J. B. W., 2014 – The genomic landscape underlying phenotypic integrity in the face of gene flow in crows. *Science*, 344: 1410-1414.
- QGIS.org, 2023 – QGIS Geographic Information System. QGIS Association. <<http://www.qgis.org>>
- Redman N., 2012 – Birdquest tour report: Djibouti & Somaliland 2012. <[www.birdquest-tours.com/wp-content/uploads/2019/06/SOMALI LAND-REP-12-ebook.pdf](http://www.birdquest-tours.com/wp-content/uploads/2019/06/SOMALI-LAND-REP-12-ebook.pdf)>
- Renzulli T., 2022 – Recent noteworthy bird records from Eritrea. *Bulletin of the African Bird Club*, 29: 58-62.
- Ryall C., 1992 – Predation and harassment of native bird species by the Indian House Crow *Corvus splendens*, in Mombasa, Kenya. *Scopus*, 16: 1-8.
- Smith K. D., 1955 – The winter breeding season of land-birds in eastern Eritrea. *Ibis*, 97: 480-507.
- Smith K. D., 1957 – An annotated check list of the birds of Eritrea. *Ibis*, 99: 307-337.
- Steinheimer F. D., 2009 – The type specimens of Corvidae (Aves) in the Museum für Naturkunde at the Humboldt-University of Berlin, with the description of a new subspecies of *Dendrocitta vagabunda*. *Zootaxa*, 2149: 1-49.
- Stevenson T. & Fanshawe J., 2020 – Field guide to the birds of East Africa: Kenya, Tanzania, Uganda, Rwanda, Burundi. London: *Bloomsbury Publishing*.
- Tesfahunegn W. & Assefa A., 2023 – Diversity and abundance of birds in dumpsites of Afar region, Ethiopia: implication for conservation. *BMC Zoology*, 8: 16.
- Zedlitz O. G., 1911 – Meine ornithologische Ausbeute in Nordost-Afrika. *Journal für Ornithologie*, 59: 1-93.