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## The pet trade as a source of introduction for the invasive common myna (*Acridotheres tristis*) and the protected common hill myna (*Gracula religiosa*) into Algeria

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### Abstract

Biological invasions are a major driver of global changes with extensive impacts on evolutionary processes. One of the 100 worst invasive species in the world is the Common myna (*Acridotheres tristis*), known to have negative effects on native avian biodiversity. We report on the presence of the Common myna and the Common Hill myna (*Gracula religiosa*) in Algeria and the causes of their introduction. These findings are discussed in the light of recent trends in the local pet trade that is driving some local species to near-extinction and favouring the introduction of alien birds.

### Keywords

Biological invasions, bird trade, biodiversity conservation, eradication, species introduction, pets

## Le commerce des animaux comme moyen d'introduction de l'espèce invasive Martin triste (*Acridotheres tristis*) et de l'espèce protégée Myna des collines (*Gracula religiosa*) en Algérie

### Résumé

La conservation de la biodiversité est gravement compromise par la pression croissante des changements globaux tels que le réchauffement climatique, la pollution, la perte et la dégradation des écosystèmes, ainsi que par la prolifération d'espèces invasives, entre autres facteurs. Parmi ces éléments, les invasions biologiques exercent une influence significative sur les processus évolutifs.

La capture et la vente d'oiseaux sauvages se sont transformées en une industrie lucrative à l'échelle mondiale, et l'Algérie ne fait pas exception. Cette expansion de ce marché dans le pays est principalement due à la situation socio-économique précaire de la population, qui trouve dans la vente d'oiseaux sauvages ou domestiques un moyen de subsistance. Cependant, ce commerce illicite, bien que toléré par les autorités, a des répercussions néfastes, notamment la vente d'espèces protégées par la législation nationale ou des conventions internationales, et la propagation d'espèces invasives mettant en péril les espèces autochtones. Les espèces invasives peuvent entraîner l'extinction ou l'hybridation des espèces indigènes, l'introduction de pathogènes et des perturbations profondes au sein des écosystèmes.

L'un des 100 pires envahisseurs au monde est le Martin triste (*Acridotheres tristis*), réputé pour ses effets néfastes sur la biodiversité aviaire indigène. Originaire d'Asie centrale et méridionale, le Martin triste est une espèce omnivore (insectes, fruits) reconnue et appréciée pour sa capacité à imiter les voix humaines. Cette espèce a été introduite ou s'est échappée de captivité dans diverses parties du monde.

Dans cet article, nous mettons en évidence la présence du Martin triste et du Myna des collines (*Gracula religiosa*) en

## Mots-clés

Algérie, tout en discutant des causes de leur introduction. Ces découvertes sont analysées à la lumière des tendances récentes du commerce local d'animaux de compagnie, qui poussent certaines espèces locales au bord de l'extinction et favorise l'introduction d'oiseaux exotiques.

Invasions biologiques, commerce d'oiseaux, conservation de la biodiversité, éradication, introduction d'espèces, animaux de compagnie

## Introduction

Conserving biodiversity is a critical challenge that requires understanding the complex interactions between human societies and the natural world (MARTIN-LOPEZ & MONTES, 2014; JOHNSON *et al.*, 2017). It is important to take into account cultural and socioeconomic factors that could affect how people view and interact with biodiversity (KINZIG *et al.*, 2005; CLARK *et al.*, 2014; AOUADI *et al.*, 2021). In this context, the examples of illegal killing and taking of wild birds for consumption or companionship illustrate the complex relationship between culture, socio-economics, and biodiversity conservation (PIRES, 2012; BAIRLEIN, 2016; BROCHET *et al.*, 2016).

The capture and sale of wild birds for the pet trade is a lucrative industry in many parts of the world (BUSH *et al.*, 2014), and Algeria is no exception (BERGIN *et al.*, 2019; RAZKALLAH *et al.*, 2019). Throughout the country, particularly in areas of socio-economic hardship where job opportunities are scarce and unemployment is soaring, many people capture and/or sell wild birds out of economic necessity. Additionally, the high prices paid for some species, such as the European goldfinch *Carduelis carduelis*, can provide a significant source of income for those who capture and sell them (LOUADJ *et al.*, 2022). However, this popular practice can have serious impacts on biodiversity, including the depletion of local bird populations which can have a cascading effect on other species and ecosystems (ŞEKERCIOĞLU *et al.*, 2004; CLAVERO *et al.*, 2009)), the introduction of invasive species which can displace native species (FRITTS & RODDA, 1998; THIBAULT *et al.*, 2018), and the spread of diseases (CHINCHIO *et al.*, 2020; FOSTER *et al.*, 2021).

There has been an increased recognition that more attention needs to be paid to the negative effects of biotic invasions (MACK *et al.*, 2000). As a major component of global changes, ecological invasions pose major challenges to the conservation of biodiversity because invasive alien species are a potential threat to native species and natural resources (WILCOVE *et al.*, 1998; SIMBERLOFF *et al.*, 2013). Invasive species may successfully become established in natural habitats by extirpating or displacing indigenous species and causing irreversible alteration to ecosystems (PIMENTEL *et al.*, 2000). Introduced species may also act as vectors or reservoirs of pathogens (CROWL *et al.*, 2008) or lead to genetic pollution by hybridizing with native species (RHYMER & SIMBERLOFF, 1996, MUÑOZ-FUENTES *et al.*, 2007). For all their adverse environmental impacts and economic costs, biological invasions are now perceived as a serious threat to global sustainability (ZAVALETÀ *et al.*, 2001; RAI & SINGH, 2020).

Originating from central and southern Asia, mainly tropical and subtropical latitudes (CRAMP & PERRINS, 1994), the common myna (*Acridotheres tristis*) is an omnivorous bird whose diet may include insects, cereal crops and commercial or not fruits (NARANG & LAMBA, 1984; GOODMAN *et al.*, 2017). The species was introduced to Mauritius and La Réunion from India and the Phillipines as early as 1762 (MOUTIA & MAMET, 1946) and from the Mascarene Islands to Madagascar in 1875 (DECARY, 1962) as an instrument of oeconomic management to mitigate locust (*Nomadacris septemfasciata*) infestations that were devastating crops (LEVER, 2005; STOCKLAND, 2014).

So far, the common myna is known to be common in the western Indian Ocean (GOODMAN *et al.*, 2017) and to have reached various parts of the world (CRAMP & PERRINS, 1994; MARTIN, 1996; PEACOCK *et al.*, 2007). It has been introduced to Hong Kong, Japan, Australia, many European countries, Turkey, the Middle East, South Africa, and North America (LEVER, 2005; HOLZAPFEL *et al.*, 2006; PER, 2022). Most importantly, it is listed as one of the 100 worst invasive species in the world (LUQUE *et al.*, 2014) for its negative impacts on native bird species (CANNING, 2011; FEAR & CRAIG, 1998; NARANG & LAMBA, 1984).

Another myna that has been introduced to many parts of the world is the common hill myna, *Gracula religiosa*, a mainly frugivorous bird of moist forests of southeast Asia and a popular pet bird (FEAR & CRAIG, 1998). Its mimicry skills, especially its ability to imitate human speech, has given rise to a cagebird industry based on wild-caught and captive-bred birds (BERTRAM, 1969; ARCHAWARANON, 2005). This fervour and loss of habitats have threatened the species in parts of its range (EATON *et al.*, 2015). Although listed as Least Concern (LC) in the IUCN Red List because of the extent of its range, the population is assessed as decreasing (BIRDLIFE INTERNATIONAL, 2022), and, since 1997, the species is listed in CITES' Appendix II.

To our knowledge, there are no previous reports of the presence of the common myna or the common hill myna in the Maghreb. This study investigates the causes of the introduction of these two species into Algeria.

## Methods

In late January 2022, we came across an unusual sighting: a loud but unfamiliar bird that was foraging in a public garden on the outskirts of Annaba, north-eastern Algeria (36.92019 N, 7.74350 E). Further investigations led to the discovery of pair of common myna that were

free-ranging but nesting in a nest box installed on the window of an appartement (Fig. 1a-b).

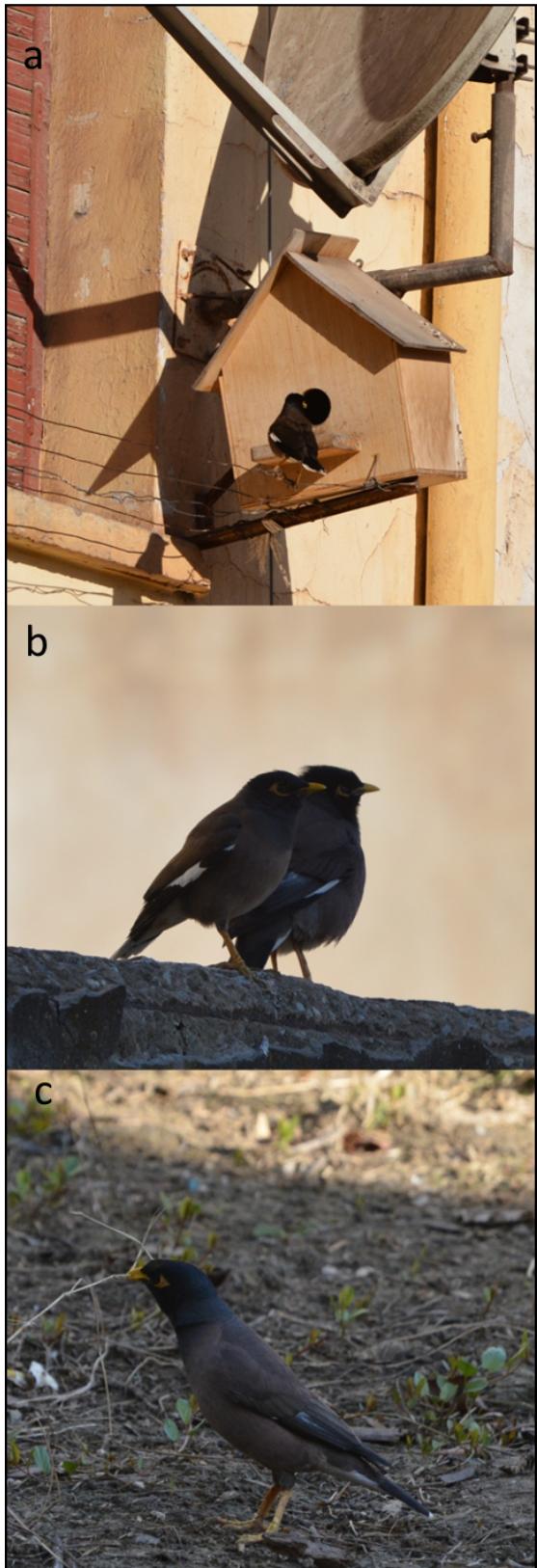


Figure 1: A breeding pair of Common myna close to their nesting box (a), resting on a wall (b), and one of the pair carrying nesting material (c).

*Un couple de Martin triste près de leur nichoir (a), se reposant sur un mur (b), et un individu transportant du matériel de nidification (c).*

We attempted to get as much information as possible from the owner. We also carried out frequent visits to the bird markets in and around Annaba to investigate whether the common myna and other mynas were present and how familiar these species were to pet traders. In addition, we resorted to social media and reviewed videos of Youtube channels and Facebook pages linked to bird trade from September to December 2022 to assess the full extent of the pet trade of mynas at the national level.

### Results

Our investigations revealed that the free-ranging Common myna pair has been bought in a pet trade from Mila, north-eastern Algeria (36.75168 N, 6.26263 E). The pair foraged unhindered but kept returning to a nest box located outside the owner's appartement to breed. Enquiries with neighbours of the owner revealed that the free-ranging Common myna pair had successfully bred over the last three years and their offsprings had been sold through the local pet trade.

At the street market of Annaba, we found one caged common myna that was proposed for sale (Fig. 2) and its owner told us that it was born in captivity and that he acquired it as a fledgling. Further inquiries in the "bird market" at Annaba where the pet trade takes place indicated that mynas are well-known to pet dealers and are particularly sought for their mimicry skills.

A review of videos from youtube channels dealing with the Algerian pet trade revealed that some youtubers had a better knowledge of both common myna ("Indian myna") and common hill myna ("Indonesian myna") than local pet dealers, but all were oblivious of their invasive propensity. Interestingly, pet shop owners acknowledge that successful breeding of both species of mynas is best achieved in a semi-captivity setting similar to that observed in Annaba. Price of adults varied between 15000 D.A. (103 €) and 35000 D.A. (239 €) for the common myna and they reach up to 200000 D.A. (1365€) for the common hill myna.

### Discussion

The presence of the common myna and common hill myna in Algeria is a combination of a deliberate introduction through the pet trade and a lack of environmental education by pet owners of the potential danger that the release of invasive species may cause (AOUADI *et al.*, 2022). The presence of these two species is part of a recent booming trend characterised by the indiscriminate capture of indigenous birds and the massive introduction of alien birds with little consideration to animal welfare.

Both species of myna have had a long history of deliberate introductions (FEARE & CRAIG, 1998), but few people involved in the local pet trade were aware that invasive species are a significant cause of extinctions and a major threat to biodiversity worldwide (DAVIS, 2003; GUREVITCH & PADILLA, 2004). The breeding season of

the common myna in its native range extends from March to September with pairs managing two broods (SIDDIQUE *et al.*, 1993).



Figure 2: (a & b) Scenes from the informal « bird market » where the pet trade at Annaba is carried out, (c) A caged Common Myna in the same « bird market ».

(a & b) Scènes du marché informel des oiseaux à Annaba où le commerce des animaux de compagnie est effectué, (c) Un Martin triste en cage dans le même marché.

The subtropical climate of north-eastern Algeria is propitious to a lengthy breeding period for the species. It is expected that the caged mynas will eventually escape from captivity or semi-captivity and multiply freely as happened with the highly invasive rose-ringed parakeet *Psittacula krameri* which has successfully occupied the whole country (BENDJOURDI *et al.*, 2013). Thus, under favorable conditions, the common myna or the common hill myna may rapidly build up a sizable population in the region.

In the context of increasing bird introductions worldwide driven in part by the cage bird trade (DYER *et al.*, 2017; CARPIO *et al.*, 2020), there is a necessity for environmental education and the improvement of livelihoods required to achieve environmental sustainability (AOUADI *et al.*, 2021, 2022). Furthermore, there is an urgent need for biosecurity legislation, enforcement, and cooperation (MCGEOCH *et al.*, 2010) in the North African region.

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## References

- AOUADI, A., SAMRAOUI, F., TALBI, A., SOUIKI, L. & SAMRAOUI, B. (2021).- Perceived wetland wildlife in a North African urban setting - Conservation implications. *Bull. Soc. Zool. Fr.*, **146**, 35-42.
- AOUADI, A., SAMRAOUI, F., TALBI, A. & SAMRAOUI, B. (2022).- Socio-demographic correlates of biodiversity perception: the need for environmental education. *JCTIE*, **2**, 19-51. <https://doi.org/10.55628/jctie.v2i1.15>
- ARCHAWARANON, M. (2005).- Captive Hill Mynah *Gracula religiosa* breeding success: potential for bird conservation in Thailand ? *Bird Conserv. Int.*, **15**, 327-335.
- BAIRLEIN, F. (2016). Migratory birds under threat. *Science*, **354**, 547-548.
- BENDJOUDI, D., CHENCHOUNI, H., DOUMANDJI, S. & VOISIN, J. F. (2013).- Bird species diversity of the Mitidja Plain (Northern Algeria) with emphasis on the dynamics of invasive and expanding species. *Acrocephalus*, **34**, 13-26.
- BERGIN, D., NIJMAN, V. & ATOUSSI, S. (2019).- Concerns about trade in wild finches in Algeria. *Oryx*, **53**, 410-411. <https://doi.org/10.1017/s003060531900022x>
- BERTRAM, B. (1969).- Hill Mynah and the trade in them from India. *Avic. Mag.*, **75**, 253-255.
- BIRD LIFE INTERNATIONAL (2022).- Species factsheet *Gracula religiosa*. Downloaded from <http://www.birdlife.org> on 19/09/2022.
- BROCHET, A., VAN DEN BOSSCHE, W., JBOUR, S., NDANG'A, P., JONES, V., ABDOU, W., ... BUTCHART, S. (2016).- Preliminary assessment of the scope and scale of illegal killing and taking of birds in the Mediterranean. *Bird Conserv. Int.*, **26**, 1-28. <https://doi.org/10.1017/S0959270915000416>
- BUSH, E.R., BAKER, S.E. & MACDONALD, D.E. (2014).- Global trade in exotic pets 2006-2012. *Conserv. Biol.*, **28**, 663-676. <https://doi.org/10.1111/cobi.12240>
- CANNING, G. (2011).- Eradication of the invasive Common myna, *Acridotheres tristis*, from Fregate Island, Seychelles. *Phelsuma*, **19**, 43-53.
- CARPIO, A.J., ÁLVAREZ, Y., OTEROS, J., LEON, F. & TORTOSA, F.S. (2020).- Intentional introduction pathways of alien birds and mammals in Latin America. *Glob. Ecol. Conserv.*, **22**, e00949. <https://doi.org/10.1016/j.gecco.2020.e00949>
- CHINCHIO, E., CROTTA, M., ROMEO, C., DREWE, J.A., GUITIAN, J. & FERRARI, N. (2020).- Invasive alien species and disease risk: an open challenge in public and animal health. *PLoS Pathog.*, **16**, e1008922.
- CLARK, N.E., LOVELL, R., WHEELER, B.W., HIGGINS, S.L., DEPLEDGE, M.H. & NORRIS, K. (2014).- Biodiversity, cultural pathways, and human health: a framework. *Trends Ecol. Evol.*, **29**, 198-204. <https://doi.org/10.1016/j.tree.2014.01.009>
- CLAVERO, M., BROTONS, L., PONS, P. & SOL, D. (2009).- Prominent role of invasive species in avian biodiversity loss. *Biol. Conserv.*, **142**, 2043-2049.
- CRAMP, S. & PERRINS, C.M. (1994).- *The Birds of the Western Palearctic*. Vol. VIII. Oxford University Press, Oxford.
- CROWL, T.A., CRIST, T.O., PARMENTER, R.R., BELOVSKY, G. & LUGO, A.E. (2008).- The spread of invasive species and infectious disease as drivers of ecosystem change. *Front. Ecol. Environ.*, **6**, 238-246. <https://doi.org/10.1890/070151>
- DAVIS, M. A. (2003).- Biotic globalization: does competition from introduced species threaten biodiversity? *Biosciences*, **53**, 481-489. [https://doi.org/10.1641/0006-3568\(2003\)053\[0481:bgdcfi\]2.0.co;2](https://doi.org/10.1641/0006-3568(2003)053[0481:bgdcfi]2.0.co;2)
- DECARY, R. (1962).- Sur des introductions imprudentes d'animaux aux Mascareignes et à Madagascar. *Bull. Mus. natl. hist. nat. série 2*, **34**, 404-407.
- DYER, E.E., CASSEY, P., REDDING, D.W., COLLEN, B., FRANKS, V., GASTON, K.J. et al. (2017).- The global distribution and drivers of alien bird species richness. *PLoS Biol.*, **15**, e2000942. <https://doi.org/10.1371/journal.pbio.2000942>
- EATON, J.A., SHEPPERD, C.R., RHEINDT, F.E., HARRIS, B.C., VAN BALEN, S. (B.), WILCOVE, D.S. & COLLAR, N.J. (2015).- Trade-driven extinctions and near-extinctions of avian taxa in Sundaic Indonesia. *Forktail*, **31**, 1-12.
- FEARE, C. & CRAIG, A. (1998).- *Starlings and mynas*. Christopher Helm, London.
- FEARE, C.J., LEBARBENCHON, C., DIETRICH, M. & LAROSE, C. (2015).- Predation of seabird eggs by Common Mynas on Bird Island, Seychelles, and its broader implications. *Bull. ABC*, **22**, 162-170.
- FOSTER, R., PEELER, E., BOJKO, J., CLARK, P.F., MORRITT, D., ROY, H.E., STEBBING, P., TIDBURY, H.J., WOOD, L.E. & BASS, D. (2021).- Pathogens co-transported with invasive non-native aquatic species: implications for risk analysis and legislation. *NeoBiota*, **69**, 79-102. <https://doi.org/10.3897/neobiota.69.71358>
- FRITTS, T.H. & RODDA, G.H. (1998).- The role of introduced species in the degradation of island ecosystems: a case history of Guam. *Annu. Rev. Ecol. Syst.*, **29**, 113-140.
- GOODMAN, S.M., RASELIMANANA, A.P., ANDRINIAINA, H.A., GAUTHIER, N.E., RAVAOJANAHAHARY, F.F., SYLVESTRE, M.H. & RAHERILALAO, M.J. (2017).- The distribution and ecology of invasive alien vertebrate species in the greater Toamasina region, central eastern Madagascar. *Malagasy Nature*, **12**, 95-109.

- GUREVITCH, J. & PADILLA, D.K. (2004).- Are invasive species a major cause of extinctions? *Trends Ecol. Evol.*, **19**, 470-474. <https://doi.org/10.1016/j.tree.2004.07.005>
- HUGHES, B.J., MARTIN, G.R. & REYNOLDS, S.J. (2017).- Estimating the extent of seabird egg depredation by introduced Common Mynas on Ascension Island in the South Atlantic. *Biol. Invasions*, **19**, 843-857. <https://doi.org/10.1007/s10530-016-1294-z>
- HOLZAPFEL, C., LEVIN, N., HATZOFE, O. & KARK, S. (2006).- Colonisation of the Middle East by the invasive Common Myna *Acridotheres tristis* L., with special reference to Israel. *Sandgrouse*, **28**, 44-51.
- JOHNSON, C.N., BALMFORD, A., BROOK, B., BUETTEL, J.C., GALETTI, M., GUANGCHUN, L. & WILMSHURST, J. (2017).- Biodiversity losses and conservation responses in the Anthropocene. *Science*, **356**, 270-275.
- KINZIG, A., WARREN, P., MARTIN, C.A., HOPE, D. & KATTI, M. (2005).- The effects of human socioeconomics status and cultural characteristics on urban patterns of biodiversity. *Ecol. Soc.*, **10**, 23. [available online at: <http://www.ecologyandsociety.org/vol10/iss1/art23/>
- LEVER, C. (2005).- *Naturalised birds of the world*. T & AD Poyser, London.
- LOUADJ, A., RAZKALLAH, I., ATOUSSI, S., NIJMAN, V., BARA, M., HOUHAMDI, M., BOUSLAMA, Z. (2022).- European Goldfinches *Carduelis carduelis* as pets in Algeria: Numbers and social dimension of a conservation issue. *Bird Conserv. Int.*, **32**, 292-300. <https://doi.org/10.1017/S0959270921000149>
- LUQUE, G.M., BELLARD, C., BERTELMEIER, C., BONNAUD, E., GENOVESI, P., SIMBERLOFF, D. & COURCHAMP, F. (2014).- The 100th of the world's worst invasive alien species. *Biol. Invasions*, **16**, 981-985. <https://doi.org/10.1007/s10530-013-0561-5>
- MACK, R.N., SIMBERLOFF, D., LONSDALE, W.M., EVANS, L., CLOUD, M. & BAZZAZ, F.A. (2000).- Biotic invasions: causes, epidemiology, global consequences, and control. *Ecol. Appl.*, **10**, 689-710. [https://doi.org/10.1890/1051-0761\(2000\)010\[0689:bicegc\]2.0.co;2](https://doi.org/10.1890/1051-0761(2000)010[0689:bicegc]2.0.co;2)
- MARTIN, W.K. (1996).- The current and potential distribution of the Common Myna *Acridotheres tristis* in Australia. *Emu*, **96**, 166-173. <https://doi.org/10.1071/mu996016>
- MARTIN-LOPEZ, B. & MONTES C. (2015). Restoring the human capacity for conserving biodiversity: a social-ecological approach. *Sustain. Sci.*, **10**, 699-706. <https://doi.org/10.1007/s11625-014-0283-3>
- MCGEOCH, M.A., BUTCHART, S.H.M., SPEAR, D., MARAIS, E., KLEYHANS, E.J., SYMES, A. et al. (2010).- Global indicators of biological invasion: species numbers, biodiversity impact and policy responses. *Divers. Distrib.*, **16**, 95-108. <https://doi.org/10.1111/j.1472-4642.2009.00633x>
- MOUTIA, L. A. & MAMET, R. (1946).- A review of twenty-five years of economic entomology in the island of Mauritius. *Bull. Entomol. Res.*, **36**, 439-472. <https://doi.org/10.1017/s0007485300024093>
- MUÑOZ-FUENTES, V., VILA, C., GREEN, A.J., NEGRO, J.J. & SORENSEN, D. (2006).- Hybridization between white-headed ducks and introduced ruddy ducks in Spain. *Mol. Ecol.*, **16**, 629-638. <https://doi.org/10.1111/j.1365-294x.2006.03170.x>
- NARANG, M.L. & LAMBA, B.S. (1984).- A contribution to the food habits of some Indian birds (Aves). *Rec. Zool. Surv. India*. Occasional Paper, **44**, 1-76.
- PEACOCK, D. S., VAN RENSBURG, B. & ROBERTSON, M.P. (2007).- The distribution and spread of the invasive alien common myna, *Acridotheres tristis* L. (Aves: Sturnidae), in southern Africa. *S. Afr. J. Sci.*, **103**, 465-473.
- PER, E. (2022).- Status of the common myna *Acridotheres tristis* Linnaeus, 1766 in Turkey. *Animal Biodivers. Conserv.*, **45**, 79-83. <https://doi.org/10.32800/abc.2022.45.0079>
- PIMENTEL, D., LACH, L., ZUNIGA, R. & MORRISON, D. (2000).- Environmental and economic costs of nonindigenous species in the United States. *BioScience*, **50**, 53-65.
- PIRES, S.F. (2012).- The illegal parrot trade: a literature review. *Glob. Crime*, **13**, 176-190.
- RAI, P.K. & SINGH, J.S. (2020).- Invasive alien plant species: Their impact on environment, ecosystem services and human health. *Ecol. Indic.*, **111**, 106020-106020.
- RAZKALLAH, I., ATOUSSI, S., TELAILIA, S., ABDELGHANI, M., BOUSLAMA, Z. & HOUHAMDI, M. (2019).- Illegal wild birds' trade in a street market in the region of Guelma, north-east of Algeria. *Avian Biol. Res.*, **12**, 96-102. <https://doi.org/10.1177/1758155919826773>
- RHYMER, J.M. & SIMBERLOFF, D. (1996).- Extinction by hybridization and introgression. *Annu. Rev. Ecol. Syst.*, **27**, 83-109. <https://doi.org/10.1146/annurev.ecolsys.27.1.83>
- ŞEKERCIOGLU, Ç, DAILY, G.C., EHRLICH, P.R. (2004).- Ecosystem consequences of bird declines. *Proc. Natl. Acad. Sci. U.S.A.*, **101**, 18042-18047.
- SIDDIQUE, M., MUSHTAQ-UL-HASSAN, M. & BEG, M.A. (1993).- Breeding behaviour of Common Myna (*Acridotheres tristis*). *Pak. J. Agric. Sci.*, **30**, 337-342.
- SIMBERLOFF, J.L., MARTIN, P., GENOVESI, V., MARIS, D.A., WARDLE, J., ARONSON, F. et al. (2013).- Impacts of biological invasions: what's what and the way forward. *Trends Ecol. Evol.*, **28**, 58-66. <https://doi.org/10.1016/j.tree.2012.07.013>
- STOCKLAND, E. (2014).- Policing the oeconomy of nature: The oiseau martin as an instrument of oeconomic management in the eighteen-century French maritime world. *Hist. Technol.*, **30**, 207-231. <https://doi.org/10.1080/07341512.2014.988425>

- THIBAULT, M., MASSE, F., PUJAPUJANE, A., LANNUZEL, G., BORDEZ, L., POTTER, M.A., FOGLIANI, B., VIDAL, E. & BRESCIA, F. (2018).- "Liaisons dangereuses": The invasive red-vented bulbul (*Pycnonotus cafer*), a disperser of exotic plant species in New Caledonia. *Ecol. Evol.*, **8**, 9259-9269. <https://doi.org/10.1002/ece3.4140>
- WILCOVE, D.S., ROTHSTEIN, D., DUBOW, J., PHILLIPS, A. & LOSOS, E. (1998).- Quantifying threats to imperiled species in the United States. *BioScience*, **48**, 607-615.
- ZAVAleta, E.S., HOBBS, R.J. & MOONEY, H.A. (2001).- Viewing invasive species removal in a whole-ecosystem context. *Trends Ecol. Evol.*, **16**, 454-459. [https://doi.org/10.1016/s0169-5347\(01\)02194-2](https://doi.org/10.1016/s0169-5347(01)02194-2)