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Face mask-wear did not affect large-scale patterns in escape and alertness of urban and rural birds during the COVID-19 pandemic

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HIGHLIGHTS
• The face mask-wear was rare before the COVID-19 pandemic in many regions.
• Previous studies suggested that the face mask-wear may affect behaviour of animals.
• Field experiments in four European countries and Israel were conducted.
• Mask-wear did not influence escape and alert behaviour in birds.
• Urban birds reacted later and fled closer than rural birds.

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ABSTRACT
Actions taken against the COVID-19 pandemic have dramatically affected many aspects of human activity, giving us a unique opportunity to study how wildlife responds to the human-induced rapid environmental changes. The wearing of face masks, widely adopted to prevent pathogen transmission, represents a novel element in many parts of the world where wearing a face mask was rare before the COVID-19 outbreak. During September 2020–March 2021, we conducted large-scale multi-species field experiments to evaluate whether face mask-use in public places elicits a behavioural response in birds by comparing their escape and alert responses when approached by a researcher with or without a face mask in four European countries (Czech Republic, Finland, Hungary, and Poland) and Israel. We also tested whether these patterns differed between urban and rural sites. We employed Bayesian generalized linear mixed models (with phylogeny and site as random factors) controlling for a suite of covariates and found no association between the face mask-wear and flight initiation distance, alert distance, and fly-away distance, respectively, neither in urban nor in rural birds. However, we found that all three distances were strongly and consistently associated with habitat type and starting distance, with birds showing earlier escape and alert behaviour and longer distances fled when approached in rural than in urban sites.
urban habitats and from longer initial distances. Our results indicate that wearing face masks did not trigger observable changes in antipredator behaviour across the Western Palearctic birds, and our data did not support the role of habituation in explaining this pattern.

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1. Introduction

The COVID-19 pandemic has affected almost every country worldwide (World Health Organization, 2021). Several governments implemented unprecedented social and health actions to mitigate the viral transmission and threats imposed by COVID-19 to human life and welfare (Gatto et al., 2020; Kraemer et al., 2020; Venter et al., 2020). Country-wide or more local lockdowns have contributed to significant changes in human socio-economic activities, including the decline in vehicular traffic, human mobility and industrial production (Fang et al., 2020; Huang et al., 2020; Kraemer et al., 2020), resulting in reduced air pollution and noise (Lecoq et al., 2020; Venter et al., 2020; Zambrano-Monserrate et al., 2020). This ‘anthropause’ has resulted, without the intention to downplay its tragic consequences, in an unexpected global natural experiment that gives us a unique opportunity to study how human-induced rapid environmental changes affect wildlife (Rutz et al., 2020; Soga et al., 2021; Zellmer et al., 2020).

Animal behaviour is a species- and individual-specific trait allowing individuals to interact flexibly and adaptively with the novel environmental challenges (Lim and Dill, 1990; Sol et al., 2005; Wong and Candolin, 2015). The rapid behavioural adjustments are usually considered as a manifestation of behavioural plasticity (Snell-Rood, 2013; Sol et al., 2013; Wong and Candolin, 2015), but our understanding of the adaptive mechanisms and stimuli eliciting observable behavioural modifications in animals remain incomplete. The conspicuous disruption of human activities due to the COVID-19 pandemic is probably most pronounced in urban areas (Rutz et al., 2020). Anecdotal media reports often showed that wildlife took advantage of the suppressed human activity in the otherwise noisy cities (Brunton, 2020; Macdonald, 2020). However, the more rigorous research revealed a complex nature of the lockdown effects on wildlife, with most studies exploring spatial and temporal changes in the occurrence and activity of animals during pre- and peri-COVID-19 periods (Gordo et al., 2021; Hentati-Sundberg et al., 2021; Manenti et al., 2020). Significantly fewer studies focused on more direct human–wildlife interactions during the pandemic, such as potential changes in animal fear behaviour during the direct interactions with humans (Jiang et al., 2020; Rutz et al., 2020).

One prominent feature of the ongoing pandemic is the wearing of face masks by people in public spaces (Greenhalgh et al., 2020; World Health Organization, 2020). As the pandemic continued, more and more countries adopted the mandatory wearing of face masks in public places, particularly within human settlements, but significant differences exist between countries (Felter and Bussemaker, 2020; He and Laurent, 2020; Imperial College London and YouGov, 2021). Previous single species studies in birds (Lee et al., 2011; Levey et al., 2009) and mammals (Huber et al., 2013; Nagasawa et al., 2011) showed differential behavioural responses due to recognition of individual human faces and facial expressions. More specifically, some species are sensitive to very subtle signals revealing human intentions based on head and gaze orientation (Bateman and Fleming, 2011; Castellano-Navarro et al., 2021) and facial expressions (Clucas et al., 2013; Davidson et al., 2015; Marzluff et al., 2010), suggesting that wearing face masks during the COVID-19 pandemic may affect risk-taking and alert behaviour in animals. For instance, a face mask may make the appearance of its proponent less threatening than a normal human face stimulus, or less information can be derived from a partially covered face, requiring a longer time for decision making and resulting in a delayed escape response. Alternatively, a face mask can be recognized as a novel (foreign) element eliciting an increased fear response in wildlife, especially when the mask is of bright colour (Gould et al., 2004; Gutzwiller and Marcum, 1993; Zhou and Liang, 2020).

In a pivotal study, Jiang et al. (2020) reported that Eurasian tree sparrows Passer montanus exhibited shortened escape distances to people wearing surgical masks than without masks in two rural sites of the Sichuan province, China. However, it remains unclear whether such a pattern also arose in urban areas and other world regions differing in their history of anti-pandemic measures and whether convergence in such behavioural shifts across multiple species exists. For instance, urban birds are bolder, less neophobic, and explore and habituate faster than rural birds (Biondi et al., 2020; Ducatez et al., 2017; Griffin et al., 2017; Tryjanowski et al., 2016; Vincze et al., 2016). Hence, risk-taking and alertness due to wearing a face mask could differ between urban and rural animals due to faster habituation, higher exposure or more nuanced response to this stimulus in urban animals (Cavalli et al., 2016; Vincze et al., 2016). If face masks would consistently lead to decreased levels of escape and alert responses across birds, this could have implications, for instance, for wildlife conservation as face masks could help to mitigate adverse impacts of human disturbance in sensitive species.

In this exploratory experimental study, we tested the hypothesis that face masks are associated with changes in escape and alert behaviour across tens of bird populations and species across a large latitudinal gradient across the Western Palearctic region, spanning from subtropical Israel to arctic Finland. In focal countries, face masks were rare before the COVID-19 outbreak during spring 2020. However, at the time of fieldwork (September 2020–March 2021), these countries significantly differed in frequency of face mask-use in public places, ranging from Israel, where mask-wearing had become the norm, through the Czech Republic, Hungary, and Poland with the frequent mask-wear in public places, to arctic Finland where masks were not used at all or very seldomly outside (see below). We employed a Bayesian phylogenetically-informed mixed modelling approach to test whether a face mask worn by a human observer affects three fear responses in birds, estimated by flight initiation distance (hereafter FID), alert distance (hereafter AD), and fly-away distance (hereafter FAD) (Biondi et al., 2020; Blumstein et al., 2005; Fernández-Juricic et al., 2001; Stankowich and Blumstein, 2005). Finally, we tested whether mask-driven changes in escape and alert behaviour differed between urban and rural areas while controlling for a suite of covariates and potentially confounding variables.

2. Materials and methods

2.1. Study sites

Data were collected in four European countries – the Czech Republic (collected by P.M.), Finland (J.J.), Hungary (G.M. and S.S.), Poland (P.T.) – and Israel (R.Y.). Previous research showed that the escape responses of birds could change during the annual life cycle of birds (Mikula et al., 2018). Hence, all field experiments were conducted during the non-breeding season, from September 2020 to March 2021, except Finland, where we stopped data collection with the increasing snow cover during the late autumn. Most of the urban data were collected in urban parks and cemeteries, whereas rural data were collected primarily in agricultural environments. We collected data in urban and rural areas in each country, except Israel, where only urban data were collected due to lockdown restrictions. In the Czech Republic, data were collected in the city of Praha (50.083°N, 14.417°E; 1.3 million inhabitants, 177–399 m a. s. l.) and rural areas around Centice village (49.812°N,
15.087°E). In Finland, birds were approached in the city of Rovaniemi (66.5°N, 25.733°E; 64,000 inhabitants, 93 m a.s.l.) and in Niskanperä (66.458°N, 25.62°E) and Rautiossaari (66.423°N, 25.461°E) rural sites. In Hungary, field data were collected in Budapest (47.498°N, 19.041°E; 1.8 million inhabitants, 96–527 m a.s.l.) and Baja (46.183°N, 18.954°E; 34,000 inhabitants, 123–175 m a.s.l., 95 m a.s.l.) cities and their immediate surroundings. In Poland, most data were collected in the cities of Poznań (52.406°N, 16.925°E; 530,000 inhabitants, 60–154 m a.s.l.) and Ostrów Wielkopolski (51.654°N, 17.807°E; 72,000 inhabitants, 41 m a.s.l.). The Czech Republic, Hungary and Poland are located in a humid continental climate zone, whereas Finnish sites were in a subarctic zone and an Israeli site in a desert zone (following Köppen climate classification). Each study site was georeferenced. Most data (~90%) were collected in the morning and around noon (07:00–13:00) when birds are most active during autumn and winter. Fieldwork was conducted during favourable weather conditions, mainly during sunny days with no or weak wind and without rain. We avoided collecting data at places with high snow cover. For further details, see our primary data file (Mikula et al., 2021).

2.2. Flight initiation, alert, and fly-away distances

The flight initiation distance (FID) of birds was collected using a modified procedure developed by Blumstein (2006). In brief, after spotting a focal bird, an observer moved at a normal walking speed (~1 m/s) directly toward the bird, having the head oriented directly toward a bird and maintaining eye contact. The distance between the position of an approaching observer and focal bird when the bird started to escape, estimated either by counting the number of ~1 m steps (P.T., S.S., and J.J.) or using a rangefinder (P.M.: Braun Range Finder 600WHD, ±1 m; J.J. only for FAD: Zeiss Victory 8 × 26 T* PRF, ±1 m; G.M.: SNDWAY SW-600A, ±1 m; R.V.: Bushnell 8 × 28 with a rangefinder, ±1 m), was recorded as the FID. To ensure that estimates of behavioural responses of birds were comparable between different researchers regardless of the method used to collect data (steps vs. rangefinder), all researchers using steps were well-trained before data collection to make their steps constantly ~1 m long. If the focal bird was positioned above the ground on some vegetation or human-made object, FID was calculated as the Euclidean distance that equals the square-root of the sum of the squared horizontal distance and the squared height above the ground. We also collected information on alert distance (AD), i.e., the distance between an observer and a focal bird when the bird became aware of and began to monitor an approaching observer. Finally, we also collected data on fly-away distance (FAD), i.e., the distance which a bird fled when flushed by an approaching observer. During each fieldwork session, the face mask experiments were performed: we approached birds in random order, either with or without a standard blue surgical face mask.

We approached only individuals engaged in comfort behaviour, such as foraging, preening, or roosting. We avoided approaching birds showing signs of distress behaviour. When birds occurred in a flock, we randomly selected one individual and estimated its response. During the fieldwork, researchers were standardized outdoor clothing without bright colours. The sampling method was designed to minimize the repeated approach of the same individuals. In general, we sampled data in each specific site only once. If the same site was visited twice, we conducted repeated (spatially overlapping) sampling at the same site with at least a 30-day interval between sampling events. Because we sampled data during the non-breeding season when local individual turnover is often much higher than during the breeding season, resampling of the same individuals was presumably minimal (Lavee et al., 1991; Pradel et al., 1997; Warnock and Bishop, 1998). Moreover, earlier studies have indicated that even a modest degree of pseudoreplication in escape data did not influence their results (Runyan and Blumstein, 2004). All researchers involved in this study were trained to measure FIDs, ADs, and FADs using standardized protocols and were experienced in identifying birds. Altogether, we collected 2089 FID estimates for 106 bird species, 1461 AD estimates for 85 species, and 1364 FAD estimates for 96 species.

2.3. Covariates

Behavioural responses of birds could be affected by several environmental and life-history factors such as habitat type (i.e., urban or rural) (Díaz et al., 2013; Samia et al., 2015b), starting distance (Blumstein, 2006; Mikula et al., 2018; Weston et al., 2012), flock size (Mikula et al., 2018; Morelli et al., 2019; Samia et al., 2015b; Tryjanowski et al., 2020), body size (Díaz et al., 2013; Stankowich and Blumstein, 2005), human density (Mikula, 2014; Morelli et al., 2018), tree cover (Braimoh et al., 2018; Samia et al., 2015a), ambient temperature and wind speed (Reynolds et al., 2020) and the latitude (Díaz et al., 2013; Möller and Liang, 2013). All variables except body size were collected directly in the field; information on the body size was extracted from the literature.

Each site was scored as urban or rural. Based on previous studies on escape responses of birds, we defined urban sites as areas with continuous urban elements, like multi-story buildings, family houses, or roads, whereas we defined rural sites as areas with natural or agricultural landscapes with no or sparsely located houses (Díaz et al., 2013; Mikula, 2014); we also followed suggestions made by Marzluff et al. (2001) (urban: built-up area >50%, building density >10/ha, human density >10/ha; rural: built-up area <20%, building density <2.5/ha, residential human density <10/ha). To make the urban–rural distinction clear, our urban data were primarily collected in heavily urbanized sites (mainly around city centres with residential human density >1000/km²), whereas rural data were usually collected several kilometres away from the closest city, in areas with no or scattered urban dwellings (residential human density <10/km² for sites in the Czech Republic and Finland; <100/km² for sites in Hungary and Poland).

The starting distance (hereafter SD) was estimated as the distance between the initial position of the observer and the initial location of the focal bird when the human approach started. The flock size was estimated as the number of all bird individuals foraging or perching together in a single-species group that was visually separated from other conspecific or mixed-species groups or single birds. Flock size was estimated by using binoculars from the longer distances, i.e., at the point when an observer first spotted and approached a focal individual.

The body mass (g) was used as an index for body size. For each species, we extracted the mean values of body mass from EltonTraits 1.0 database (Willman et al., 2014) that broadly used data from the compilation by Dunning (2008).

The human density and mask-wearing habits of site visitors were characterized for each sampling site during each visit within a 50 m radius from the observer by using a ‘snapshot’ method. For each site and visit, human density was estimated before and after each sampling session. During these counts, we also estimated the proportion of people (%) wearing face masks. We then calculated the mean of human visitors and the proportion of visitors wearing masks for each site and visit.

All sampling sites were also characterized by a mean tree cover (%) at the time of data collection; the tree was characterized as a woody plant higher than 3 m. We also estimated ambient temperature (°C) and wind speed (using a slightly modified Beaufort scale: 0 – no to light wind [0–5 km/h]; 1 – light to gentle [6–11 km/h]; 2 – gentle to moderate [12–19 km/h]; 3 – moderate [20–28 km/h]; no data were collected during strong wind) at the sites at the time of data collection. Finally, for each georeferenced site, we estimated a latitude value that helped us to control for potential changes in responses of birds along a
latitudinal gradient. Latitude could be used as a surrogate for country ID (latitude coordinates did not overlap between countries), being also associated with the time of face mask-wear enforcement and commonness at public places, covering a gradient from Israel (early adoption and common public wear of face masks), through Central European countries to the sites in arctic Finland (no enforced or common face mask-wear).

2.4. Statistical analyses

We explored the association between FID, AD, and FAD of birds (response variables) and predictors (face mask-wear, habitat type) while controlling for a set of covariates (SD, flock size, body mass, number of people observed, percent people wearing masks, tree cover, ambient temperature, wind speed, and latitude) by Bayesian phylogenetic generalized linear mixed models (PGLMMs). To reduce noise in our data, we excluded all species with less than 15 observations, resulting in 1730 estimates (32 species) for FID, 1204 estimates (19 species) for AD, and 1038 estimates (20 species) for FAD. All response variables and some covariates (SD, flock size, and body mass) were log-transformed before analyses. All non-binary variables were centred and scaled. Prior to the statistical analyses, we also checked multicollinearity between covariates, revealing that the mutual correlation was generally weak (FID: mean Spearman $|r| = 0.19$; AD: $|r| = 0.23$; FAD: $|r| = 0.13$; Fig. S1). However, we found that in FID and AD datasets, the number of people recorded on the site was strongly and positively correlated with the percentage of people wearing masks ($r = 0.73$ and 0.72, respectively). We thus re-run main multivariable models, but where only one of these variables was kept; we found that this procedure had no qualitative effect on the main results. We thus re-ran main multivariable models, using either the Bayesian or frequentist version of PGLMM (Table S2). The Bayesian PGLMM was fitted using the ‘pcode’ setting, which uses a complexity penalizing prior designed to automatically choose good model parameters (Simpson et al., 2017). In addition, we also ran models where data from Israel were excluded (lack of rural data) (Table S3), a different sample size threshold (10 instead of 15 observations per species at minimum) was used (Table S4), or we tested for an interaction between face mask-wear by the researcher and the percentage of people wearing masks at each site (Table S5). Because all approaches gave qualitatively identical results regarding our main study question, we reported only the results of Bayesian PGLMM based on at least 15 observations per species, also covered Israeli data, and included the interaction between face mask-wear by the researcher and habitat type in the main text. Finally, to ensure that our main results were not affected by collinearity between some covariates, we also calculated variation inflation factors (VIFs) using vif function in the car v. 3.0-10 package (Fox et al., 2020). Because this function did not work for PGLMM objects, we re-ran our main models by fitting a maximum likelihood linear mixed models (LMMs), using lmer function in the lme4 v. 1.1-26 package (Bates et al., 2015) with species and site introduced as random factors. All VIFs were well below the critical value of 10, indicating that collinearity was not a problem in our case (Dormann et al., 2013).

3. Results

While controlling for the effect of several covariates (SD, flock size, body mass, number of people observed, percent people wearing masks, tree cover, ambient temperature, wind speed, and latitude), our analyses revealed that mask-use was not significantly associated with FID, AD, and FAD across birds, neither in interaction with habitat type (urban/rural) nor as the main effect (Figs. 1 and 2; Table S2). Moreover, we found that escape behaviour and alertness of birds were not associated with the percent of people wearing masks at studied sites.

We found that habitat type and SD were the best predictors of escape and alert responses of birds; birds escaped and became alerted earlier, and flew longer distances after human disturbance when researchers approached them in rural than in urban habitats, and when the SD was greater (Fig. 1; Table S2). FID also increased with the flock size, and AD also increased with the ambient temperature (Fig. 1; Table S2).

![Fig. 1. Standardized effect sizes (coloured objects) with their 95% confidence intervals (horizontal lines) based on multivariable Bayesian phylogenetic generalized linear mixed models (PGLMMs) exploring the association between flight initiation distance (blue dots and lines; $N = 1730$ estimates for 32 species), alert distance (grey squares and lines; $N = 1204$ and 19) and fly-away distance (yellow triangles and lines; $N = 1038$ and 20) (response variables) and the face mask-wear by the observer and habitat type (urban/rural) (predictors) while controlling for the effect of a set of covariates. Covariates included starting distance, flock size, species-specific body mass, number of people observed, the proportion of people wearing masks, tree cover, temperature, and wind speed at a site during each visit, and site latitude. We considered an association significant if the confidence intervals did not overlap zero. For full model statistics, see Table S2.](https://example.com)
4. Discussion

In this study, we asked whether wearing a surgical face mask by a human, widely adopted as a part of prevention against COVID-19, was associated with large-scale patterns in escape and alert behaviour of European and Israeli birds. We also tested whether these responses differed between birds at urban and rural sites representing differential human disturbances. In contrast to the recent findings by Jiang et al. (2020) on a single species, our multi-species analyses found no association between the face mask-wear and escape and alert behaviour across bird populations along the gradient from subtropical Israel to the sites at the Arctic Circle in Finland. We revealed that the most important predictors of risk-taking and alertness of European and Israeli birds were the type of habitat (i.e., urban or rural) and starting distance.

Face masks represent a novel element in many countries and regions such as Europe, wherein their wear was sporadic before the outbreak of COVID-19 during spring 2020 (Aravindakshan et al., 2020) and there is some evidence that masks and other obstacles covering human face can change the level of perceived fear in animals by affecting the facial expression of human (Clucas et al., 2013; Davidson et al., 2015; Jiang et al., 2020; Marzluff et al., 2010). However, we found no association between escape decisions of birds and the face mask-wear by an approaching researcher neither in urban nor rural areas. We propose two alternative explanations for this observation: (1) animals were already habituated to this stimulus, or (2) surgical face masks generally triggered little or no changes in the behaviour of sampled birds and other stimuli played a more important role in their decision making.

We started with data collection in September 2020, when the mask-wear in public places was enforced or recommended for a couple of months in all studied countries except Finland. Hence, the effect of face masks might diminish with the ongoing pandemic, and the commonness of face masks outside might allow birds to become habituated...
to this stimulus over time. However, in rural sites, face masks were rare outside in all studied countries during the whole study period, hence, rural birds had little chance to habituate. Moreover, rural birds exhibited escape and alert behaviour much earlier (i.e., their FIDs and ADs were longer) than urban birds (particularly in the Czech Republic and Poland). These results suggest that a judgment of perceived danger of an approaching human, based on visual cues linked to wearing the mask, was improbable in rural birds and their decision making when to escape relied predominantly on other cues like direction or speed of approach (Møller and Tryjanowski, 2014). Still, habituation might have played a role in urban birds. Urban birds generally exhibit faster habituation and lower neophobia to novel stimuli when compared with rural birds (Biondi et al., 2020; Ducatez et al., 2017; Griffin et al., 2017; Vinzve et al., 2016), and masks were common in urban areas in four out of five studied countries. However, in Finland, face masks were virtually absent in studied urban sites, but we observed no change in escape and alert behaviour of the birds (Figs. 1 and 2; see also Mikula et al., 2021). Likewise, we found no association between behavioural responses of birds and the proportion of people wearing masks at our study sites, indicating that the level of exposure to this stimulus was a poor predictor of the bird escape decisions. Finally, in contrast to all countries included, wearing face masks has been a common practice in East Asia, including China, even in the pre-COVID-19 period (Ban et al., 2017; Tang and Wong, 2004; Wada et al., 2012; Wong and Tang, 2005; Zhang and Mu, 2018), making the finding of positive correlation between the face mask-wear and relaxed escape response reported by Jiang et al. (2020) even more intriguing. Altogether, it seems that the most parsimonious explanation for the lack of association between the face mask-wear and fear responses in our sample of birds is that surgical face masks had no, or minimal, influence on a birds’ decision when to escape or become alerted in both urban and rural settings. Our results thus collectively indicate that recognition of human facial expressions and inclusion of this information in risk-assessment could be generally rare or that response to this stimulus was weak in our sample of birds. However, we acknowledge that our data were collected only during the non-breeding season (mainly late autumn and winter) and reactions of birds might differ during other seasons.

We found that the most important factors predicting escape, alert and fly-away distances were habitat type and starting distance. In general, birds escaped earlier and further, and became alerted earlier when approached in rural areas and from a longer starting distance. The relaxed antipredator behaviour of prey animals in areas where humans are common and human-wildlife interactions are typically benign is one of the most general patterns in antipredator behaviour observed across vertebrates (Nunes et al., 2018; Samia et al., 2015b). Interestingly, we found that human density at the sampling site was a poor predictor of the fear responses of birds. However, in some world regions, human outdoor activity increased significantly in urban parks or rural sites during the pandemic (Rutz et al., 2020; Soga et al., 2021). Increased human presence may act as an important stressor for wildlife and, hence, further monitoring of spatio-temporal changes in human mobility and their effects on wildlife is of high importance. Finally, although some studies found no or weak association between starting distance and escape behaviour of birds (Díaz et al., 2013; Tätte et al., 2018), our results indicate that the lack of information on starting distance can significantly bias estimates on several aspects of antipredator behaviour of animals. Therefore, we suggest that the effect of starting distance should be routinely monitored and reported in studies on the risk-taking and alertness of animals (Blumstein, 2006; Mikula et al., 2018; Weston et al., 2012).

The global effort to investigate how urban wildlife reacts to ongoing environmental changes due to the COVID-19 pandemic can help us better understand mechanisms and ways of wildlife–human interactions. This may also bring important insights into the long-standing questions of urban ecology and provide evidence-based cues leading to more informed and sustainable conservation efforts of wildlife associated with human settlements. In this large-scale experimental study, we capitalized on a unique opportunity provided by the global COVID-19 lockdown to detect possible changes in animal fear responses due to anti-pandemic measures across several European countries and Israel simultaneously. We encourage researchers and the public worldwide to document the effects of often ephemeral phenomena that emerged due to actions taken against the COVID-19 pandemic on wildlife ecology and behaviour in particular. Long-term studies exploring animal behaviour during pre-, peri- and post-lockdown times will be especially valuable (e.g., Derryberry et al., 2020).

CRediT authorship contribution statement

Peter Mikula: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Jukka Jokimäki: Investigation, Methodology, Writing – review & editing.

Marja-Liisa Kaisanlaihti-Jokimäki: Investigation, Writing – review & editing.

Gábor Markó: Investigation, Methodology, Writing – review & editing.

Anders Pape Møller: Methodology, Writing – review & editing.

Sára Szakony: Investigation.

Tomáš Albrecht: Conceptualization, Investigation, Methodology, Writing – review & editing.

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