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# Reactions to human disturbances in an urban population of the Swan Goose *Anser cygnoides* in Heidelberg (SW Germany)

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**Randler Ch. 2003. Reactions to human disturbances in an urban population of the Swan Goose *Anser cygnoides* in Heidelberg (SW Germany). Acta Ornithol. 38: 47–52.**

**Abstract.** A total of 127 cases of disturbances were recorded, most of them resulting in not-too-serious reactions. An average disturbance affected 25 geese, occurred at 43 m distance to the cause and lasted 31–60 s. Geese feeding prior to the disturbance reacted more strongly than resting ones, and they were more sensitive to disturbances during the hatching and moulting/flightless period. More than fifty percent of the disturbances were caused by dogs — they affected significantly more geese, caused longer durations of disturbances, and probably higher energy costs. There were highly significant positive correlations between a reaction, the duration of a disturbance and the number of geese affected. However, distance to the waterline correlated only with the number of geese affected. Distance to waterline and distance to the source of the disturbance had a high impact on the number of geese affected in a regression model. When disturbances occurred at greater distances, these were more serious, lasted longer and affected more geese. Separate analysis of the dogs demonstrated the influence of dog size (the larger the dog, the greater the disturbance), but not whether it was on a lead. Fleeing into the water was caused by dogs more often than expected. Habituation to an urban environment and predictions for fleeing behaviour are discussed.

**Key words:** Swan Goose, *Anser cygnoides*, feral population, habituation, human disturbances, bird-dog disturbances, urban environment

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## INTRODUCTION

Research into the impact of disturbances on natural goose and wildfowl populations has reached a wealth of literature because of the interest in endangered species and to establish measures for their conservation (Keller 1995, Stock & Hofeditz 1996). Disturbances influence feeding and resting habits of wildfowl and place further energetic stress on birds due to increased costs of locomotion or constrained time available for feeding. Also reactions differ between sites and species with some species being more sensitive towards human disturbances than others (e.g. Keller 1989, Mathers et al. 2000). Semi-tame and feral populations have seldom been object of research although those species have habituated successfully to human disturbances and therefore are less shy. Further, individuals or populations in an urban environment may experience decreased predation (Drost et al. 2001). Habituation of wild living birds in natural populations are also increasingly stressed, especially in protected areas where visitors are not allowed to leave footpathes or motorways (national-park-effect, e.g. Bellebaum 2001). Studies in urban environments can help identifying factors, that may influence species and populations in natural settings.

The first objective of the study was to assess the effects of disturbances to an urban goose population and to reveal the adaptation to their urban environment. Living in an urban environment trades-off benefits, e.g. decreased predation, versus costs, e.g. increased rates of disturbance. Therefore it is necessary for a species to habituate to frequent disturbances, otherwise the energetic costs would be to high to compensate for.

Secondly, fleeing probability and flight initiation depends on whether stimuli: a) approach more directly, b) approach more quickly, c) are larger in size. They increase further when d) distances from refuge is greater, e) group size is greater and f) the costs of fleeing are lower (Lima & Dill 1990, Frid & Dill 2002). Some of these predictions (c, d, f) have been tested in the present work in order to assess their validity in an urban environment.

Thirdly, geese may be more sensitive towards disturbances in the period of hatching and moulting because of their flightlessness and should react towards disturbances earlier, i.e. at greater distances.

## STUDY AREA AND SPECIES

Swan Geese and their derived domestic forms are non-native species in Europe, breeding mainly in parts of Siberia and China (del Hoyo et al. 1992). Counts made in Heidelberg in 1994 showed the population number as equal as 20 adult birds (M. Preusch unpubl.). Swan Geese have bred there in single pairs at least since the mid 1990s, e.g. 8 pairs in 1996 and 7 in 1997 (Randler 2000). In 2002 the maximum count was 140 individuals. This resident flock was one of the only ones with regular reproductive success in Europe (Delany 1993, Hagemeijer & Blair 1997). Heidelberg is situated in southwest Germany (8°41’E, 49°25’W). The habitat consisted of a meadow for public use (lawn), which extends over 1.1 km along the river Neckar with a maximum width of 60 m totalling an area of 5.5 ha in size. Breeding took place on a small island in the river Neckar. After hatching the families moved to the lawn because of much better feeding conditions. Although not permitted feeding by the public was commonplace. There was a high amount of non-breeders present and in 2002 only 7 different families were observed. Some individuals of this flock resembled true Swan Geese, others their domestic form and at least 13 individuals were either $F_1$-hybrids with Greylag Goose *Anser anser*, $F_2$-hybrids or backcrosses with Swan Geese. Identification of such hybrids is straightforward because of their characteristic leg and bill colour, hind neck coloration, eyering and pale forewing. Details and a picture of one bird were described and depicted by Randler (2001). Hybrids between these two species are not uncommon in ornamental wildfowl collections or in animal breeding (Delacour 1954).

## METHODS

Observations were made between 15 February and 10 October 2002 on 19 days between 08.00–16.00 a.m. (CET). The following parameters have been noted and subsequently grouped to create dichotomous, ordinal and continuous variables: date, behaviour before disturbance, cause, duration until resuming to previous or other behaviour, distance between source and birds, reaction of the birds, number of geese affected and distance to the waterline measured from the midpoint of the flock. The habitat is highly fragmented by many single trees, bushes, short hedgerows, footpathes, streets, playgrounds and benches which made it possible to ascertain distances almost precisely. Both distances were treated as continuous variables. Reactions towards disturbances were coded in an ordinal manner due to their energetic costs (no reaction, alerting, turning away, walking, running, flying). These assumptions were based on Newson & Hughes (1998) who compiled published basal metabolic rates (BMR) coefficients used in energy budget calculations. Due to those authors resting on land (i.e. no reaction) is calculated 1.4 × BMR, and flying 10.0 × BMR. Stock & Hofeditz (1997) compiled energetic costs of Brent Geese *Branta bernicla* and found resting = 1.1 × BMR, walking = 1.7 × BMR and flying = 15.0 × BMR. Duration was categorized the same way (no reaction, less than 10 s, 11–30 s, 31–60 s, 61–120 s, 2–5 min, 5–10 min, >10 min). The longer the durations, the more costly they are because of keeping the geese away from their feeding grounds. Previous behaviour and causes of disturbance were treated as nominal variables.

### Statistics

Because distance of disturbance and number of geese affected differed significantly from a normal distribution (Kolmogorov-Smirnov Z = 3.061, and 3.058; both $p < 0.01$), these were log-transformed to reach normality to use parametric tests. Distance to the waterline did not differ from normal distribution ($p > 0.05$). Non-parametric tests were carried out without data transformation. All tests were carried out two-tailed.

## RESULTS

Swan Geese normally reacted in a typical manner by first alerting, then neck stretching which was sometimes accompanied by vocalization, and afterwards walking or running towards the waterline or flying. Nearly all disturbances were induced by humans, only one situation originated naturally: Carrion Crow *Corvus c. corone* unsuccessfully predating on a gosling. A total number of 127 disturbances were recorded with 26 out of them showing no visible reaction of any goose (Table 1). The latter illustrates the low sensitivity towards some specific situations, especially towards passers-by and joggers (Table 1). Further birds may be disturbed without any visual outcome but, e.g. by increasing heart rate. Most disturbances were less serious resulting in no visible reaction, in alerting behaviour, turning away or in walking only a few steps (total 58.8%). The Swan Geese avoided flying (only 4.8% of all reactions), but tried to reach the water by foot. This was possible due to the low distances between the waterline and most preferred feeding grounds (< 50 m). Further, feeding sometimes took place near the waterline. An average disturbance affected 25.0 ± 3.39 of geese, occurred at 43.0 ± 6.52 m distance to the cause and lasted between 31–60 s. Previous behaviour (feeding, resting) influenced duration (Mann-Whitney U = 915.0, p = 0.023, n = 102), reaction (U = 961.5, p = 0.035, n = 103) and number of geese affected (U = 786.0, p = 0.014, n = 98) with feeding geese being more sensitive. During moult and hatching geese reacted earlier at greater distances towards the source of disturbance (t-test, t = -3.896, df = 85, p = 0.003) and more geese were affected (t = -4.283, df = 88, p < 0.001, using log-transformed data for both) than outside this period. There were no significant differences concerning reaction (Mann-Whitney U = 581.00, ns) and duration (U = 604.00, ns).

Most of the independent and dependent variables were highly correlated (Table 2, Fig. 1): significant correlations could be found between the dependent variables reaction, duration of a disturbance and the number of geese affected. However, distance to the waterline did not correlate with reaction of the geese and duration of the disturbance but with the number of geese affected. A stepwise multiple regression was used to test the independent variables (distance of disturbance, distance to the waterline) and their impact on the number of geese affected as outcome because it was measured continuously and correlated very high with the duration of the disturbance (Table 2, Fig. 2). Both variables entered the model (R = 0.488, $F_{2,37}$ = 5.770, p = 0.007); with distance to waterline (B = 0.298, p = 0.046) and distance to disturbance (B = 0.359, p = 0.018) both having positive effect. When disturbances occurred at farther distances, these were more serious, lasted longer and affected more geese.

More than fifty percent of the disturbances were caused by dogs, which were also responsible for the more severe disturbances where the birds were walking or running away or flying (Table 1). A one-way-ANOVA revealed differences between the causes of disturbances and the number of geese affected ($F_{5,114}$ = 9.993, p < 0.01, n = 119). Disturbances by dogs affected significantly more geese, than disturbances without dogs (Mann-Whitney U = 427.0, p < 0.001); also dogs caused

Table 1. Releasers of disturbances and subsequent reaction: no visible reaction, alert, turn (or walk away 1–2 m), walking away (Walk), running away (Run), flying away (Fly).

| Cause/releaser | Reaction | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No reaction | Alert | Turn | Walk | Run | Fly | n | % |
| Passers by | 8 | 19 | 2 | 2 | 2 | | 33 | 26.2 |
| Jogger/walker | 11 | 5 | 1 | 1 | 0 | | 18 | 14.3 |
| Dogs | 3 | 18 | 1 | 30 | 8 | 6 | 66 | 52.4 |
| Cars | 2 | 0 | 0 | 2 | 1 | | 5 | 4 |
| Cyclists | 2 | 1 | 1 | 0 | 0 | | 4 | 3.2 |
| Total (n) | 26 | 43 | 5 | 35 | 11 | 6 | 126 | |
| % | 20.6 | 34.1 | 4 | 27.8 | 8.8 | 4.8 | | 100 |

Table 2. Correlations between dependent and independent variables (Spearman's rank correlation): number of geese affected, duration, distance to the waterline, distance of disturbance. () — n of cases. ** p < 0.01; *** p < 0.001.

| | Geese | Duration | Waterline | Disturbance |
|---|---|---|---|---|
| Reaction | 0.732*** (119) | 0.813*** (124) | ns (44) | 0.477*** (121) |
| Geese affected | – | 0.843*** (119) | 0.424** (44) | 0.642*** (117) |
| Duration | – | – | ns (44) | 0.678*** (120) |

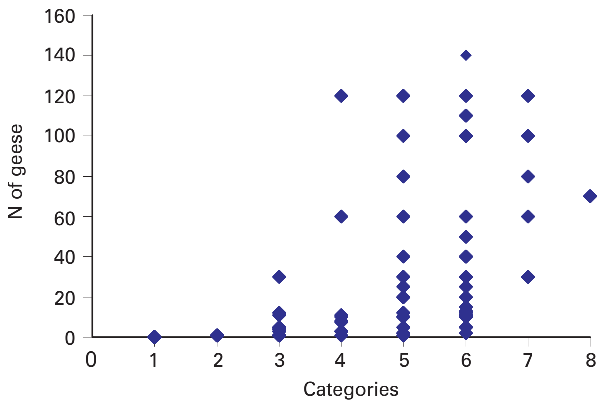


Fig. 1. Correlation between duration and the number of geese affected. Durations are coded in an ordinal manner (see Fig. 2).

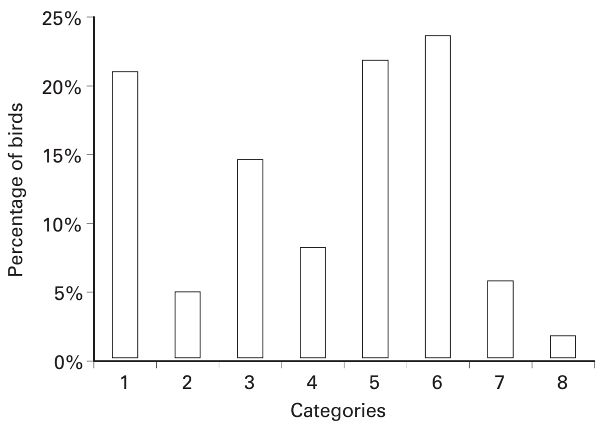


Fig. 2. Duration of disturbances until resuming to previous or other behaviour (categories: 1 = no reaction, 2 = > 10 s, 3 = 11–30 s, 4 = 31–60 s, 5 = 1–2 min, 6 = 2–5 min, 7 = 5–10 min, 8 = >10 min).

longer durations (Mann-Whitney U = 278.0, $p < 0.001$) and presumably higher energetic costs because of more severe reactions (Mann-Whitney U = 773.5, $p < 0.001$).

Due to their high potential of disturbance dogs were analyzed separately in a stepwise multiple regression with number of geese affected as outcome variable. The factors: a) dog size (1 = small; 2 = medium; 3 = large), b) dog leaded or not (dichotomous), c) distance to the waterline and d) distance to the source were use as independent variables. Only dog size influenced the severity of the disturbance, other variables did not enter the model: leaded: B = -0.049, p = 0.767; distance waterline: B = 0.276, p = 0.089; distance of disturbance: B = -0.209, p = 0.191; model: R = 0.579, $F_{1,30}$ = 15.143, p = 0.001). These results suggest that dogs cause severe disturbances according to their size and even at larger distances. Although distance to the waterline correlated with the number of geese affected in a simple correlation (Table 2), it did not contribute to the regression model with respect of disturbances by dogs, but failed the p-value just slight and may therefore be considered as possible factor too.

In 28 out 127 cases the geese reacted by fleeing into the water. An overall $\chi^2$ test revealed significant differences between the cause and this specific reaction ($\chi^2$ = 20.768, df = 5, p = 0.001) with dogs causing significantly more escapes into the water than expected ($p < 0.01$). Other causes did not differ from expected values or resulted in less escapes to the water.

## DISCUSSION

Swan Geese in Heidelberg are adapted to their urban environment and their behaviour results in a trade-off between costs (higher rate of disturbances) and benefits (using artificial feeding, absence of predators). The geese showed a less sensitivity towards humans and reacted towards disturbances with much shorter durations until resuming to previous or other behaviour and with much less costly behaviour compared to natural populations, e.g. Brent Geese, Wigeon *Anas penelope* (Riddington et al. 1996, Mathers et al. 2000), also the geese showed reduced flight distances. Therefore it is assumed that the high rate of disturbance can be compensated and does not affect time budgets, i.e. time spent feeding. Similar effects were found in Great Crested Grebes *Podiceps cristatus* by Keller (1989). Habituation to human disturbances has been reported in different waterbird species, e.g. Mallard *Anas platyrhynchos* and Common Pochard *Aythya ferina* (Sell 1991), Tufted Duck *Aythya fuligula* (Zehnter & Abs 1994), Common Tern *Sterna hirundo* (Siebolts 1998), Barnacle Geese *Branta leucopsis* (Drost et al. 2001), Goosander *Mergus merganser* (Bellebaum 2001) and different passerines (Cooke 1980, see Keller 1989 for an overview).

Distance of disturbance correlated significantly positive with reaction and the number of geese affected, which seems contradictory to other published studies. This results from the specific situation of the urban environment. Severe disturbances (e.g. large dogs) occurred at farther distances and therefore affected many geese at greater distances and also lasted longer, while disturbances that occurred at shorter distances (e.g. joggers or pedestrians) affected only a few individuals and resulted in shorter durations.

The most and most severe disturbances were caused by dogs. In urban environments dogs account for a high rate of disturbances, even when they were leaded and passed further away, simply through their presence. Therefore it is assumed, that dogs may cause serious disturbances in natural settings, especially on ground-feeding and ground-nesting species.

The geese were more sensitive towards disturbances during their flightless period which confirmed the expectation. Because they have to escape by foot, they should start fleeing earlier.

The following predictions already outlined in the Introduction have been tested: The reaction of the geese was dependent on dog size; distance to the waterline did not correlate with reaction and duration (Table 2) but with the number of geese affected — therefore this prediction is only partially confirmed. The geese should flee when the costs of fleeing are lower. Although the costs of fleeing are low due to the proximity of the water, habituation developed instead. Species in urban environment therefore should habituate in a way that seeks to reduce fleeing despite costs of fleeing often are lower than in natural environments but disturbance rate is much higher. Habituation therefore could be less costly.

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## REFERENCES

Bellebaum J. 2001. Tourismus in Schutzgebieten — können wir uns auf Habituation und "Nationalparkeffekte" verlassen? Vogelkundl. Ber. Niedersachsen 33: 125–129.

Cooke A. S. 1980. Observations on how close certain passerine species will tolerate an approaching human in rural and suburban habitats. Biol. Cons. 18: 85–88.

Delacour J. 1954. The waterfowl of the world. Vol. I. Country Life, London.

Delany S. 1993. Introduced and escaped Geese in Britain in summer 1991. Brit. Birds 86: 591–599.

del Hoyo J., Elliott A., Sargatal J. (eds). 1992. Handbook of the birds of the world. Vol. I. Lynx Edicions, Barcelona.

Drost A., Kruckenberg H., Loonen J. J. E. 2001. Untersuchungen zur Störungsempfindlichkeit arktischer Nonnengänse während der Mauserzeit. Vogelkundl. Ber. Niedersachsen 33: 137–142.

Frid A., Dill L. M. 2002. Human-caused disturbance stimuli as a form of predation risk. Conserv. Ecol. 6: 11.

Hagemeijer E. J. M., Blair M. J. 1997. The EBCC Atlas of European breeding birds: Their distribution and abundance. T & A D Poyser, London.

Keller V. 1989. Variation in the response of great crested grebes *Podiceps cristatus* to human disturbance — a sign of adaptation? Biol. Conserv. 49: 31–45.

Keller V. 1995. Auswirkungen menschlicher Störungen auf Vögel — eine Literaturübersicht. Ornithol. Beob. 92: 3–38.

Lima S. L., Dill L. M. 1990. Behavioral decisions made under the risk of predation: a review and prospectus. Can. J. Zool. 68: 619-640.

Mathers R. G., Watson S., Stone R., Montgomery W. I. 2000. A study of the impact of human disturbance on wigeon *Anas penelope* and Brant geese *Branta bernicla* on an Irish Sea loch. Wildfowl 51: 67-81.

Newson S. E., Hughes B. 1998. Diurnal activity and energy budgets of goosander *Mergus merganser* wintering on Chew Valley Lake, North Somerset: influence of time of day and sex. Wildfowl 49: 173–180.

Randler C. 2000. Wasservogelhybriden (Anseriformes) im westlichen Mitteleuropa — Verbreitung, Auftreten und Ursachen. Ökol. Vögel 22: 1–106.

Randler C. 2001. Field identification of hybrid wildfowl — Geese. Alula 7: 42–48.

Riddington R., Hassall M., Lane S. J., Turner P. A., Walters R. 1996. The impact of disturbances on the behaviour and energy budgets of Brent Geese *Branta b. bernicla*. Bird Study 43: 269–279.

Sell M. 1991. Raum-Zeit-Muster übernwinternder Entenvögel unter dem Einfluß anthropogener Störfaktoren: Experimente an einem Freizeitstausee im Ruhrgebiet. Ber. Sek. Intern. Rat Vogelschutz 30: 71–85.

Siebolts U. 1998. Reaktionen der Flußseeschwalbe *Sterna hirundo* gegenüber Menschen in verschiedenen Brutkolonien. Vogelwelt 119: 271–277.

Stock M., Hofeditz F. 1996. Zeit-Aktivitäts-Budgets von Ringelgänsen (*Branta bernicla bernicla*) in unterschiedlich stark von Menschen beeinflußten Salzwiesen des Wattenmeers. Vogelwarte 38: 121–145.

Stock M., Hofeditz F. 1997. Grenzen der Kompensation: Energiebudgets von Ringelgänsen (*Branta b. bernicla*) — die Wirkung von Störreizen. J. Ornithol. 138: 387–411.

Zehnter H.-C., Abs M. 1994. Fahrradfahrer und Fußgänger als Zeitgeber der diurnalen Aktivitätsrhythmik überwinternder Reiherenten (*Aythya fuligula*). J. Ornithol. 135: 81–93.

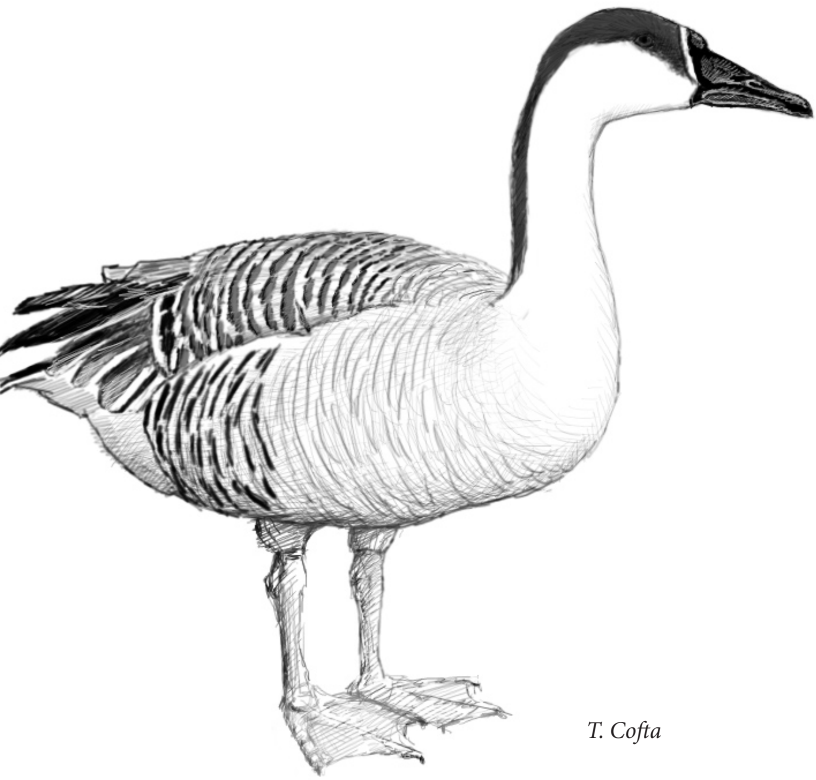
## STRESZCZENIE

**[Reakcje stada gęsi łabędzionosych na antropogeniczne bodźce zakłócające w warunkach miejskich Heidelbergu (SW Niemcy)]**

Bodźce zakłócające wpływają na zachowanie ptaków wodnych oraz powodują koszty energetyczne przemieszczeń lub ograniczeń żerowania. Warunki miejskie są, pod różnymi względami korzystne dla tych ptaków, jednak zwiększają nasilenie bodźców zakłócających. Reakcja na nie jest silniejsza gdy źródło bodźca: a) zbliża się czołowo, b) szybko, c) ma większe rozmiary, d) odległość do miejsca schronienia jest większa, e) stado jest liczniejsze, f) koszt energetyczny odlotu jest

mniejszy. Celem pracy było zbadanie w warunkach miejskich zależności od czynników c, d i f.

Badania prowadzono przez 19 dni w różnych okresach cyklu fenologicznego między 15 II a 19 X 2002, na odwiedzanym przez publiczność błoniu (5.5 ha) parku miejskiego ze stawem. Badane stado liczyło do 140 osobników tego egzotycznego azjatyckiego gatunku występującego w mieście od lat 1990. Analizowano 127 przypadków działania bodźca zakłócającego, z których 126 dotyczyło przyczyn antropogenicznych (Tab. 1). Większość (58.8% przypadków) stanowiły bodźce słabe, które nie wywołały reakcji lub słabe reakcje, co świadczy że ptaki były do tego przyzwyczajone. Średnio zakłócenia oddziaływały na 25 ± 3.39 osobników z odległości 43 ± 6.52 m i trwały 31–60 sek. Gęsi żerujące reagowały silniej niż odpoczywające. Nasilała się też bardziej wrażliwość na bodźce w okresie lęgów i nielotności podczas pierzenia. Ponad połowa przypadków zakłóceń była spowodowana przez psy (Tab. 1). W tych przypadkach wyższa była średnia liczba spłoszonych gęsi, ich reakcje trwały dłużej i prawdopodobnie powodowały większe straty energii. Stwierdzono wysoką pozytywną zależność między nasileniem reakcji, trwaniem zakłócenia i liczbą reagujących gęsi (Tab. 2, Fig. 2). Liczba reagujących gęsi była też wyższa przy zwiększającej się odległości od linii brzegowej parkowego stawu. Odmiennością w stosunku do wyników podobnych badań w środowiskach pozamiejskich była pozytywna korelacja między odległością od bodźca i nasileniem reakcji oraz liczbą reagujących gęsi. Był to skutek tego, że silniejsze bodźce (np. duży pies) już z daleka płoszyły ptaki, podczas gdy np. obecność ludzi nie wywoływała reakcji z dalekiego dystansu. Psy powodowały też stosunkowo częstsze ucieczki gęsi na wodę.



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