



Universiteit
Leiden
The Netherlands

Bearing with noise: the effects of highway noise on behaviour and development in zebra finches

Liu, Q.

Citation

Liu, Q. (2021, June 2). *Bearing with noise: the effects of highway noise on behaviour and development in zebra finches*. Retrieved from <https://hdl.handle.net/1887/3180750>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3180750>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <https://hdl.handle.net/1887/3180750> holds various files of this Leiden University dissertation.

Author: Liu, Q.

Title: Bearing with noise: the effects of highway noise on behaviour and development in zebra finches

Issue Date: 2021-06-02

B

Bibliography

Bibliography

- Adam, I., Scharff, C., & Honarmand, M. (2014). Who is who? Non-invasive methods to individually sex and mark altricial chicks – J. Vis. Exp. e51429.
- Adar, E., Lotem, A., & Barnea, A. (2008). The effect of social environment on singing behavior in the zebra finch (*Taeniopygia guttata*) and its implication for neuronal recruitment – Behav. Brain Res. 187: 178–184.
- Akamatsu, T., Okumura, T., Novarini, N., & Yan, H.Y. (2002). Empirical refinements applicable to the recording of fish sounds in small tanks – J. Acoust. Soc. Am. 112: 3073–3082.
- Amy, M., Sprau, P., de Goede, P., & Naguib, M. (2010). Effects of personality on territory defence in communication networks: a playback experiment with radio-tagged great tits – Proc. R. Soc. B 277: 3685–3692.
- Angelier, F., Meillère, A., Grace, J.K., Trouvé, C., & Brischoux, F. (2016). No evidence for an effect of traffic noise on the development of the corticosterone stress response in an urban exploiter – Gen. Comp. Endocrinol. 232: 43–50.
- Arévalo, J.E. & Newhard, K. (2011). Traffic noise affects forest bird species in a protected tropical forest – Rev. Biol. Trop. 59: 969–980.
- Arroyo-Solís, A., Castillo, J.M., Figueroa, E., López-Sánchez, J.L., & Slabbekoorn, H. (2013). Experimental evidence for an impact of anthropogenic noise on dawn chorus timing in urban birds – J. Avian Biol. 44: 288–296.
- Audacity Team (2020). Audacity(R): Free Audio Editor and Recorder [Computer application]. Multiple versions retrieved from <https://audacityteam.org/>
- Barber, J.R., Burdett, C.L., Reed, S.E., Warner, K.A., Formichella, C., Crooks, K.R., Theobald, D.M., & Fristrup, K.M. (2011). Anthropogenic noise exposure in protected natural areas: Estimating the scale of ecological consequences – Landsc. Ecol. 26: 1281–1295.
- Barber, J.R., Crooks, K.R., & Fristrup, K.M. (2010). The costs of chronic noise exposure for terrestrial organisms – Trends Ecol. Evol. 25: 180–189.
- Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., & Stansfeld, S. (2014). Auditory and non-auditory effects of noise on health – Lancet 383: 1325–1332.

Bibliography

- Bayne, E.M., Habib, L., & Boutin, S. (2008). Impacts of chronic anthropogenic noise from energy-sector activity on abundance of songbirds in the boreal forest – *Conserv. Biol.* 22: 1186–1193.
- Beaugeard, E., Brischoux, F., Henry, P.-Y., Parenteau, C., Trouvé, C., & Angelier, F. (2019). Does urbanization cause stress in wild birds during development? Insights from feather corticosterone levels in juvenile house sparrows (*Passer domesticus*) – *Ecol. Evol.* 9: 640–652.
- Benítez-López, A., Alkemade, R., & Verweij, P.A. (2010). The impacts of roads and other infrastructure on mammal and bird populations: A meta-analysis – *Biol. Conserv.* 143: 1307–1316.
- Bennett, V.J. (2017). Effects of road density and pattern on the conservation of species and biodiversity – *Curr. Landsc. Ecol. Reports* 2: 1–11.
- Bent, A.M., Ings, T.C., & Mowles, S.L. (2018). Anthropogenic noise disrupts mate searching in *Gryllus bimaculatus* – *Behav. Ecol.* 29: 1271–1277.
- Bermúdez-Cuamatzin, E., Delamore, Z., Verbeek, L., Kremer, C., & Slabbekoorn, H. (2020). Variation in diurnal patterns of singing activity between urban and rural great tits – *Front. Ecol. Evol.* 8: 246.
- Bermúdez-Cuamatzin, E., Ríos-Chelén, A.A., Gil, D., & Garcia, C.M. (2011). Experimental evidence for real-time song frequency shift in response to urban noise in a passerine bird – *Biol. Lett.* 7: 36–38.
- Biondi, L.M., Fuentes, G.M., Córdoba, R.S., Bó, M.S., Cavalli, M., Paterlini, C.A., Castano, M. V., & García, G.O. (2020). Variation in boldness and novelty response between rural and urban predatory birds: The Chimango Caracara, *Milvago chimango* as study case – *Behav. Processes* 173: 104064.
- Blickley, J.L., Blackwood, D., & Patricelli, G.L. (2012). Experimental evidence for the effects of chronic anthropogenic noise on abundance of greater sage-grouse at leks – *Conserv. Biol.* 26: 461–471.
- Boersma, P.; & Weenink, D. (2019). Praat: doing phonetics by computer [Computer program].

Bibliography

- Boogert, N.J., Farine, D.R., & Spencer, K.A. (2014). Developmental stress predicts social network position – *Biol. Lett.* 10: 20140561.
- Boucaud, I.C.A., Mariette, M.M., Villain, A.S., & Vignal, C. (2016). Vocal negotiation over parental care? Acoustic communication at the nest predicts partners' incubation share – *Biol. J. Linn. Soc.* 117: 322–336.
- Boucaud, I.C.A., Perez, E.C., Ramos, L.S., Griffith, S.C., & Vignal, C. (2017). Acoustic communication in zebra finches signals when mates will take turns with parental duties – *Behav. Ecol.* 28: 645–656.
- Brandl, H.B., Farine, D.R., Funghi, C., Schuett, W., & Griffith, S.C. (2019). Early-life social environment predicts social network position in wild zebra finches – *Proc. R. Soc. B* 286: 20182579.
- Brischoux, F., Meillère, A., Dupoué, A., Lourdais, O., & Angelier, F. (2017). Traffic noise decreases nestlings' metabolic rates in an urban exploiter – *J. Avian Biol.* 48: 905–909.
- Brown, A.L. (1990). Measuring the effect of aircraft noise on sea birds – *Environ. Int.* 16: 587–592.
- Brumm, H. & Naguib, M. (2009). Environmental acoustics and the evolution of bird song – *Adv. Study Behav.* 40: 1–33.
- Brumm, H. & Slabbekoorn, H. (2005). Acoustic communication in noise – *Adv. Study Behav.* 35: 151–209.
- Brumm, H. & Todt, D. (2002). Noise-dependent song amplitude regulation in a territorial songbird – *Anim. Behav.* 63: 891–897.
- Brumm, H. & Zollinger, A. (2011). The evolution of the Lombard effect: 100 years of psychoacoustic research – *Behaviour* 148: 1173–1198.
- Brumm, H., Zollinger, S.A., & Slater, P.J.B. (2009). Developmental stress affects song learning but not song complexity and vocal amplitude in zebra finches – *Behav. Ecol. Sociobiol.* 63: 1387–1395.
- Bruno, J.H. & Tchernichovski, O. (2019). Regularities in zebra finch song beyond the repeated motif – *Behav. Processes* 163: 53–59.

Bibliography

- Buchanan, K.L. (2011). The developmental stress hypothesis: a special case of the evolution of condition-dependent sexual traits – *Behav. Ecol.* 22: 12–13.
- Buchanan, K.L., Leitner, S., Spencer, K.A., Goldsmith, A.R., & Catchpole, C.K. (2004). Developmental stress selectively affects the song control nucleus HVC in the zebra finch – *Proc. R. Soc. B* 271: 2381–2386.
- Bunkley, J.P., McClure, C.J.W., Kawahara, A.Y., Francis, C.D., & Barber, J.R. (2017). Anthropogenic noise changes arthropod abundances – *Ecol. Evol.* 7: 2977–2985.
- Buxton, R.T., McKenna, M.F., Mennitt, D., Fristrup, K., Crooks, K., Angeloni, L., & Wittemyer, G. (2017). Noise pollution is pervasive in U.S. protected areas – *Science* 356: 531–533.
- Carere, C., Drent, P.J., Koolhaas, J.M., & Groothuis, T.G.G. (2005). Epigenetic effects on personality traits: Early food provisioning and sibling competition – *Behaviour* 142: 1329–1355.
- Carrete, M. & Tella, J.L. (2011). Inter-individual variability in fear of humans and relative brain size of the species are related to contemporary urban invasion in birds – *PLoS One* 6: e18859.
- Carter, A.J., Feeney, W.E., Marshall, H.H., Cowlshaw, G., & Heinsohn, R. (2013). Animal personality: What are behavioural ecologists measuring? – *Biol. Rev.* 88: 465–475.
- Cartwright, L.A., Taylor, D.R., Wilson, D.R., & Chow-Fraser, P. (2014). Urban noise affects song structure and daily patterns of song production in Red-winged Blackbirds (*Agelaius phoeniceus*) – *Urban Ecosyst.* 17: 561–572.
- Casagrande, S., Pinxten, R., Zaid, E., & Eens, M. (2016). Positive effect of dietary lutein and cholesterol on the undirected song activity of an opportunistic breeder – *PeerJ* 2016: e2512.
- Casasole, G., Raap, T., Costantini, D., AbdElgawad, H., Asard, H., Pinxten, R., & Eens, M. (2017). Neither artificial light at night, anthropogenic noise nor distance from roads are associated with oxidative status of nestlings in an urban population of songbirds – *Comp. Biochem. Physiol. -Part A Mol. Integr. Physiol.* 210: 14–21.

Bibliography

- Chan, A.A.Y.-H., Giraldo-Perez, P., Smith, S., & Blumstein, D.T. (2010). Anthropogenic noise affects risk assessment and attention: the distracted prey hypothesis – *Biol. Lett.* 6: 458–461.
- Chang, E.F. & Merzenich, M.M. (2003). Environmental noise retards auditory cortical development. – *Science* 300: 498–502.
- Chapman, B.B., Morrell, L.J., Tosh, C.R., & Krause, J. (2010). Behavioural consequences of sensory plasticity in guppies – *Proc. R. Soc. B* 277: 1395–1401.
- Clark, C. & Stansfeld, S.A. (2007). The effect of transportation noise on health and cognitive development: A review of recent evidence – *Int. J. Comp. Psychol.* 20: 145–158.
- Coleman, S.L. & Mellgren, R.L. (1994). Neophobia when feeding alone or in flocks in zebra finches, *Taeniopygia guttata* – *Anim. Behav.* 48: 903–907.
- Conomy, J.T., Dubovsky, J.A., Collazo, J.A., & Fleming, W.J. (1998). Do black ducks and wood ducks habituate to aircraft disturbance? – *J. Wildl. Manage.* 62: 1135.
- Coppens, C.M., de Boer, S.F., & Koolhaas, J.M. (2010). Coping styles and behavioural flexibility: towards underlying mechanisms – *Philos. Trans. R. Soc. B* 365: 4021–4028.
- Crino, O.L., Johnson, E.E., Blickley, J.L., Patricelli, G.L., & Breuner, C.W. (2013). Effects of experimentally elevated traffic noise on nestling white-crowned sparrow stress physiology, immune function and life history – *J. Exp. Biol.* 216: 2055–2062.
- Crino, O.L., Van Oorschot, B.K., Johnson, E.E., Malisch, J.L., & Breuner, C.W. (2011). Proximity to a high traffic road: Glucocorticoid and life history consequences for nestling white-crowned sparrows – *Gen. Comp. Endocrinol.* 173: 323–332.
- Cynx, J., Lewis, R., Tavel, B., & Tse, H. (1998). Amplitude regulation of vocalizations in noise by a songbird, *Taeniopygia guttata* – *Anim. Behav.* 56: 107–113.
- David, M., Auclair, Y., & Cézilly, F. (2011a). Personality predicts social dominance in female zebra finches, *Taeniopygia guttata*, in a feeding context – *Anim. Behav.* 81: 219–224.
- David, M., Cézilly, F., & Giraldeau, L.-A. (2011b). Personality affects zebra finch feeding success in a producer–scrounger game – *Anim. Behav.* 82: 61–67.

Bibliography

- de Kogel, C.H. (1997). Long-term effects of brood size manipulation on morphological development and sex-specific mortality of offspring – J. Anim. Ecol. 66: 167.
- de Kogel, C.H. & Prijs, H.J. (1996). Effects of brood size manipulations on sexual attractiveness of offspring in the zebra finch – Anim. Behav. 51: 699–708.
- Derryberry, E.P., Danner, R.M., Danner, J.E., Derryberry, G.E., Phillips, J.N., Lipshutz, S.E., Gentry, K., & Luther, D.A. (2016). Patterns of song across natural and anthropogenic soundscapes suggest that white-crowned sparrows minimize acoustic masking and maximize signal content – PLoS One 11: e0154456.
- Derryberry, E.P., Phillips, J.N., Derryberry, G.E., Blum, M.J., & Luther, D. (2020). Singing in a silent spring: Birds respond to a half-century soundscape reversion during the COVID-19 shutdown – Science eabd5777.
- Dominoni, D.M., Greif, S., Nemeth, E., & Brumm, H. (2016). Airport noise predicts song timing of European birds – Ecol. Evol. 6: 6151–6159.
- Dooling, R.J. (1992). Hearing in birds – In: The Evolutionary Biology of Hearing. (Webster, D.B. & Fay, R.R., eds). Springer New York, 1st ed., p. 545–559.
- Dooling, R.J. (2011). The effects of noise on birds. – J. Acoust. Soc. Am. 129: 2395–2395.
- Dooling, R.J. & Popper, A.N. (2007). The effects of highway noise on birds. Sacramento, CA: The California Department of Transportation Division of Environmental Analysis.
- Dooling, R.J. & Saunders, J.C. (1974). Threshold shift produced by continuous noise exposure in the parakeet (*Melopsittacus undulatus*) – J. Acoust. Soc. Am. 55: S77–S77.
- Dorado-Correa, A.M., Zollinger, S.A., Heidinger, B., & Brumm, H. (2018). Timing matters: traffic noise accelerates telomere loss rate differently across developmental stages – Front. Zool. 15: 29.
- Dunn, A.M. & Zann, R.A. (1996). Undirected song in wild zebra finch flocks: contexts and effects of mate removal – Ethology 102: 529–539.
- EEA (2015). Noise. SOER 2015 - The European environment - state and outlook 2015. Copenhagen, Denmark: European Environment Agency. <https://www.eea.europa.eu/soer/2015/europe/noise>.

Bibliography

- Ehlman, S.M., Sandkam, B.A., Breden, F., & Sih, A. (2015). Developmental plasticity in vision and behavior may help guppies overcome increased turbidity – *J. Comp. Physiol. A* 201: 1125–1135.
- Elie, J.E., Soula, H.A., Mathevon, N., & Vignal, C. (2011). Dynamics of communal vocalizations in a social songbird, the zebra finch (*Taeniopygia guttata*) – *J. Acoust. Soc. Am.* 129: 4037–4046.
- Emmerson, M.G. & Spencer, K.A. (2017). Long-term effects of adolescent stress on neophobic behaviors in zebra finches are modulated by social context when in adulthood – *Horm. Behav.* 90: 48–55.
- Evans, J., Boudreau, K., & Hyman, J. (2010). Behavioural syndromes in urban and rural populations of song sparrows – *Ethology* 116: 588–595.
- Evans, J.C., Dall, S.R.X., & Kight, C.R. (2018). Effects of ambient noise on zebra finch vigilance and foraging efficiency – *PLoS One* 13: e0209471.
- Farrell, T., Kriengwatana, B., & MacDougall-Shackleton, S.A. (2015). Developmental stress and correlated cognitive traits in songbirds – *Comp. Cogn. Behav. Rev.* 10: 1–23.
- Ferrari, M.C.O., McCormick, M.I., Meekan, M.G., Simpson, S.D., Nedelec, S.L., & Chivers, D.P. (2018). School is out on noisy reefs: the effect of boat noise on predator learning and survival of juvenile coral reef fishes – *Proc. R. Soc. B* 285: 20180033.
- Flores, R., Penna, M., Wingfield, J.C., Cuevas, E., Vásquez, R.A., & Quirici, V. (2020). Effects of traffic noise exposure on corticosterone, glutathione and tonic immobility in chicks of a precocial bird – *Conserv. Physiol.* 7.
- Francis, C.D., Ortega, C.P., & Cruz, A. (2009). Noise pollution changes avian communities and species interactions – *Curr. Biol.* 19: 1415–1419.
- Friard, O. & Gamba, M. (2016). BORIS: a free, versatile open-source event-logging software for video/audio coding and live observations – *Methods Ecol. Evol.* 7: 1325–1330.
- Funabiki, Y. & Funabiki, K. (2009). Factors limiting song acquisition in adult zebra finches – *Dev. Neurobiol.* 69: 752–759.

Bibliography

- Funabiki, Y. & Konishi, M. (2003). Long memory in song learning by zebra finches – J. Neurosci. 23: 6928–6935.
- Garamszegi, L.Z., Eens, M., & Török, J. (2008). Birds reveal their personality when singing – PLoS One 3: e2647.
- Gentry, K.E., Derryberry, E.P., Danner, R.M., Danner, J.E., & Luther, D.A. (2017). Immediate signaling flexibility in response to experimental noise in urban, but not rural, white-crowned sparrows – Ecosphere 8: e01916.
- Gil, D. & Gahr, M. (2002). The honesty of bird song: Multiple constraints for multiple traits – Trends Ecol. Evol. 17: 133–141.
- Gil, D., Honarmand, M., Pascual, J., Pérez-Mena, E., & Macías Garcia, C. (2015). Birds living near airports advance their dawn chorus and reduce overlap with aircraft noise – Behav. Ecol. 26: 435–443.
- Gil, D., Naguib, M., Riebel, K., Rutstein, A., & Gahr, M. (2006). Early condition, song learning, and the volume of song brain nuclei in the zebra finch (*Taeniopygia guttata*) – J. Neurobiol. 66: 1602–1612.
- Gilbert, E.A., Sompud, J., & Sompud, C.B. (2017). A review on the impact of anthropogenic noise on birds – Borneo Sci. 38: 28–35.
- Gilby, A.J., Mainwaring, M.C., Rollins, L.A., & Griffith, S.C. (2011). Parental care in wild and captive zebra finches: Measuring food delivery to quantify parental effort – Anim. Behav. 81: 289–295.
- Gill, L.F., Goymann, W., Ter Maat, A., & Gahr, M. (2015a). Patterns of call communication between group-housed zebra finches change during the breeding cycle – Elife 4: e07770.
- Gill, S.A., Job, J.R., Myers, K., Naghshineh, K., & Vonhof, M.J. (2015b). Toward a broader characterization of anthropogenic noise and its effects on wildlife – Behav. Ecol. 26: 328–333.
- Goodwin, S.E. & Shriver, W.G. (2011). Effects of traffic noise on occupancy patterns of forest birds – Conserv. Biol. 25: 406–411.

Bibliography

- Grabarczyk, E.E. & Gill, S.A. (2020). A female perspective: Testing the effects of noise masking on signal transmission patterns inside the nest box – *Behaviour* 157: 59–76.
- Grade, A.M. & Sieving, K.E. (2016). When the birds go unheard: highway noise disrupts information transfer between bird species – *Biol. Lett.* 12: 20160113.
- Griffith, S.C. & Buchanan, K.L. (2010). The zebra finch: the ultimate Australian supermodel – *Emu* 110: v–xii.
- Griffith, S.C., Crino, O.L., Andrew, S.C., Nomano, F.Y., Adkins-Regan, E., Alonso-Alvarez, C., Bailey, I.E., Bittner, S.S., Bolton, P.E., Boner, W., Boogert, N., Boucaud, I.C.A., Briga, M., Buchanan, K.L., Caspers, B.A., Cichoń, M., Clayton, D.F., Derégnaucourt, S., Forstmeier, W., Guillelte, L.M., Hartley, I.R., Healy, S.D., Hill, D.L., Holveck, M.-J., Hurley, L.L., Ihle, M., Tobias Krause, E., Mainwaring, M.C., Marasco, V., Mariette, M.M., Martin-Wintle, M.S., McCowan, L.S.C., McMahon, M., Monaghan, P., Nager, R.G., Naguib, M., Nord, A., Potvin, D.A., Prior, N.H., Riebel, K., Romero-Haro, A.A., Royle, N.J., Rutkowska, J., Schuett, W., Swaddle, J.P., Tobler, M., Trompf, L., Varian-Ramos, C.W., Vignal, C., Villain, A.S., & Williams, T.D. (2017). Variation in reproductive success across captive populations: methodological differences, potential biases and opportunities – *Ethology* 123: 1–29.
- Groothuis, T.G.G. & Trillmich, F. (2011). Unfolding personalities: The importance of studying ontogeny – *Dev. Psychobiol.* 53: 641–655.
- Grunst, M.L., Grunst, A.S., Pinxten, R., & Eens, M. (2020). Anthropogenic noise is associated with telomere length and carotenoid-based coloration in free-living nestling songbirds – *Environ. Pollut.* 260: 114032.
- Guillelte, L.M. & Sturdy, C.B. (2011). Individual differences and repeatability in vocal production: stress-induced calling exposes a songbird's personality – *Naturwissenschaften* 98: 977–981.
- Guo, F., Bonebrake, T.C., & Dingle, C. (2016). Low frequency dove coos vary across noise gradients in an urbanized environment – *Behav. Processes* 129: 86–93.
- Habib, L., Bayne, E.M., & Boutin, S. (2007). Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla* – *J. Appl. Ecol.* 44: 176–184.

Bibliography

- Halfwerk, W., Bot, S., Buikx, J., van der Velde, M., Komdeur, J., ten Cate, C., & Slabbekoorn, H. (2011a). Low-frequency songs lose their potency in noisy urban conditions – PNAS 108: 14549–14554.
- Halfwerk, W., Both, C., & Slabbekoorn, H. (2016). Noise affects nest-box choice of 2 competing songbird species, but not their reproduction – Behav. Ecol. 27: 1592–1600.
- Halfwerk, W., Holleman, L.J.M., Lessells, Ck.M., & Slabbekoorn, H. (2011b). Negative impact of traffic noise on avian reproductive success – J. Appl. Ecol. 48: 210–219.
- Halfwerk, W. & Slabbekoorn, H. (2015). Pollution going multimodal: the complex impact of the human-altered sensory environment on animal perception and performance – Biol. Lett. 11: 20141051.
- Herrera-Montes, M.I. & Aide, T.M. (2011). Impacts of traffic noise on anuran and bird communities – Urban Ecosyst. 14: 415–427.
- Hill, S.D., Aryal, A., Pawley, M.D.M., & Ji, W. (2018). So much for the city: Urban-rural song variation in a widespread Asiatic songbird – Integr. Zool. 13: 194–205.
- Holveck, M.-J. & Riebel, K. (2010). Low-quality females prefer low-quality males when choosing a mate – Proc. R. Soc. B 277: 153–160.
- Hubert, J., Campbell, J., van der Beek, J.G., den Haan, M.F., Verhave, R., Verkade, L.S., & Slabbekoorn, H. (2018). Effects of broadband sound exposure on the interaction between foraging crab and shrimp – A field study – Environ. Pollut. 243: 1923–1929.
- Huet des Aunay, G., Slabbekoorn, H., Nagle, L., Passas, F., Nicolas, P., & Draganoiu, T.I. (2014). Urban noise undermines female sexual preferences for low-frequency songs in domestic canaries – Anim. Behav. 87: 67–75.
- Hutton, P. & McGraw, K.J. (2016). Urban impacts on oxidative balance and animal signals – Front. Ecol. Evol. 4: 54.
- Iglesias Merchan, C., Diaz-Balteiro, L., & Soliño, M. (2014). Noise pollution in national parks: Soundscape and economic valuation – Landsc. Urban Plan. 123: 1–9.
- Injaian, A.S., Francis, C.D., Ouyang, J.Q., Dominoni, D.M., Donald, J.W., Fuxjager, M.J., Goymann, W., Hau, M., Husak, J.F., Johnson, M.A., Kircher, B.K., Knapp, R., Martin,

Bibliography

- L.B., Miller, E.T., Schoenle, L.A., Williams, T.D., & Vitousek, M.N. (2020). Baseline and stress-induced corticosterone levels across birds and reptiles do not reflect urbanization levels – *Conserv. Physiol.* 8: 2020.
- Injaian, A.S., Gonzalez-Gomez, P.L., Taff, C.C., Bird, A.K., Ziur, A.D., Patricelli, G.L., Haussmann, M.F., & Wingfield, J.C. (2019). Traffic noise exposure alters nestling physiology and telomere attrition through direct, but not maternal, effects in a free-living bird – *Gen. Comp. Endocrinol.* 276: 14–21.
- Injaian, A.S., Poon, L.Y., & Patricelli, G.L. (2018a). Effects of experimental anthropogenic noise on avian settlement patterns and reproductive success – *Behav. Ecol.* 29: 1181–1189.
- Injaian, A.S., Taff, C.C., & Patricelli, G.L. (2018b). Experimental anthropogenic noise impacts avian parental behaviour, nestling growth and nestling oxidative stress – *Anim. Behav.* 136: 31–39.
- Injaian, A.S., Taff, C.C., Pearson, K.L., Gin, M.M.Y., Patricelli, G.L., & Vitousek, M.N. (2018c). Effects of experimental chronic traffic noise exposure on adult and nestling corticosterone levels, and nestling body condition in a free-living bird – *Horm. Behav.* 106: 19–27.
- Isojunno, S., Wensveen, P.J., Lam, F.P.A., Kvadsheim, P.H., Von Benda-Beckmann, A.M., Martín López, L.M., Kleivane, L., Siegal, E.M., & Miller, P.J.O. (2020). When the noise goes on: Received sound energy predicts sperm whale responses to both intermittent and continuous navy sonar – *J. Exp. Biol.* 223.
- Jack, J., Rytwinski, T., Fahrig, L., & Francis, C.M. (2015). Influence of traffic mortality on forest bird abundance – *Biodivers. Conserv.* 24: 1507–1529.
- Jacobs, C.G.C., van Overveld, T., Careau, V., Matthysen, E., Adriaensen, F., & Slabbekoorn, H. (2014). Personality-dependent response to field playback in great tits: slow explorers can be strong responders – *Anim. Behav.* 90: 65–71.
- Jesse, F. & Riebel, K. (2012). Social facilitation of male song by male and female conspecifics in the zebra finch, *Taeniopygia guttata* – *Behav. Processes* 91: 262–266.

Bibliography

- Jimeno, B., Hau, M., & Verhulst, S. (2018). Corticosterone levels reflect variation in metabolic rate, independent of ‘stress’ – *Sci. Rep.* 8: 13020.
- Kight, C.R., Saha, M.S., & Swaddle, J.P. (2012). Anthropogenic noise is associated with reductions in the productivity of breeding Eastern bluebirds (*Sialia sialis*) – *Ecol. Appl.* 22: 1989–1996.
- Kight, C.R. & Swaddle, J.P. (2011). How and why environmental noise impacts animals: an integrative, mechanistic review – *Ecol. Lett.* 14: 1052–1061.
- Kimbell, H.S., Chapman, B.B., Dobbinson, K.E., & Morrell, L.J. (2019). Foraging guppies can compensate for low-light conditions, but not via a sensory switch – *Behav. Ecol. Sociobiol.* 73: 32.
- Kleist, N.J., Guralnick, R.P., Cruz, A., & Francis, C.D. (2017). Sound settlement: noise surpasses land cover in explaining breeding habitat selection of secondary cavity-nesting birds – *Ecol. Appl.* 27: 260–273.
- Kleist, N.J., Guralnick, R.P., Cruz, A., Lowry, C.A., & Francis, C.D. (2018). Chronic anthropogenic noise disrupts glucocorticoid signaling and has multiple effects on fitness in an avian community – *PNAS* 115: E648–E657.
- Kok, A.C.M., Engelberts, J.P., Kastelein, R.A., Helder-Hoek, L., Van de Voorde, S., Visser, F., & Slabbekoorn, H. (2018). Spatial avoidance to experimental increase of intermittent and continuous sound in two captive harbour porpoises – *Environ. Pollut.* 233: 1024–1036.
- Krause, E.T. & Naguib, M. (2011). Compensatory growth affects exploratory behaviour in zebra finches, *Taeniopygia guttata* – *Anim. Behav.* 81: 1295–1300.
- Kriengwatana, B., Wada, H., Macmillan, A., & MacDougall-Shackleton, S.A. (2013). Juvenile nutritional stress affects growth rate, adult organ mass, and innate immune function in zebra finches (*Taeniopygia guttata*) – *Physiol. Biochem. Zool.* 86: 769–781.
- Kull, R.C. & McGarrity, C. (2003). Noise effects on animals: 1998-2002 review – In: *Proc. 8th Int. Congr. Noise as a Public Heal. Probl.*, p. 291–298.
- Kunc, H.P., McLaughlin, K.E., & Schmidt, R. (2016). Aquatic noise pollution: implications for individuals, populations, and ecosystems – *Proc. R. Soc. B* 283: 20160839.

Bibliography

- Kunc, H.P. & Schmidt, R. (2019). The effects of anthropogenic noise on animals: a meta-analysis – *Biol. Lett.* 15: 20190649.
- LaZerte, S.E., Slabbekoorn, H., & Otter, K.A. (2016). Learning to cope: vocal adjustment to urban noise is correlated with prior experience in black-capped chickadees – *Proc. R. Soc. B* 283: 20161058.
- Leonard, M. & Horn, A. (2012). Ambient noise increases missed detections in nestling birds – *Biol. Lett.* 8: 530–532.
- Leonard, M., Horn, A., Oswald, K., & McIntyre, E. (2015). Effect of ambient noise on parent–offspring interactions in tree swallows – *Anim. Behav.* 109: 1–7.
- Linley, G.D., Kostoglou, K., Jit, R., & Weston, M.A. (2018). Australian magpies exhibit increased tolerance of aircraft noise on an airport, and are more responsive to take-off than to landing noises – *Wildl. Res.* 45: 282–286.
- Liu, Q., Slabbekoorn, H., & Riebel, K. (2020). Zebra finches show spatial avoidance of near but not far distance traffic noise – *Behaviour* 157: 333–362.
- Lowry, H., Lill, A., & Wong, B.B.M. (2013). Behavioural responses of wildlife to urban environments – *Biol. Rev.* 88: 537–549.
- Lucass, C., Eens, M., & Müller, W. (2016). When ambient noise impairs parent-offspring communication – *Environ. Pollut.* 212: 592–597.
- Luther, D.A., Phillips, J., & Derryberry, E.P. (2016). Not so sexy in the city: Urban birds adjust songs to noise but compromise vocal performance – *Behav. Ecol.* 27: 332–340.
- Manohar, S., Spoth, J., Radziwon, K., Auerbach, B.D., & Salvi, R. (2017). Noise-induced hearing loss induces loudness intolerance in a rat Active Sound Avoidance Paradigm (ASAP) – *Hear. Res.* 353: 197–203.
- Mariette, M.M. & Griffith, S.C. (2012). Nest visit synchrony is high and correlates with reproductive success in the wild Zebra finch *Taeniopygia guttata* – *J. Avian Biol.* 43: 131–140.
- Mariette, M.M. & Griffith, S.C. (2015). The adaptive significance of provisioning and foraging coordination between breeding partners – *Am. Nat.* 185: 270–280.

Bibliography

- Marler, P., Konishi, M., Lutjen, A., & Waser, M.S. (1973). Effects of continuous noise on avian hearing and vocal development – PNAS 70: 1393–6.
- Martins, T.L.F., Roberts, M.L., Giblin, I., Huxham, R., & Evans, M.R. (2007). Speed of exploration and risk-taking behavior are linked to corticosterone titres in zebra finches – Horm. Behav. 52: 445–453.
- Masini, C. V., Day, H.E.W., & Campeau, S. (2008). Long-term habituation to repeated loud noise is impaired by relatively short interstressor intervals in rats. – Behav. Neurosci. 122: 210–223.
- McClure, C.J.W., Ware, H.E., Carlisle, J., Kaltenecker, G., & Barber, J.R. (2013). An experimental investigation into the effects of traffic noise on distributions of birds: avoiding the phantom road – Proc. R. Soc. B 280: 20132290–20132290.
- McCowan, L.S.C., Mainwaring, M.C., Prior, N.H., & Griffith, S.C. (2015). Personality in the wild zebra finch: exploration, sociality, and reproduction – Behav. Ecol. 26: 735–746.
- McIntyre, E., Leonard, M.L., & Horn, A.G. (2014). Ambient noise and parental communication of predation risk in tree swallows, *Tachycineta bicolor* – Anim. Behav. 87: 85–89.
- Meillère, A., Brischoux, F., Angelier, F., Meillere, A., Brischoux, F., & Angelier, F. (2015). Impact of chronic noise exposure on antipredator behavior: An experiment in breeding house sparrows – Behav. Ecol. 26: 569–577.
- Mellinger, D.K. (2016). Overview of the behavioral effects of noise on animals – J. Acoust. Soc. Am. 139: 2089–2089.
- Mennitt, D., Fristrup, K., & Nelson, L. (2015). A spatially explicit estimate of environmental noise exposure in the contiguous United States – J. Acoust. Soc. Am. 137: 2339–2340.
- Mönkkönen, M. & Forsman, J.T. (2002). Heterospecific attraction among forest birds: a review – Ornithol. Sci. 1: 41–51.
- Morley, E.L., Jones, G., & Radford, A.N. (2014). The importance of invertebrates when considering the impacts of anthropogenic noise – Proc. R. Soc. B 281: 20132683.

Bibliography

- Moseley, D.L., Derryberry, G.E., Phillips, J.N., Danner, J.E., Danner, R.M., Luther, D.A., & Derryberry, E.P. (2018). Acoustic adaptation to city noise through vocal learning by a songbird – *Proc. R. Soc. B* 285: 20181356.
- Naguib, M. (2013). Living in a noisy world: indirect effects of noise on animal communication – *Behaviour* 150: 1069–1084.
- Naguib, M., Kazek, A., Schaper, S. V., Van Oers, K., & Visser, M.E. (2010). Singing activity reveals personality traits in great tits – *Ethology* 116: 763–769.
- Naguib, M., Riebel, K., Marzal, A., & Gil, D. (2004). Nestling immunocompetence and testosterone covary with brood size in a songbird. – *Proc. R. Soc. B* 271: 833–8.
- Naguib, M., van Oers, K., Braakhuis, A., Griffioen, M., de Goede, P., & Waas, J.R. (2013). Noise annoys: effects of noise on breeding great tits depend on personality but not on noise characteristics – *Anim. Behav.* 85: 949–956.
- Naguib, M., van Rooij, E.P., Snijders, L., & van Oers, K. (2016). To sing or not to sing: seasonal changes in singing vary with personality in wild great tits – *Behav. Ecol.* 27: 932–938.
- Nakagawa, S. & Schielzeth, H. (2010). Repeatability for Gaussian and non-Gaussian data: a practical guide for biologists – *Biol. Rev.* 85: 935–956.
- Nedelec, S.L., Radford, A.N., Simpson, S.D., Nedelec, B., Lecchini, D., & Mills, S.C. (2014). Anthropogenic noise playback impairs embryonic development and increases mortality in a marine invertebrate – *Sci. Rep.* 4.
- Neo, Y.Y., Hubert, J., Bolle, L.J., Winter, H. V., & Slabbekoorn, H. (2018). European seabass respond more strongly to noise exposure at night and habituate over repeated trials of sound exposure – *Environ. Pollut.* 239: 367–374.
- Newport, J., Shorthouse, D.J., & Manning, A.D. (2014). The effects of light and noise from urban development on biodiversity: Implications for protected areas in Australia – *Ecol. Manag. Restor.* 15: 204–214.
- Noirot, I.C., Brittan-Powell, E.F., & Dooling, R.J. (2011). Masked auditory thresholds in three species of birds, as measured by the auditory brainstem response (L) – *J. Acoust. Soc. Am.* 129: 3445–3448.

Bibliography

- Nugent, C., Blanes, N., Fons, J., de la Maza, M.S., Ramos, J.M., Domingues, F., van Beek, A., Houthuijs, D., Union, P.O. of the E., Maza, M.S. de la, Ramos, M.J., Domingues, F., Beek, A. van, & Houthuijs, D. (2014). Noise in Europe 2014. Luxembourg: European Environmental Agency.
- Okanoya, K. & Dooling, R.J. (1987). Hearing in passerine and psittacine birds: A comparative study of absolute and masked auditory thresholds. – *J. Comp. Psychol.* 101: 7–15.
- Owens, J.L., Stec, C.L., & O’Hatnick, A. (2012). The effects of extended exposure to traffic noise on parid social and risk-taking behavior – *Behav. Processes* 91: 61–69.
- Papp, S., Vincze, E., Preiszner, B., Liker, A., & Bókony, V. (2015). A comparison of problem-solving success between urban and rural house sparrows – *Behav. Ecol. Sociobiol.* 69: 471–480.
- Parks, S.E., Johnson, M., Nowacek, D., & Tyack, P.L. (2011). Individual right whales call louder in increased environmental noise – *Biol. Lett.* 7: 33–35.
- Parris, K.M. & Schneider, A. (2009). Impacts of traffic noise and traffic volume on birds of roadside habitats – *Ecol. Soc.* 14: 29.
- Partan, S.R. (2017). Multimodal shifts in noise: switching channels to communicate through rapid environmental change – *Anim. Behav.* 124: 325–337.
- Partan, S.R., Fulmer, A.G., Gounard, M.A.M., & Redmond, J. (2010). Multimodal alarm behavior in urban and rural gray squirrels studied by means of observation and a mechanical robot.
- Parvulescu, A. (1967). The acoustics of small tanks – In: *Marine Bioacoustics*. Pergamon Press, Oxford, 1st ed., p. 7–13.
- Patricelli, G.L. & Blickley, J.L. (2006). Avian communication in urban noise: causes and consequences of vocal adjustment – *Auk* 123: 639–649.
- Patrick, S.C. & Weimerskirch, H. (2014). Personality, foraging and fitness consequences in a long lived seabird – *PLoS One* 9: e87269.
- Peterson, C. (2010). Learned helplessness – In: *The Corsini Encyclopedia of Psychology*. John Wiley & Sons, Inc., Hoboken, NJ, USA, 2nd ed., p. 525–530.

Bibliography

- Phillips, J.N. & Derryberry, E.P. (2018). Urban sparrows respond to a sexually selected trait with increased aggression in noise – Sci. Rep. 8: 7505.
- Phillips, J.N., Gentry, K.E., Luther, D.A., & Derryberry, E.P. (2018). Surviving in the city: higher apparent survival for urban birds but worse condition on noisy territories – Ecosphere 9: e02440.
- Podos, J., Lahti, D.C., & Moseley, D.L. (2009). Vocal performance and sensorimotor learning in songbirds – Adv. Study Behav. 40: 159–195.
- Potvin, D.A. (2017). Coping with a changing soundscape: avoidance, adjustments and adaptations – Anim. Cogn. 20: 9–18.
- Potvin, D.A. (2019). Mud acts as a noise dampener in Australian passerine nests – Emu - Austral Ornithol. 119: 45–52.
- Potvin, D.A., Curcio, M.T., Swaddle, J.P., & MacDougall-Shackleton, S.A. (2016). Experimental exposure to urban and pink noise affects brain development and song learning in zebra finches (*Taeniopygia guttata*) – PeerJ 4: e2287.
- Potvin, D.A. & MacDougall-Shackleton, S.A. (2015). Traffic noise affects embryo mortality and nestling growth rates in captive zebra finches – J. Exp. Zool. Part A Ecol. Genet. Physiol. 323: 722–730.
- Potvin, D.A. & Mulder, R.A. (2013). Immediate, independent adjustment of call pitch and amplitude in response to varying background noise by silvereyes (*Zosterops lateralis*) – Behav. Ecol. 24: 1363–1368.
- Proppe, D.S., Sturdy, C.B., & St. Clair, C.C. (2013). Anthropogenic noise decreases urban songbird diversity and may contribute to homogenization – Glob. Chang. Biol. 19: 1075–1084.
- Quinn, J., Whittingham, M., Butler, S., & Cresswell, W. (2006). Noise, predation risk compensation and vigilance in the chaffinch *Fringilla coelebs* – J. Avian Biol. 37: 601–608.
- R Core Team (2019). R: A language and environment for statistical computing. Vienna, Austria.

Bibliography

- Rankin, C.H., Abrams, T., Barry, R.J., Bhatnagar, S., Clayton, D.F., Colombo, J., Coppola, G., Geyer, M.A., Glanzman, D.L., Marsland, S., McSweeney, F.K., Wilson, D.A., Wu, C.F., & Thompson, R.F. (2009). Habituation revisited: An updated and revised description of the behavioral characteristics of habituation – *Neurobiol. Learn. Mem.* 92: 135–138.
- Rehling, A., Spiller, I., Krause, E.T., Nager, R.G., Monaghan, P., & Trillmich, F. (2012). Flexibility in the duration of parental care: Zebra finch parents respond to offspring needs – *Anim. Behav.* 83: 35–39.
- Reijnen, R. & Foppen, R. (1991). Effect of road traffic on the breeding site-tenacity of male willow warblers (*Phylloscopus trochilus*) – *J. Ornithol.* 132: 291–295.
- Reijnen, R., Foppen, R., & Meeuwsen, H. (1996). The effects of traffic on the density of breeding birds in Dutch agricultural grasslands – *Biol. Conserv.* 75: 255–260.
- Riebel, K. (2009). Song and female mate choice in zebra finches: A review – *Adv. Study Behav.* 40: 197–238.
- Riebel, K., Spierings, M.J., Holveck, M.-J., & Verhulst, S. (2012). Phenotypic plasticity of avian social-learning strategies – *Anim. Behav.* 84: 1533–1539.
- Ríos-Chelén, A.A., Salaberria, C., Barbosa, I., Macías Garcia, C., & Gil, D. (2012). The learning advantage: bird species that learn their song show a tighter adjustment of song to noisy environments than those that do not learn – *J. Evol. Biol.* 25: 2171–2180.
- Ritschard, M. & Brumm, H. (2012). Zebra finch song reflects current food availability – *Evol. Ecol.* 26: 801–812.
- Ryals, B.M., Dooling, R.J., Westbrook, E., Dent, M.L., MacKenzie, A., & Larsen, O.N. (1999). Avian species differences in susceptibility to noise exposure – *Hear. Res.* 131: 71–88.
- Salmón, P., Nilsson, J.F., Nord, A., Bensch, S., & Isaksson, C. (2016). Urban environment shortens telomere length in nestling great tits, *Parus major* – *Biol. Lett.* 12: 20160155.
- Schaub, A., Ostwald, J., & Siemers, B.M. (2008). Foraging bats avoid noise – *J. Exp. Biol.* 211: 3174–3180.

Bibliography

- Schepers, M.J. & Proppe, D.S. (2017). Song playback increases songbird density near low to moderate use roads – *Behav. Ecol.* 28: 123–130.
- Schoech, S.J., Rensel, M.A., & Heiss, R.S. (2011). Short- and long-term effects of developmental corticosterone exposure on avian physiology, behavioral phenotype, cognition, and fitness: A review – *Curr. Zool.* 57: 514–530.
- Schroeder, J., Nakagawa, S., Cleasby, I.R., & Burke, T. (2012). Passerine birds breeding under chronic noise experience reduced fitness – *PLoS One* 7: e39200.
- Schuett, W. & Dall, S.R.X. (2009). Sex differences, social context and personality in zebra finches, *Taeniopygia guttata* – *Anim. Behav.* 77: 1041–1050.
- Seligman, M.E. & Beagley, G. (1975). Learned helplessness in the rat – *J. Comp. Physiol. Psychol.* 88: 534–541.
- Shafiei Sabet, S., Neo, Y.Y., & Slabbekoorn, H. (2015). The effect of temporal variation in sound exposure on swimming and foraging behaviour of captive zebrafish – *Anim. Behav.* 107: 49–60.
- Shannon, G., McKenna, M.F., Angeloni, L.M., Crooks, K.R., Fristrup, K.M., Brown, E., Warner, K.A., Nelson, M.D., White, C., Briggs, J., McFarland, S., & Wittemyer, G. (2016). A synthesis of two decades of research documenting the effects of noise on wildlife – *Biol. Rev.* 91: 982–1005.
- Siemers, B.M. & Schaub, A. (2011). Hunting at the highway: Traffic noise reduces foraging efficiency in acoustic predators – *Proc. R. Soc. B* 278: 1646–1652.
- Sierro, J., Schloesing, E., Pavón, I., & Gil, D. (2017). European blackbirds exposed to aircraft noise advance their chorus, modify their song and spend more time singing – *Front. Ecol. Evol.* 5: 68.
- Simmons, A.M. & Narins, P.M. (2018). Effects of anthropogenic noise on amphibians and reptiles – In: *Effects of Anthropogenic Noise on Animals*. (Slabbekoorn, H., Dooling, R.J., Popper, A.N., & Fay, R.R., eds). Springer, New York, NY, 1st ed., p. 179–208.
- Slabbekoorn, H. (2013). Songs of the city: Noise-dependent spectral plasticity in the acoustic phenotype of urban birds – *Anim. Behav.* 85: 1089–1099.

Bibliography

- Slabbekoorn, H. (2016). Aiming for progress in understanding underwater noise impact on fish: complementary need for indoor and outdoor studies – In: *The Effects of Noise on Aquatic Life II*. (Arthur N. Popper & Anthony Hawkins, eds). Springer, New York, NY, 1st ed., p. 1057–1065.
- Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C., & Popper, A.N. (2010). A noisy spring: The impact of globally rising underwater sound levels on fish – *Trends Ecol. Evol.* 25: 419–427.
- Slabbekoorn, H. & den Boer-Visser, A. (2006). Cities change the songs of birds – *Curr. Biol.* 16: 2326–2331.
- Slabbekoorn, H., Dooling, R.J., Popper, A.N., & Fay, R.R., eds (2018a). *Effects of Anthropogenic Noise on Animals*. Springer New York, New York, NY, 1st ed.
- Slabbekoorn, H. & Halfwerk, W. (2009). Behavioural ecology: noise annoys at community level – *Curr. Biol.* 19: R693–R695.
- Slabbekoorn, H., McGee, J., & Walsh, E.J. (2018b). Effects of man-made sound on terrestrial mammals – In: *Effects of Anthropogenic Noise on Animals*. (Slabbekoorn, H., Dooling, R.J., Popper, A.N., & Fay, R.R., eds). Springer, New York, NY, 1st ed., p. 243–276.
- Slabbekoorn, H. & Peet, M. (2003). Ecology: Birds sing at a higher pitch in urban noise – *Nature* 424: 267.
- Slabbekoorn, H. & Ripmeester, E. (2008). Birdsong and anthropogenic noise: implications and applications for conservation – *Mol. Ecol.* 17: 72–83.
- Slabbekoorn, H. & Smith, T.B. (2002). Bird song, ecology and speciation – *Philos. Trans. R. Soc. B* 357: 493–503.
- Snell-Rood, E.C. (2013). An overview of the evolutionary causes and consequences of behavioural plasticity – *Anim. Behav.* 85: 1004–1011.
- Snijders, L., van Rooij, E.P., Henskens, M.F.A., van Oers, K., & Naguib, M. (2015). Dawn song predicts behaviour during territory conflicts in personality-typed great tits – *Anim. Behav.* 109: 45–52.

Bibliography

- Sokal, R.R. & Rohlf, F.J. (1995). *Biometry: the principles and practice of statistics in biological research*. W. H. Freeman and Company, New York, 3rd ed.
- Spencer, K.A. (2017). Developmental stress and social phenotypes: Integrating neuroendocrine, behavioural and evolutionary perspectives – *Philos. Trans. R. Soc. B* 372: 20160242.
- Spencer, K.A., Buchanan, K.L., Goldsmith, A.R., & Catchpole, C.K. (2003). Song as an honest signal of developmental stress in the zebra finch (*Taeniopygia guttata*) – *Horm. Behav.* 44: 132–139.
- Spencer, K.A. & MacDougall-Shackleton, S.A. (2011). Indicators of development as sexually selected traits: The developmental stress hypothesis in context – *Behav. Ecol.* 22: 1–9.
- Spencer, K.A. & Verhulst, S. (2007). Delayed behavioral effects of postnatal exposure to corticosterone in the zebra finch (*Taeniopygia guttata*) – *Horm. Behav.* 51: 273–280.
- Stamps, J. (2003). Behavioural processes affecting development: Tinbergen’s fourth question comes of age – *Anim. Behav.* 66: 1–13.
- Summers, P.D., Cunnington, G.M., & Fahrig, L. (2011). Are the negative effects of roads on breeding birds caused by traffic noise? – *J. Appl. Ecol.* 48: 1527–1534.
- Swaddle, J.P., McBride, L., & Malhotra, S. (2006). Female zebra finches prefer unfamiliar males but not when watching noninteractive video – *Anim. Behav.* 72: 161–167.
- Swaddle, J.P. & Page, L.C. (2007). High levels of environmental noise erode pair preferences in zebra finches: implications for noise pollution – *Anim. Behav.* 74: 363–368.
- Tachibana, R.O., Takahasi, M., Hessler, N.A., & Okanoya, K. (2017). Maturation-dependent control of vocal temporal plasticity in a songbird – *Dev. Neurobiol.* 77: 995–1006.
- Templeton, C.N., Laland, K.N., & Boogert, N.J. (2014). Does song complexity correlate with problem-solving performance in flocks of zebra finches? – *Anim. Behav.* 92: 63–71.
- Templeton, C.N., Zollinger, S.A., & Brumm, H. (2016). Traffic noise drowns out great tit alarm calls – *Curr. Biol.* 26: R1173–R1174.

Bibliography

- Thompson, M.J., Evans, J.C., Parsons, S., & Morand-Ferron, J. (2018). Urbanization and individual differences in exploration and plasticity – *Behav. Ecol.* 20: 22–24.
- Tryjanowski, P., Møller, A.P., Morelli, F., Biaduń, W., Brauze, T., Ciach, M., Czechowski, P., Czyz, S., Dulisz, B., Golawski, A., Hetmański, T., Indykiewicz, P., Mitrus, C., Myczko, L., Nowakowski, J.J., Polakowski, M., Takacs, V., Wysocki, D., & Zduniak, P. (2016). Urbanization affects neophilia and risk-taking at bird-feeders – *Sci. Rep.* 6: 1–7.
- Tschirren, B., Rutstein, A.N., Postma, E., Mariette, M., & Griffith, S.C. (2009). Short- and long-term consequences of early developmental conditions: A case study on wild and domesticated zebra finches – *J. Evol. Biol.* 22: 387–395.
- Tumer, E.C. & Brainard, M.S. (2007). Performance variability enables adaptive plasticity of “crystallized” adult birdsong – *Nature* 450: 1240–1244.
- Uller, T. (2008). Developmental plasticity and the evolution of parental effects – *Trends Ecol. Evol.* 23: 432–438.
- Valero, M.D., Burton, J.A., Hauser, S.N., Hackett, T.A., Ramachandran, R., & Liberman, M.C. (2017). Noise-induced cochlear synaptopathy in rhesus monkeys (*Macaca mulatta*) – *Hear. Res.* 353: 213–223.
- Verbeek, M.E.M., Boon, A., & Drent, P.J. (1996). Exploration, aggressive behaviour and dominance in pair-wise confrontations of juvenile male great tits – *Behaviour* 133: 945–963.
- Villain, A.S., Fernandez, M.S.A., Bouchut, C., Soula, H.A.H.A., & Vignal, C.C. (2016). Songbird mates change their call structure and intrapair communication at the nest in response to environmental noise – *Anim. Behav.* 116: 113–129.
- Vitousek, M.N., Jenkins, B.R., Hubbard, J.K., Kaiser, S.A., & Safran, R.J. (2017). An experimental test of the effect of brood size on glucocorticoid responses, parental investment, and offspring phenotype – *Gen. Comp. Endocrinol.* 247: 97–106.
- Voellmy, I.K., Purser, J., Flynn, D., Kennedy, P., Simpson, S.D., & Radford, A.N. (2014). Acoustic noise reduces foraging success in two sympatric fish species via different mechanisms – *Anim. Behav.* 89: 191–198.

Bibliography

- Wale, M.A., Simpson, S.D., & Radford, A.N. (2013). Noise negatively affects foraging and antipredator behaviour in shore crabs – *Anim. Behav.* 86: 111–118.
- Walthers, A.R. & Barber, C.A. (2020). Traffic noise as a potential stressor to offspring of an urban bird, the European Starling – *J. Ornithol.* 161: 459–467.
- Ware, H.E., McClure, C.J.W., Carlisle, J.D., & Barber, J.R. (2015). A phantom road experiment reveals traffic noise is an invisible source of habitat degradation – *PNAS* 112: 12105–12109.
- Weaver, M., Hutton, P., & McGraw, K.J. (2019). Urban house finches (*Haemorrhous mexicanus*) are less averse to novel noises, but not other novel environmental stimuli, than rural birds – *Behaviour* 156: 1393–1417.
- Weilgart, L.S. (2007). A brief review of known effects of noise on marine mammals – *Int. J. Comp. Psychol.* 20: 159–168.
- WHO (2017). Burden of disease from environmental noise: quantification of healthy life years lost in Europe. World Health Organization (WHO) Regional Office for Europe. 0304-4750.
- WHO Environmental Noise Guidelines (2018, October 8). World Health Organization. <http://www.euro.who.int/en/health-topics/environment-and-health/noise/environmental-noise-guidelines-for-the-european-region>.
- Wickham, J.D. & Riitters, K.H. (2003). How far to the nearest road? – *Front. Ecol. Environ.* 1: 125–129.
- Winger, B.M., Weeks, B.C., Farnsworth, A., Jones, A.W., Hennen, M., & Willard, D.E. (2019). Nocturnal flight-calling behaviour predicts vulnerability to artificial light in migratory birds – *Proc. R. Soc. B* 286: 20190364.
- Wolfenden, A.D., Slabbekoorn, H., Kluk, K., & Kort, S.R. (2019). Aircraft sound exposure leads to song frequency decline and elevated aggression in wild chiffchaffs – *J. Anim. Ecol.* 88: 1720–1731.
- Wright, A.J., Soto, N.A., Baldwin, A.L., Bateson, M., Beale, C.M., Clark, C., Deak, T., Edwards, E.F., Fernández, A., Godinho, A., Hatch, L.T., Kakuschke, A., Lusseau, D., Martineau, D., Romero, M.L., Weilgart, L.S., Wintle, B.A., Notarbartolo-di-Sciara, G.,

Bibliography

- & Martin, V. (2007). Anthropogenic noise as a stressor in animals: a multidisciplinary perspective – *Int. J. Comp. Psychol.* 20.
- Wu, Q., Zhang, X., & Cao, G. (2019). Study on the prevention and control measures of China's urban road traffic noise pollution – In: *E3S Web Conf. EDP Sciences*, Vol. 96, p. 03003.
- Wuerz, Y. & Krüger, O. (2015). Personality over ontogeny in zebra finches: long-term repeatable traits but unstable behavioural syndromes – *Front. Zool.* 12: S9.
- Xu, J., Yu, L., Rowland, B.A., Stanford, T.R., & Stein, B.E. (2014). Noise-rearing disrupts the maturation of multisensory integration – *Eur. J. Neurosci.* 39: 602–613.
- Yang, X.-J. & Slabbekoorn, H. (2014). Timing vocal behavior: Lack of temporal overlap avoidance to fluctuating noise levels in singing Eurasian wrens – *Behav. Processes* 108: 131–137.
- Zann, R.A. (1996). *The zebra finch : a synthesis of field and laboratory studies*. Oxford University Press, Oxford. 1st ed.
- Zevin, J.D., Seidenberg, M.S., & Bottjer, S.W. (2004). Limits on reacquisition of song in adult zebra finches exposed to white noise – *J. Neurosci.* 24: 5849–5862.
- Zollinger, S.A., Dorado-Correa, A., Goymann, W., Forstmeier, W., Knief, U., Bastidas-Urrutia, A.M., & Brumm, H. (2020). Traffic noise exposure depresses plasma corticosterone and delays offspring growth in breeding zebra finches – *Conserv. Physiol.* 7.
- Zollinger, S.A., Slater, P.J.B., Nemeth, E., & Brumm, H. (2017). Higher songs of city birds may not be an individual response to noise – *Proc. R. Soc. B* 284: 20170602.

Curriculum Vitae

Quanxiao Liu received his secondary education at Dalian No.39 Middle School and Dalian No.24 High School from 2002 to 2008 in Dalian, China. He then moved to the city of Guangzhou in China to attend Sun Yat-sen University for a five-year bachelor program, specializing in *Ecology*. During his bachelor program he participated in an exchange program at the National Cheng Kung University in Taiwan in 2009, taking part in a field project investigating egret populations in South Taiwan. After obtaining his bachelor degree, he started his master program *Ecology, Evolution and Biodiversity* at Leiden University with a *Leiden University Excellence Scholarship*. During this program, he was involved in two projects, *How carcass freshness affects parental care investment in burying beetles* and *The effects of anthropogenic noise on locating conspecific calls in field crickets*. Upon the completion of his master program, he wrote a successful grant application for the Chinese Scholarship Council with Dr. Katharina Riebel. In 2015, he started his PhD. program under the supervision of Prof. dr. Carel J. ten Cate, Dr. Katharina Riebel and Dr. Hans W. Slabbekoorn.