Fifth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2014
Lisbon, Portugal, February 10-12, 2014

Chaos and noise in population biology: the case study of dengue fever epidemiology, modelling and data analysis

Nico Stollenwerk

Centro de Matemática e Aplicações Fundamentais, University of Lisbon, Portugal
nico@ptmat.fc.ul.pt

ABSTRACT

Based on some recent work [1, 2, 3, 4, 5, 6, 7] new results on understanding the epidemiology of dengue fever as a prime example of complex dynamics in the interplay between chaos and noise will be presented. Recent advances in modelling and data analyis will be shown within a framework, which is applicable to investigate many population biological systems.

References

[1] Stollenwerk, N., & and Jansen, V. (2011) *Population Biology and Criticality: From critical birth–death processes to self-organized criticality in mutation pathogen systems* (Imperial College Press, World Scientific, London).

[2] Stollenwerk, N., Aguiar, M., Ballesteros, S., Boto, J., Kooi, W. B., & Mateus, L. (2012) Dynamic noise, chaos and parameter estimation in population biology, *J. Royal Soc. Interface Focus*, **2**, 156–169.

[3] Nico Stollenwerk, Maira Aguiar, Filipe Rocha, Urszula Skwara (2013) Testing particle filters for dengue fever studies via simple reinfection models. *Proceedings of the 13th International Conference on Mathematical Methods in Science and Engineering - CMMSE 2013*, pp 1262-1277, ISBN: 978-84-616-2723-3, edited by Jesus Vigo et al., Almeria.

[4] Nico Stollenwerk, Davide Masoero, Urszula Skwara, Filipe Rocha, Peyman Ghaffari, Maira Aguiar (2013) Semiclassical approximations of stochastic epidemiological processes towards parameter estimation. *Proceedings of the 13th*

 ISBN: 978-989-98750-0-5

International Conference on Mathematical Methods in Science and Engineering - CMMSE 2013, pp 1278-1289, ISBN: 978-84-616-2723-3, edited by Jesus Vigo et al., Almeria.

[5] Aguiar, M., Kooi, W. B., Rocha, F., Ghaffari, P. & Stollenwerk, N. (2013). How much complexity is needed to describe the fluctuations observed in dengue hemorrhagic fever incidence data? *Ecological Complexity*, **16**, 31–40.

[6] Rocha, F., Aguiar, M., Souza, M., & Stollenwerk, N. (2013) Time-scale separation and center manifold analysis describing vector-borne disease dynamics, *Int. Journal. Computer Math.*, **90**, 2105–2125.

[7] Mateus, L., Stollenwerk, N., & Zambrini, J.C. (2013) Stochastic Models in Population Biology: From Dynamic Noise to Bayesian Description and Model Comparison for Given Data Sets, *Int. Journal. Computer Math.*, **90**, 2161–2173.

 ISBN: 978-989-98750-0-5