

Legros Mathieu, Ph.D.

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Date of birth: 10 Jan. 1981

Nationality: French

CURRENT POSITION

2017-2022: Research Scientist, CSIRO Agriculture & Food, Canberra, Australia

Details: - modelling of gene drive dynamics in agricultural environments,
- evaluation of gene drives as potential novel pest control methods;
- genetic strategies for combating the evolution of resistance.

RESEARCH EXPERIENCE

2011-2017: Postdoctoral Scholar: Evolution of drug resistance in malaria.
Theoretical Biology Group, ETH Zürich, Switzerland (Sebastian Bonhoeffer)

Details: - between-hosts, within-host and within-vector malaria modelling
- impact of treatment on strain competition and disease transmission;
- interactions between chemotherapy, vector ecology and vector control

2006-2011: Postdoctoral Research Associate: Modelling *Aedes aegypti*
population dynamics and genetic strategies of dengue.

North Carolina State University, Entomology Dpt., Raleigh, NC, USA. (Fred Gould, Alun Lloyd)
University of California Davis, Entomology Dpt., Davis, CA, USA (Thomas Scott)

Details: - construction and development of biologically rich models of the
population dynamics and population genetics of *Aedes aegypti*;
- model-based assessment of control strategies based on the release of
transgenic mosquitoes (population suppression and/or replacement).

2001-2006: Ph.D. in Ecology: Genotype x genotype interactions between hosts
and parasites and coevolutionary consequences.

Laboratoire de Parasitologie Evolutive, CNRS UMR 7103, Univ. Paris VI, France. (Jacob Koella)

Details: - experimental evolution: cost of specialization of a microsporidian
parasite *Brachiola algerae* to isofemale lines of its host *Ae. aegypti*;
- theoretical study: spatially explicit model of the role of host-parasite
interactions in the evolutionary maintenance of sexual reproduction.

EDUCATION

2001-2006: Ph.D. in Ecology, Univ. Paris VI, France (Supervisor: Jacob Koella).
Funding: "Allocation couplée", French Research Dpt.

1998-2001: M.S. (Magistère) in Molecular and Cell Biology

École Normale Supérieure de Lyon / Univ. Lyon I

Includes:

- 2000-2001: Masters 2 (DEA) in Ecology, Univ. Paris VI
- 1999-2000: Masters 1 (Maîtrise) in Ecosystems and Population Biology, École Normale Supérieure Lyon – Univ. Lyon I
- 1998-1999: B.S. (Licence) in Cell Biology and Physiology, École Normale Supérieure Lyon – Univ. Lyon I

1996-1998: Classes préparatoires BCPST (biology, chemistry, physics, geology)
Lycée Michel Montaigne, Bordeaux, France.

TEACHING AND SUPERVISING

2010-2011: Advisor, Rochak Bisaria, Masters project, Computer Science (GUI development), North Carolina State University, Raleigh, NC, USA.

2005-2006: Assistant Lecturer (ATER)

Université de Picardie Jules Verne, Amiens, France

Undergraduate: ecology, evolutionary biology, zoology, cell biology;

Graduate: population biology, interspecific interactions.

2003: Co-advisor, Julien Delcher, Masters project, experimental evolution of specialization, Université Paris VI, France.

2002-2005: Teaching Assistant (Moniteur)

Université Paris VI, France.

Undergraduate: ecology, evolutionary biology, biogeography, population biology, zoology;

Graduate: parasitology.

Additional teaching:

2011-2016: ETH Zürich, Switzerland: semester project tutoring (Masters), literature search and review article writing;

2006-2011: North Carolina State University, USA: graduate seminar classes on genetic pest control, literature review and presentations.

PUBLICATIONS

- [22-1] **Legros M**, Barrett LG. DriverSEAT: A spatially-explicit stochastic modelling framework for the evaluation of gene drives in novel target species. *PLoS Comp. Biol.* In review, bioRxiv preprint doi: 10.1101/2022.06.13.496025
- [21-1] **Legros M**, Marshall JM, Macfadyen S, Hayes KR, Sheppard A, Barrett LG (2021) Gene drive strategies of pest control in agricultural systems: Challenges and opportunities. *Evolutionary Applications* 14(9): 2162-78.
- [20-2] Price T, Windbichler N, Unckless R, Sutter A, Runge JN, Ross P, Pomiankowski A, Nuckolls N, Montchamp-Moreau C, Mideo N, Martin O, Manser A, **Legros M**, Larracuenta A, Holman L, Godwin J, Gemmell N, Courret C, Buchman A, Barrett L, Lindholm A. (2020) Resistance to Natural and Synthetic Gene Drive Systems. *Journal of Evolutionary Biology* 33:1345-60.
- [20-1] Kumaran N., Choudhary A., **Legros M.**, Sheppard A., Barrett L., Gardiner D., Raghu S. (2020) Gene technologies in weed management: a technical feasibility analysis. *Curr. Op. Insect Sci.* 38: 6-14.
- [19-2] Boëte C., Seston M., **Legros M.** (2019) Strategies of host resistance to pathogens in spatially structured populations: An agent-based evaluation. *Theor. Pop. Biol.* 130: 170-181.
- [19-1] Barrett L.G., **Legros M.**, Kumaran N., Glassop D., Raghu S., Gardiner D.M. (2019) Gene drives in plants: opportunities and challenges for weed control and engineered resilience. *Proc. Roy. Soc. Lond. B* 286: 20191515.
- [16-2] **Legros M.***, Otero M.*, Aznar V.R., Solari H., Gould F., Lloyd A.L. (2016) Comparison of two detailed models of *Aedes aegypti* population dynamics. *Ecosphere* 7(10): e01515.
- [16-1] **Legros M.**, Bonhoeffer S. (2016) Evolution of resistance to antimalarial drugs: a combined within-host and between-hosts modelling framework. *J. Roy. Soc. Interface*, 13:20160148.
- [13-1] **Legros M.**, Xu C., Morrison A.C., Scott T.W., Lloyd A.L., Gould F. (2013) Modeling the dynamics of a non-limited and a self-limited gene drive system in structured *Aedes aegypti* populations. *PLoS One* 8(12): e83354.
- [12-3] **Legros M.**, Xu C., Okamoto K., Scott T.W., Morrison A.C., Lloyd A.L., Gould F. (2012) Assessing the feasibility of controlling *Aedes aegypti* with transgenic methods: A model-based evaluation. *PLoS One* 7(12): e52235.
- [12-2] Padmanabha H., Correa F., **Legros M.**, Nijhout H.F., Lord C. & Lounibos L.P. (2012) An eco-physiological model of the impact of temperature on *Aedes aegypti* life history traits. *J. Insect Physiol.* 58(12): 1597-1608.
- [12-1] Robert M.A., **Legros M.**, Facchinelli L., Valerio L., Ramsey J.M., Scott T.W., Gould F. & Lloyd A.L. (2012) Mathematical models as aids for design and interpretation of experiments: The case of transgenic mosquitoes. *J. Med. Entomol.* 49(6): 1177-1188.

- [11-2] **Legros M.**, Magori K., Morrison A.C., Xu C., Scott T.W., Lloyd A.L. & Gould F. (2011) Evaluation of location-specific predictions by a detailed simulation model of *Aedes aegypti* populations. *PLoS One* 6(7): e22701.
- [11-1] Huang Y., Lloyd A.L., **Legros M.** & Gould F. (2010) Gene-drive into insect populations with age and spatial structure: a theoretical assessment. *Evol. Appl.* 4(3): 415-428
- [10-3] Xu C., **Legros M.**, Gould F. & Lloyd A.L. (2010) Understanding uncertainties in model-based predictions of *Aedes aegypti* population dynamics. *PLoS Negl. Trop. Dis.* 4(9): e830.
- [10-2] **Legros M.** & Koella J.C. (2010) Experimental evolution of specialization by a microsporidian parasite. *BMC Evol. Biol.* 10: 159.
- [10-1] Jongsma M.A., Gould F., **Legros M.**, Yang L., van Loon J.J.A. & Dicke M. (2010) Insect behavior affects the evolution of adaptation to *Bt* crops: consequences for refuge policies. *Evol. Ecol.* 24(5): 1017-1030.
- [09-3] **Legros M.**, Lloyd A.L., Huang Y. & Gould F. (2009) Density-dependent intraspecific competition in the larval stage of *Aedes aegypti* (Diptera: Culicidae): Revisiting the current paradigm. *J. Med. Entomol.* 46(3): 409-419.
- [09-2] Magori K.*, **Legros M.***, Puente M., Focks D.A., Scott T.W., Lloyd A.L. & Gould F. (2009) Skeeter Buster: a stochastic, spatially-explicit modeling tool for studying *Aedes aegypti* population replacement and population suppression strategies. *PLoS Negl. Trop. Dis.* 3(9): e508.
- [09-1] Huang Y., Lloyd A.L., **Legros M.** & Gould F. (2009) Gene drive in age-structured populations. *Evol. Appl.* 2(2): 143-159.
- [08-1] Gould F., Huang Y., **Legros M.** & Lloyd A.L. (2008) A killer-rescue system for self-limiting gene drive of anti-pathogen constructs. *Proc. R. Soc. B* 275: 2823-9.
- [00-1] Fournel S., Huc X., Aguerre-Gire M., Solier C., **Legros M.**, Praud-Brethenou C., Moussa M., Chaouat G., Berrebi A., Bensussan A., Lenfant F. & Le Bouteiller P. (2000) Comparative reactivity of different HLA-G monoclonal antibodies to soluble HLA-G molecules, *Tissue Antigens*, 55(6): 510-8.

(*: equal author participation)

OTHER

- Languages:** French: native
English: fluent
German: B2 level
- Programming:** C/C++, python, MATLAB, R, HTML/CSS
- Peer review:** *PLoS Biology, Proc. Roy. Soc. Lond. B., J. R. Soc. Interface, Malaria J., J. Med. Entomol., J. Theor. Biol., etc.*

PROFESSIONAL REFERENCES

Dr. Luke Barrett

(supervisor since 2018)

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Prof. Sebastian Bonhoeffer

(postdoctoral advisor 2011-2017)

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Prof. Fred Gould

(postdoctoral advisor 2006-2011)

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