Research on entomopathogenic nematodes in Ireland

Christine Griffin, Ann Burnell and Martin Downes

EPN research at Carlow Institute of Technology

Thomae Kakouli Duarte

- Development of *Steinernema feltiae* as a bioindicator of CrVI pollution in Irish soils.
- Genetic variation of *Steinernema feltiae* (collaboration with NUI Maynooth)

At National University of Ireland Maynooth (NUI Maynooth)

- Research on EPNs since 1986
- Three research groups:
  - Ann Burnell: Molecular Genetics
  - Martin Downes: Ecology & Biocontrol
  - Christine Griffin: Behaviour and Biocontrol

- Formerly a fourth research group

  -Barbara Dowds:

  Bacterial molecular genetics

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Nematode molecular genetics

- Chemotaxis in *Heterorhabditis*,
- Molecular basis of desiccation tolerance in *S. carpocapsae*

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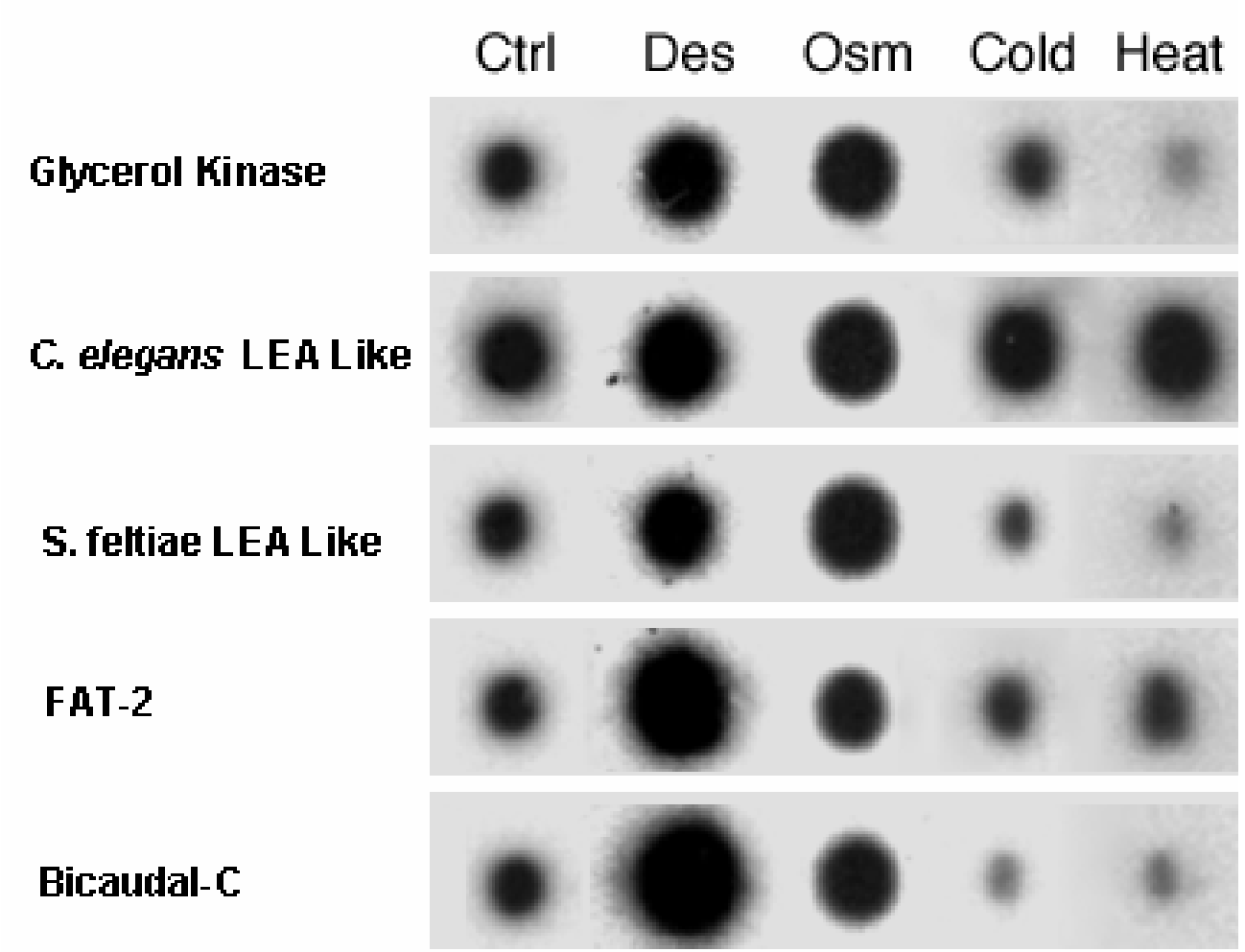
Genes Upregulated in response to desiccation stress in *S. carpocapsae*



Tyson *et al.*

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Nematode molecular genetics

- Chemotaxis in *Heterorhabditis*,
- Molecular basis of desiccation tolerance in *S. carpocapsae*,
- Sequencing of the mtDNA genome from *H. bacteriophora*

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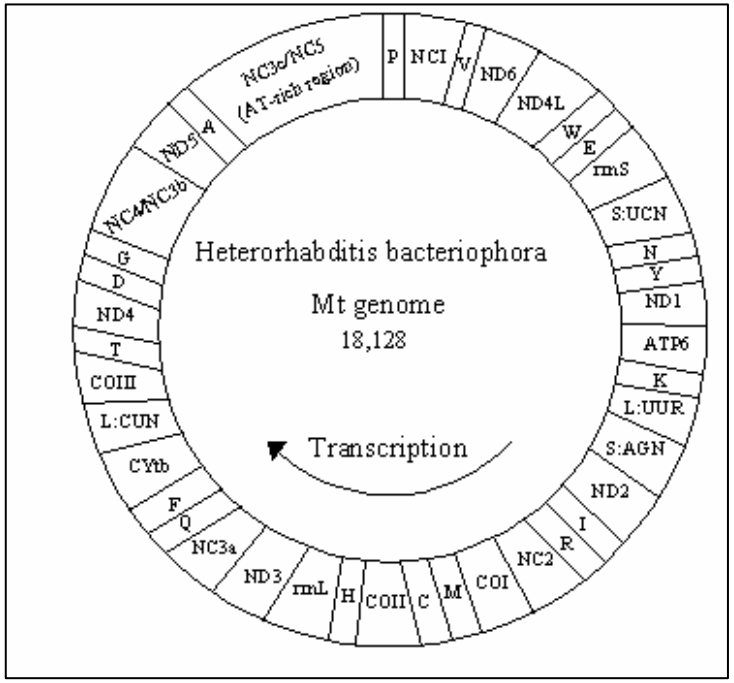
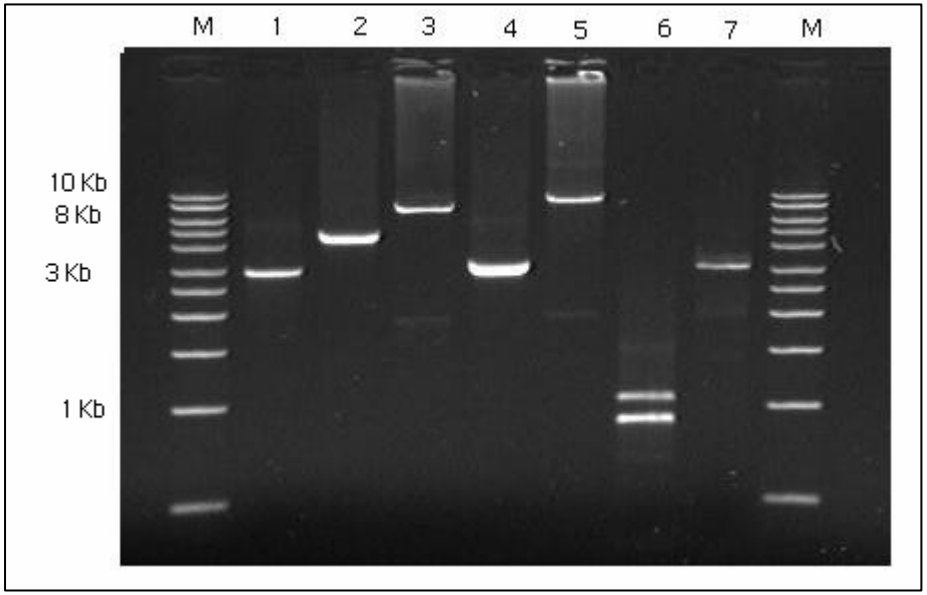
The Mt genome sequence of *Heterorhabditis bacteriophora*





The whole genome was amplified in 7 separate fragments and its sequence determined by Sassia Omar Regeai

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Nematode molecular genetics

- Chemotaxis in *Heterorhabditis*,
- Molecular basis of desiccation tolerance in *S. carpocapsae*,
- Sequencing of the mtDNA genome from *H. bacteriophora*
- Dauer recovery in *Heterorhabditis* and *Steinernema*,
- Expressed Sequence Tag (EST) project for recovering DJs of *S. carpocapsae.*

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Biocontrol

- Vine weevil
- Sciarids and phorids
- Pine weevil *Hylobius abietis*

Biodiversity/Biogeography

Behaviour

Biodiversity/Biogeography

New species: *Heterorhabditis downesi*

Stock, Griffin, & Burnell, 2002.

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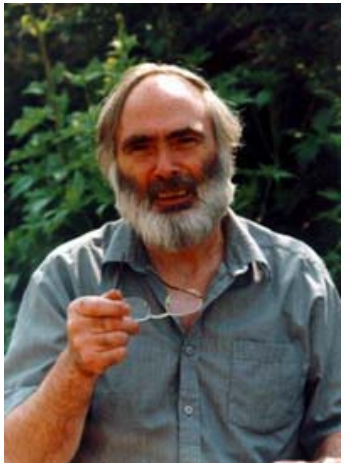
Systematic Parasitology 51, 95-106

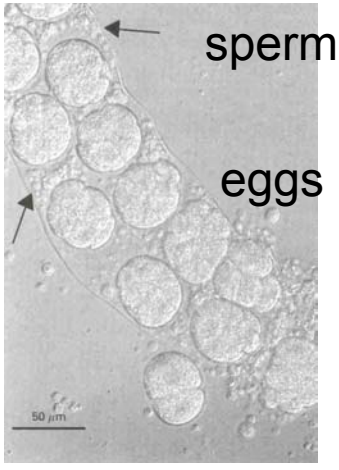
- Formerly *Heterorhabditis* "Irish type"
- Closely related to *H. megidis*
- Found in Ireland, UK, Northwest Europe & Hungary
- Favours sandy soils



Prof. Martin Downes

New species: *Steinernema hermaphroditum* Stock, Griffin & Chaerani 2004. *Nematology* 6, 401-412

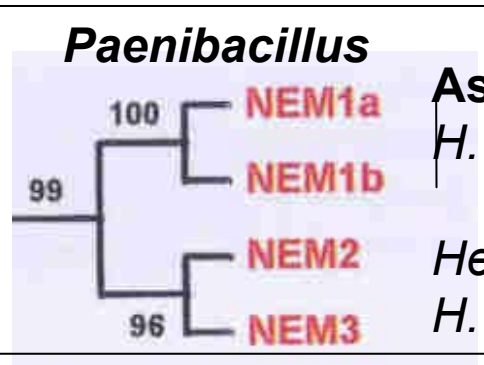
- Mostly hermaphrodites: self fertile, produce eggs and sperm, small number of males (<10%) (Griffin,O'Callaghan, & Dix, 2001: Parasitology 122, 181-186)
- Found in the South Moluccas, Indonesia (Griffin et al., 2000, *J. Helminthol*. 74, 143-150).

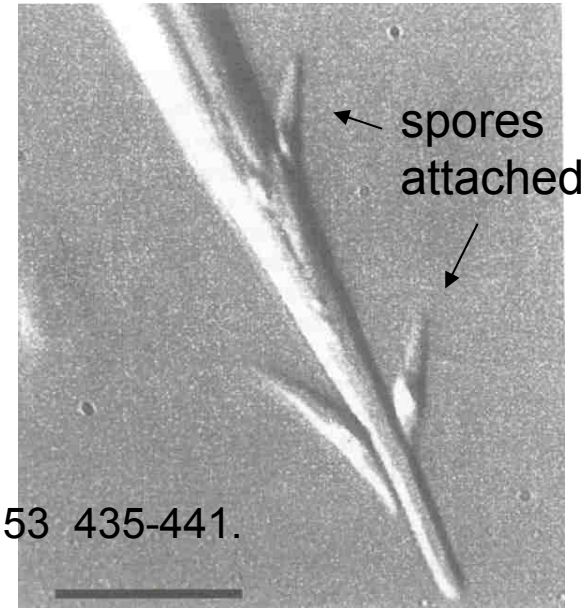


Uterus

Endospore-forming bacteria associated with *Heterorhabditis* spp., including *Paenibacillus nematophilus* sp. nov

- Species complex:
- Sporangia attach to IJs of several species of *Heterorhabditis*
- Hinder IJ movement
- Multiply in cadaver; tolerant of antibiotics



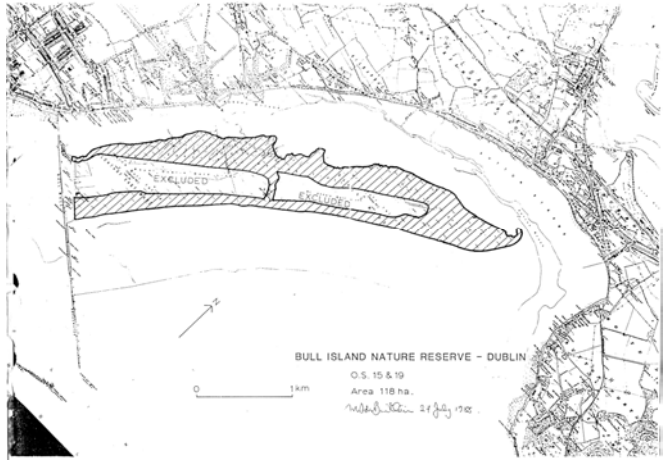


Enright, M.R., et al. (2003).*Int. J. Syst. Evol. Microbiol.* 53 435-441.
Enright & Griffin (2004) *Microb. Ecol.*, 48, 412-421
Enright & Griffin (2005). *J. Invertebr. Pathol.*, 88, 40-48.

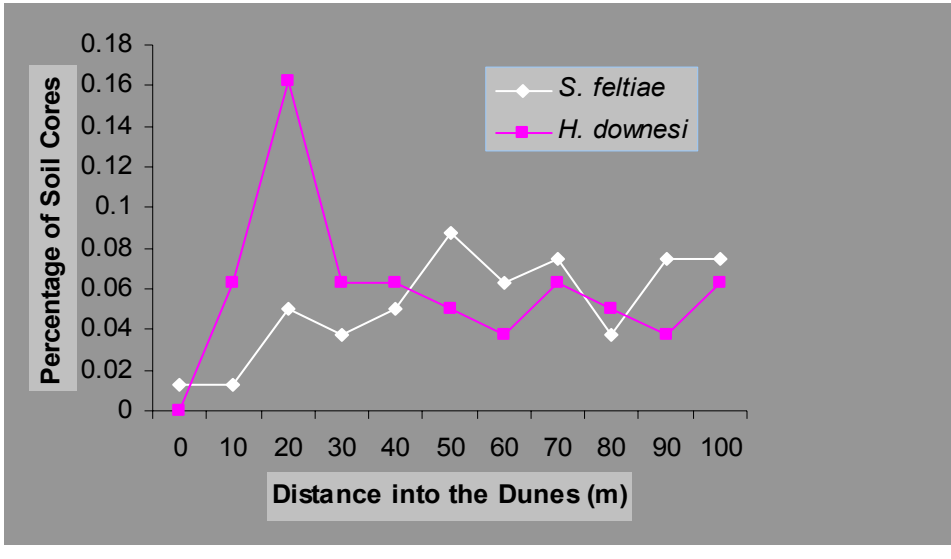
Population biology: Bull Island

Rolston, Griffin & Downes 2005, *Nematology* 7, 259-266.

- Intensive sampling for EPN on a single site, a consolidated sand bar in Dublin Bay

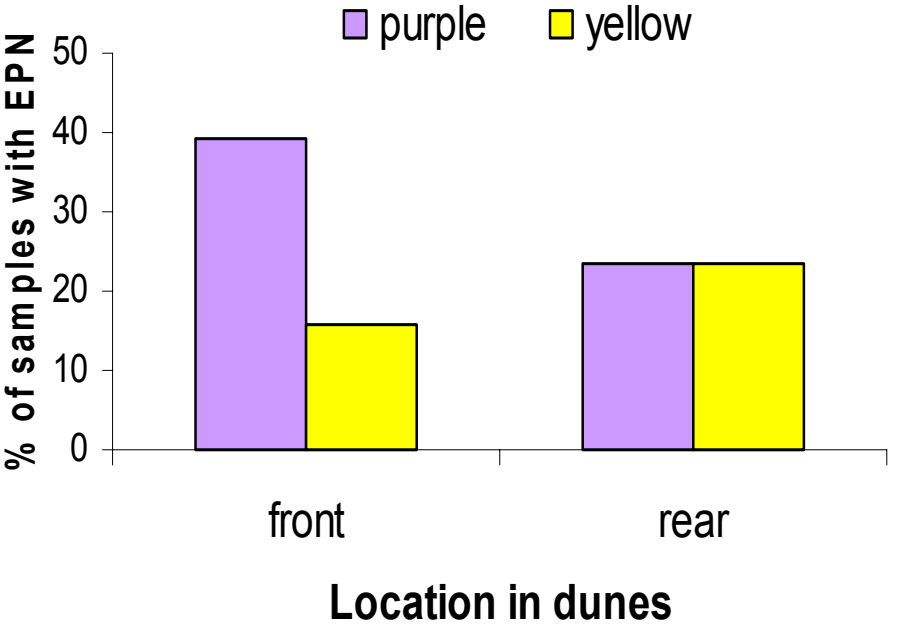


- *H. downesi* prevalent in foredunes, *S.feltiae* in established grassland



H. downesi on Bull Island

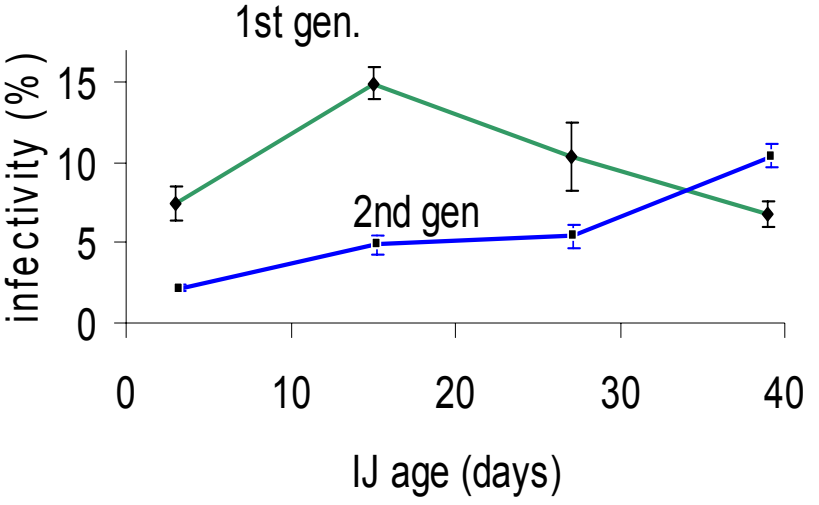
- Two cadaver colour morphs coexisting: “ “purple” and “golden”
- Purple more prevalent at front of dunes- salinity? different hosts?
- AFLP analysis shows intrerbreeding of nemas associated with the 2 bacterial phenotypes



Behaviour

"Phased infectivity" *in H. megidis*

- Proportion of IJs infecting increases with IJ age
- Pattern of "phasing" depends on conditions in cadaver (crowding, etc)



Dempsey & Griffin (2002), *Parasitology* 124, 605-613.
Ryder & Griffin (2003) *Int. J. Parasitol.* 33,1013-1018

Lipids and activity *(H. megidis)*

- IJs are spontaneously active during storage when young- inactive when older (conserves lipid)
- intraspecific variation in survival of IJs explained mainly by differences in activity

young

old- lipids depleted

Fitters & Grifffin (2004) Nematology 6, 911-917
Fittters & Griffin (2006) *Biol. Cont.* 37, 82-88.

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