

LifeWatch Scientific Community Meeting

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Hidden biodiversity: an insight into parasite communities of eels from lagoons

LUISA GIARI, Giuseppe Castaldelli and Elisa Anna Fano

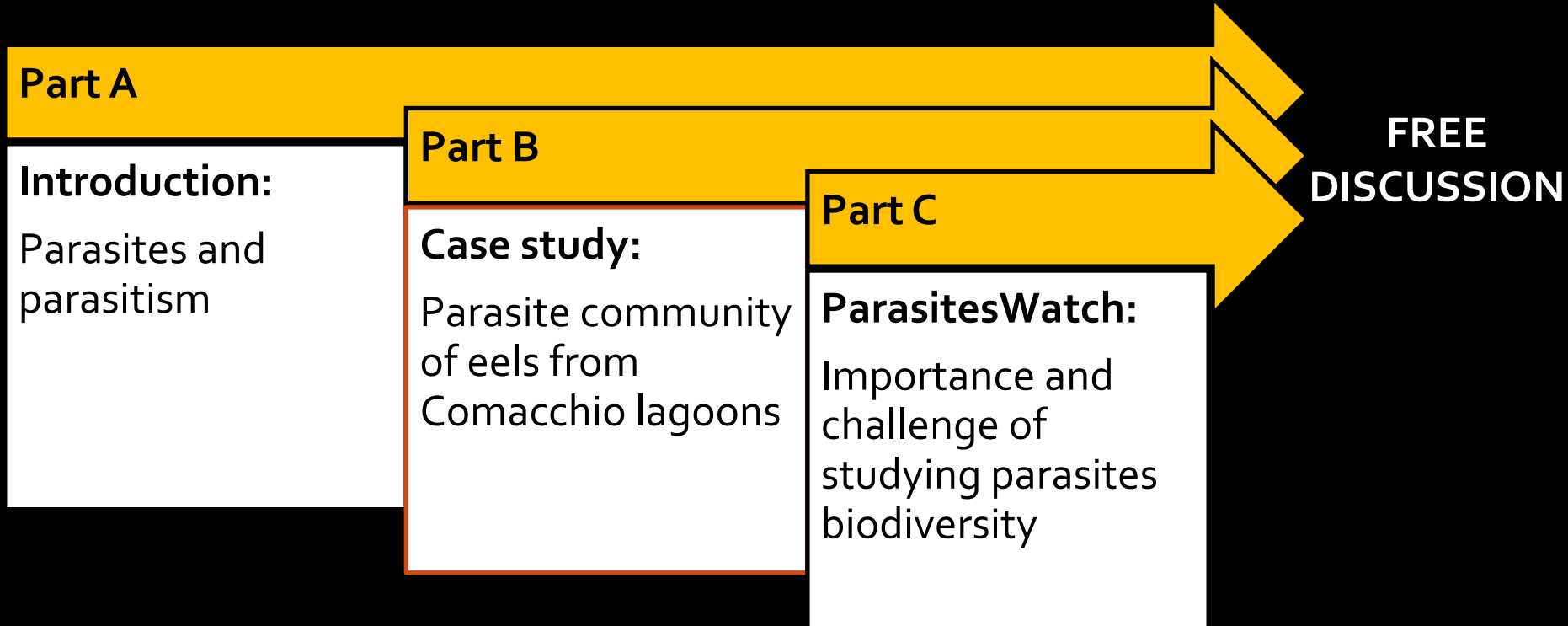
*Department of Life Sciences and Biotechnology, University of Ferrara
LifeWatch Italy*

E-mail: grilsu@unife.it



**Università
degli Studi
di Ferrara**

ROAD MAP OF THE TALK



Part A: Introduction

Parasitism is one of the most successful modes of life

Every ecosystem on Earth contains parasites

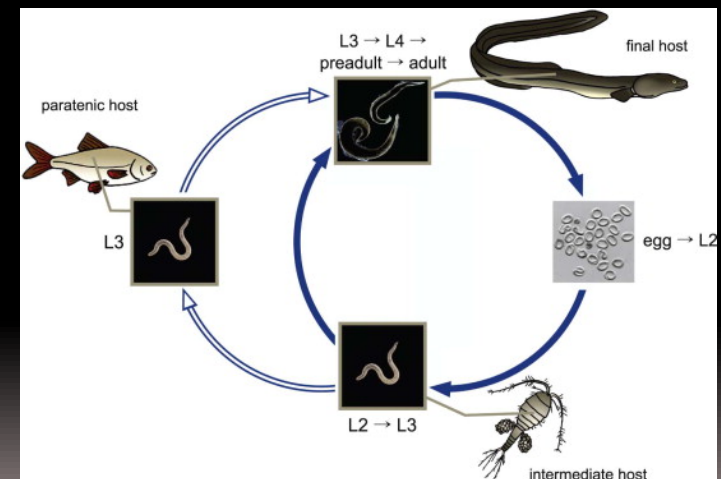
Parasites represent about 40% of described species

No organism avoids parasitic infection during its lifetime



Parasites are enormously diverse in terms of

- systematics
- dimensions (micro- or macro-parasites)
- location in the host (ecto- or endo-parasites)
- type of life cycle (direct or indirect)
- transmission modes
- pathogenicity

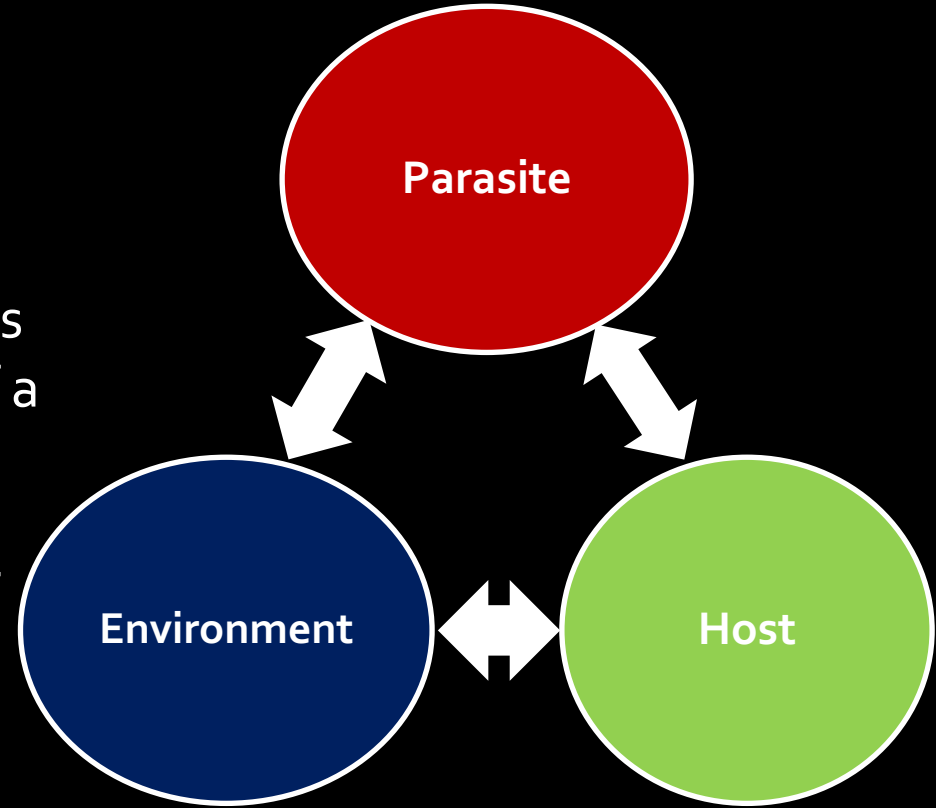


Part A: Introduction

Parasites play an important role at individual, population, community and ecosystem levels

Parasites are not passive inhabitants of other organisms, they are part of a dynamic system/balance

Host-parasite interactions and their dynamics are driven by numerous biotic and/or abiotic factors



Research on parasites can provide a great deal of information on host population structure, evolutionary hypotheses, environmental stressors, trophic interactions, climatic conditions and biodiversity

Parasites = indicators of ecosystem health

Part B: Case study

What? Parasite fauna in European eels (*Anguilla anguilla*)



Where?

Comacchio lagoons
Northern Adriatic Sea, Italy



When?

From 1997 to 2017:
a long-term study



Part B: Case study

- How?
- eel samplings
 - parasitological examination and parasites identification
 - count of parasite individuals of each species (prevalence, abundance)
 - measure of component community structure: Species Richness, Shannon-Wiener Index, Berger-Parker Index
 - measure of similarity: Sorensen's index



Why?

The aims are to

- determine composition and diversity of the helminth community
- evaluate the temporal change of the parasite community
- compare this community with communities from other lagoons
- understand what parasites tell about ecosystem conditions

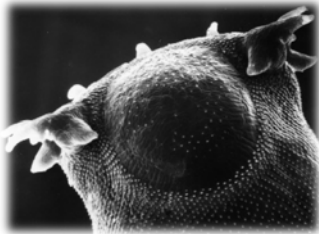
Part B: Case study

N° examined eels: 345
% infected eels: 72

Parasite component community: 10 species
Parasite infracommunity: 6 species max

DIGenea:

Deropristis inflata, *Helicometra fasciata*,
Bucephalus anguillae, *Lecithochirium musculus*



CESTODA:

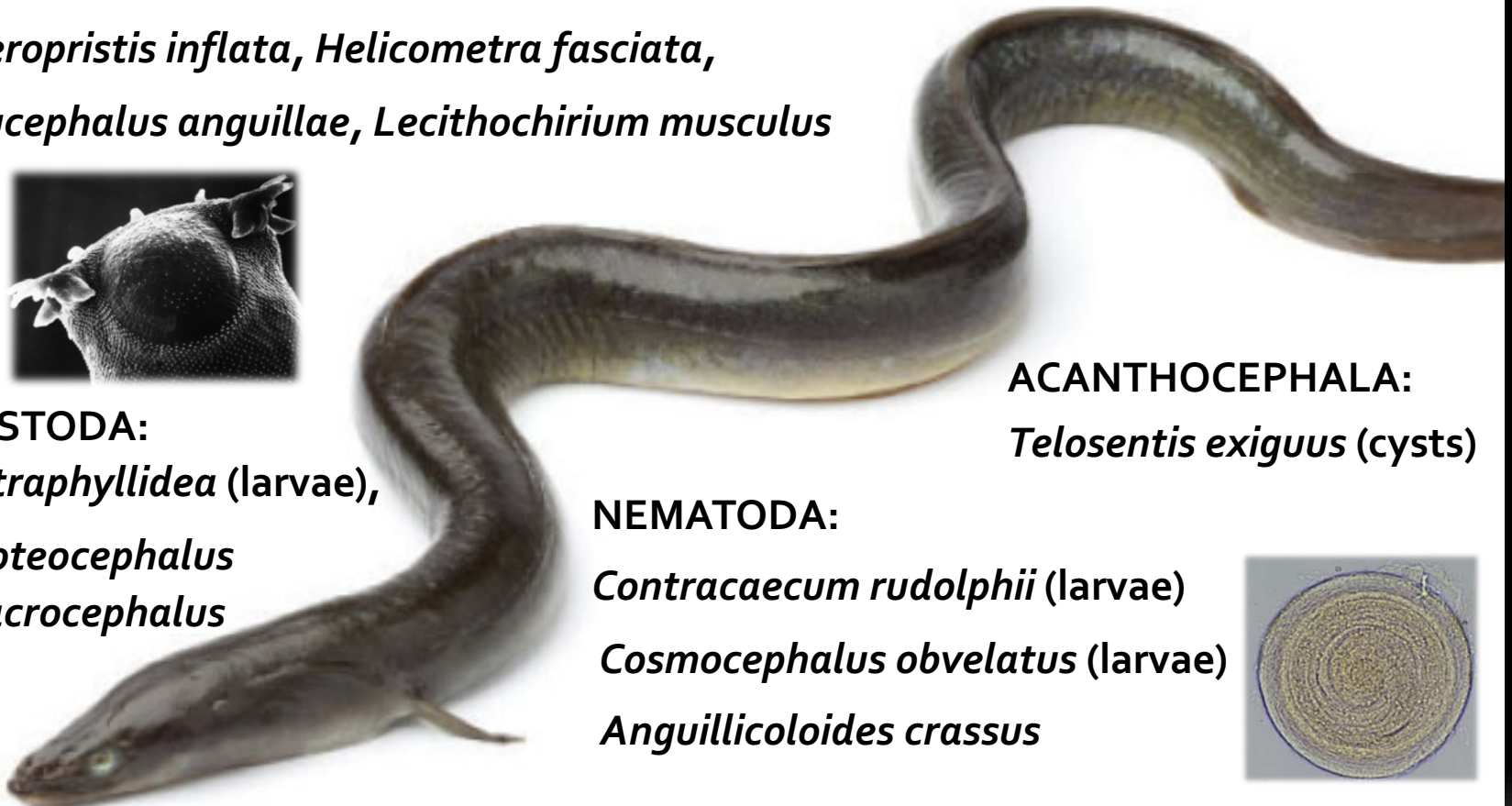
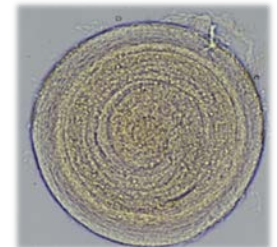
Tetraphyllidea (larvae),
Proteocephalus macrocephalus

ACANTHOCEPHALA:

Telosentis exiguus (cysts)

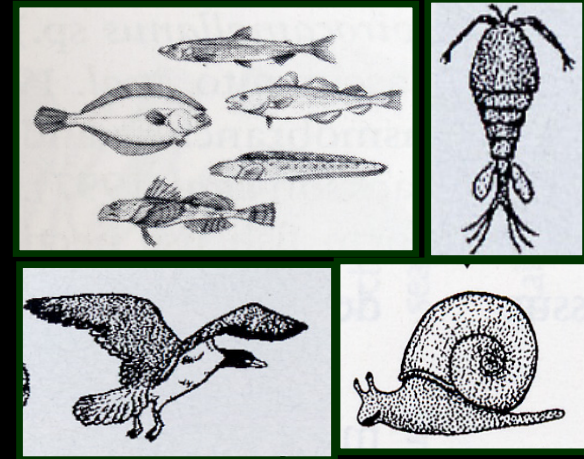
NEMATODA:

Contracaecum rudolphii (larvae)
Cosmocephalus obvelatus (larvae)
Anguillicoloides crassus



Part B: Case study

All the 10 species are helminthic ENDOPARASITES with COMPLEX LIFE CYCLES involving, beside eel, numerous other animal species as hosts (mollusks, crustaceans, annelids, bony and cartilaginous fishes, birds):
2 species (*C. obvelatus* and *C. rudolphii*) are allogenic



8 species out of 10 are marine
(exceptions *P. macrocephalus* and *A. crassus*)



4 species are eel specific (*D. inflata*, *L. musculus*, *A. crassus*, *P. macrocephalus*),
6 are generalist

All species, except *A. crassus*, are sited in the gastro-intestinal tract, a primary route of infection, and are transmitted via predator-prey interactions

Part B: Case study

Diversity characteristics of the parasite component communities from Comacchio lagoons

	All samples 1997/2017	1997	2005/2006	2010/2012	2013/2017
No. of eels	345	42 (Y)	140 (Y+S)	126 (Y+S)	37 (S)
No. of parasite species	10	7	7	8	7
No. of parasites	8585	1944	2887	3378	376
Shannon - Wiener Index	1.48	0.86	1.49	1.34	1.04
Berger-Parker Index	0.44	0.64	0.46	0.55	0.53
Dominant species	<i>H. fasciata</i>	<i>D. inflata</i>	<i>H. fasciata</i>	<i>H. fasciata</i>	<i>D. inflata</i>

Part B: Case study

Temporal trend of the component community of Comacchio lagoons: similarity levels

The relative abundance of the species changed over time but the composition of the parasite community remained quite constant (high similarity indices)



Sorensens's index

1997 vs 2005-06	0.86
1997 vs 2010-12	0.80
1997 vs 2013-17	0.57
2005-06 vs 2010-12	0.93
2005-06 vs 2013-17	0.71
2010-12 vs 2013-17	0.80

Part B: Case study

Parasite component communities in eels from different coastal lagoons

	Comacchio	Figheri	Acquatina	4 Italian Tyrrhenian lagoons	3 Ebro delta lagoons	Urbino
No. of eels	345	33	21	20-44	36-141	31
Species richness	10	11	6	3-8	4-5	5
Shannon - Wiener Index	1.48	1.45	0.71	0.86-1.34	0.98-1.41	0.56
Berger- Parker Index	0.44	0.38	0.70	0.34-0.67	0.32-0.92	0.91
Dominant species	<i>H. fasciata</i>	<i>D. inflata</i>	<i>Contra caecum</i>	<i>B. anguillae</i> <i>D. inflata</i>	<i>Pseudodactylo gyrus anguillae</i>	<i>D. inflata</i>

Di Cave et al. 2001

Kennedy et
al. 1997

Maillo et
al. 2005

Ternengo
et al. 2005

Part C: ParasitesWatch

Parasite species
constitute a large
portion of the total
biodiversity

Parasites may enhance
or reduce biodiversity

Parasites are affected
by changes in
biodiversity and
abundance of their
host

**DESPITE THEIR UBIQUITY, ABUNDANCE AND IMPORTANCE IN NATURE,
PARASITES ARE NEGLECTED COMPONENTS OF THE BIODIVERSITY!**

Why the parasites are overlooked in studies on communities?

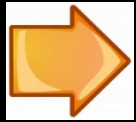
They usually have
cryptic habits
(hidden biodiversity)

They are generally
very small
(invisible biodiversity)

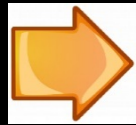
They are difficult to
identify and less
known than their hosts

Part C: ParasitesWatch

WHAT SHOULD BE DONE TO IMPROVE PARASITESWATCH?



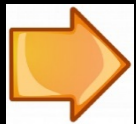
Increasing parasitological monitoring based on an adequate sample size and on more than one sampling



Collecting complete and detailed data: data on parasites species, data on hosts, environmental data



Sharing data to facilitate comparisons



Setting up a scientific network of parasitologists with different expertises and of researchers working on hosts

APPLICATIONS

Knowledge on occurrence and distribution of parasites in host species and in different geographical localities over time could aid in understanding:

CONSERVATION BIOLOGY

INTRODUCTION OF PARASITES AND ITS CONSEQUENCES

RELATIONSHIP BETWEEN PARASITISM AND CLIMATE CHANGE

INTERACTION BETWEEN PARASITISM AND POLLUTION

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