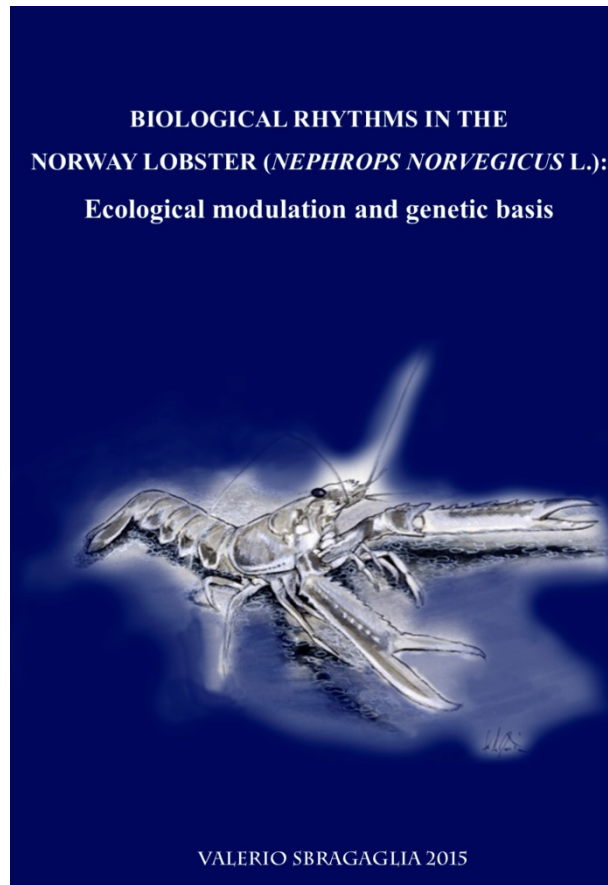
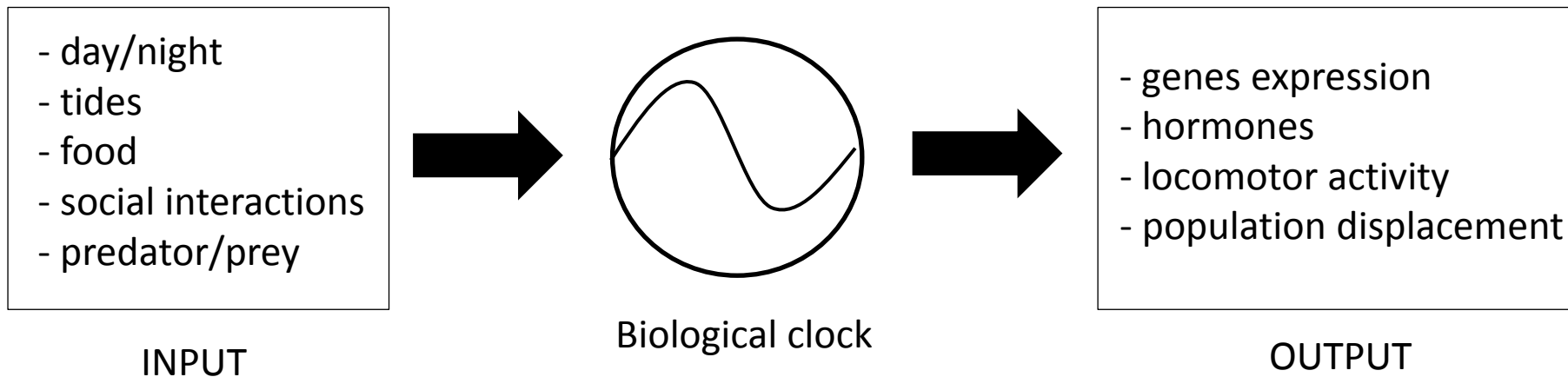


What time is it? Circadian clocks in crustaceans



INTRODUCTION

Almost all species have a circadian clock to synchronize their activity to day/night



INTRODUCTION

The description of the circadian clock (such as in *Drosophila melanogaster*) is one of the best molecular dissection of a behaviour

- *First revolution*: molecular mechanisms
- *Second revolution*: peripheral oscillators and physiological control
- *Third revolution*: ecological significance (non model species).

According to Menaker (2006)

INTRODUCTION

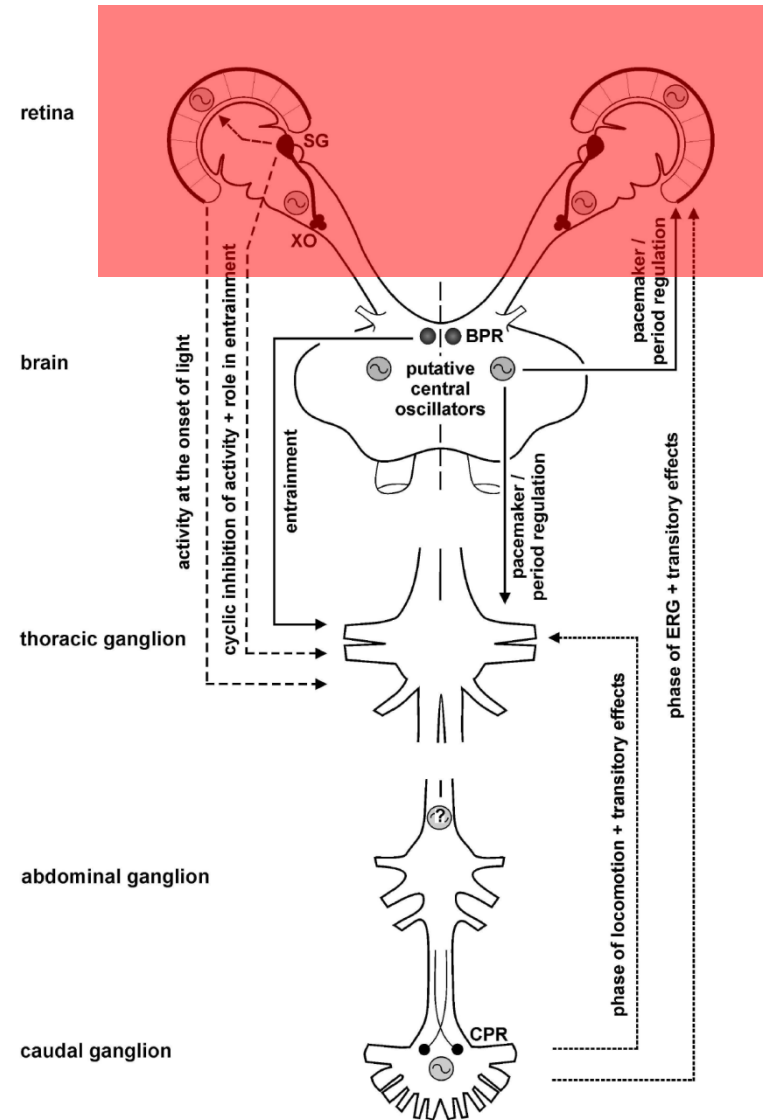
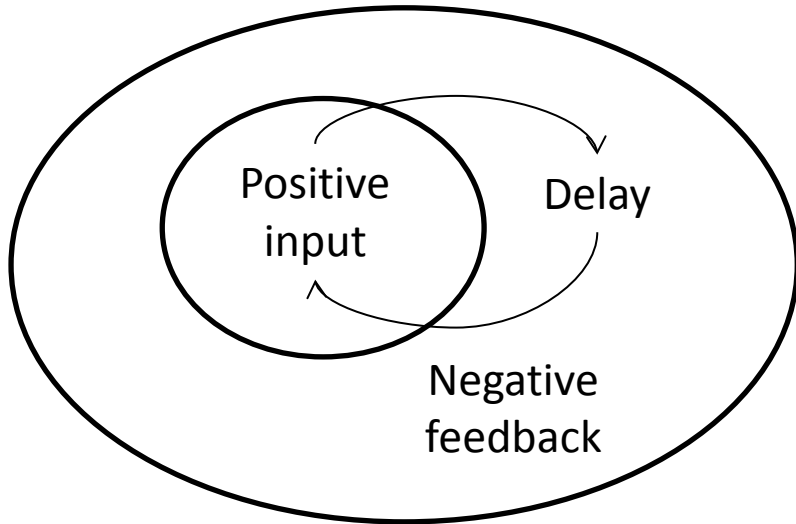


Fig.5

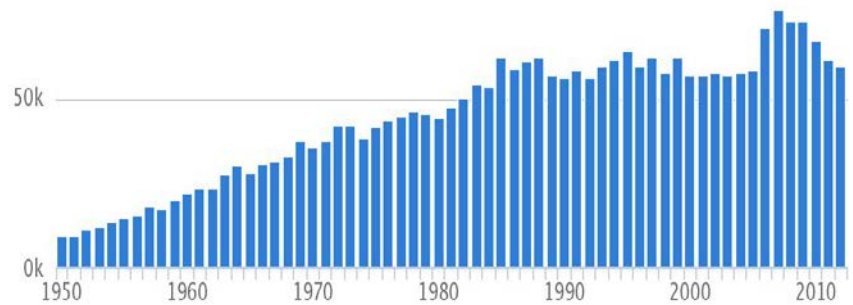
INTRODUCTION



Source: FAO FishStat

Landings in Tons

100k



RITFIM Project Funded by MICINN

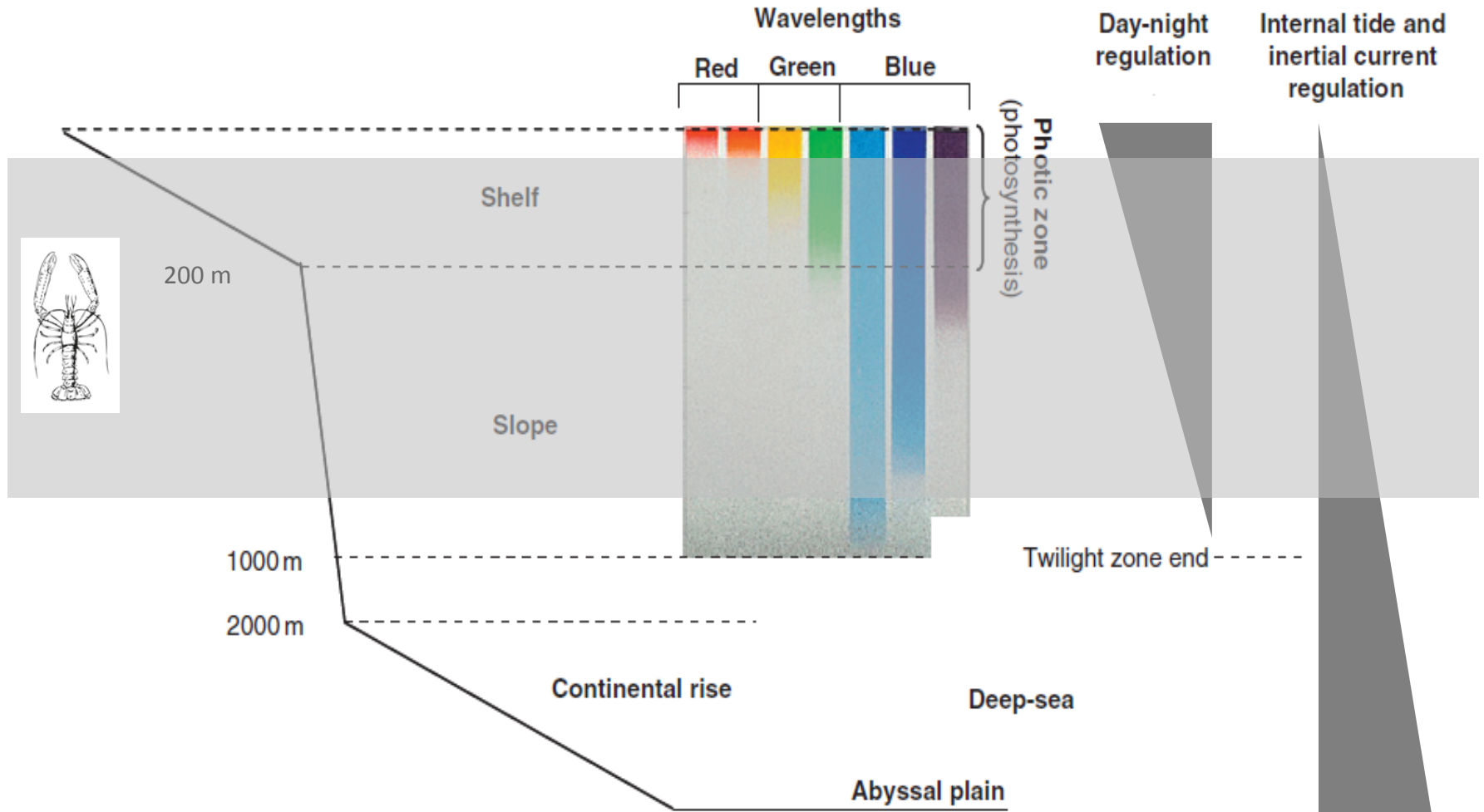


GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA
E INNOVACIÓN

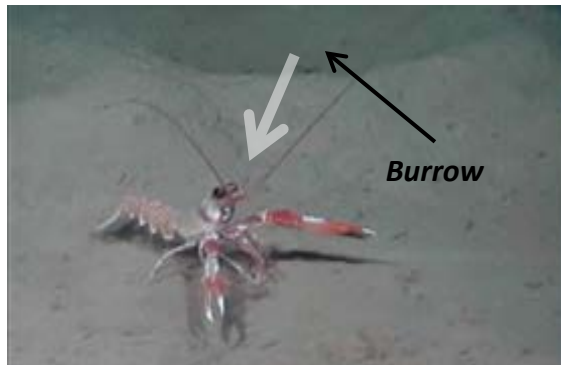
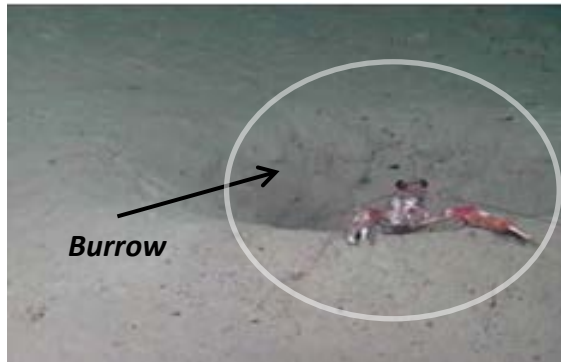
INTRODUCTION

Bathymetric distribution (10-800 m)



INTRODUCTION

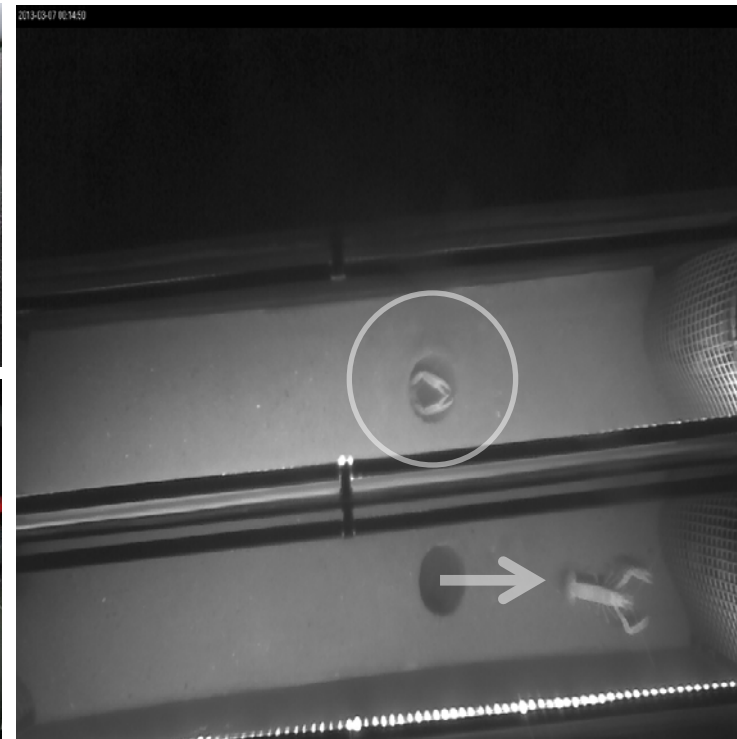
FIELD



(NORIT)
PAST



(RITFIM)
My PhD



DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

OBJECTIVE: Identify, characterize and study the diel pattern of expression of canonical clock genes in *N. norvegicus* eyestalk

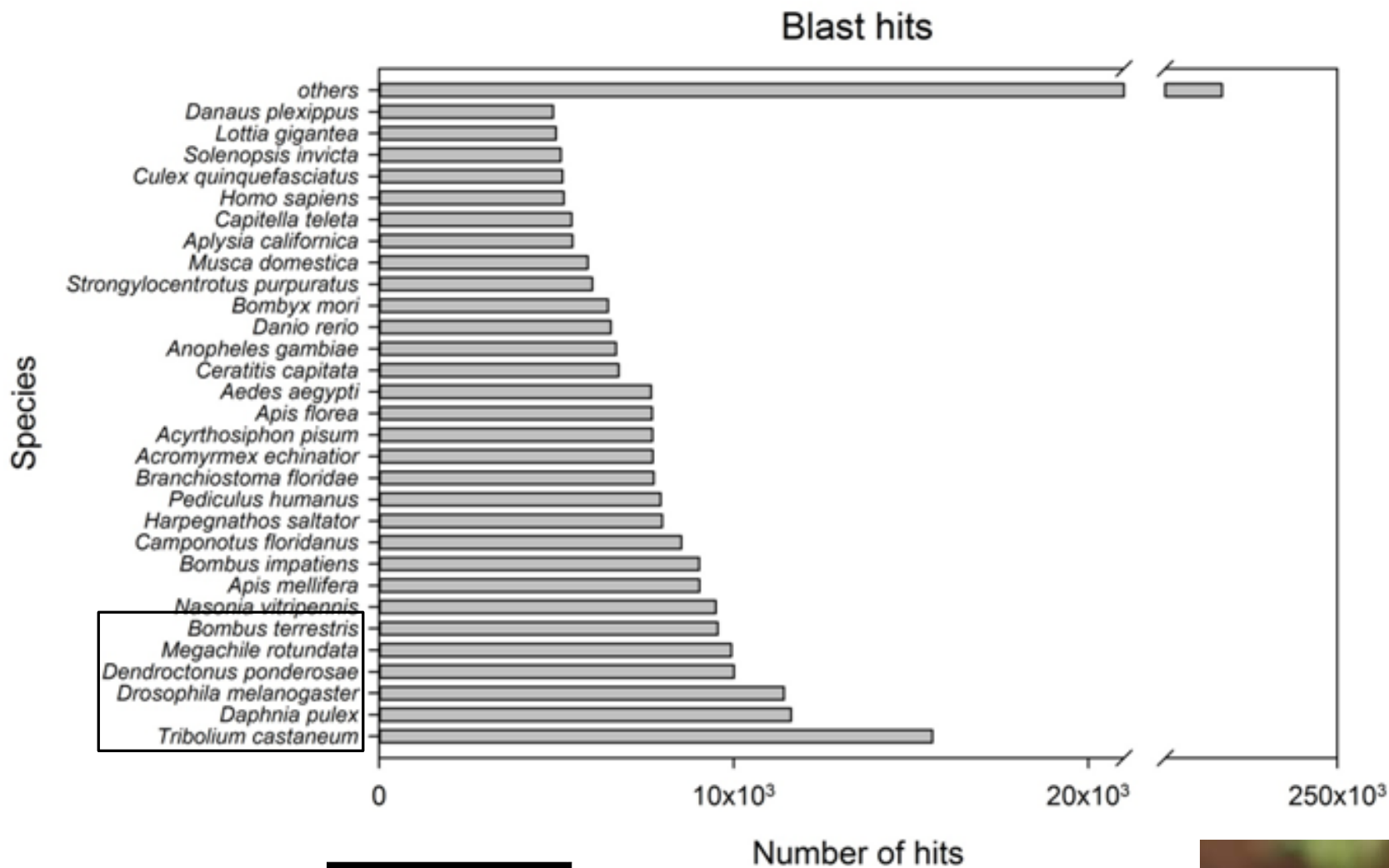


DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

OBJECTIVE: Identify, characterize and study the diel pattern of expression of canonical clock genes in *N. norvegicus* eyestalk



DAILY PATTERN OF CLOCK GENES TRANSCRIPTS



DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

Genes	species	Phylum - Class -Order	protein product	identity	gaps	accession
	<i>Eurydice pulchra</i>	Arthropoda - Malacostraca - Isopoda	period	520/1101	110/1101	AGV28714
	<i>Blattella germanica</i>	Arthropoda - Insecta - Blattodea	circadian clock protein period	360/1099	167/1099	AAN02439
NnPeriod	<i>Apteronemobius asahinai</i>	Arthropoda - Insecta - Orthoptera	period isoform1	356/1100	157/1100	BAL72155
	<i>Laupala cerasina</i>	Arthropoda - Insecta - Orthoptera	period	317/1031	149/1031	ADO24376
	<i>Rhyarobia maderae</i>	Arthropoda - Insecta - Blattodea	period	201/538	46/538	AGA01525
	<i>Eurydice pulchra</i>	Arthropoda - Malacostraca - Isopoda	timeless	471/799	34/799	AGV28716
	<i>Thermobia domestica</i>	Arthropoda - Insecta - Thysanura	timeless	203/456	26/456	BAL27710
NnTimeless	<i>Drosophila melanogaster</i>	Arthropoda - Insecta - Diptera	timeless	196/465	13/465	AAC46920
	<i>Clunio marinus</i>	Arthropoda - Insecta - Diptera	timeless	192/456	20/456	AFS34623
	<i>Belgica antarctica</i>	Arthropoda - Insecta - Diptera	timeless	188/459	34/459	AGZ88039
	<i>Pacifastacus leniusculus</i>	Arthropoda - Malacostraca - Decapoda	clock-like protein	34/55	15/55	AFV39704
	<i>Anopheles darlingi</i>	Arthropoda - Insecta - Diptera	clock-like protein	34/41	0/41	ETN62614
Nnclock	<i>Macrobrachium rosenbergii</i>	Arthropoda - Malacostraca - Decapoda	clock	28/29	0/29	AAX44045
	<i>Thermobia domestica</i>	Arthropoda - Insecta - Thysanura	clock	25/29	0/29	AJ16353
	<i>Eurydice pulchra</i>	Arthropoda - Malacostraca - Isopoda	clock 1-7	25/29	0/29	AGV28721
	<i>Pacifastacus leniusculus</i>	Arthropoda - Malacostraca - Decapoda	bmal1a	72/75	1/75	AFV39705
	<i>Eurydice pulchra</i>	Arthropoda - Malacostraca - Isopoda	brain and muscle arnt-like protein-1	59/75	1/75	AGV28715
Nnbmal1	<i>Tribolium castaneum</i>	Arthropoda - Insecta - Coleoptera	cycle protein	46/73	6/73	EFA01256
	<i>Phyllotreta striolata</i>	Arthropoda - Insecta - Coleoptera	cycle protein, partial	46/61	6/61	CCA29756
	<i>Culex quinquefasciatus</i>	Arthropoda - Insecta - Diptera	circadian protein clock/arnt/bmal/pas	45/72	6/72	XP_001865023

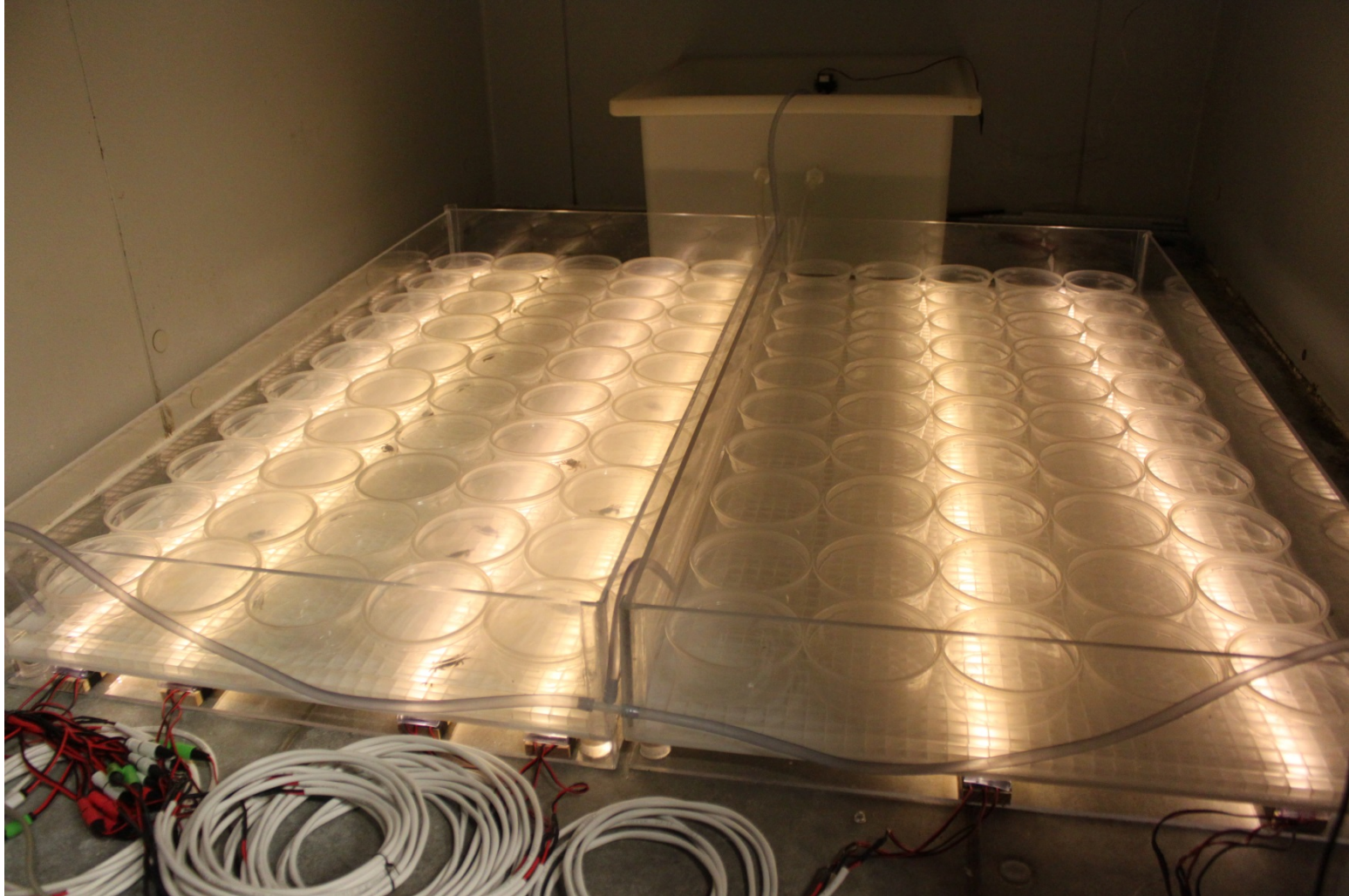
Genes	species	Phylum - Class -Order	definition	identity	gaps	accession
Cry2	<i>Euphausia superba</i>	Arthropoda - Malacostraca - Euphasiacea	cryptochrome	441/539	3/539	CAQ86665
	<i>Eurydice pulchra</i>	Arthropoda - Malacostraca - Isopoda	cryptochrome 2	421/541	4/541	AGV28717
	<i>Talitrus saltator</i>	Arthropoda - Malacostraca - Amphipoda	cryptochrome 2	396/499	0/499	AFV96168

DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

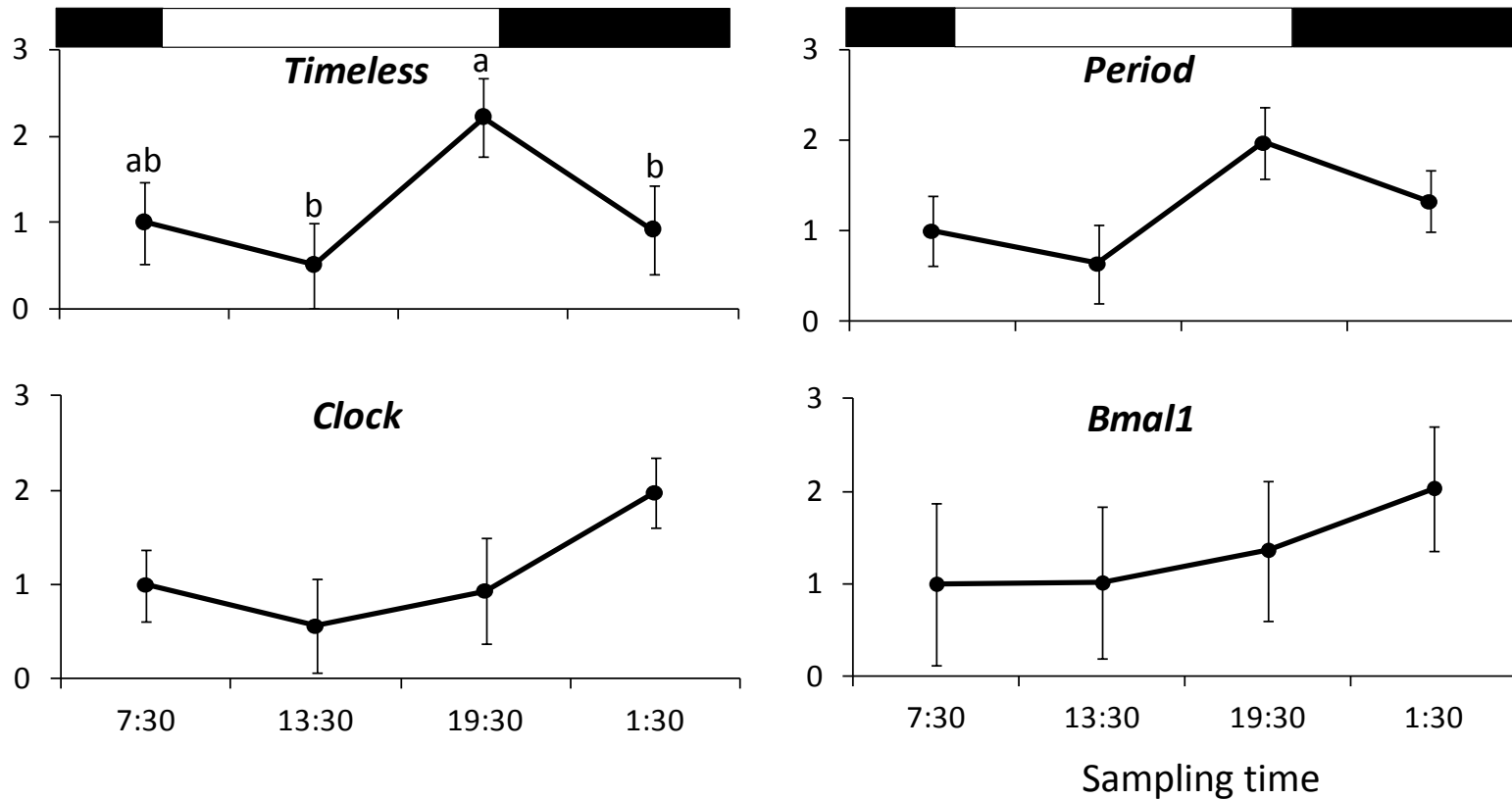


DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

OBJECTIVE: Identify, characterize and study the diel pattern of expression of canonical clock genes in *N. norvegicus* eyestalk



DAILY PATTERN OF CLOCK GENES TRANSCRIPTS



- First assembled transcriptome in *Nephrops*
- *Timeless* is the gene with a more robust daily oscillation
- Most complete insight into molecular clockwork of decapod

DAILY PATTERN OF CLOCK GENES TRANSCRIPTS

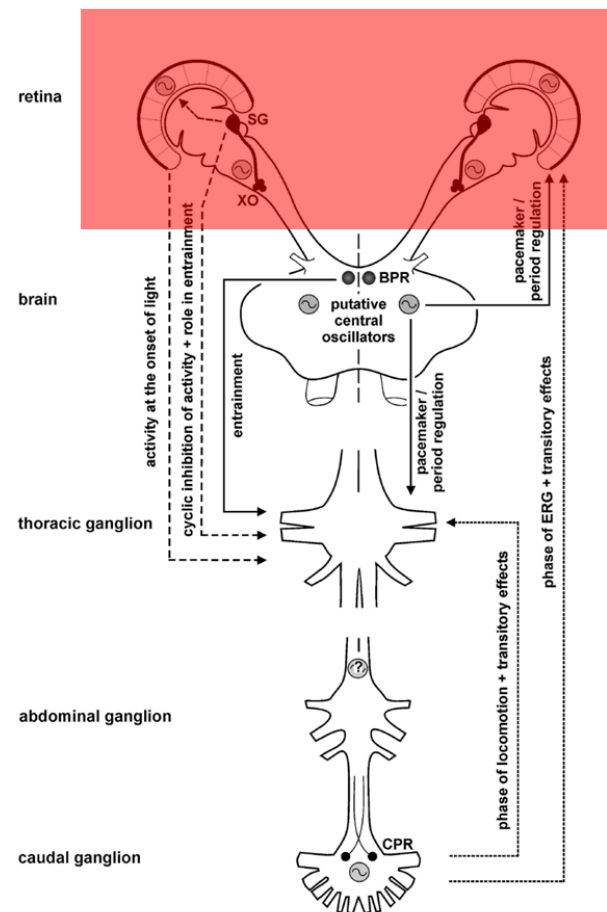
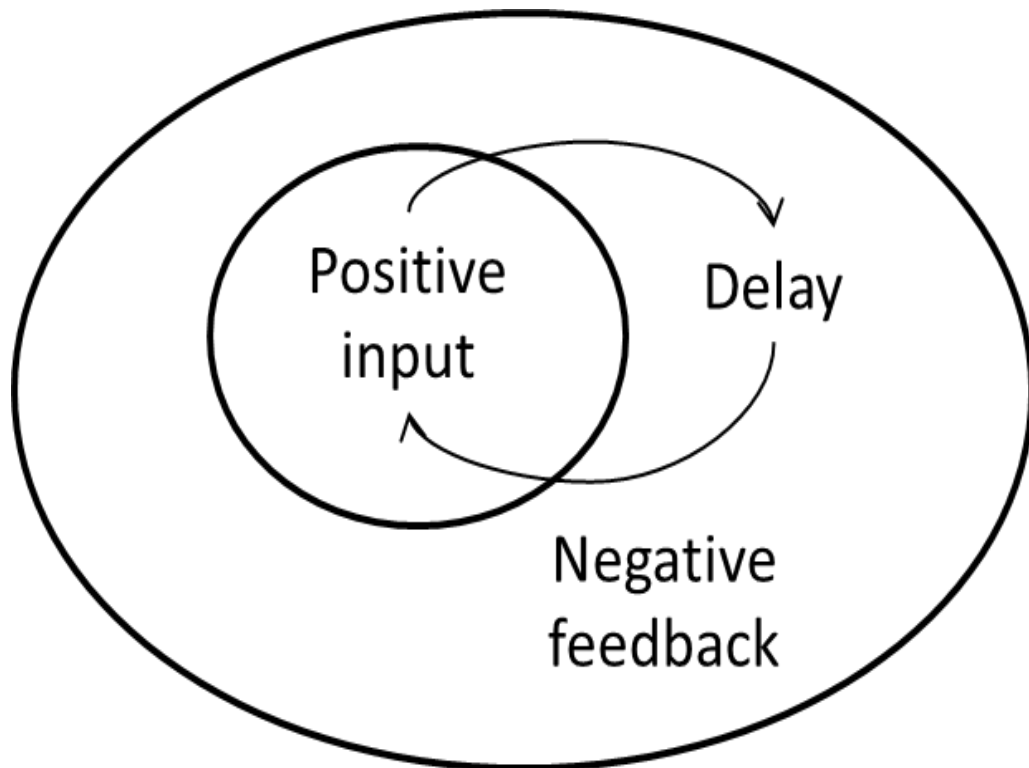


Fig.5



Euphausia superba

Cyclic expression of clock gene in



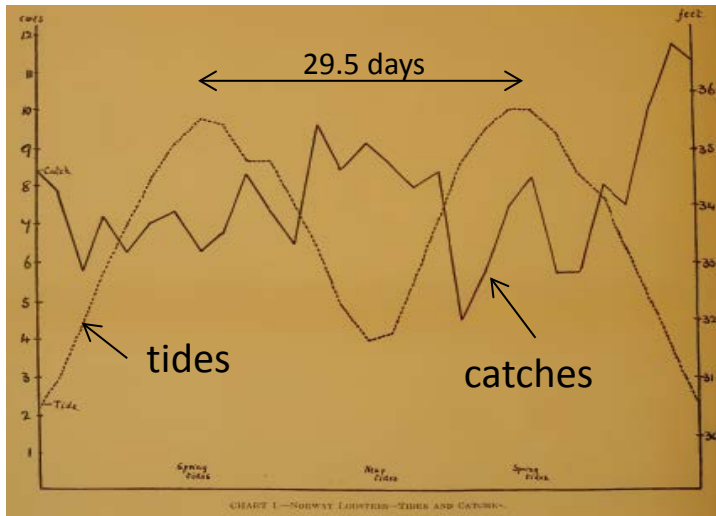
Nephrops norvegicus

Cyclic expression of *tim* in the eyestalk but not in the brain

Sbragaglia et al. 2015

TIDAL CURRENTS

OBJECTIVE: Investigate the effect of periodic water currents and light cycles on the burrow emergence behavior of *Nephrops* (representative of deep water habitat)



(Storrow, 1912)

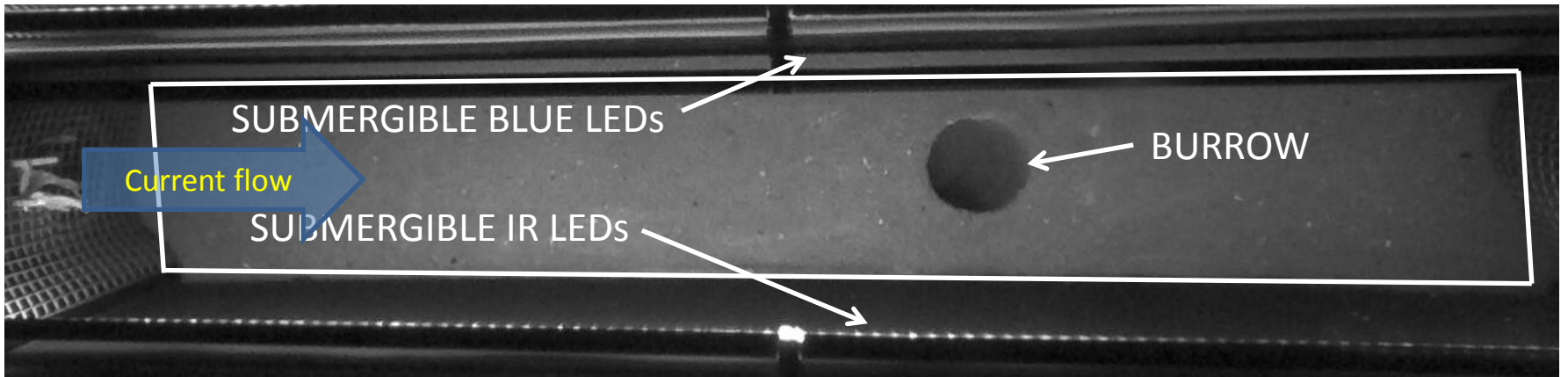
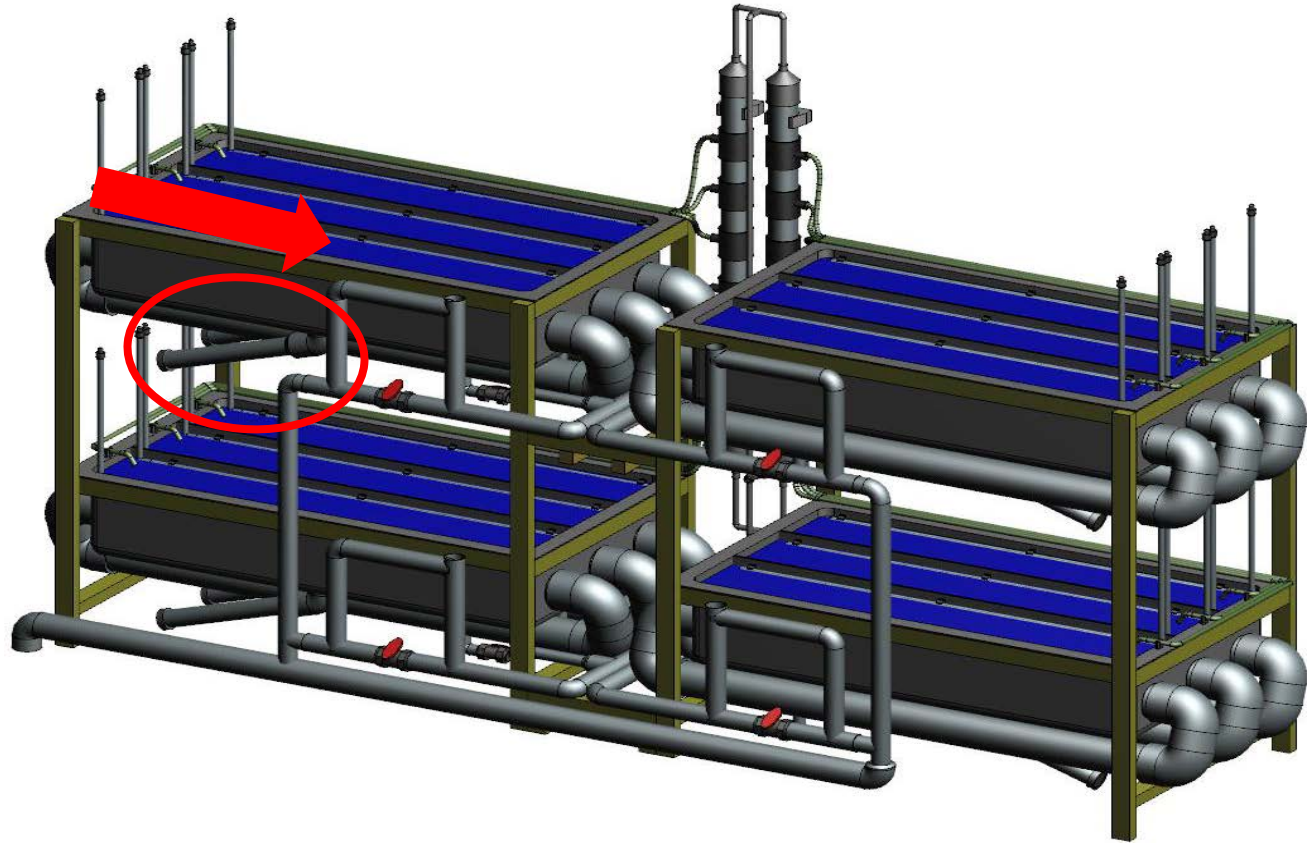


(Newland, 1988)

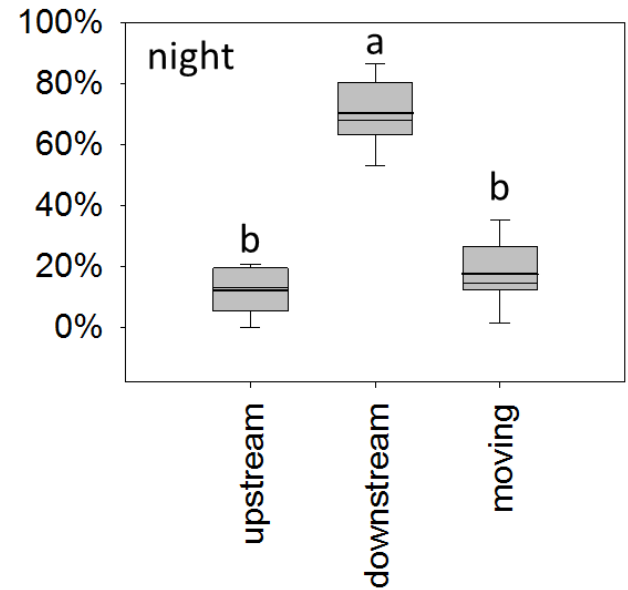
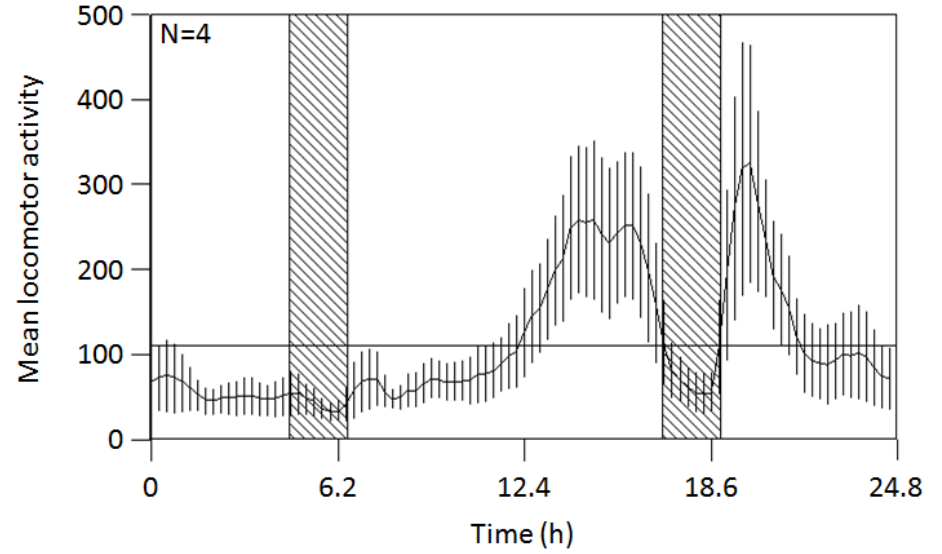
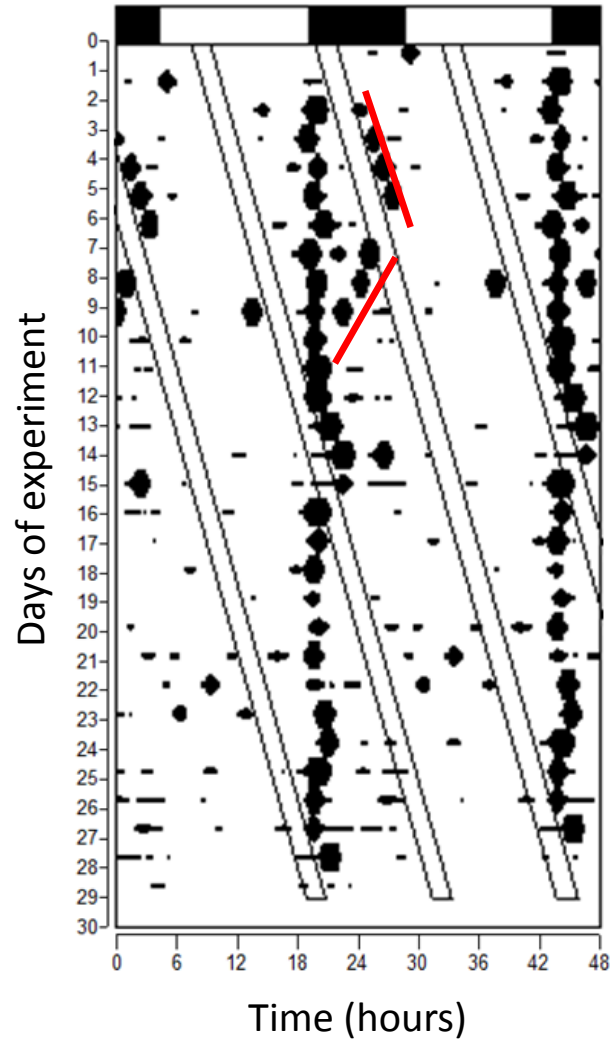


Sbragaglia et al., 2015, *Marine Biology*

TIDAL CURRENTS



TIDAL CURRENTS



DOMINANCE HIERARCHY AND DAILY ACTIVITY RHYTHMS

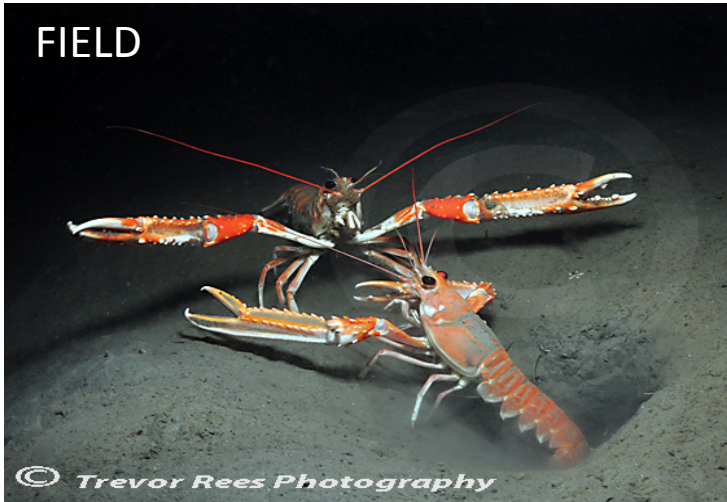
OBJECTIVE: Understand the effect of a dominance hierarchy on daily activity rhythms



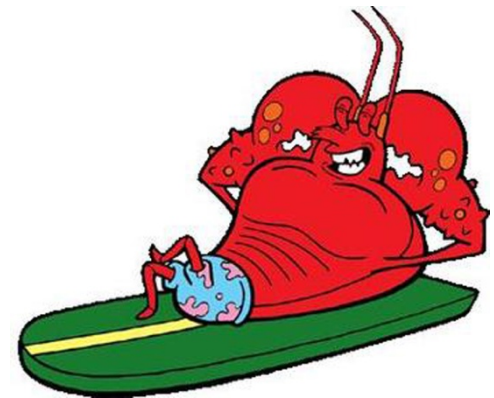
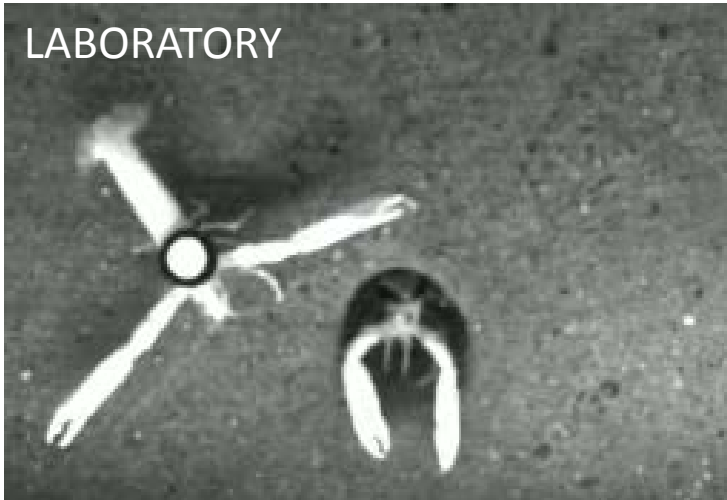
DOMINANCE HIERARCHY AND DAILY ACTIVITY RHYTHMS

OBJECTIVE: Understand the effect of a dominance hierarchy on daily activity rhythms

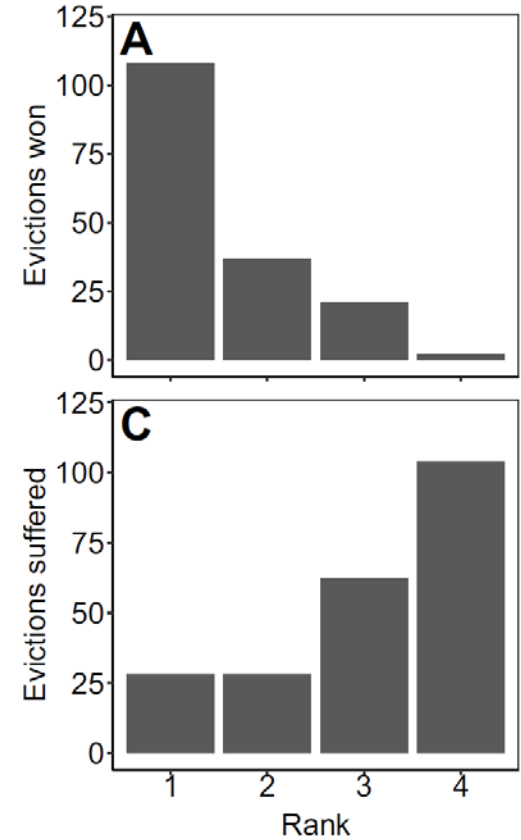
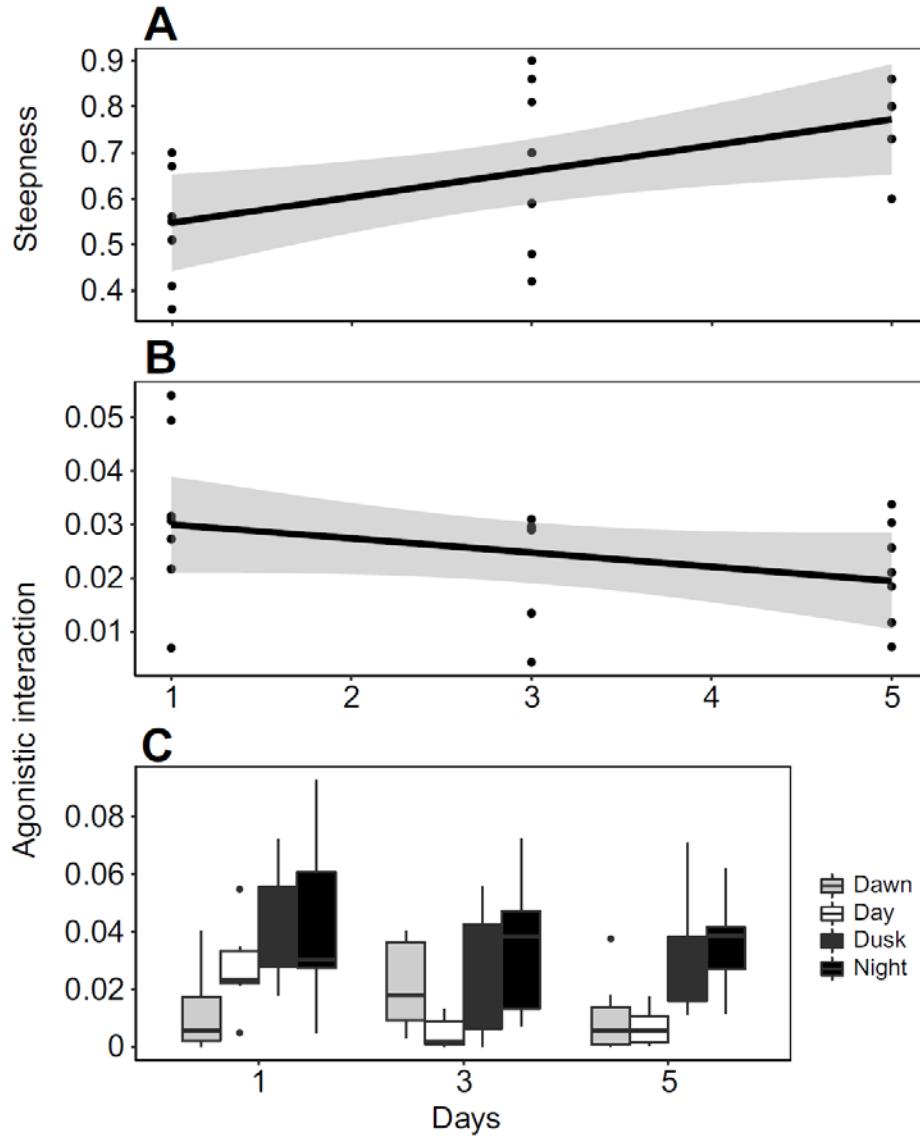
FIELD



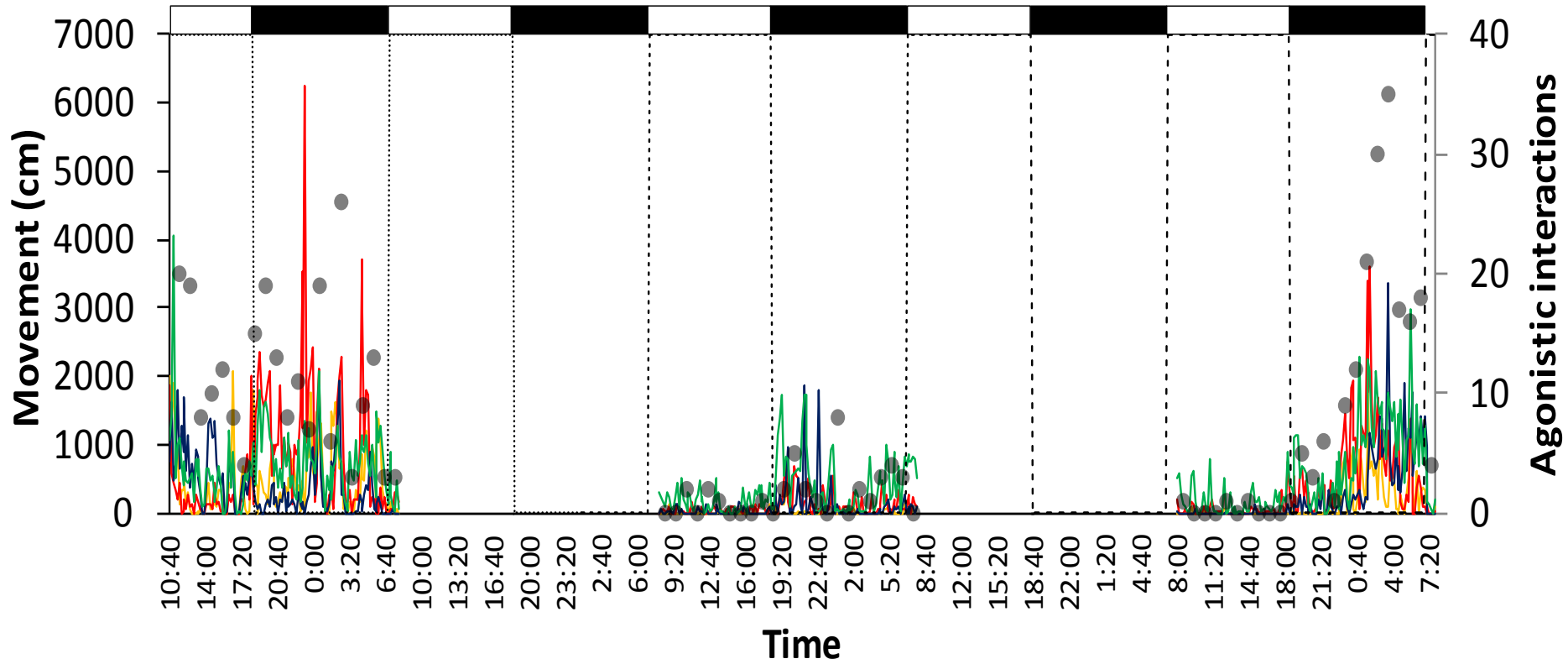
LABORATORY



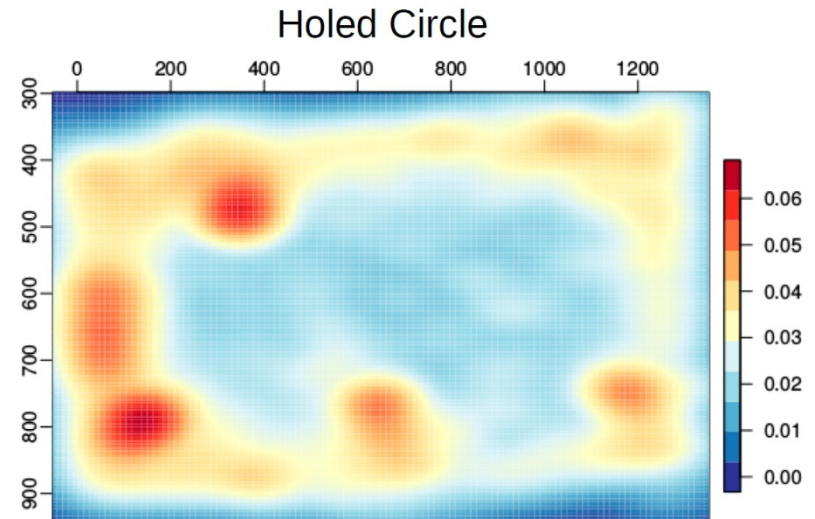
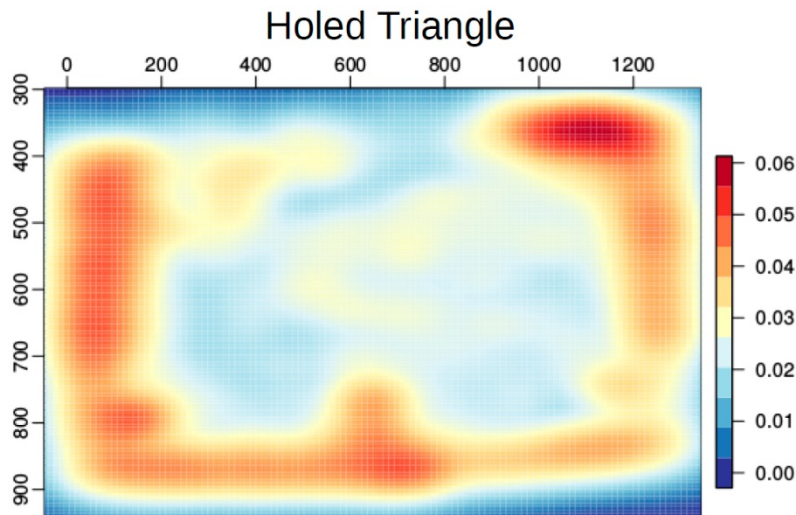
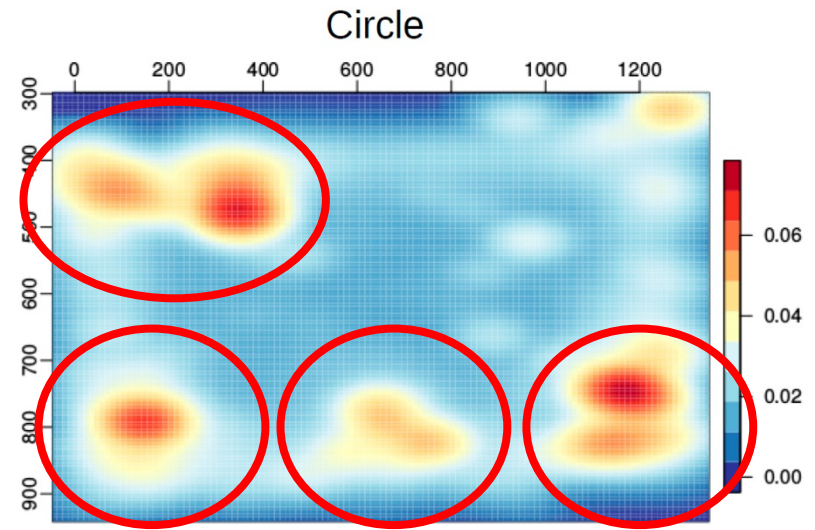
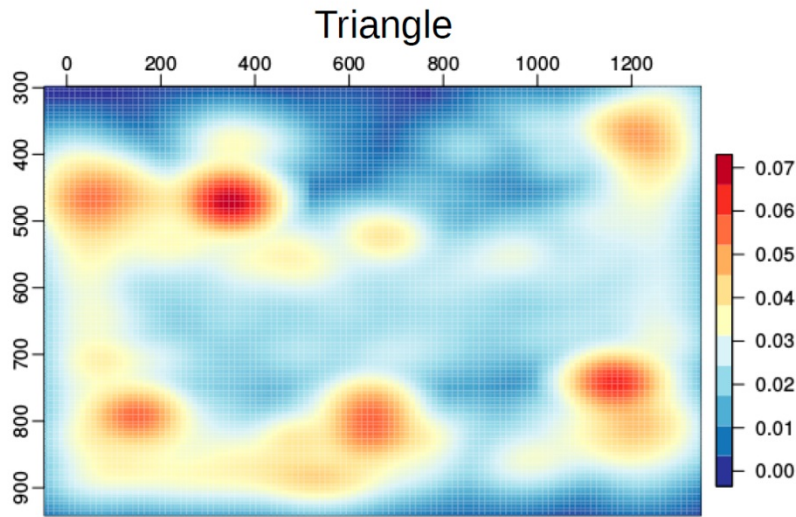
DOMINANCE HIERARCHY AND DAILY ACTIVITY RHYTHMS



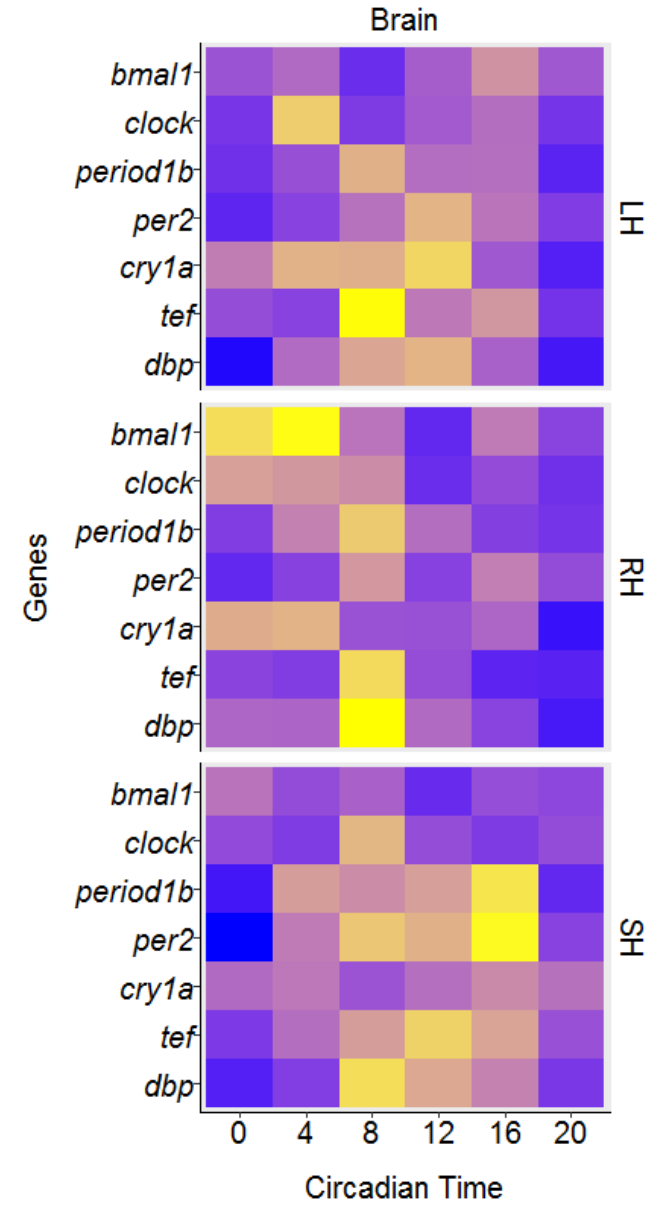
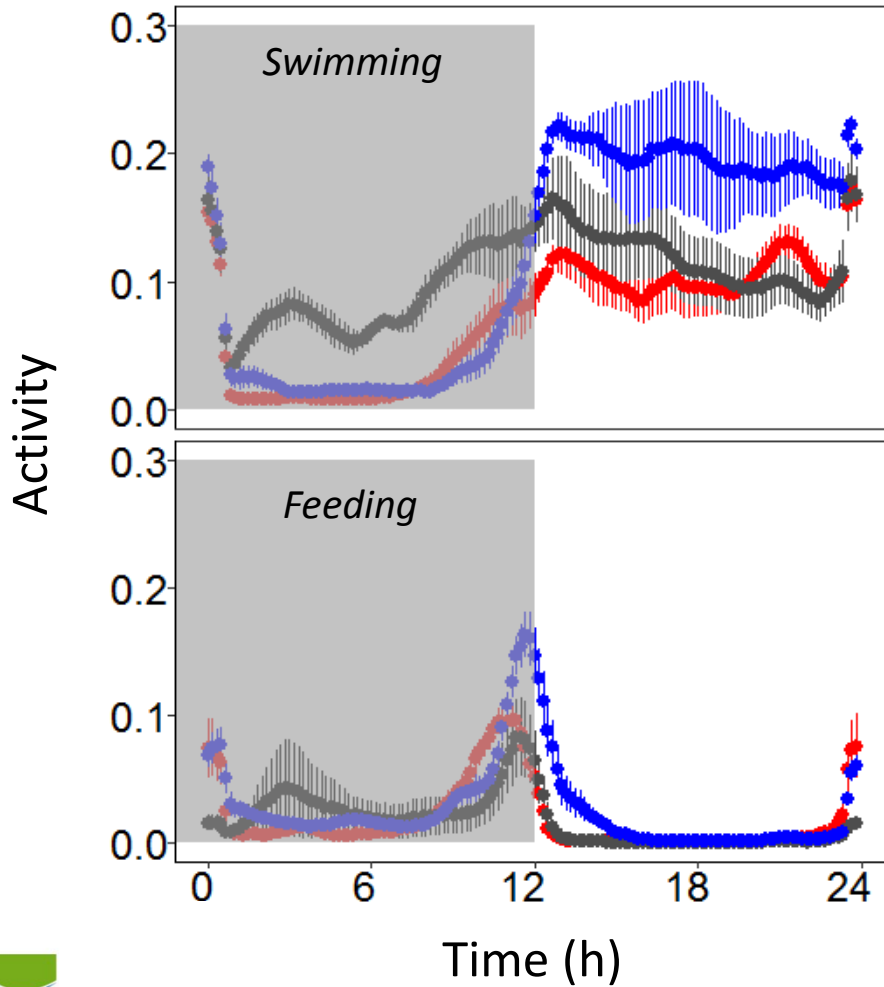
DOMINANCE HIERARCHY AND DAILY ACTIVITY RHYTHMS



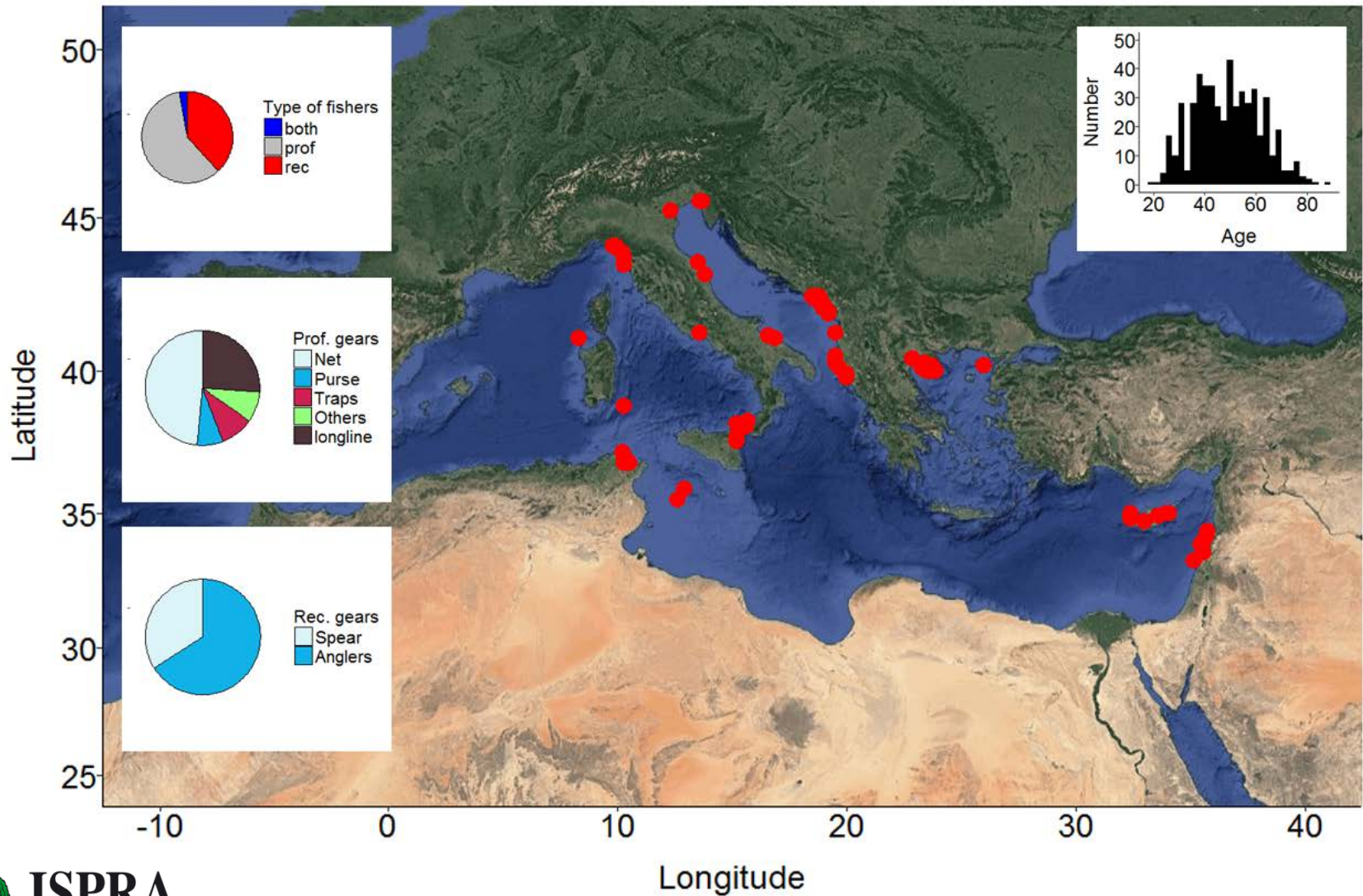
DOMINANCE HIERARCHY AND DAILY ACTIVITY RHYTHMS



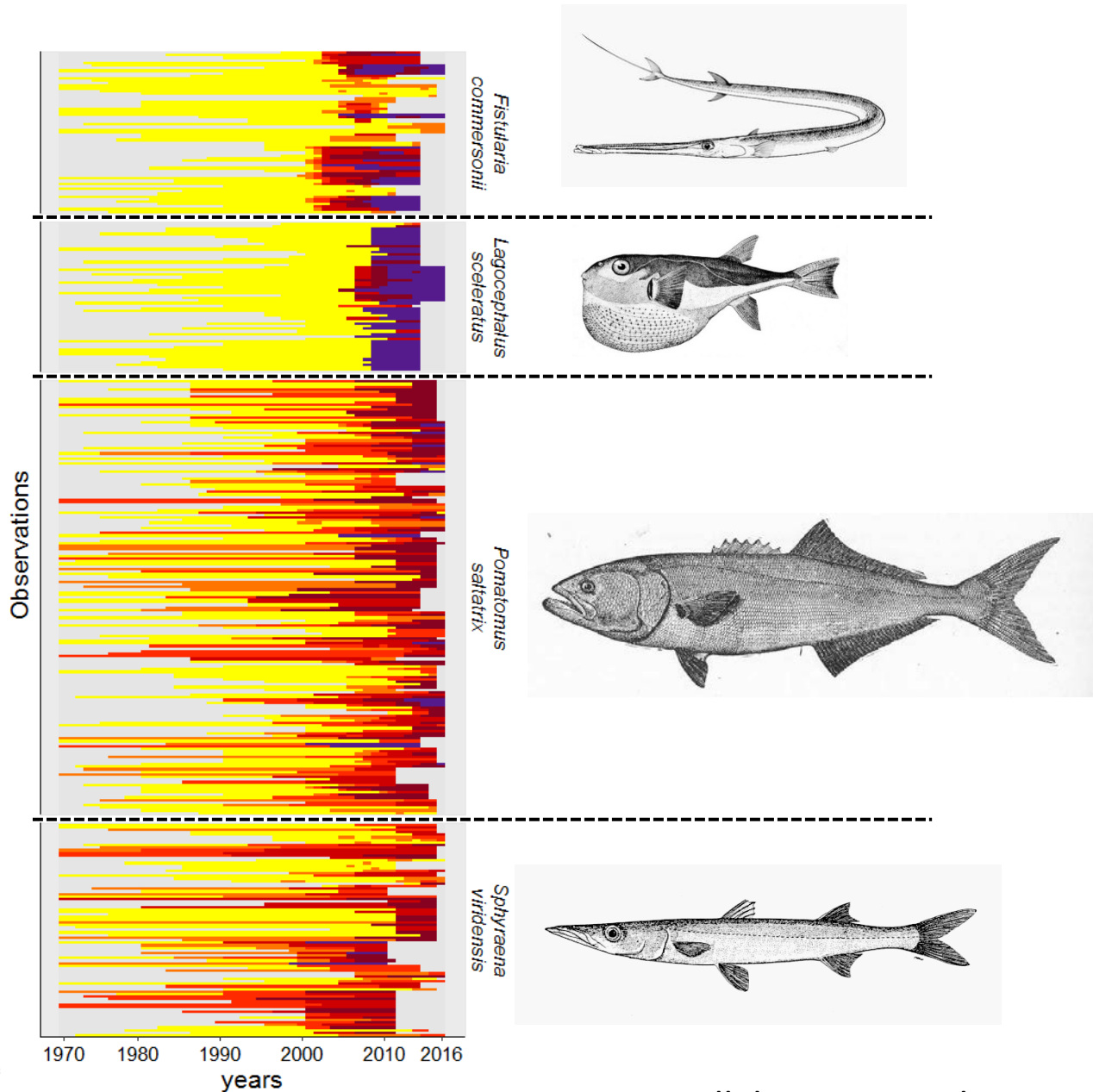
FISHERIES-INDUCED EVOLUTION OF BEHAVIOR



BIOLOGICAL INVASIONS



BIOLOGICAL INVASIONS



In collaboration with Dr. Ernesto Azzurro



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ACKNOWLEDGMENTS



Leibniz-Institute of
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