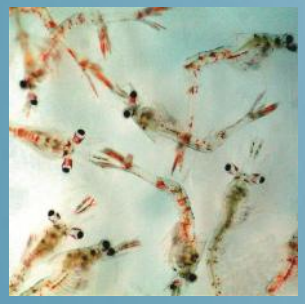
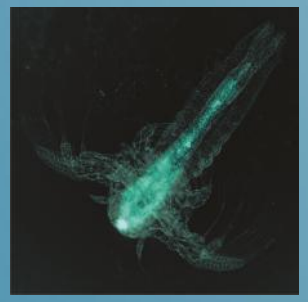
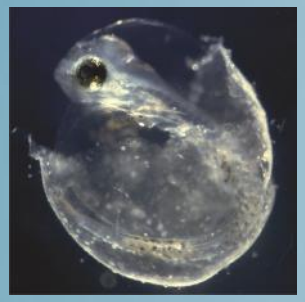
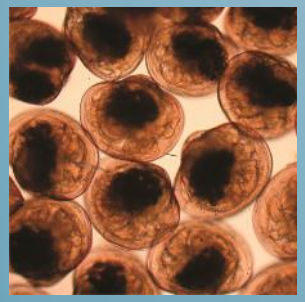




larvi 2013

6th fish & shellfish larviculture symposium

Current Status of crab larviculture in Thailand

(Pam Tamtin)

ghent university, belgium, 2-5 september 2013

Current Status of Crab Larviculture in Thailand

and

Development of a Diet

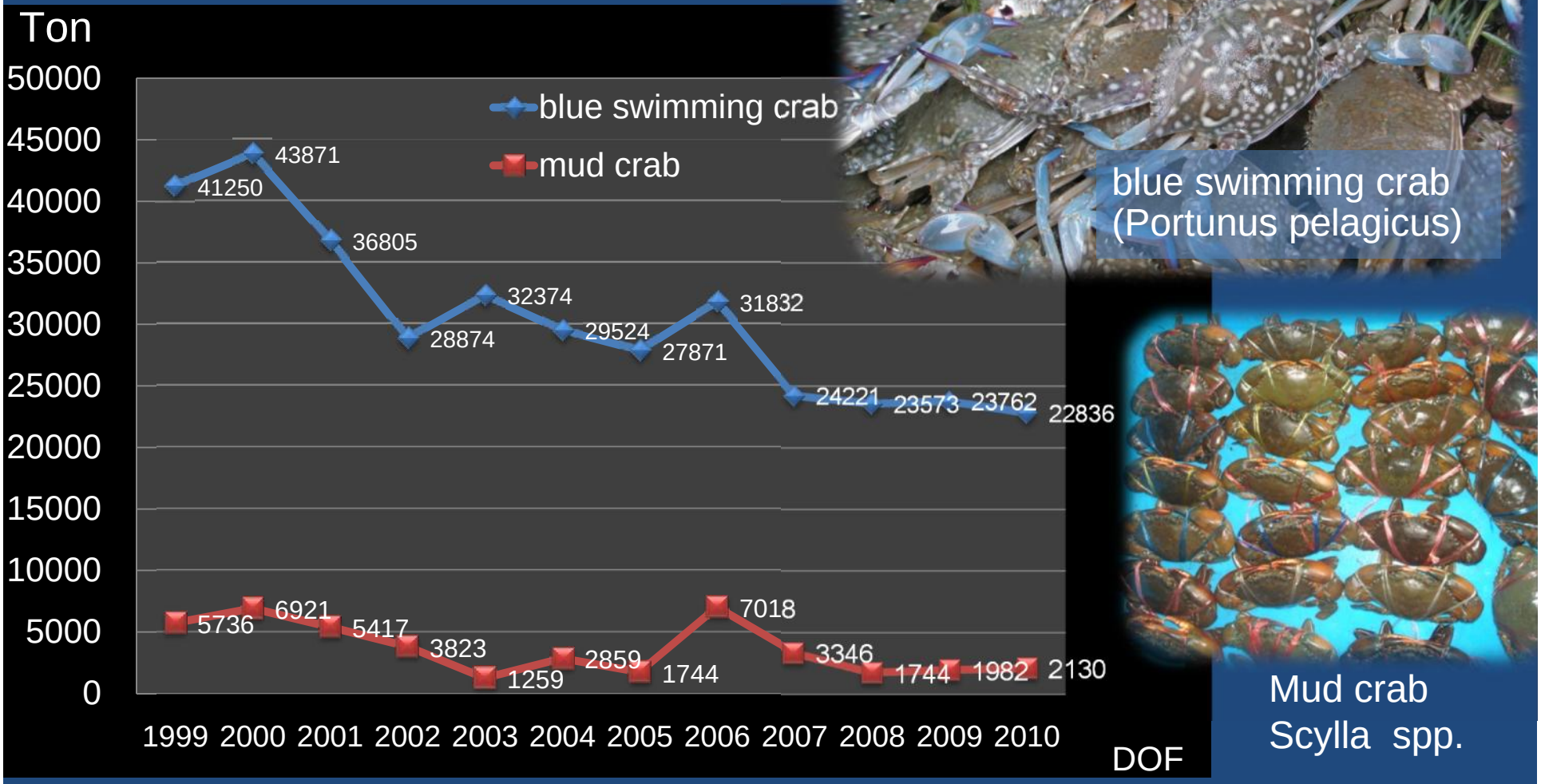
for

Domesticated Broodstock

M. Tamtin*[1,2], M. Wille[2], J. Saeton[3],
K. Kademuan[1], V. Tanasomwang[1],
P. Sobhon[3] and P. Sorgeloos[2]

[1]Department of Fisheries, Thailand.
[2]Ghent University, Belgium
[3]Mahidol University, Thailand

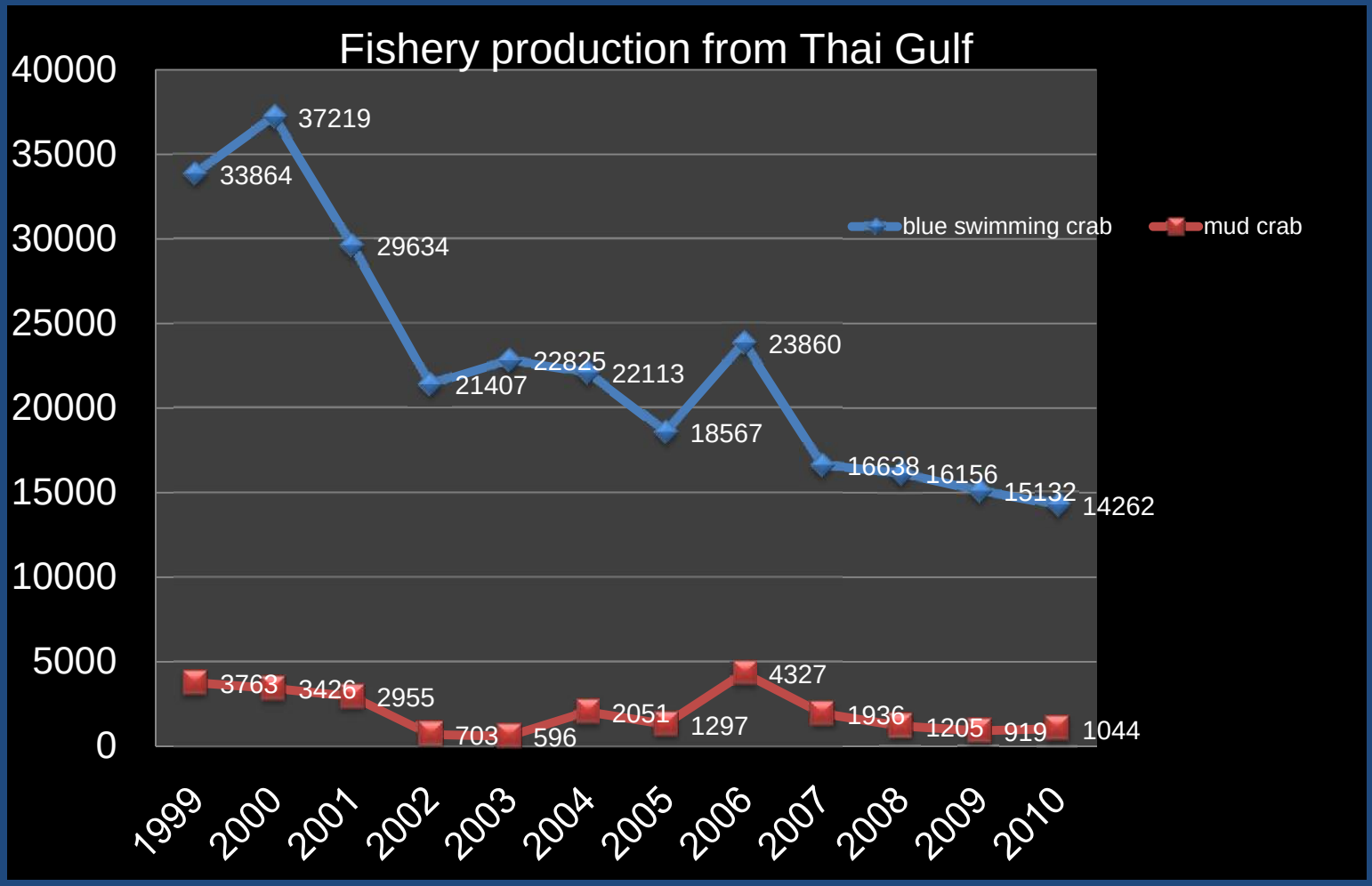
Fishery Production
(Gulf of Thailand&Indian Ocean)



blue swimming crab
(Portunus pelagicus)

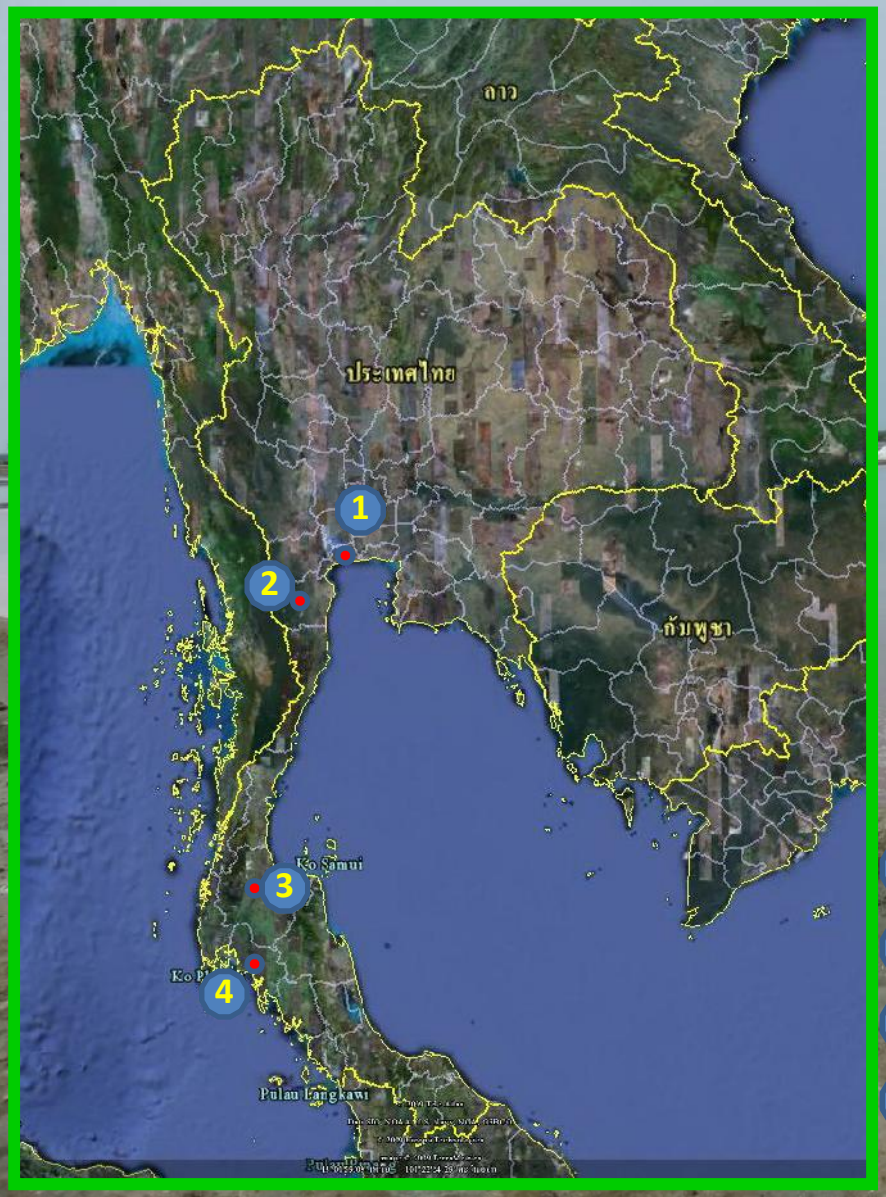
Mud crab
Scylla spp.

The export volumn of P. pelagicus in 2010 = 8752 ton(38% of Total production)/2525 million BT
38% airtight container and 38% frozen product


Fishery production from Thai Gulf
40000
35000
30000
25000
20000
15000
10000
5000
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
blue swimming crab
mud crab
33864
37219
29634
21407
22825
22113
18567
23860
16638
16156
15132
14262
3763
3426
2955
703
596
2051
1297
4327
1936
1205
919
1044

Source,DOF

Developing of Hatchery Techniques



P. pelagicus

Scylla paramamosain

Scylla olivacea

1956 :Research on sustainable culture of blue swimming crab (P. pelagicus) and mud crab (Scylla spp.) by DOF

1987 commercial culture have been started

1978 A breeding research program was initiated by DOF

1. Samut Songkhram – Outdoor
2. Phetcha Buri – Outdoor
3. Surat Thani – Indoor
4. Krabi - Indoor

Crab Larviculture

	Swimming crab		Mud crab
	Indoor	Outdoor	Indoor
Ponds	Concrete tank	Earthen pond	Concrete tank
Size	➢ 2 ton	0.5-1 rai(1rai/0.16 ha)	➢ 2 ton
Stocking density	50-100 Z1/l	13-22 berried females	50-100 Z1/l

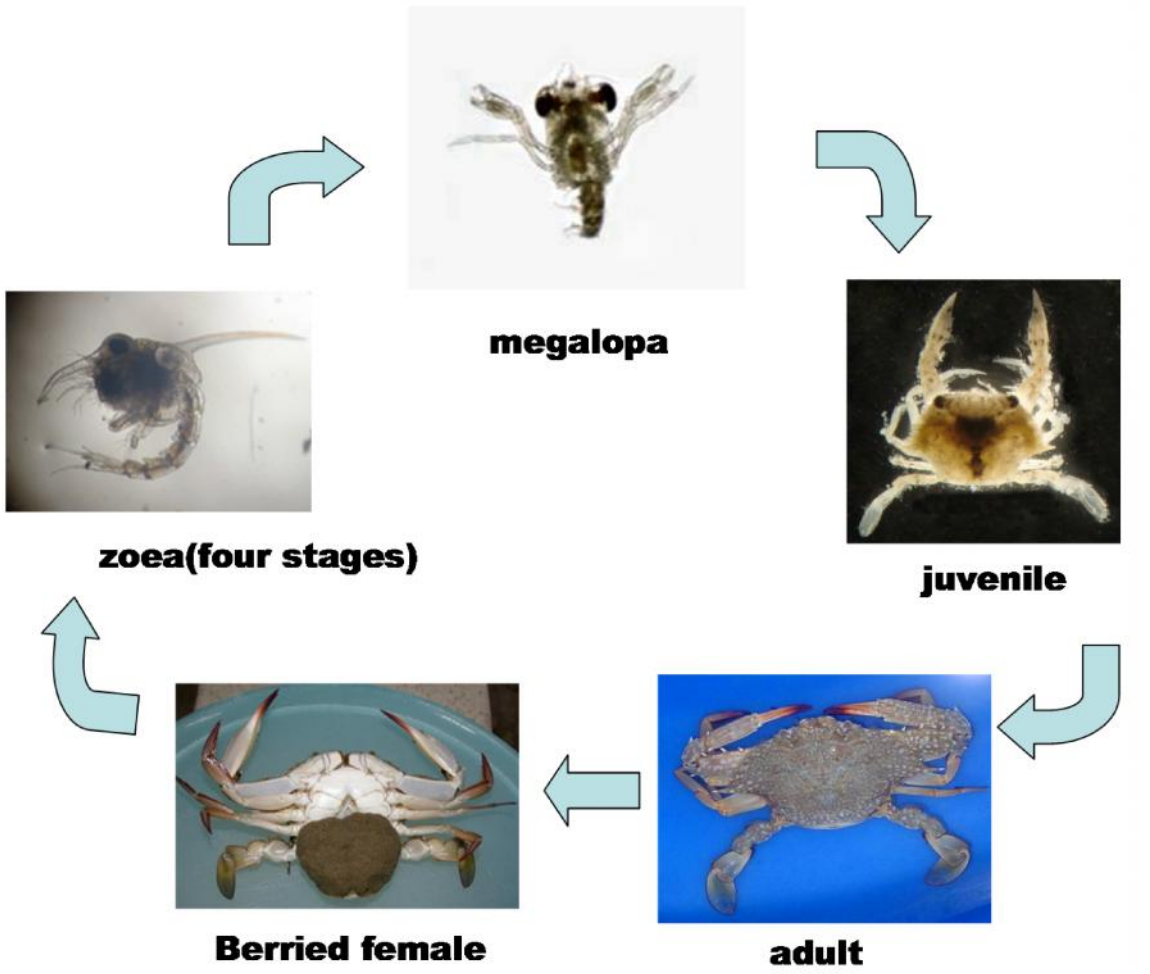
Larval rearing tanks

+ greenwater culture
(Chlorella or Tetraselmis spp.)

Wild Broodstocks

Hatching tanks

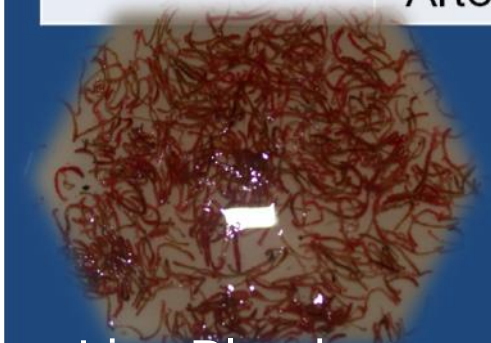
Life Cycle of P. pelagicus



Outdoor Crab Larviculture
(P. Pelagicus)

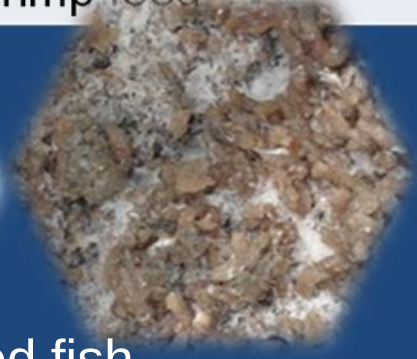
Crab Larviculture

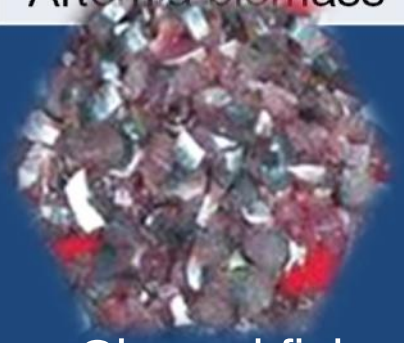
	Swimming crab		Mud crab
	Indoor	Outdoor	Indoor
Diets			
Z1-Z2	Rotifer	Natural zooplankton	Rotifer
Z2-Z4/Z5	Artemia instar I	Artemia instar I	Artemia instar I
Megalopa	-Live Blood worm -Live/frozen Artemia -Minced fish/clam	Artemia biomass	-Live Blood worm -Live/frozen Artemia -Minced fish/clam
Early young crab	-Minced/choped fish/clam -Artemia biomass	-Artemia biomass -minced fish -shrimp feed	-Minced/choped fish/clam, -Artemia biomass



Live Blood worm

Minced fish





Choped fish

Crab Larviculture

	Swimming crab		Mud crab
	Indoor	Outdoor	Indoor
Salinity	25-32 ppt	27-32 ppt	25-32 ppt
Temperature	28-32 ^{o}C	28-32 ^{o}C	28-32 ^{o}C
Larviculture duration	21 days	30 days	22-30 days
Survival rate (%)	25-30%	3-3.5%	10%
Harvested size	0.5-1 cm	1.5 -2 cm	0.5-1 cm
Market	stock enhancement growout farm	stock enhancement	For growout 30% of total farms
Annual Production		1.5-2 million crablets	
crablets	➢5 millions		
megalopa	➢2.5 millions		
Zoea	> 150 millions		

Outdoor Crab Larviculture
(P. Pelagicus)

Stock enhancement

Officially released by DOF during 2010-2012 > 2 million young crabs (1-3 cm) + Zoea/Megalopa

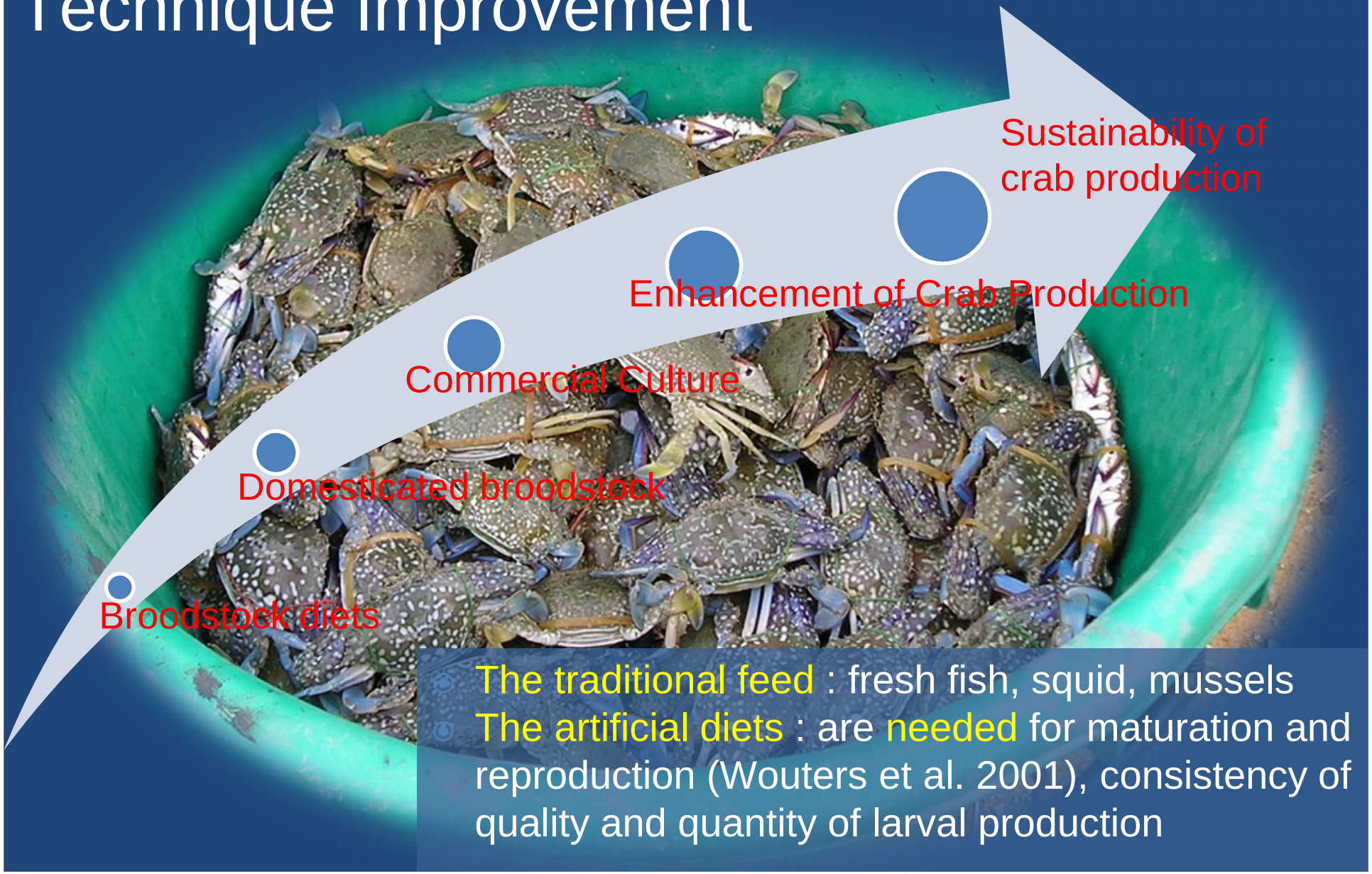
Broodstock conditioning

	Swimming crab	Mud crab	
Broodstock conditioning	Indoor	Indoor	Outdoor
Broodstock source	Wild crab/crab trader	Wild crab/crab trader	Wild crab/crab trader
Ponds	Concrete tank	Concrete tank	Earthen pond
Size	10 m3	10 m3	1 rai (0.16 ha)
Stocking density	2 females/m^2	1 female/4m^2	1 female/m^2
Broodstock diets	Fresh fish/cockle/mussels	Fresh fish/cockle/mussels	Fresh fish/cockle/mussels
Salinity	30 ppt	30 ppt	25-35 ppt
Duration to obtain berried female	7-28 days	21-90 days	15-60 days
Fecundity	0.8-2 million eggs/female	0.5-5 million eggs/female	0.5-5 million eggs/female
Duration from eggs to hatching	7-9 days	9-12 days	9-12 days

Source of Eggs

Due to a supply shortage of crabs, eggs of berried crabs from the processing plant are used for larval production

Development& Technique Improvement



- The traditional feed : fresh fish, squid, mussels
- The artificial diets : are needed for maturation and reproduction (Wouters et al. 2001), consistency of quality and quantity of larval production

Fact : The insufficient knowledge on broodstock nutrition

: What is the role of a specific nutrient?

: What is the nutrient requirement for

- sexual development?
- production of viable eggs & offspring?

Lipids are required for energy & cell mb structure and cell function

Determination of biochemical composition and metabolism of nutrients during ovarian maturation
(Wouters et al., 2001; Cavalli et al., 2001; Alava et al., 2007)

Lipid dynamics of wild P. pelagicus females during gonad maturation and egg development

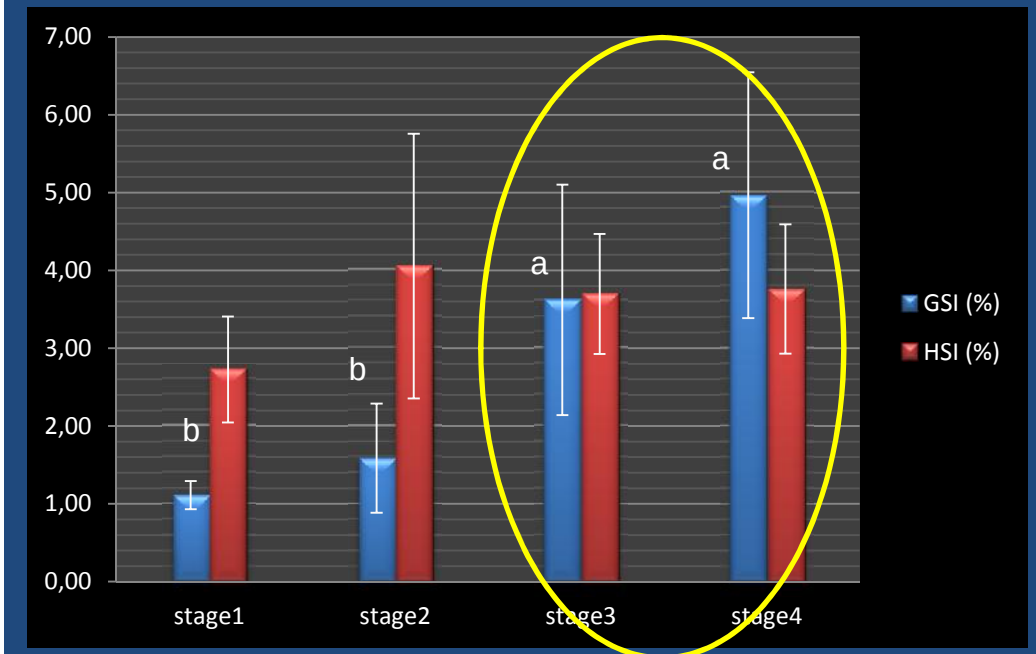
Stage1
spawn-spent

Stage2
proliferative

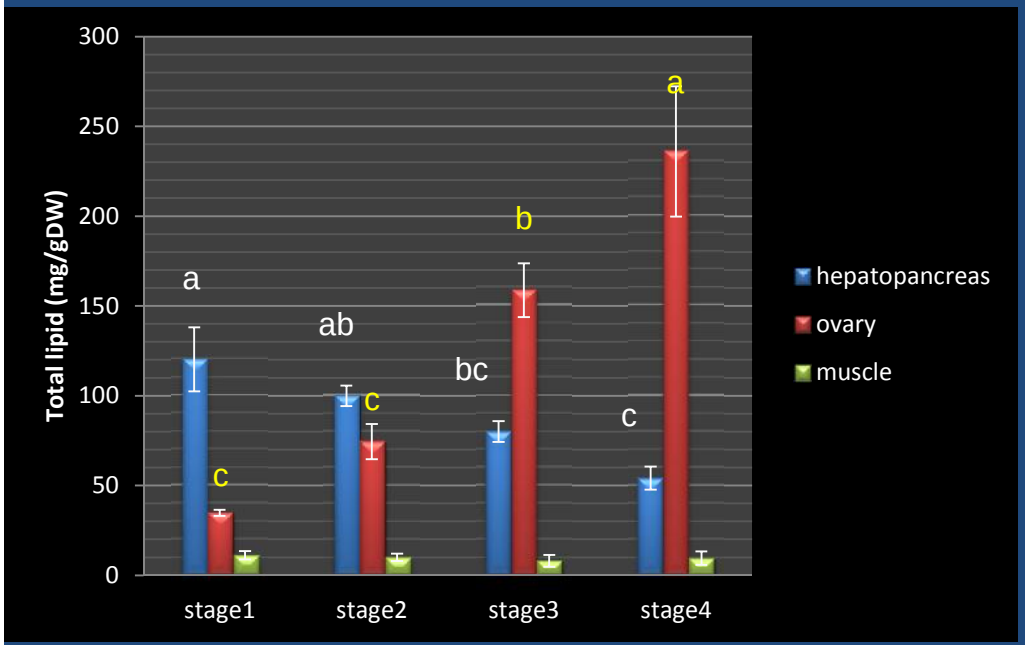
Stage3
premature

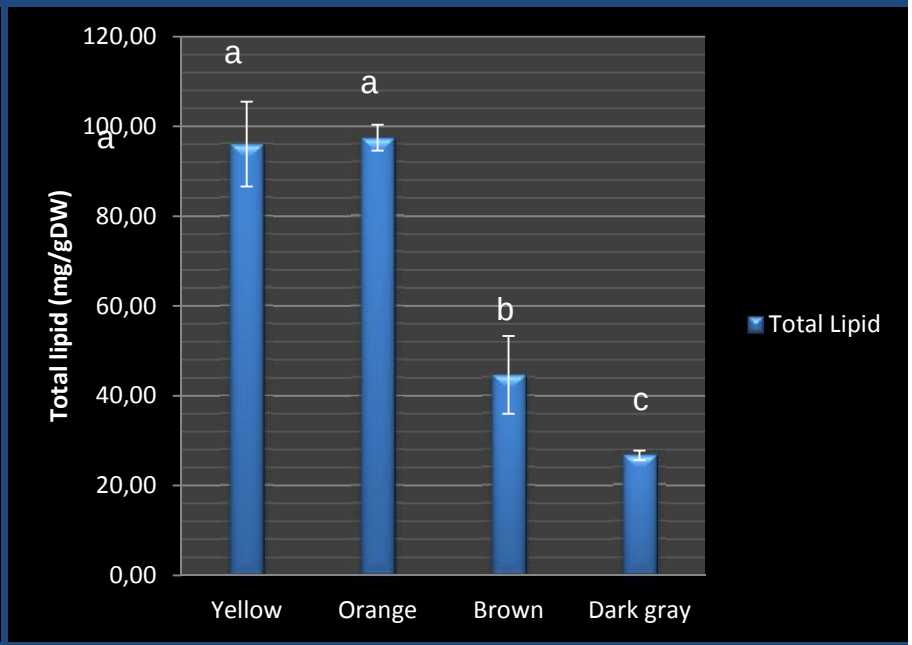
Stage4
mature

Classified according to
Stewart et al. (2007)

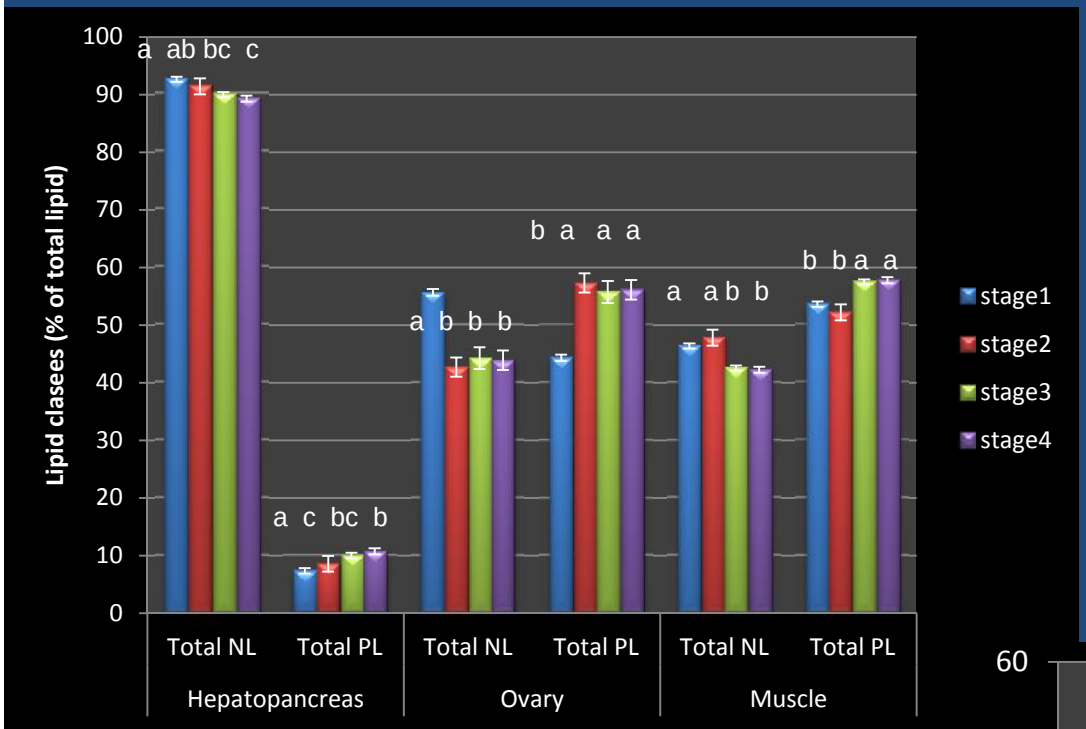

7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
b
b
a
a
stage1
stage2
stage3
stage4
GSI (%)
HSI (%)

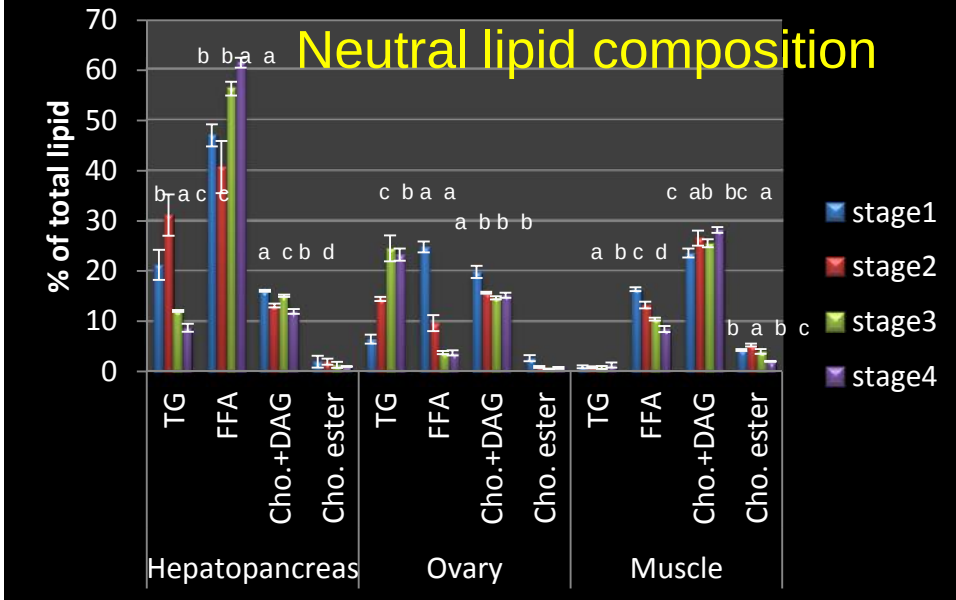
Total Lipid

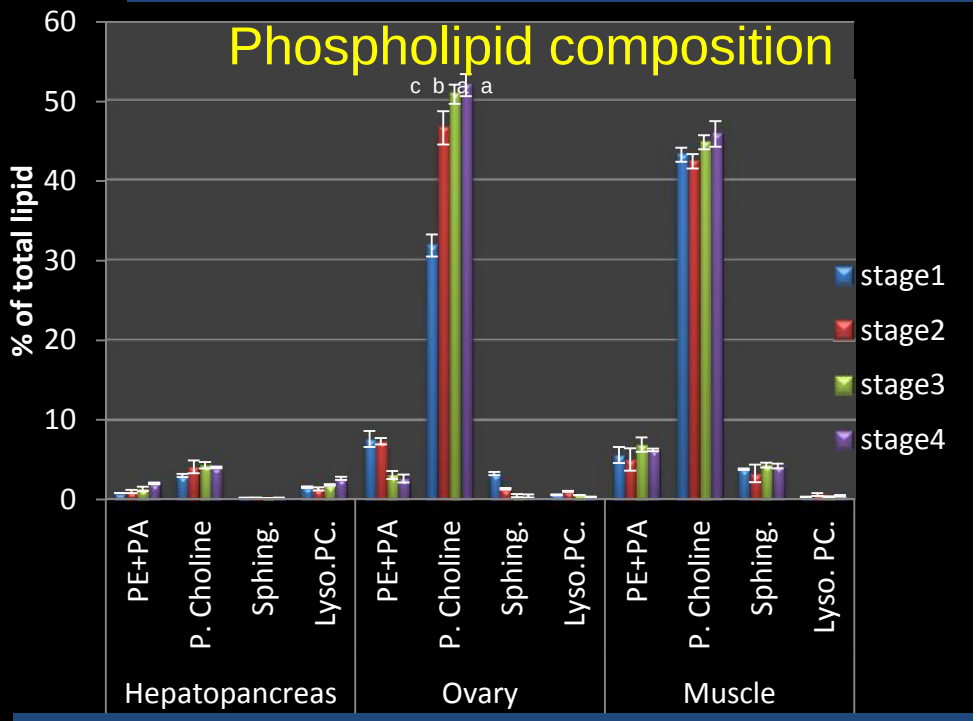

300
250
200
150
100
50
0
Total lipid (mg/gDW)
a
c
ab
c
bc
b
c
a
stage1
stage2
stage3
stage4
hepatopancreas
ovary
muscle


120,00
100,00
80,00
60,00
40,00
20,00
0,00
Total lipid (mg/gDW)
a
a
a
b
c
Yellow
Orange
Brown
Dark gray
Total Lipid

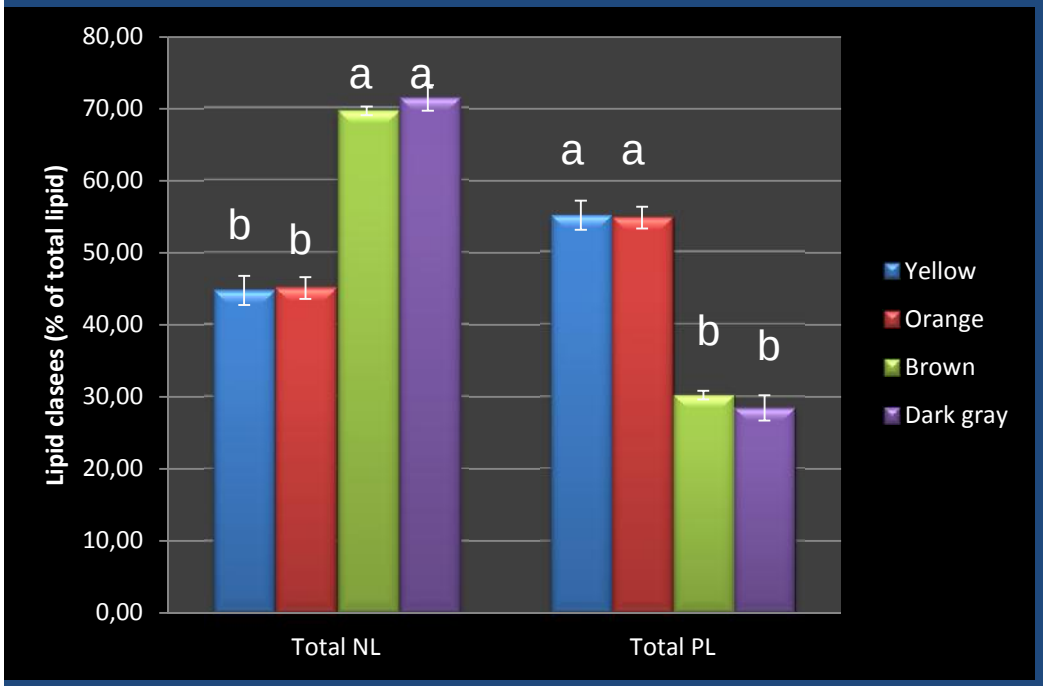
Lipid Classes

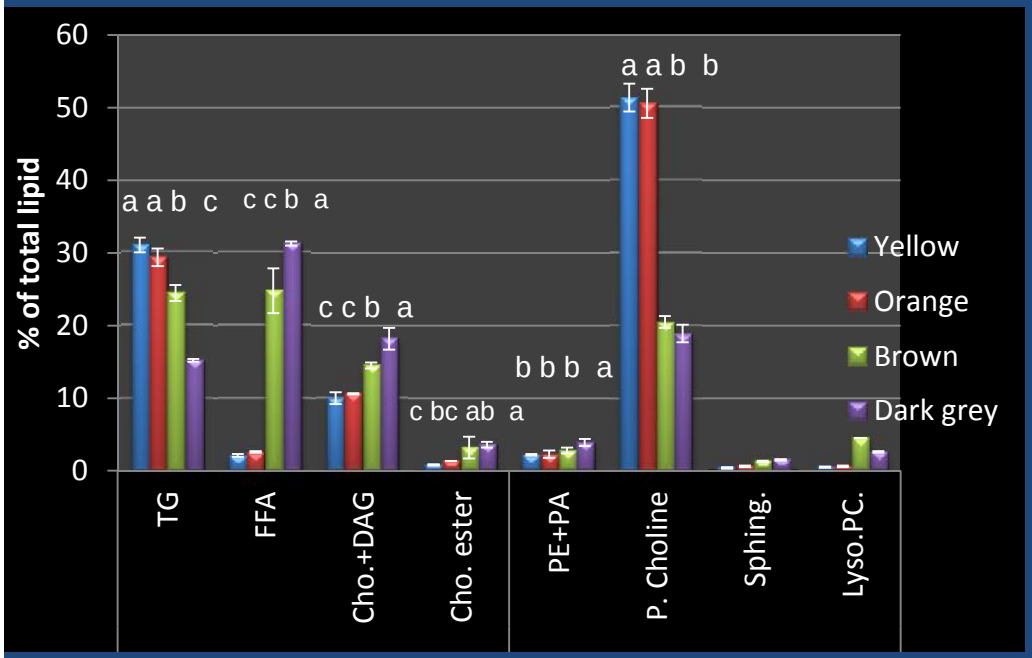




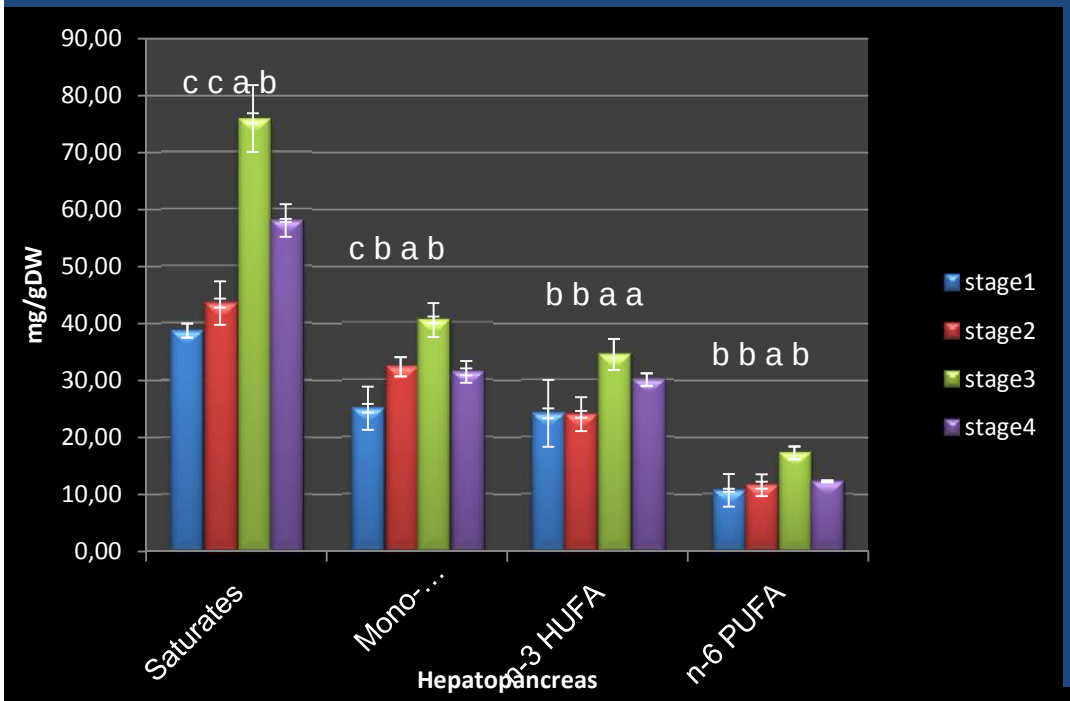


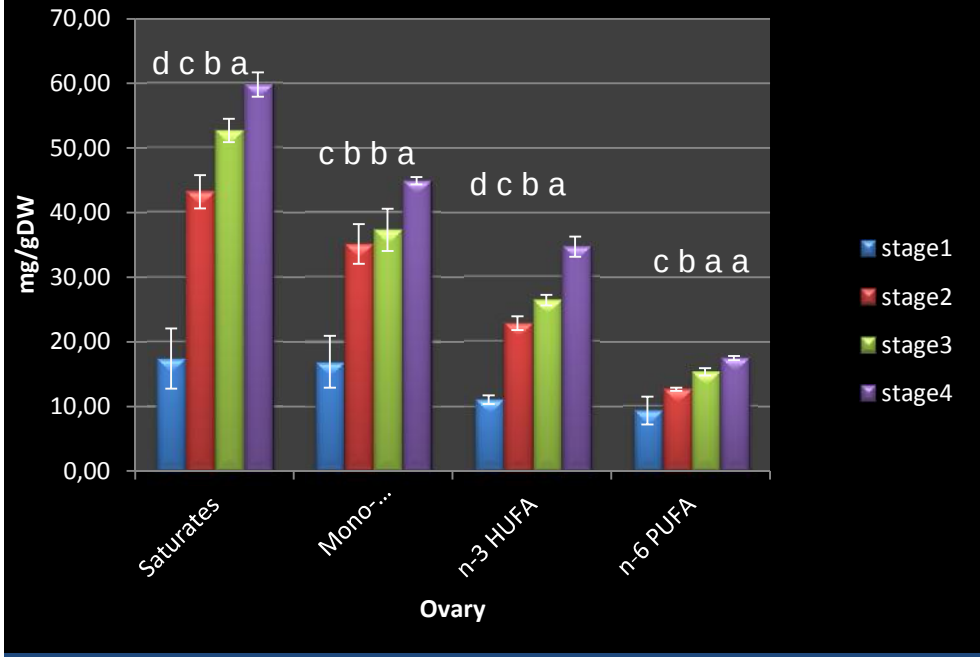
Lipid classes

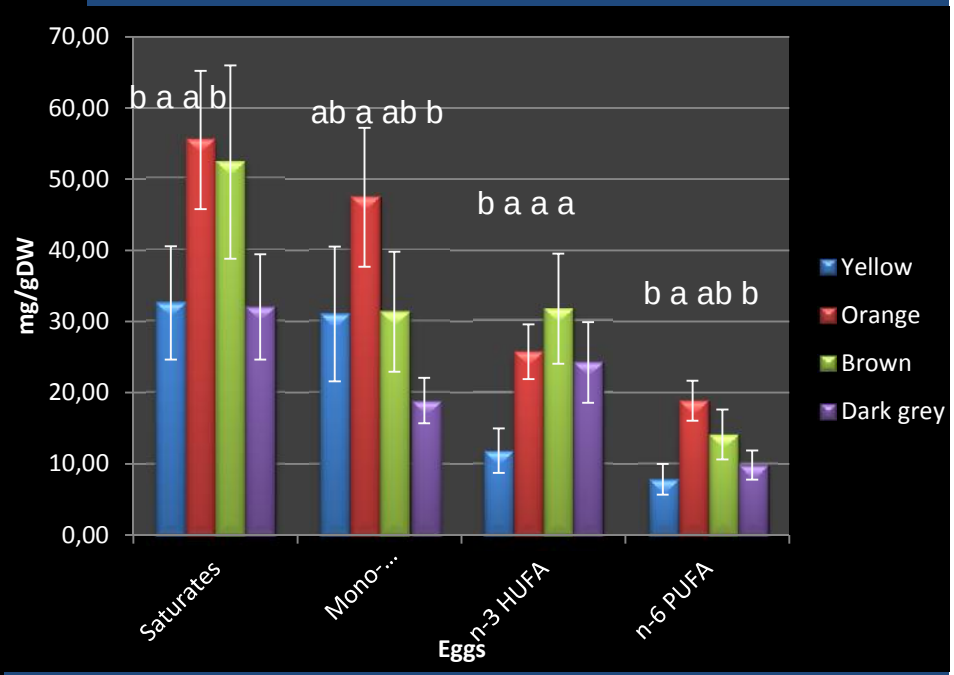




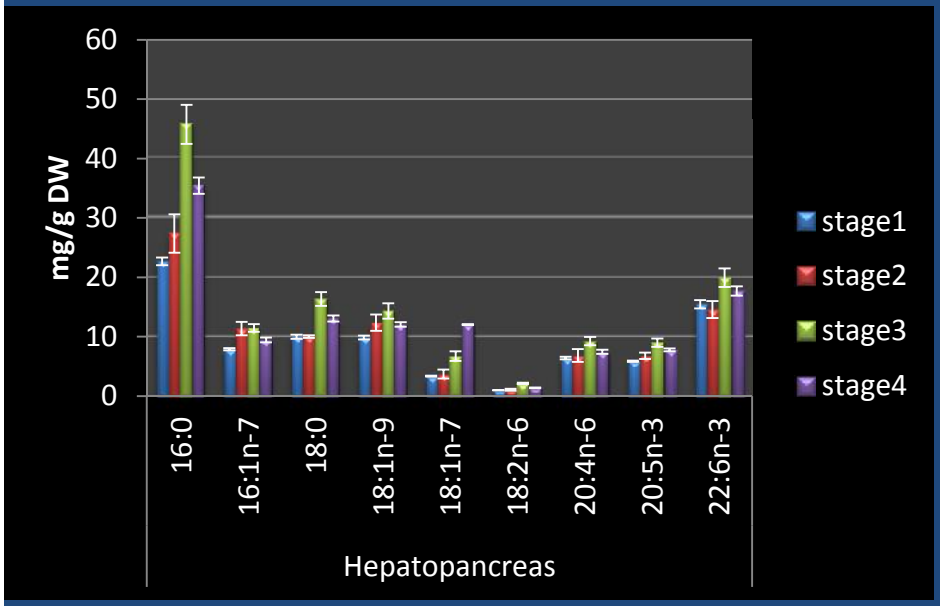
Fatty acids

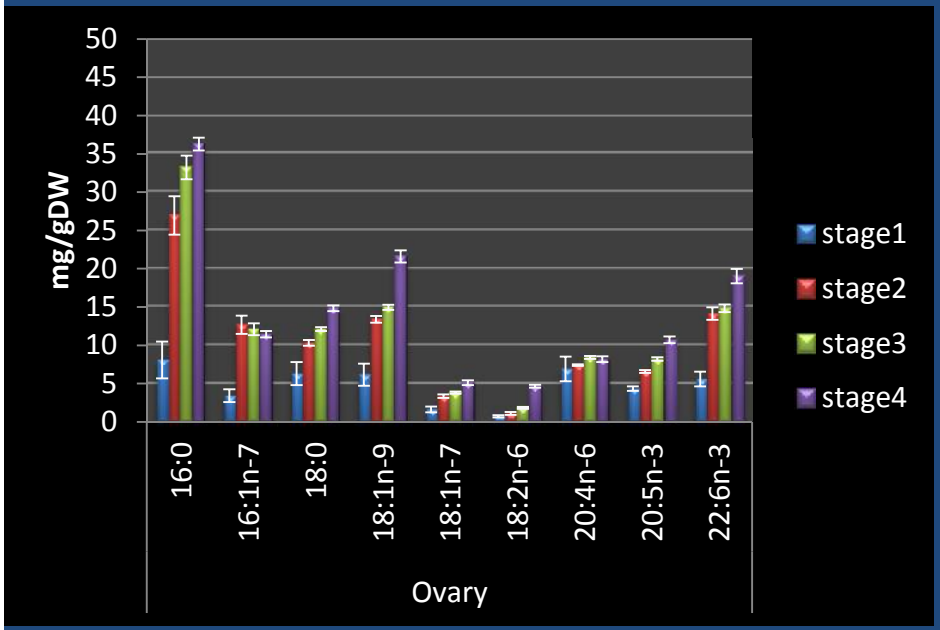

90,00
80,00
70,00
60,00
50,00
40,00
30,00
20,00
10,00
0,00
mg/gDW
c c a b
c b a b
b b a a
b b a b
Saturates
Mono-…
n-3 HUFA
n-6 PUFA
Hepatopancreas
stage1
stage2
stage3
stage4

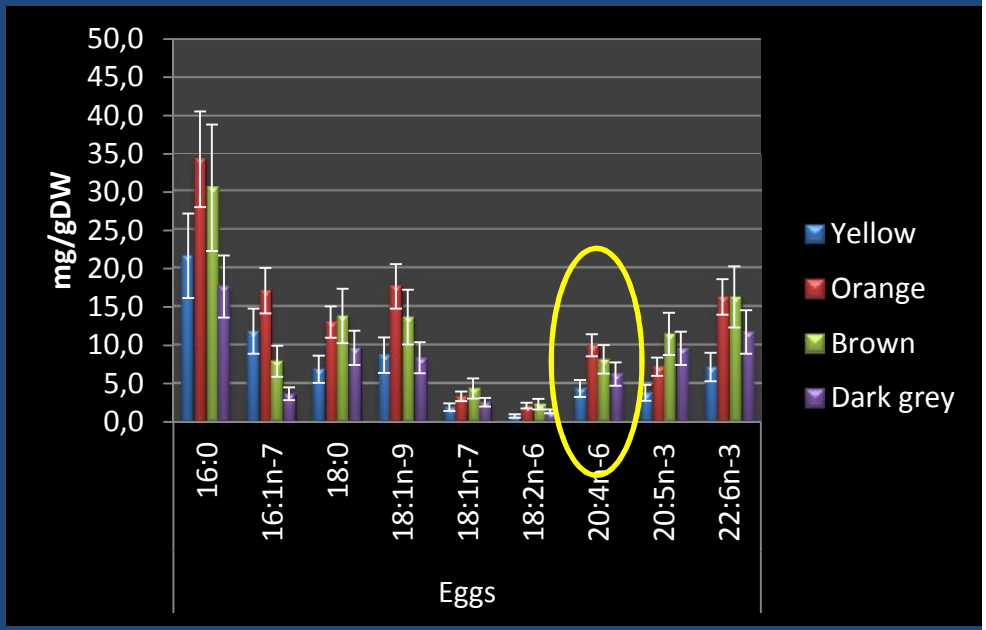

70,00
60,00
50,00
40,00
30,00
20,00
10,00
0,00
mg/gDW
d c b a
c b b a
d c b a
c b a a
Saturates
Mono-…
n-3 HUFA
n-6 PUFA
Ovary
stage1
stage2
stage3
stage4


70,00
60,00
50,00
40,00
30,00
20,00
10,00
0,00
mg/gDW
b a a b
ab a ab b
b a a a
b a ab b
Saturates
Mono-…
n-3 HUFA
n-6 PUFA
Eggs
Yellow
Orange
Brown
Dark grey

Fatty acids


mg/g DW
60
50
40
30
20
10
0
16:0
16:1n-7
18:0
18:1n-9
18:1n-7
18:2n-6
20:4n-6
20:5n-3
22:6n-3
Hepatopancreas
stage1
stage2
stage3
stage4

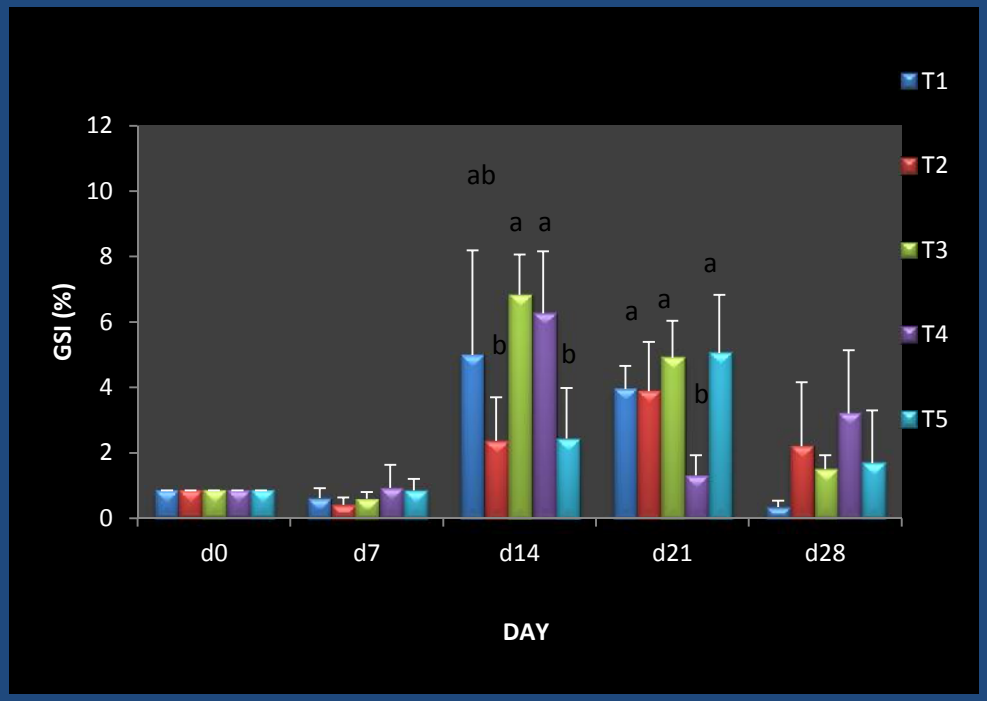

mg/gDW
50
45
40
35
30
25
20
15
10
5
0
16:0
16:1n-7
18:0
18:1n-9
18:1n-7
18:2n-6
20:4n-6
20:5n-3
22:6n-3
Ovary
stage1
stage2
stage3
stage4

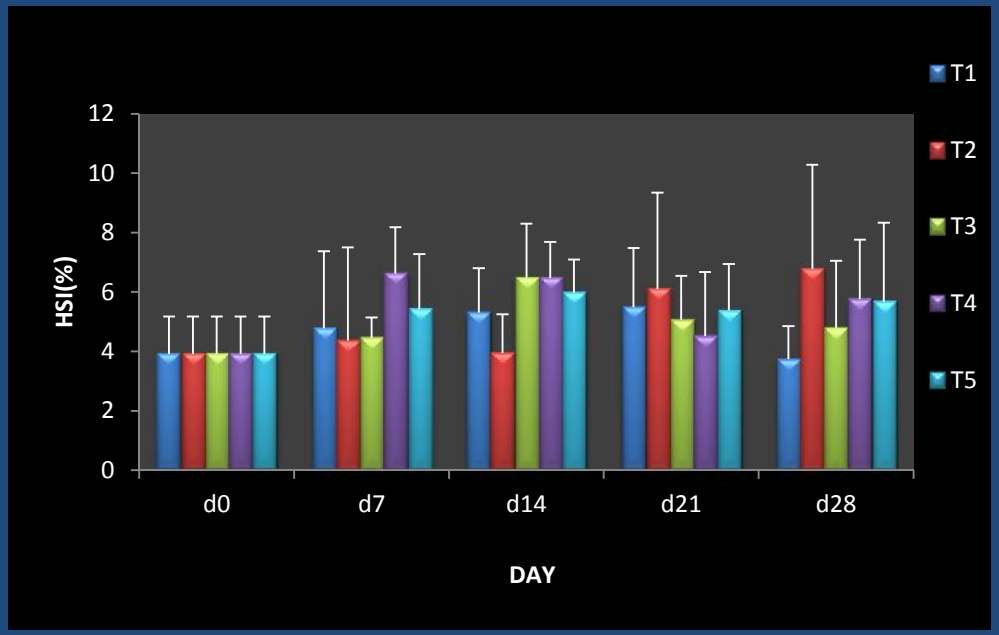

mg/gDW
50,0
45,0
40,0
35,0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
16:0
16:1n-7
18:0
18:1n-9
18:1n-7
18:2n-6
20:4n-6
20:5n-3
22:6n-3
Eggs
Yellow
Orange
Brown
Dark grey

Ovarian maturation, vitellin concentration, reproductive performance and offspring quality of pond raised blue swimming crab (P. pelagicus Linnaeus, 1758) broodstock fed various levels of total dietary lipids

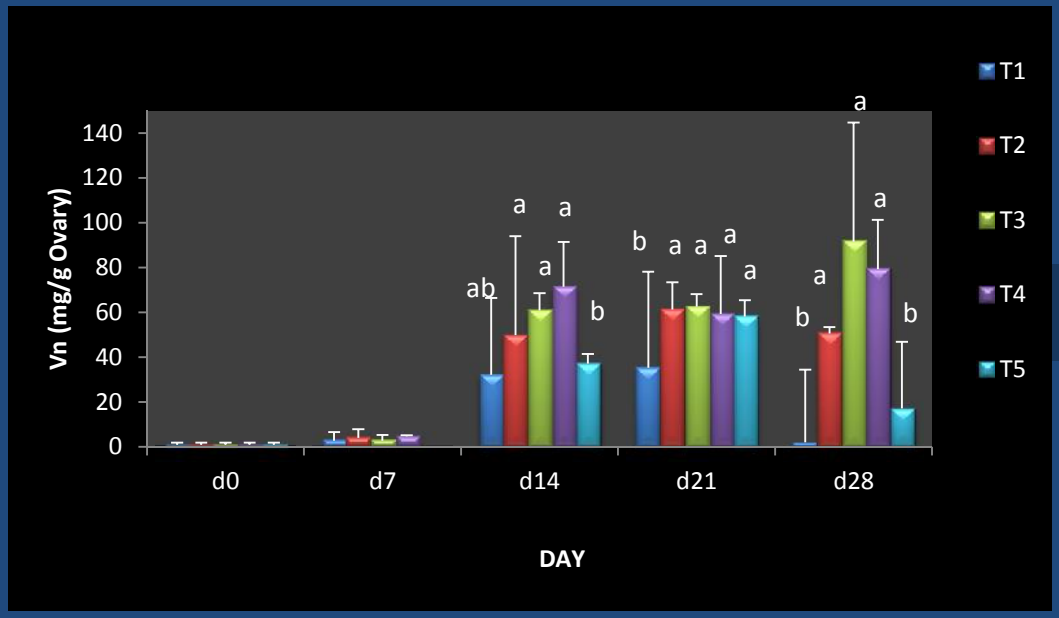
Pond raised broodstocks

Culture of experimental crabs
Using 5 isonitrogenous diets:
6.98, 9.40, 11.19, 12.46 and 15% TDL

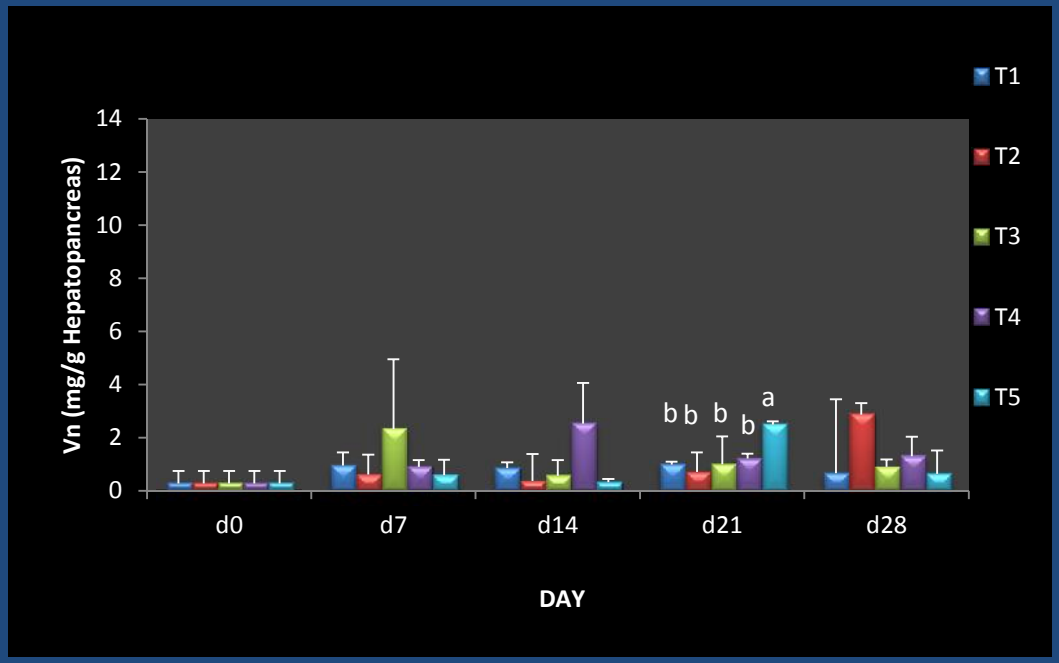


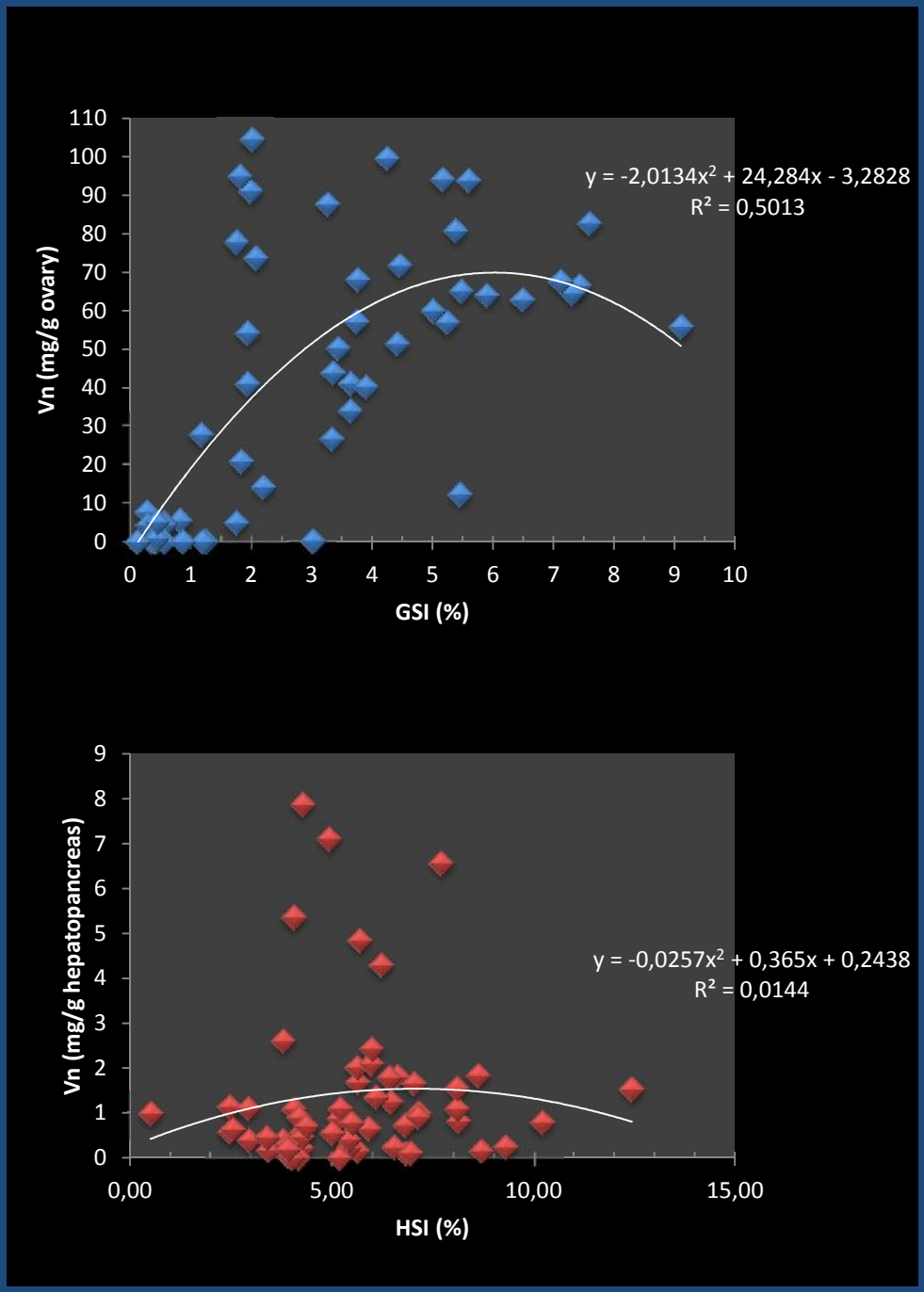


Ě TDL sig effected on GSI

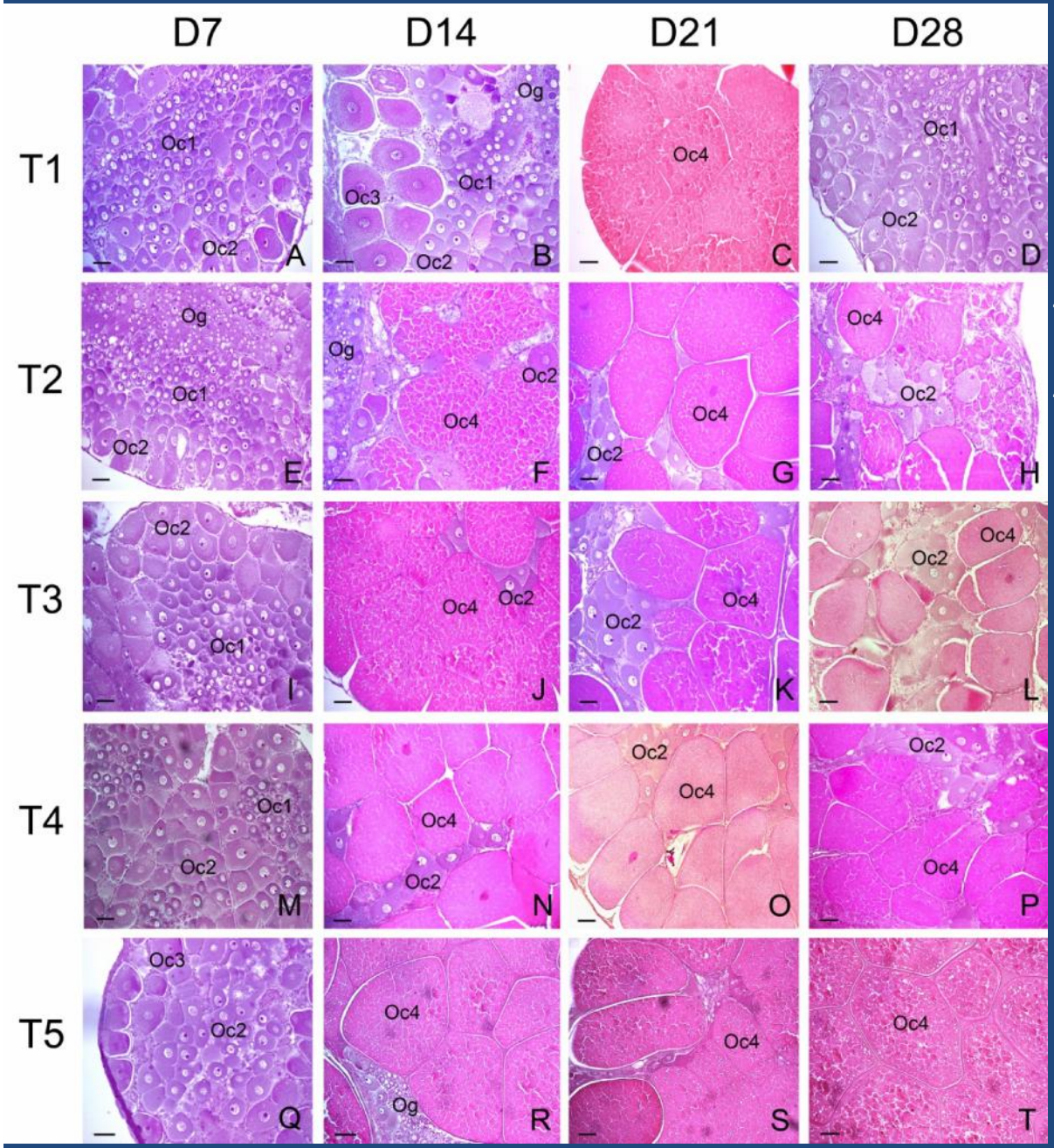


Ě Ovary vitellin concentration





Ě Relation between vitellin and GSI

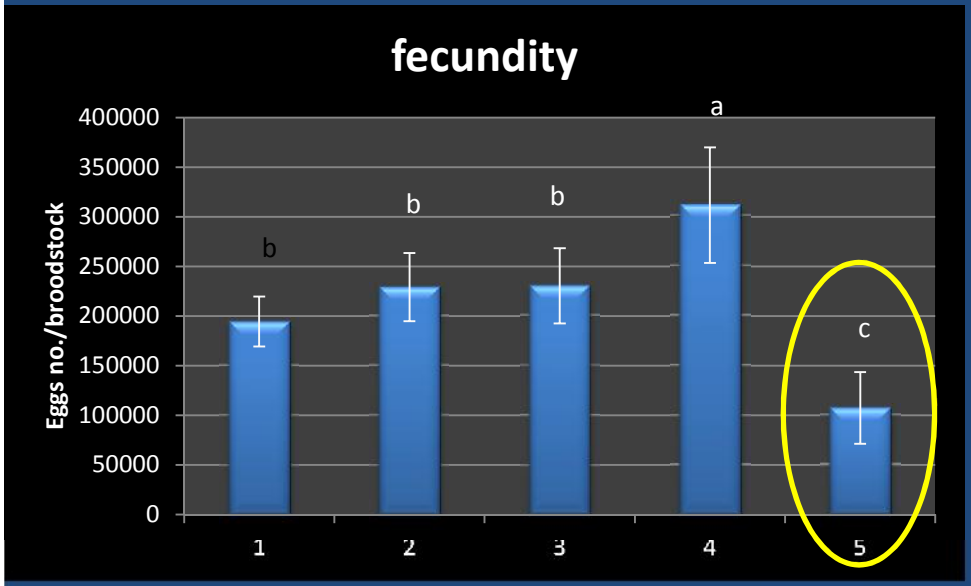


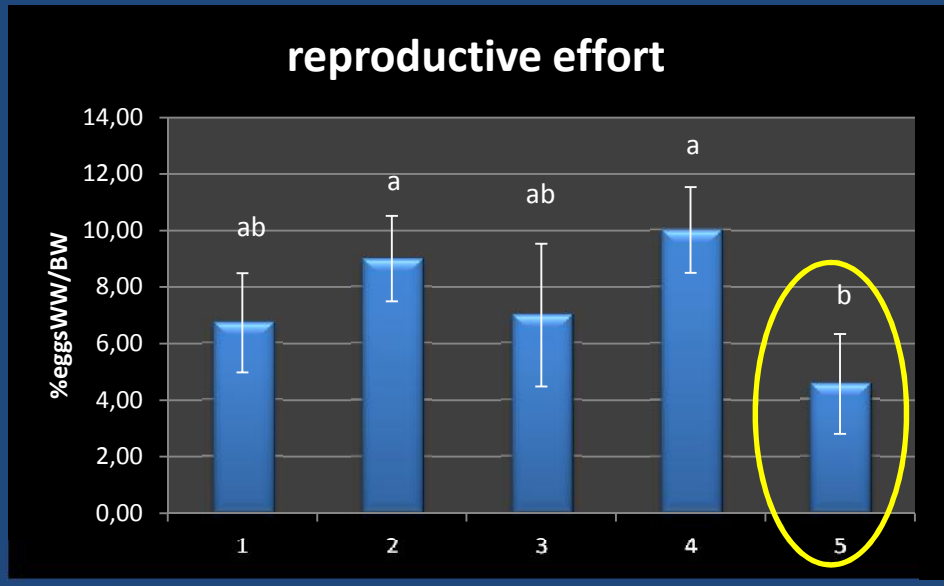
Day7, previtellogenic stages (Oc1,Oc2)

Day14,
T2-T5 (9.4,11.19,12.46,15%TDL) mature stage (Oc4) with some Oc2
T1 (6.98%TDL) retained in the premature stage (Oc3)

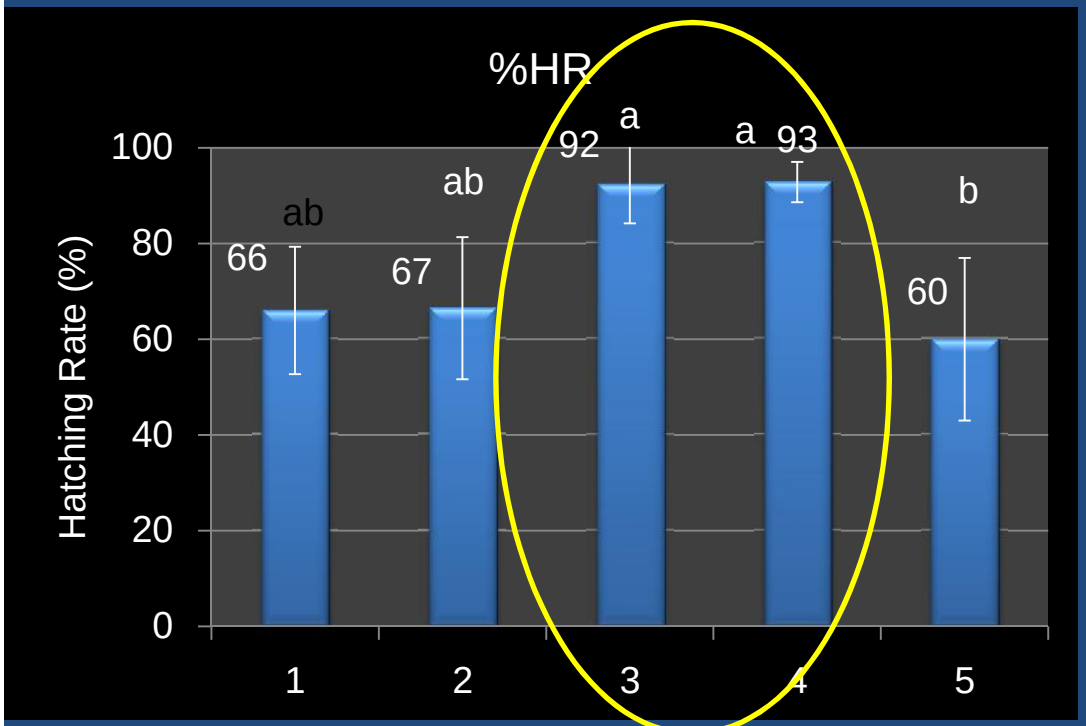
Day21, all treatments were synchronized mature (Oc4)

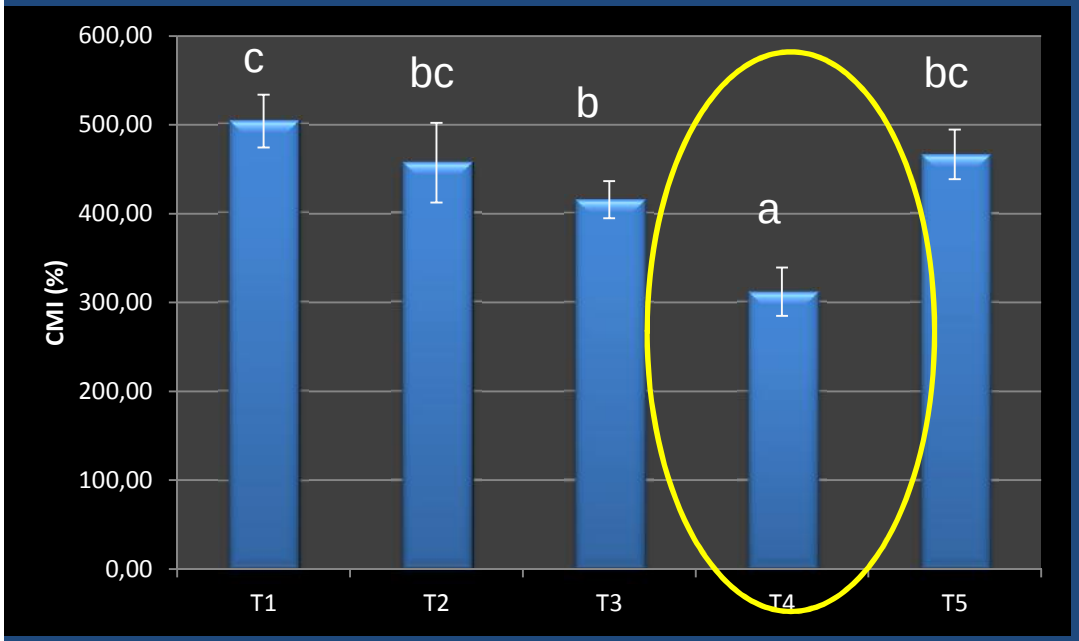
Day28, the same pattern as day 14





Diets	T1	T2	T3	T4	T5
	6.98	9.4	11.19	12.46	15
FC(eggs/female)	194,397	229,229	230,500	311,620	107,404
RE(%)	6.7	9.0	7.0	10.0	4.6





6.98-15%TDL ≠
Egg diameter (371-411 µm)
Egg DW (7-8.6 µg/egg)
FR (72-88%)

6.98-15%TDL → HR,CMI

Acknowledgements

• Agricultural Research Development Agency: The ARDA Golden Jubilee Ph.D. Scholarship Project

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•Jaran Mee Raksa, Samut Songkhram Coastal and Development Center

•Phetcha Buri Aquatic Aninal Genetic Research and Development Center


Thank you