

Capture of wild fish For aquaria and Research

TURKISH CHARTER DELIGHT



Flying Sharks

Istanbul Akvaryum

Tunipex

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*Escola Superior de Turismo
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*Estação de Biologia
Marinha do Funchal*

UTI

**Largest marine animal
charter from Europe
= 7 December 2010**



Flying Sharks
collections consulting
conservation education

0. Index

Index

 History

 Air transports

 Sea transports

 Road transports

 Science



A long time ago in a galaxy far,
far away....

1. History

Collections

 West Coast

 South of Portugal

 Azores

 Madeira


 West Africa



1. History

South of Portugal (Olhão)

 Bluefin tuna set-net (*almadraba*)

 Net hauled daily at dawn and after lunch

 800 mm mesh size allows passage of small specimens

 Sustainable fishing: ~ 1.000 ind. per year

 Passive fishing: non-target species released or sold; zero fish 'trashed'



1. History

South of Portugal (Olhão)

 Collecting from wild done with plastic bags, i.e. non-invasive method

 Superb quality animals



Watch your back, you moron!!



1. History

South of Portugal (Olhão)

Teleosts – misc.:

 *Dentex dentex, Dicentrarchus labrax*

 *Diplodus vulgaris, Diplodus puntazzo, Diplodus sargus*

 *Trachurus trachurus, Seriola rivoliana, Sarpa salpa*

 *Mola mola, Argyrosomus regius, Xiphias gladius*

 *Coryphaena hippurus, Coryphaena equiselis, Etc.*




1. History

South of Portugal (Olhão)

Teleosts - Scombrids:

 *Scomber japonicus* (Chub mackerel), *Scomber scombrus* (Atlantic mackerel)

 *Auxis rochei*, *Sarda sarda*,
Euthynnus alletteratus

 *Thunnus thynnus*, *Katsuwonus pelamis*



1. History

South of Portugal (Olhão)

Elasmobranchs:



 *Isurus oxyrinchus, Prionace glauca, Sphyrna zygaena*

 *Alopias vulpinus, Alopias superciliosus, Mitsukurina owstoni (!)*

 *Myliobatis aquila, Pteromylaeus bovinus*

 *Raja clavata, Raja undulata, Dasyatis pastinaca*

 *Manta birostris, Mobula mobular*



1. History

Azores (Horta)

 **Extremely sustainable gill-netting and long-lining:**

 **Commercial fishermen – fair-trade**

 *Naucrates ductor, Sphyræna viridensis*

 *Pagellus spp., Sarpa salpa, Trachinotus ovatus*

 *Callistoctopus macropus, Etc.*



1. History

West Coast (Peniche)

 **Extremely sustainable hand collecting:**

 **Commercial fishermen – fair-trade**

 *Paracentrotus lividus*

 *Holothuria* spp.

 *Octopus vulgaris*, *Eledone moschata*, Etc.



1. History

A trip down memory lane...

Transport – *Argyrosomus regius*

- Collection: ~ September 2006
 - 12 animals: ~ 1.14 m TL & ~ 20 Kg individual body-weight
 - Acclimation to 10 m diam. x 2 m deep round fibreglass tank
 - Fed daily with misc. fish, squid, etc.
 - Animals sexed before shipping



**Neil Duncan
rocks!!**



1. History

A trip down memory lane...

Transport – *Argyrosomus regius*

- Transport: 24-25 October 2006 - Tarragona
- Total duration: 22 hours, by road



1. History

A trip down memory lane...

Transport – *Argyrosomus regius*

- Transport: 24-25 October 2006
 - Meagre tanks: 6 x 1.6 m diam. round polyethylene vats
 - Filtration:
 - Mechanical: cartridge
 - Chemical: activated carbon
 - Bioload: $2 \times 20 \text{ Kg} / 1.4 \text{ m}^3 = \underline{28.6 \text{ Kg} / \text{m}^3}$
 - 50% water change
 - pH > 7.45
 - $\text{NH}_4^+ / \text{NH}_3 < 1.5 \text{ ppm}$



1. History

A trip down memory lane...

Transport – *Argyrosomus regius*

- Transport: 24-25 October 2006
- Water quality with some fluctuations but within required limits
- Only one partial water change
- Bioload of 28.6 Kg / m³
- Multiple sodium bicarbonate additions

Date	Time at origin	Dissolved oxygen (%)	Temp. (° C)	NH ₄ ⁺ / NH ₂ (mg/l)	pH	AmQuel ⁽¹⁰⁾ additions	Sodium bicarbonate additions (g)	Filtration (on/off)	Obs.	Location	Transport means	Total time
25 Oct 06	14:00	100	20,9	0,00	7,90	--		1	Loading - baseline parameters	Olhão		0:00
	17:00	149	21,2			--	100	1			road	3:00
	20:00	162	21,0	1,5 - 3,0	7,45	--	100	1			road	8:00
	23:00	160				--		1			road	9:00
26 Oct 06	1:00	163	20,3			--		1	50% water change		road	11:00
	2:30	161		0,25 - 1,50	7,50	--	100	1			road	12:30
	5:00	144				--		1			road	15:00
	7:30	176				--	100	1			road	17:30
	11:00	143				--		0	begin acclimation	Tarragona	road	21:00
	12:00					--		0	introduction to new tank	local time: 13:00	road	22:00



2. Air transports

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 History

 **Air transports**

 Sea transports

 Road transports

 Science



2. Air transports

Small ornamentals shipped worldwide

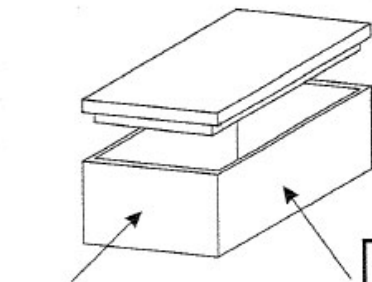


UPS

Delivery to your door!



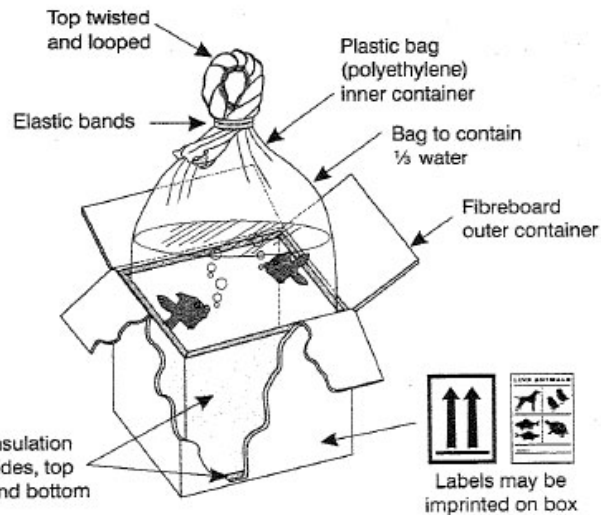
Air-freight



Expanded polystyrene outer container



Labels may be imprinted on box



Labels may be imprinted on box



2. Air transports

Large ornamentals shipped worldwide

 Air-freight

Protein skimmer



Oxygen: *no can do*

2. Air transports

Large ornamentals shipped worldwide



Air-freight

Often from **Madrid**

Naucrates ductor

Gadus morhua

Sphyraena barracuda

Mola mola

Myliobatis aquila

Etc.



3. Sea transports

Index

 History

 Air transports

 **Sea transports**

 Road transports

 Science



3. Sea transports

4-5 days by sea

 Water changes

 Feeding

 Stability

 No "Leroy Merlin"



Protein skimmer

"One stop" water change

4. Road transports

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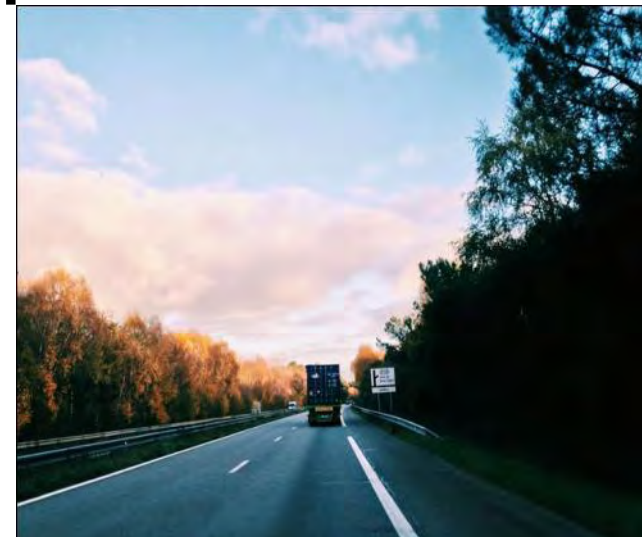
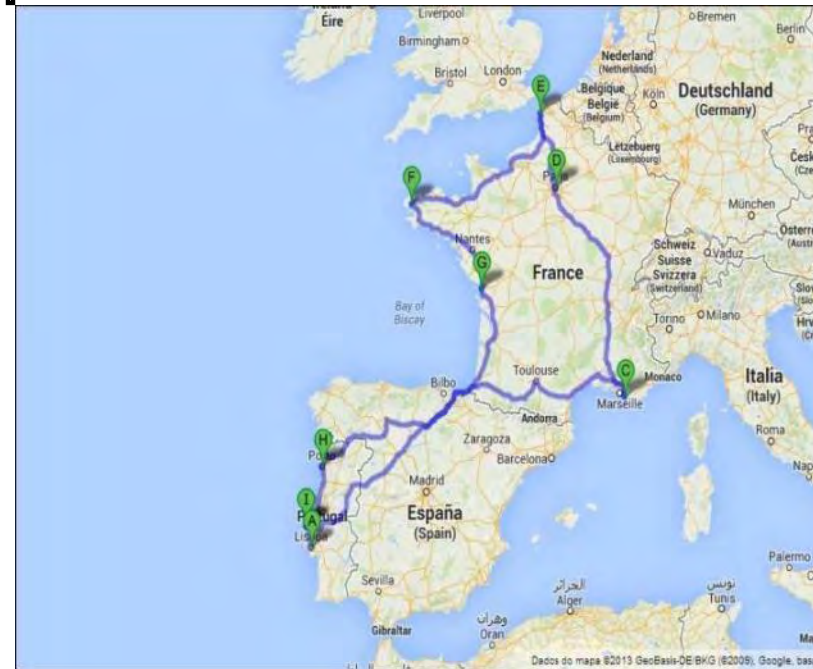
 History

 Air transports

 Sea transports

 **Road transports**

 Science



4. Road transports

~ 2 dozen trips to/from aquaculture facilities

 *Solea solea* & *S. senegalensis*

 *Argyrosomus regius*

 *Dicentrarchus labrax*

 *Sparus aurata*

 *Diplodus* spp.


 Etc.





4. Road transports

100% survivorship thus far except...

 *When the sh*t hits the fan...*

 ...or the numbers
are wrong...

 1100 x 100 g
(110 Kg) is *not*

 1500 x 130 g
(195 Kg, +80%)



4. Road transports

Our amazing tanks!

 1.35 | 1.4 | 1.6 | 1.9 | 2.4 m

 Mechanical filtration

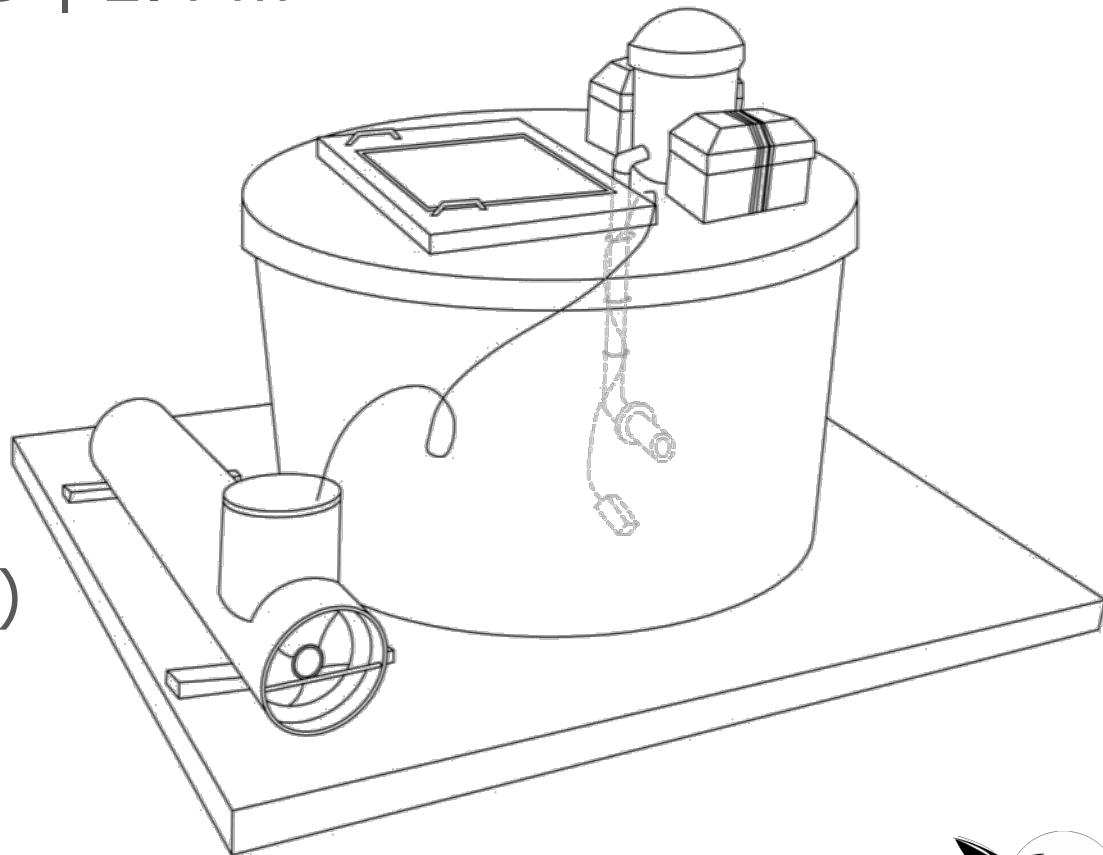
 Chemical filtration

 Protein skimming

 Oxygen feed (200%)

 Circulation

 Volumes 500 to 4000 L



4. Road transports

The amazing *Silurus glanis* box!

 3.0 x 1.0 x 1.4 m

 360 Kg

 Inbuilt 12 V batteries

 Awesome baffle plate

 IATA approved for flying

 Aeration units

 100% sealed (Duh!... :p)



4. Road transports

Awesome protein skimmers and chemicals!

 25 g Amquel +

 100 g Sodium bicarbonate +

 100 g Sodium carbonate +

 Protein skimmers =

 0.0 ppm ammonia and stable pH



5. Science

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 History

 Air transports

 Sea transports

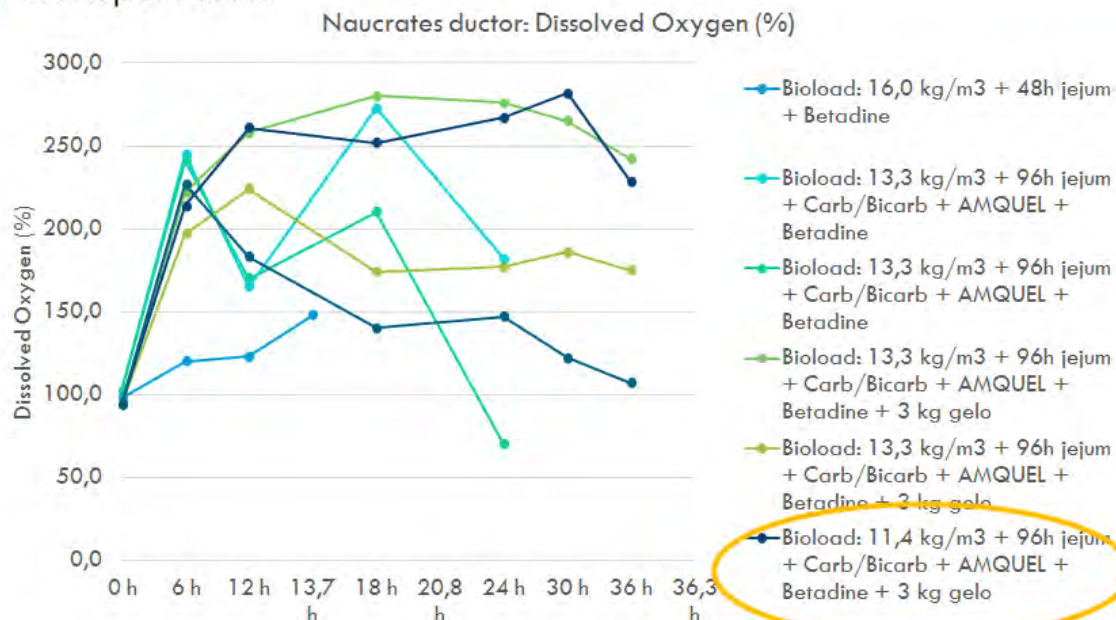
 Road transports

 **Science**



Test transport in styrofoam boxes

□ Transport tests



5. Science

Pre-transport trials are critical

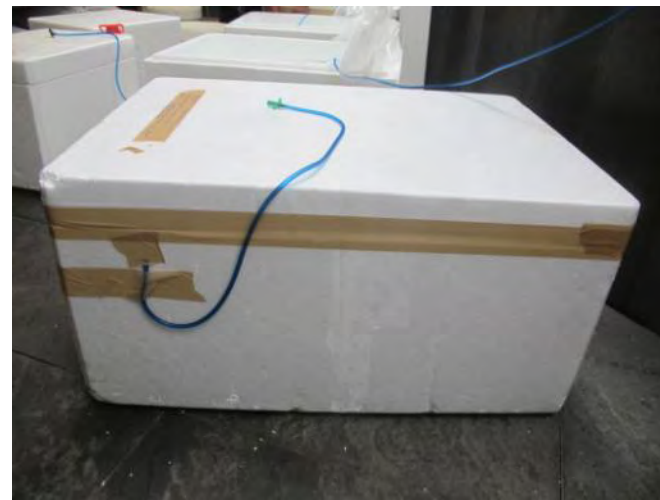
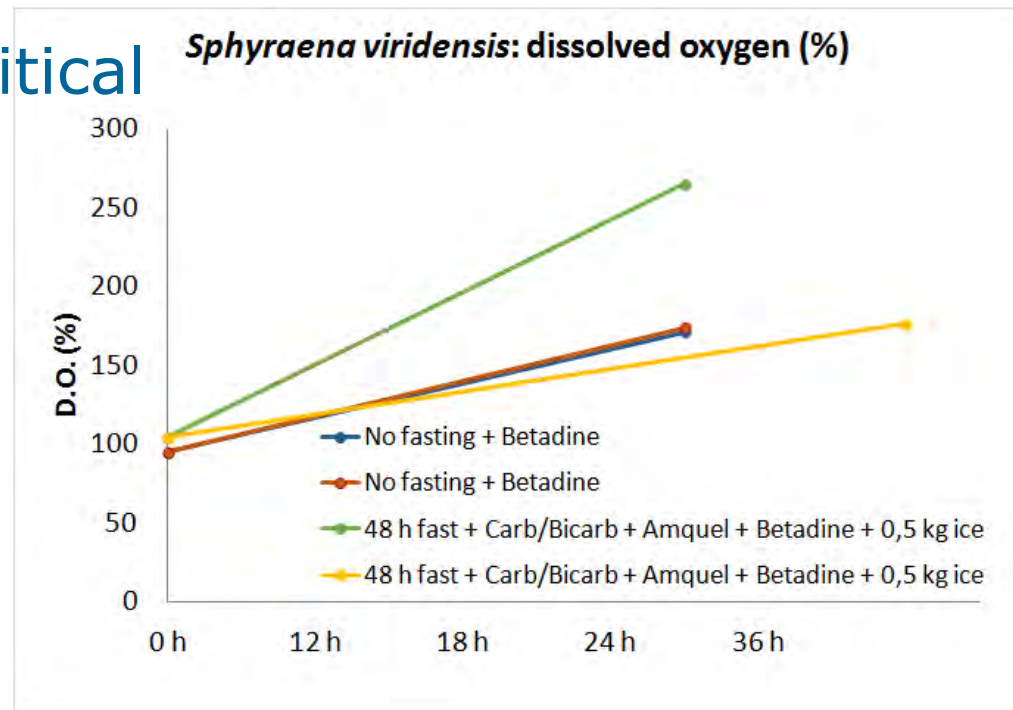
 Time of fasting

 With / without ice

 More / less Amquel

 More / less pH buffers

 With / without Betadine



5. Science

Betadine rocks!

 Lesions treated: 1 ml / 100 L for 48 hrs

 Rest 24 hrs + 24 hrs treatment

 Repeat (up to 3 times)

 In the holding tank

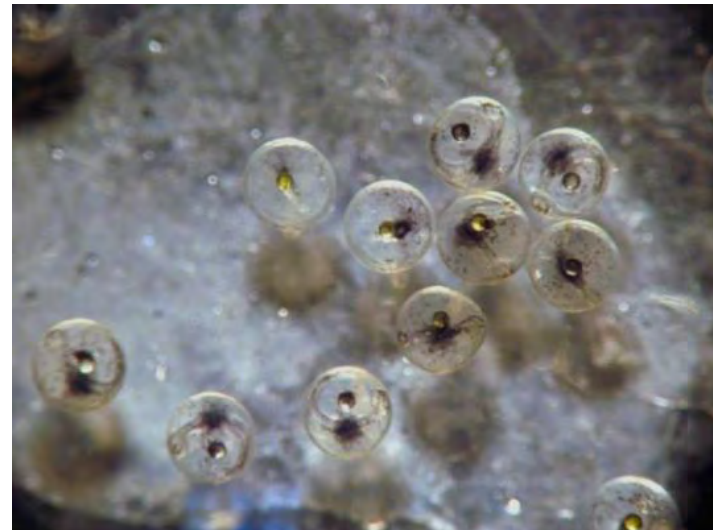
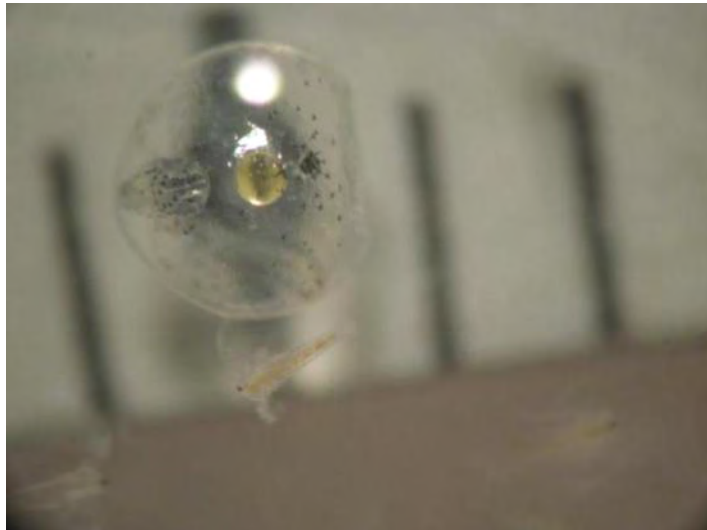
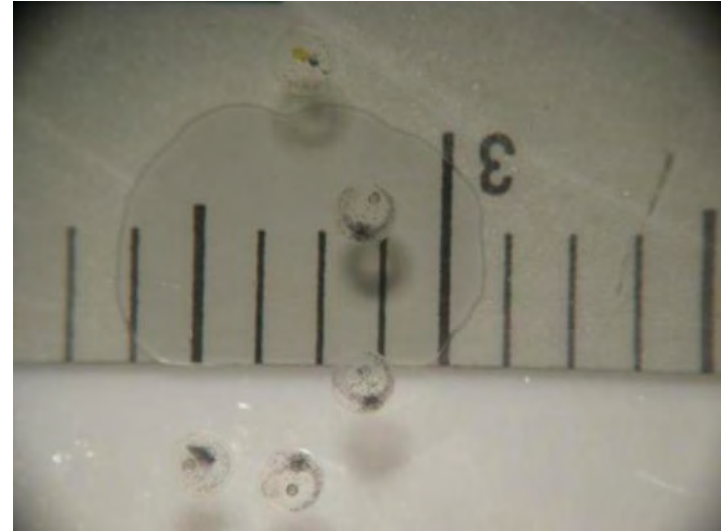


5. Science

Captive reproduction

 Transporting fry / eggs

 Cheaper / easier



5. Science

Post transport analysis



Improvements?

Flying Sharks Shipment 15/07/2015 - Acquario di Livorno 16/07/2015			
Box no.	Bag 1	Bag 2	Notes
1	ok	ok	sample for stress hormone level
2	ok	ok	
3	ok	x	(x) collapsed bag, specimen upsidedown
4	x	ok	(x) collapsed bag
5	ok	ok	
6	ok	x	(x) collapsed bag, specimen upsidedown
7	x	ok	(x) collapsed bag
8	ok	x	(x) specimen upsidedown
9	ok	ok	
10	ok	ok	
11	x	ok	(x) specimen dead
12	ok	ok	
13	ok	ok	
14	ok*	ok	T 21,8, Sal 34,8 ‰, pH 6,72, NH ₄ > 2 mg/L, NO ₂ 0,03 mg/L
15	ok	ok	
16	x	x*	both sampled for stress hormone level+x* specimen upsidedown
17	ok	x	(x) collapsed bag
18	ok*	ok	T 21.5, Sal 34,8 ‰, pH 6,97, NH ₄ > 0,5 mg / L, NO ₂ 0,04 mg/L
19	x*	x	(x*) specimen upsidedown,(x) collapsed bag
20	x	x*	both specimens upsidedown + (x*)water sample tested
			T 22,3, Sal 34,6 ‰, pH 6.56, NH ₄ > 2 mg/L, NO ₂ 0,03 mg/L



5. Science

Post transport analysis



Good record keeping

A	B	C	D	E	F	G	H
Modelo saco (cm)	Volume água (L)	Espécie	Nº indivíduos	Peso indiv. estimado (g)	Bioload (Kg / m ³)	Resultado	Obs.
35 x 55	3	Aurelia aurita	1	10,0	3,33	ok	1 saco com pedras de gelo e temperatura à chegada 18 graus
35 x 55	3	Pelagia noctiluca	1	15,0	5,00	ok	vários sacos gelo e temperatura à chegada 8 graus
Tanque 1,35	500	Mola mola	1	5000	10,00	ok	Stand-alone para Copenhaga; O2 não medido à chegada; pH 7,8; temp. 1
80 x 120	30	Raja clavata	1	1600,0	53,33	ok	Amónia 0,05 ppm; O2 98% ao fim de 33 horas; PMED78
80 x 120	30	Raja clavata	1	1600,0	53,33	ok	Amónia 5,0 ppm; O2 330%; pH 6,6 ao fim de 18 horas; PMED78. Temp 23
80 x 120	30	Raja clavata	1	1400,0	46,67	ok	Amónia 5,0 ppm; O2 330%; pH 6,6 ao fim de 18 horas; PMED78. Temp 23
80 x 120	30	Raja clavata	1	1200,0	40,00	ok	Amónia 0,25 ppm; O2 370%; pH 6,8 ao fim de 18 horas; PMED78. Temp 2
80 x 120	30	Raja clavata	1	1200,0	40,00	ok	Amónia 0,25 ppm; O2 370%; pH 6,8 ao fim de 18 horas; PMED78. Temp 2
80 x 120	30	Raja brachyura	1	800,0	26,67	ok	Amónia 0,25 ppm; O2 370%; pH 6,8 ao fim de 18 horas; PMED78. Temp 2
1,4 m tank (Japan)	1000	Solea senegalensis	300	500,0	150,00	ok	
Longos	11	Gadus morhua	1	1,0	0,09	ok	27 horas desde Sudavik até livavo
Longos	11	Gadus morhua	1	2,0	0,18	DOA	27 horas desde Sudavik até livavo
35 x 55	6	Scorpaena scrofa	1	1,0	0,17	ok	
1 L (Hagen)	1	Sepia officinalis (eggs)	50	0,5	25,00	ok	pH of 7.92, temp of 15.4 C and dissolved oxygen in the 260% saturation
80 x 120	37	Naucrates ductor	1	430,0	11,62	DOA	40 horas desde Peniche até Atlanta - sem qualquer tratamento; 2 dias jej
80 x 120	37	Naucrates ductor	1	280,0	7,57	DOA	40 horas desde Peniche até Atlanta - sem qualquer tratamento; 2 dias jej
80 x 120	37	Naucrates ductor	1	90,0	2,43	DOA	40 horas desde Peniche até Atlanta - sem qualquer tratamento; 2 dias jej
80 x 120	37	Naucrates ductor	1	300,0	8,11	ok	40 horas desde Peniche até Atlanta - sem qualquer tratamento; 2 dias jej
80 x 120	37	Naucrates ductor	1	250,0	6,76	ok	40 horas desde Peniche até Atlanta - sem qualquer tratamento; 2 dias jej
80 x 120	40	Naucrates ductor	1	250,0	6,25	2 mortos em 7	Aprox. 18 horas desde embalagem em Madrid até Atlanta. com mix de
30 x 40	3	Pelagia noctiluca	1	10,0	3,33	ok	Tempo jejum: 36 h, Volume de O2: 1,35 L, Quantidade gelo (caixa): 0,83
35 x 55	6	Ophidiaster ophidianus	4	97,3	64,89	Vivos mas amónia 7 ppi	Pesos confirmados
35 x 55	6	Ophidiaster ophidianus	5	97,3	81,11	Vivos mas amónia 7 ppi	Pesos confirmados
35 x 55	6	Spaherechinus grannularis	4	290,7	193,78	DOA dois dias depois	Dentro de garrafão; apertado demais; pesos confirmados!
35 x 55	6	Trachurus picturatus	2	34,3	11,43	1 DOA em 32 ind	
10 x 20	1,5	Macroramphosus scolopax	1	10,0	6,67	2 DOA em 18 ind	
35 x 55	6	Anthias anthias	2	50,0	16,67	ok	
35 x 55	6	Sparisoma cretense	1	75,0	12,50	DOA	Dentro de garrafão; ciente achou que colocámos pouca água, mas usán
35 x 55	6	Thalassoma pavo	1	50,0	8,33	ok	
35 x 55	6	Helicolenus dactylopterus	1	25,0	4,17	ok	Dentro de garrafão
35 x 55	6	Chromis limbata	1	35,0	5,83	ok	
80 x 120	24	Enchelycore anatina	1	750,0	31,25	ok	
15 x 25	1,5	Sepia officinalis	1	5,0	3,33	ok	Aprox. 3-4 cm
35 x 55	6	Coris julis	2	25,0	8,33	ok	
35 x 55	6	Thalassoma pavo	2	25,0	8,33	ok	
35 x 55	6	Sparisoma cretense	1	75,0	12,50	ok	Dentro de garrafão
35 x 55	6	Sarpa salpa	1	75,0	12,50	ok	
15 x 25	1,5	Diplodus sargus	2	3,0	4,00	ok	
35 x 55	6	Palaemon sp.	25	0,5	2,08	ok	
35 x 55	6	Mysis	1000	0,0	1,67	ok	
50 x 80	12	Callistocotopus macropus	1	500,0	41,67	DOA	
80 x 120	28	Raja clavata	1	750,0	26,79	DOA	1 Raja chegou bem e a outra morta
80 x 120	28	Raja clavata	1	750,0	26,79	ok	1 Raja chegou bem e a outra morta
40 x 60	6	Anthias anthias	2	50,0	16,67	ok	T°C - 21,4 pH - 7,24 Sal - 36
40 x 60	5	Scyllarides latus	2	150,0	60,00	ok	T°C - 21,0 pH - 7,18 Sal - 36
40 x 60	6	Ophidiaster ophidianus	6	25,0	25,00	ok	
40 x 60	6,5	Bothus podas	2	100,0	30,77	ok	
80 x 120	20	Sphyræna barracuda	1	250,0	12,50	ok	T°C - 20,2 pH - 7,01 sal - 35,8 Amónia - 0,08
40 x 60	6,5	Thalassoma pavo	2	15,0	4,62	ok	
40 x 60	6,5	Mullus surmuletus	2	25,0	7,69	ok	
40 x 60	6,5	Thalassoma pavo	2	25,0	7,69	ok	



5. Science

New species

 *Coryphaena* spp.



 *Seriola* spp.



 *Thunnus* spp.



 *Pagellus* spp.



 *Trachinotus*
ovatus

 Etc.

5. Science

Zoo Biology 30: 459–472 (2011)

Publications



Publish/share the *good*...



...and the *bad* results

Zoo Biology 00: 1–8 (2012)

Zoo Biology 20:435–441 (2010)

Zoo Biology 27: 1–17 (2008)

HUSBANDRY REPORTS

Notes on the Husbandry and Long-Term Transportation of Bull Ray (*Pteromylaeus bovinus*) and Dolphinfish (*Coryphaena hippurus* and *Coryphaena equiselis*)

Nuno Rodrigues,¹ João Correia,¹ Rúben Pinho,¹ José Graça,² Filipe Rodrigues,² and Morikawa Hirofumi²

Zoo Biology 21:243–251 (2002)

TECHNICAL REPORT

Long-Term Transportation of Ratfish, *Hydrolagus colliei*, and Tiger Rockfish, *Sebastes nigrocinctus*

João P.S. Correia*

TECHNICAL REPORT

Long-Term Transportation, by Road and Air, of Chub Mackerel (*Scomber japonicus*) and Atlantic Bonito (*Sarda sarda*)

João P.S. Correia,^{1*} José T.C. Graça,¹ Morikawa Hirofumi,² and Nicole Kube³

RESEARCH ARTICLE

Long-Term Transportation, by Road and Air, of Devil-Ray (*Mobula mobular*), Meagre (*Argyrosomus regius*), and Ocean Sunfish (*Mola mola*)

João P. S. Correia,^{1*} José T. C. Graça,¹ and Morikawa Hirofumi²



Notes on the Long-term Transport of the Scalloped Hammerhead Shark (*Sphyrna lewini*)

Evidence-based practice

Optimising sealed transports of small ornamental fish

Rui E. Silva¹, Hugo A. Morais^{1,2}, Nuno V. Rodrigues^{1,2}, Tiago Reis¹ and João P. Correia^{1,2*}



Flying Sharks
collections consulting
conservation education

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