The need for more diversity in *Artemia* cyst resources

varying characteristics - a handicap or an opportunity for the optimal use of *Artemia* in fish and shellfish larviculture

larvi 2001 - Ghent University, Belgium - September 3-6, 2001

in cooperation with

Artemia
major component in larval feeding

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World *Artemia* **Demand** '90

>2,000 MT dry cysts / year

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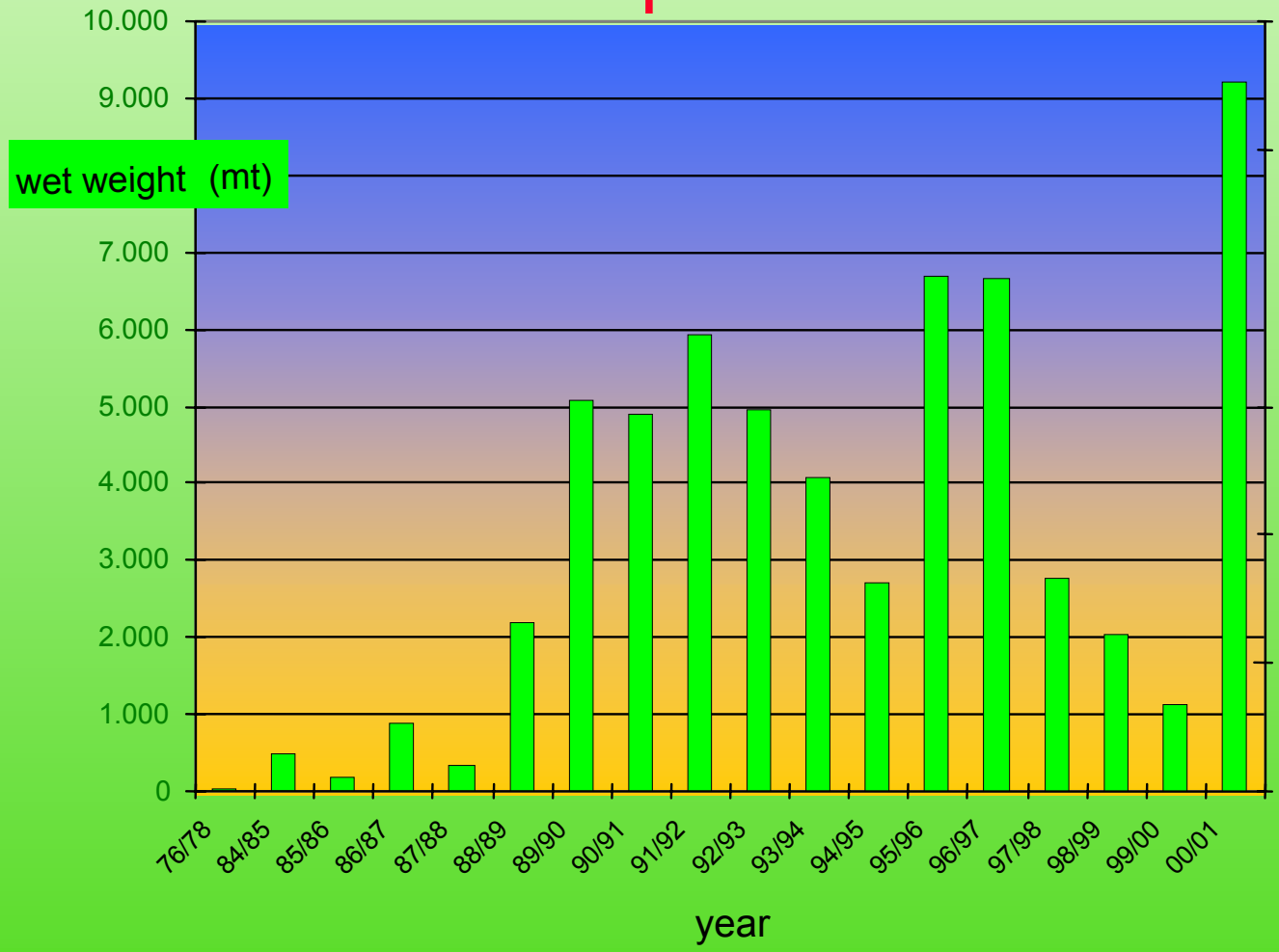
GSL – *Artemia* production



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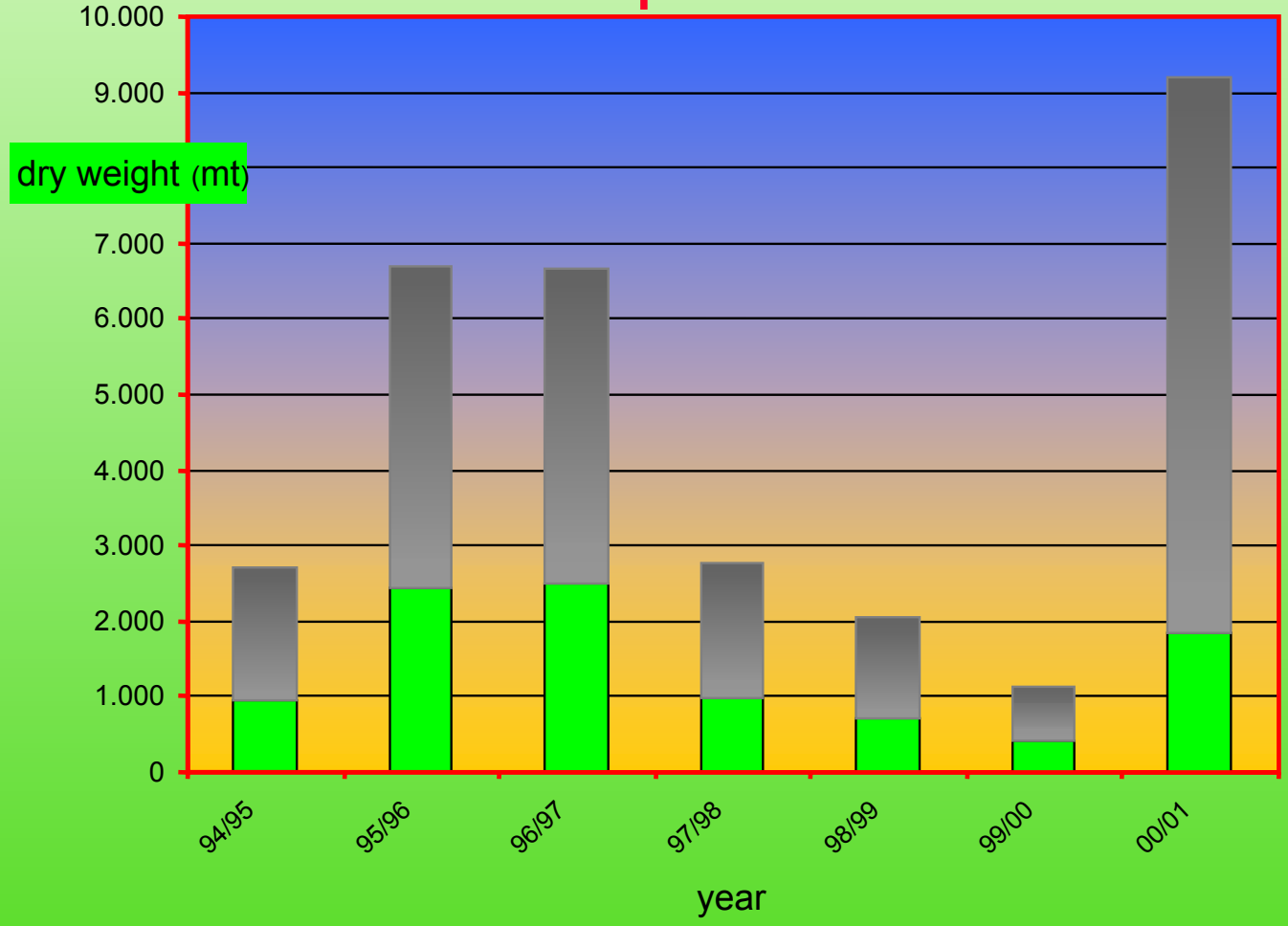
GSL – *Artemia* production



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The need for more diversity in *Artemia* cyst resources

INVE: Artemia Task Force

>> diversification & stabilization of the *Artemia* supply

Site surveys & explorations worldwide → identification

Ecological studies → sustainability
- population dynamics
- contaminations

Technical and economical studies → feasibilty
- accessibility, sustainable quantities
- characteristics of the resource relevant to larviculture, …

Harvest of the new resource → exploitation

Processing → production

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The need for more diversity in *Artemia* cyst resources

INVE: Artemia Task Force

>> diversification & stabilization of the *Artemia* supply

Site surveys & explorations worldwide

Ecological studies

Technical and economical studies

Harvest of the new resource

Processing

multi-disciplinary approach

- in-house expertise
- universities, specialized laboratories
- local institutes

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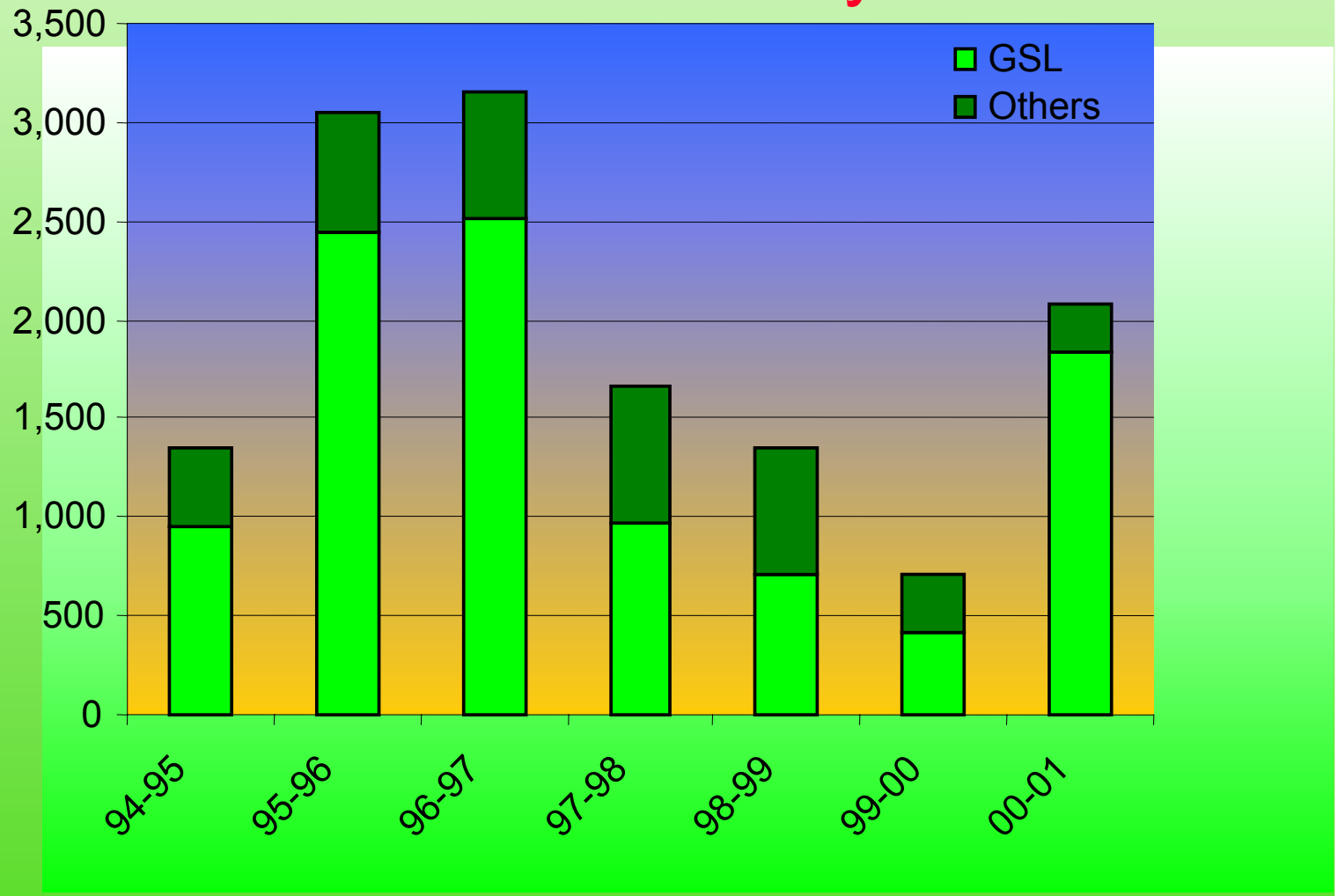
The need for more diversity in *Artemia*



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The need for more diversity in *Artemia* cyst resources

Central Asia
Few large lakes
Depressions along the Caspian sea
Small primary productivity
Unstable

Siberia
Numerous smaller lakes
Mostly relicts from ice-ages
Often large primary productivity
+/- stable

China – Bohai bay
Huge area of coastal saltworks
Productive
Variable

Diverse origin / biotopes
Genetically different *Artemia*

Different characteristics

a handicap or an opportunity
for the optimal use of *Artemia*
in fish and shellfish larviculture

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Variability of *Artemia*

Characteristics

- biometrics of the cysts
- biometrics of the nauplii
- hatching characteristics
- separation of nauplii / unhatched cysts
- decapsulation behaviour
- pigmentation of the nauplii
- nutritional value
- enrichment

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Variability of *Artemia*: tested strains

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Variability of *Artemia:* cyst biometrics

GSL South 2000	Siberia Pavlodar 2000	GSL South 2000	Siberia B.Yarovoe 2000	GSL South 1998	C-Asia KBG 1999	China Bohai B. 1999	GSL North 1999
cyst color							
							
cyst diameter (µm)							
249	270	250	276	249	268	257	244
diameter decapsulated cysts (µm)							
238	254	232	254	243	250	238	228
chorion thickness (µm)							
5.2	7.8	9.0	11.0	3.2	8.9	9.1	7.8

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Variability of *Artemia:* hatching

Traditional evaluations

- Hatching percentage (number of nauplii hatched out of 100 full cysts)
  > overlooks impurities, empty shells, …

- Hatching efficiency (number of nauplii / gram of cysts)
  > overlooks size, weight of nauplii

- Hatching output (weight of nauplii / gram of cysts)
  - number of nauplii
    number of cysts / gram + hatching percentage
  - weight of the nauplii
    strain specific
  - development stage
    time of harvest
    hatching rate

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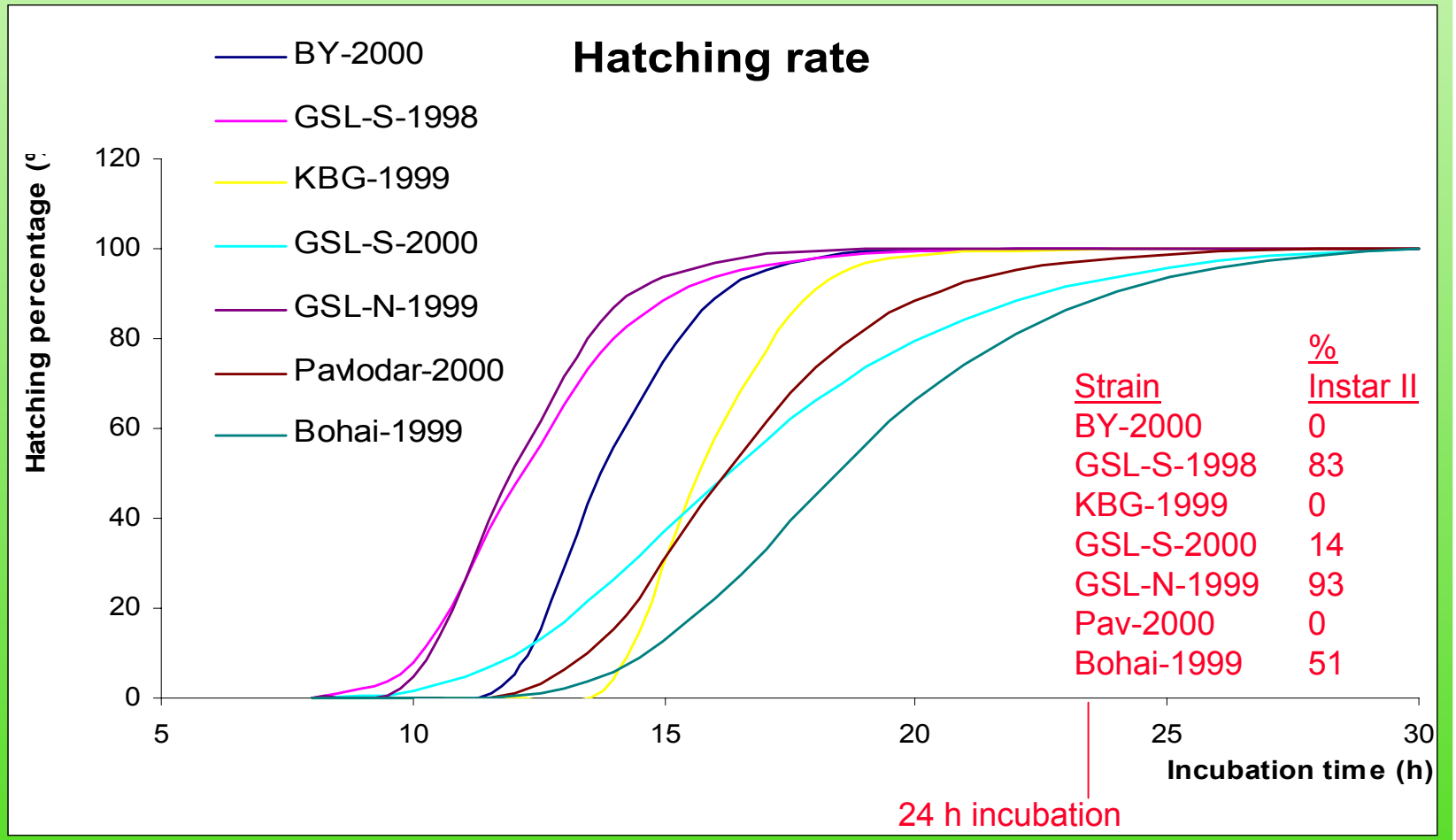
Variability of *Artemia:* hatching



Strain	% Instar II
BY-2000	0
GSL-S-1998	83
KBG-1999	0
GSL-S-2000	14
GSL-N-1999	93
Pav-2000	0
Bohai-1999	51

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Variability of *Artemia:* nauplius biometrics

GSL South 2000	Siberia Pavlodar 2000	Siberia B.Yarovoe 2000	GSL South 1998	C-Asia KBG 1999	China Bohai B. 1999	GSL North 1999
Instar I dry weight (µg)						
2.15	2.76	2.73	2.25	2.60	1.78	2.17
Instar II dry weight (µg)						
1.95	2.15	2.41	1.82	2.49	1.58	1.86
Dry weight upon 24h incubation (µg)						
1.87	2.20	2.18	1.80	2.21	1.52	1.85

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Variability of *Artemia:* nauplius biometrics

GSL South	Siberia Pavlodar	Siberia B.Yarovoe	GSL South	C-Asia KBG	China Bohai B.	GSL North
2000	2000	2000	1998	1999	1999	1999
Dry weight upon 24h incubation (µg)						
1.87	2.20	2.18	1.80	2.21	1.52	1.85
Number of cysts / gram (x1000)						
272	235	225	285	242	265	292
Nauplius biomass per kg of cysts (g dry weight)						
509	517	491	513	535	403	540

Dry weight nauplius biomass = objective measure for cyst value

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Variability of *Artemia:* nauplius biometrics

GSL South	Siberia Pavlodar	Siberia B.Yarovoe	GSL South	C-Asia KBG	China Bohai B.	GSL North
2000	2000	2000	1998	1999	1999	1999
Lenght instar I (µm)						
441	505	508	450	525	461	452
Width Instar I (µm)						
158	172	175	161	182	164	161

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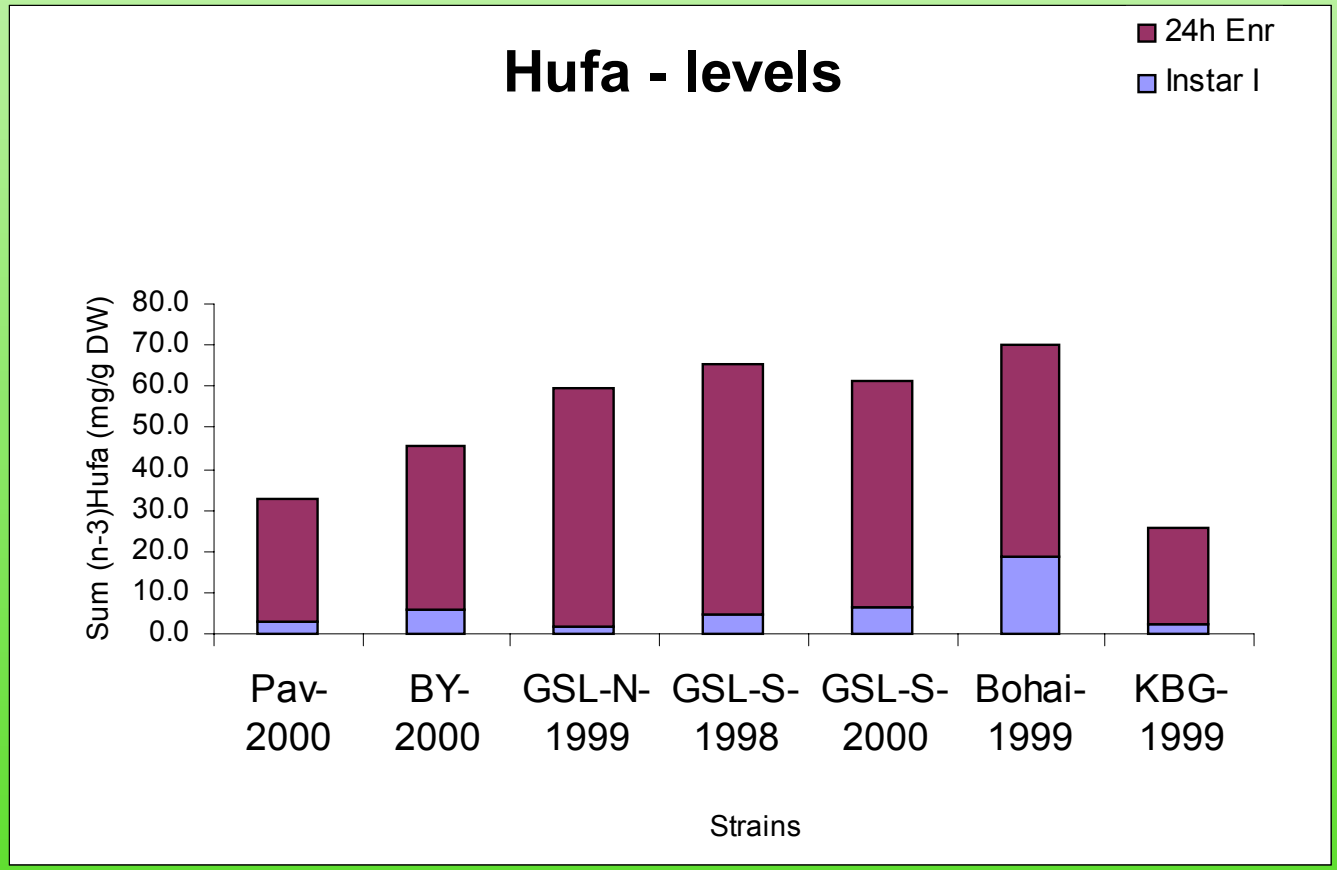
Variability of *Artemia:* nutritional value



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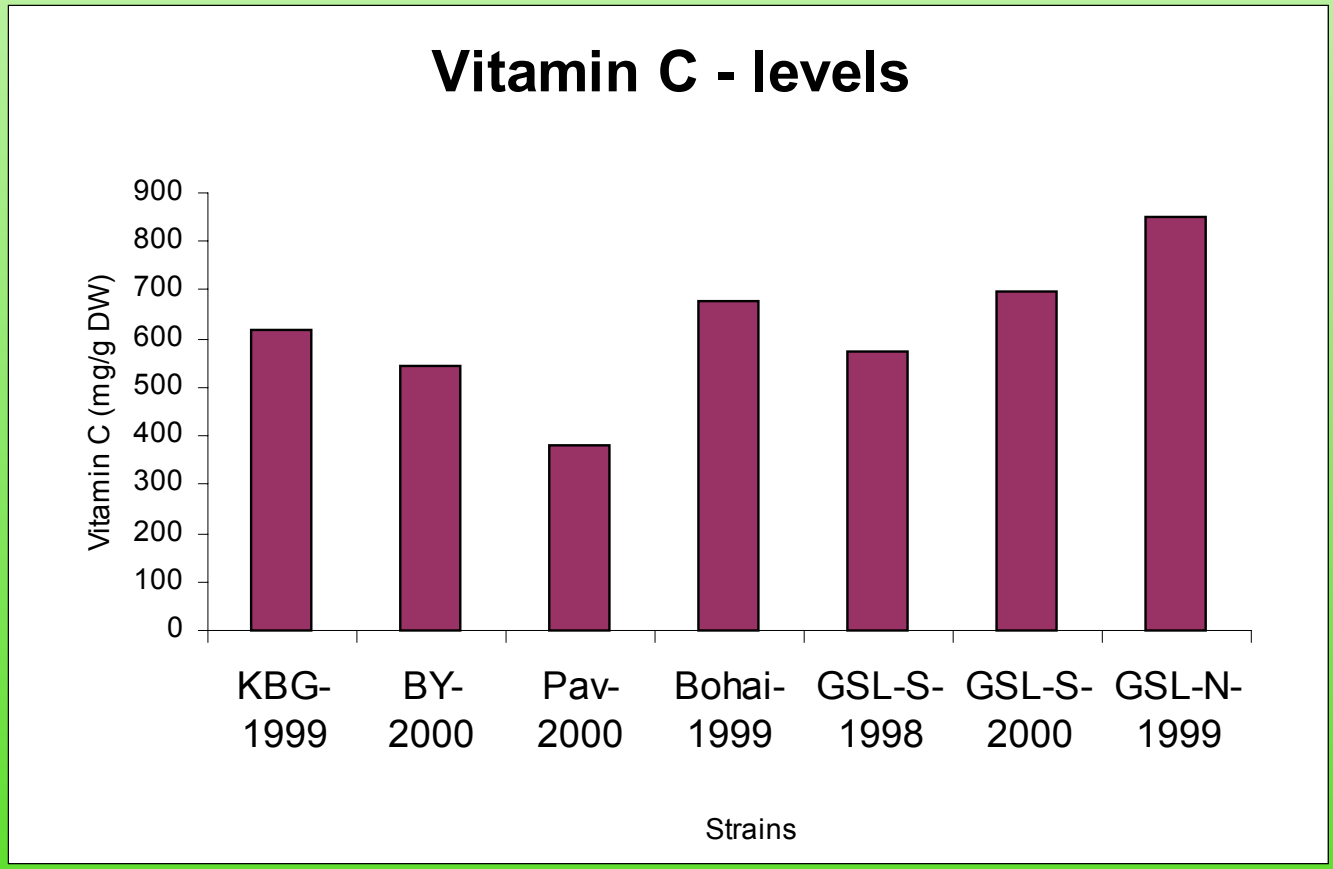
Variability of *Artemia:* nutritional value



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Variability of *Artemia:* pigmentation

GSL	Siberia	GSL	Siberia	GSL	C-Asia	China	GSL
South	Pavlodar	South	B.Yarovoe	South	KBG	Bohai B.	North
2000	2000	2000	2000	1998	1999	1999	1999

cyst color

nauplius color

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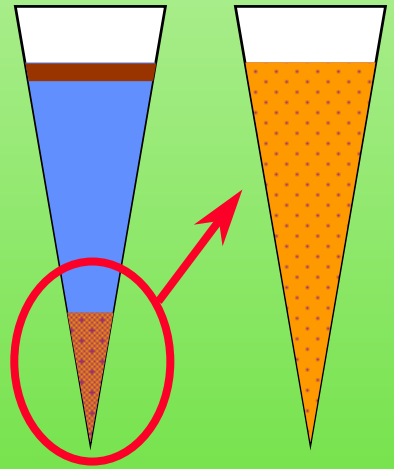
Variability of *Artemia:* separation



$$\frac{\text{nauplii + umbrella}}{\text{nauplii + umbrella + cysts}} \times 100$$

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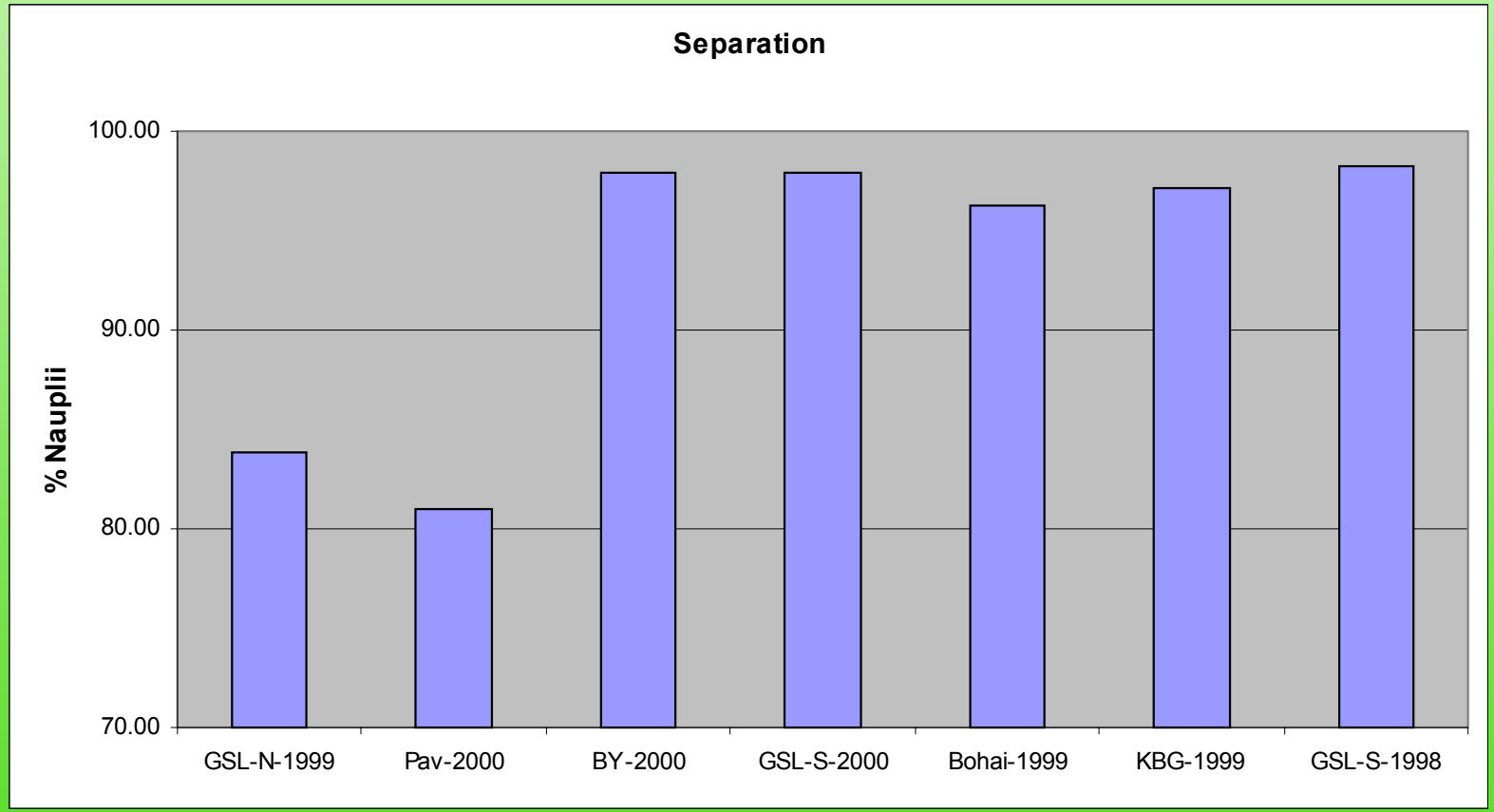
Variability of *Artemia:* separation



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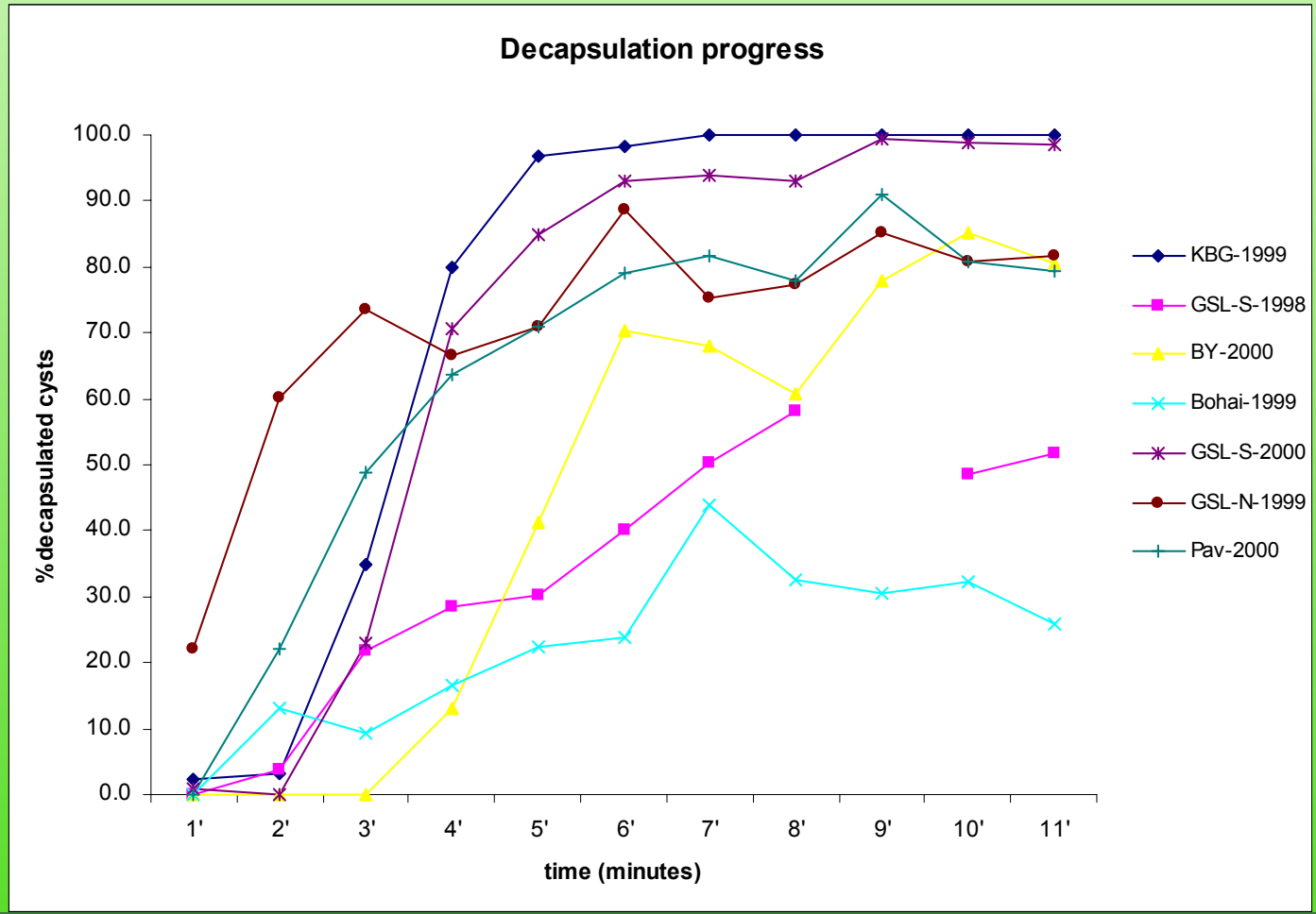
Variability of *Artemia:* decapsulation behaviour



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Variability of *Artemia:* decapsulation behaviour

Hatching (%)

Strain	Cysts	Decap	%
GSL-N-1999	86.5	84.8	98
Pav-2000	45.6	47.2	104
BY-2000	41.2	39.3	95
GSL-S-2000	87.9	85	97
Bohai-1999	75.3	70.6	94
KBG-1999	83.9	67.4	80
GSL-S-1998	87.2	90.2	103

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varying characteristics - a handicap or an opportunity for the optimal use of *Artemia* in fish and shellfish larviculture

Quantitative food value: nauplius dry weight
Varies according to strain & hatching rate

Qualitative food value:
- Length / width: 525-441 / 182-158 µm
- HUFA: low (< 3) – moderate (5-10) – high (> 15) mg/g DW
- Vitamin C: 400 – 800 mg/g DW
- Pigmentation: strain & season dependent

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varying characteristics - a handicap or an opportunity for the optimal use of *Artemia* in fish and shellfish larviculture

Quantitative food value

Qualitative food value

Operational value:
- separation: very good – very bad
- decapsulation time: depending on chorion thickness & impurities

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varying characteristics - a handicap or an opportunity for the optimal use of *Artemia* in fish and shellfish larviculture

Quantitative food value

Qualitative food value

Operational value

Diversified supply and the variety in quality enables aquaculturist to select the most appropriate *Artemia* strain / batch for his/her specific application

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