Artemia Resources and Development in China

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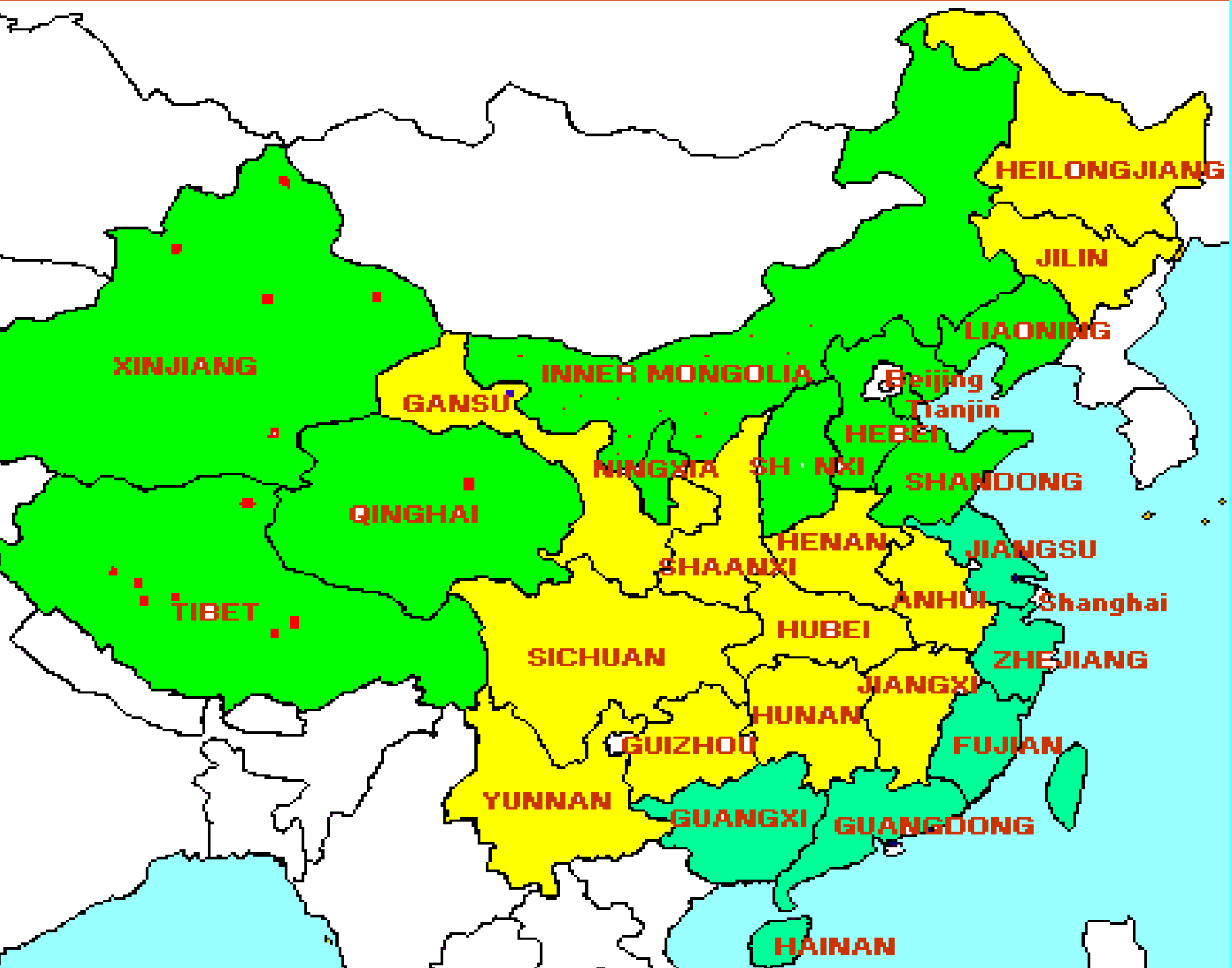
Artemia resources and development in China

- Artemia resources in China
- Strain characterization and nutrition of Chinese Artemia
- Introduction and culture of Artemia in China
- Artemia application in China
- Challenge of Chinese Artemia resources

Artemia resources in China

- Artemia has been reported in more than 65 salt lakes and 30 saltworks in China
- Artemia is widely distributed in 18 provinces (60% of total provinces)
- Estimated production:

- Cysts:720-850 tons
- Biomass: around 4000 tons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Artemia resources in China

- **Diversity of Artemia habitats:**

- Elevation: from 0 to 4720 m
- Area: from 0.1 ha (small saltponds) to 560km^2 (salt lakes)
- Depth: from 0.01 to 16m
- Salt lake type and ion composition: Strong-Carbonate type, Medium Carbonate type, Weak Carbonate type, Na-sulfate subtype, Mg-sulfate subtype, Chloride type

Artemia resources in China

- **Diversity of climate condition:**

- Temperature: highest: 40°C , lowest:-40°C , maximum temperature difference: 30°C .
- Sunlight and radiant intensity: varies a lot from habitat to habitat
- Rainfall and evaporation: varies a lot from habitat to habitat
- Saltworks are mainly distributed in coastal area (populated area), most of the saltlakes are distributed in desert area (depopulated area).

Artemia resources in China

- **Diversity of species:**

- *A.sinica*: Shanxi, Inner Mongolia, Qinghai
- *A.tibetiana*: Tibet
- *A.franciscana*: Bohai Bay
- *A.parthenogenetic*: Bohai Bay, Xinjiang, Qinghai

Artemia resources in China

- **Aibi Salt Lake:**

- Located in Xinjiang (83°53′E 44°55′N)
- Surface area:560km^2
- Lake type: Na-sulfate subtype
- Salinity: 8-10%
- Mode of reproduction: P
- Estimated production: Cysts:100-200 tons.

Artemia resources in China

- **Balikun Salt lake**

- Located in Xinjiang (92°47′E 43°40′N)
- Elevation:1585m
- Surface area:70-128km^2 ,depth:0.05-0.3m
- Lake type: Na-sulfate subtype
- Salinity:6-28%
- Mode of reproduction: P
- Estimated production: cysts: 15-25 tons.

Artemia resources in China

- **Gahai Salt lake:**

- Located in Qinghai (97°47′E 37°02′N)
- Elevation:2849.6m
- Surface area:37.4km^2,depth:8-13m
- Lake type: Na-sulfate subtype
- Salinity:10-14%
- Mode of reproduction: P
- Estimated production: Cysts: 25-50 tons.

Artemia resources in China

- **Whale Lake:**

- Located in Xinjiang (89.9^{o}E 36.3^{o}N)
- Elevation: 4720m
- Surface area: 300km^{2}
- Lake type: Mg-sulfate subtype
- Reproduction: B
- Estimated cyst production: around 200 tons

Artemia resources in China

- **Inner Mongolia lakes**

- More than 37 salt lakes
- Widely distributed in whole Inner Mongolia
- Elevation: around 1000m
- Surface area: 1-10km^2, depth: 0.05-2m
- Lake types: Most of lakes: carbonate type
- Mode of reproduction: B
- Estimated cyst production:20 tons

Artemia resources in China

- **Tibet lakes**

- >50g/l salt lakes: 221 (Artemia are reported in 13 Tibet salt lakes)
- Location: widely distributed in Tibet
- Elevation: more than 4500m
- Surface area: 8-250km^2
- Reproduction: Bisexual
- Estimated cyst production: 40-50 tons

Artemia resources in China

- **Bohai bay**

- More than 19 salt works (salt production > 100,000tons per year)
- Located in Liaoning, Tianjin, Hebei, Shandong provinces.
- Area: 180,346ha.
- Mode of reproduction: P and B (mixed population)
- Estimated production: cysts: 320 tons

Strain characterization and nutrition of Chinese Artemia

- **Cyst diameter and nauplii length:**

- Bisexual strains in Inner Mongolia:hydrated cyst: from 235 to 245 μm, nauplii:from 420 to 480 μm .
- Parthenogenetic strains in Xinjiang, Qinghai: hydrated cyst: from 267 to 282 μm, nauplii: from 500 to 539 μm.
- Bohai bay strains: hydrated cyst: from 242 to 271 μm , naupii: from 480 μm to 520 μm .
- Tibet strains: hydrated cyst: from 292 to 358 μm , nauplii: from:602 to 663 μm.

Strain characterization and nutrition of Chinese Artemia

- **PUFA levels**

- Highest EPA content was found in Tibet strains (19.22mg/g-46.64mg/g dw)
- Lowest EPA content was found in Inner Mongolia strain (0.25mg/g d.w-12.52mg/g dw)
- Bohai bay Artemia strains: from 10.27 to 18.23 mg.g dw
- Inland parthenogenetic strains: from 8.79 to 15.1mg/g dw.

Strain characterization and nutrition of Chinese Artemia

- **Protein content**: from 45% to 55%.
- **Potential hatching ability (HP):**

- Aibi lake:70- 90%
- Bilikun lake:50- 70%
- Gahai lake: 70-90%
- Bohai bay:70-90%
- Inner Mongolia: 70-90%
- Whale lake: 70-90%

Introduction and culture of Artemia in China

- **Introduction of Artemia (since 1992):**

- Introduced strain: *A.franciscana*
- 4 saltworks: Luannan, Tanggu, Dagang, Hangu
- Cyst diameter was decreased from 272 μm to 240 μm.
- Increase cyst quality and production (increase in production of the biomass: 30% -100%).
- More suitable for local salt production (resistance to low temperature and high salinity).

Introduction and culture of Artemia in China

- **Culture of Artemia in China (since 1999)**
- Shrimp ponds (0.1-1ha each) or Artemia ponds (1-10ha,each)
- Extensive (fertilized with chicken manure and chemicals)
- Introduction of cyst or nauplii once in early spring
- Production: 15-30kg of cysts per ha (wet weight)
- Total culture area: 12,000 ha (Bohai bay)

Artemia application in China

- **Larvae feed** (cysts:consumption:500-1000tons):
- Shrimp (40%): *P.chinensis, P.japonicus, P. vanamei, P.monodon, Metapenaeus ensis, P.penicillatus, P. merguiensis, Macrobrachium rosenbergii*
- Crab (50%): *Eriocheir sinensis, Portunus trituberculatus*
- Marine fish (10%): Yellow Croaker, Seabream, seabass, flounder, turbot, fugu etc.
- **Feed for on growing shrimp** (Biomass: 4000 tons)

Challenge of Chinese Artemia Resources

- The area is decreasing and salinity is increasing for most of salt lakes due to climatic changes and lack of fresh water input (irrigation competition)
- Over exploitation
- Pollution in Bohai bay
- Current salt production procedure: shallow water and fast flow --- too high water temperature in summer
- Diseases(?): crush of Artemia adults in saltponds (often occurred in summer)

Thank you!

Welcome to Beijing for Regional Workshop I

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