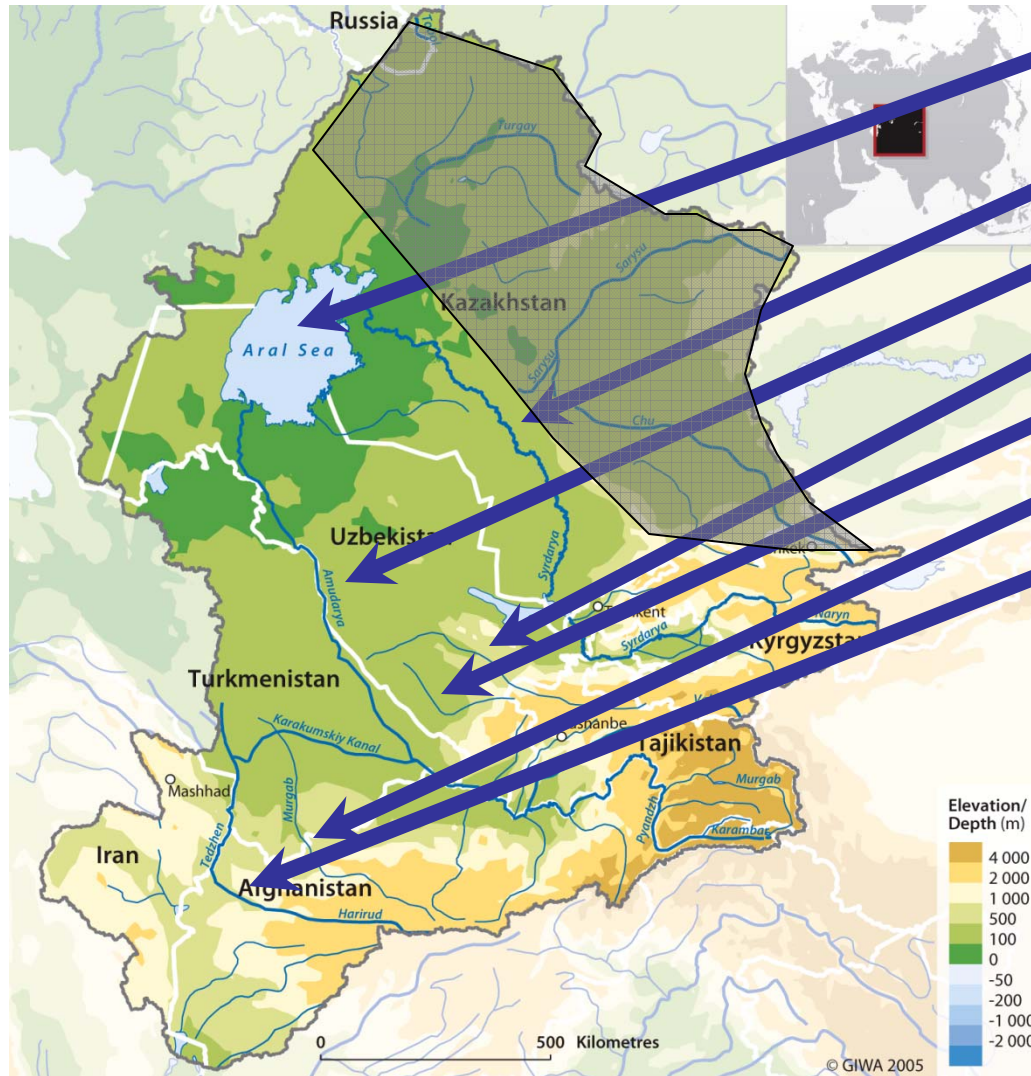


Invasive Fishes in the Aral Sea basin, arid Central Asia

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Uzbekistan

Aral Sea basin



- Aral Sea
 - Syr-Darya River
 - Amu-Darya River
 - Zeravshan River
 - Qashqa-Darya River
 - Murgab River
 - Tedzhen (Harirud) River
- South Kazakhstan

Pathways

Invading

- Unintentional release
- Intentional (/ Deliberate) introduction
- Invasion via irrigating canals
- Release by aquarians

Expansion

- Escape from fish farms
- Expansion via irrigating canals
- Fish seed handling between fish farms

Deliberate introductions

- Goals of introduction
 - Augmenting fish productivity of water bodies
 - Fish culture
 - Biomelioration
 - ◆ Aquatic plants control
 - ◆ Water bloom control
 - Struggle against malaria (mosquito control)

Deliberate introductions

- Since 1927
- Into the Aral Sea alone were introduced about 30 species of fishes and invertebrates.
- The native Aral ichthyofauna consisted of 20 fish species.
- Most of aliens either doesn't naturalised or damaged native fauna. But most likely both.

Augmenting fish productivity



- 1927
- introduced in Aral Sea
- *Acipenser stellatus*
- + ***Nitzschia sturionism***
- drastic decline of *Acipenser nudiventris*
- 1948-1963, 1978-1980



Augmenting fish productivity

- 1954-1956
- introduced in Aral Sea
- *Mugil (=Lisa) auratus* + *M. saliens*
- + 6 gobies:
 - *Knipowitschia caucasica*, *Neogobius fluviatilis*,
N. iljini, *N. melanostomus*, *N. syrman*,
Proterorhinus marmoratus
- + *Syngnathus nigrolineatus*
- + *Atherina boyeri*
- + prawn

Fish farming

- Imported fish culture technology in USSR
- Grass carp and Silver carp
- polyculture with Common carp and Crussian carp
- 1958 - Amu-Darya River basin
 - Karamet-Niyaz fish farm, Turkmenistan
- 1961 - Syr-Darya River basin
 - Akkurgan (later Balykchi) fish farm, Uzbekistan

Biomelioration

- Grass carp *Ctenopharyngodon idella*
 - control of aquatic plants
- Silver carp *Hypophthalmichthys molitrix*
 - prevent water bloom
- 1958 - Amu-Darya River basin
 - Karamet-Niyaz fish farm, Turkmenistan
 - Kara-Kum canal, Turkmenistan
- + 19 fish species from the Yangtze River

Malarial mosquito control



- *Gambusia affinis*
 - Late 1930s brought from Dagestan, Caucasus



- Medaka *Oryzias latipes*
 - Kazakhstan
 - northern Uzbekistan

Unintentional release



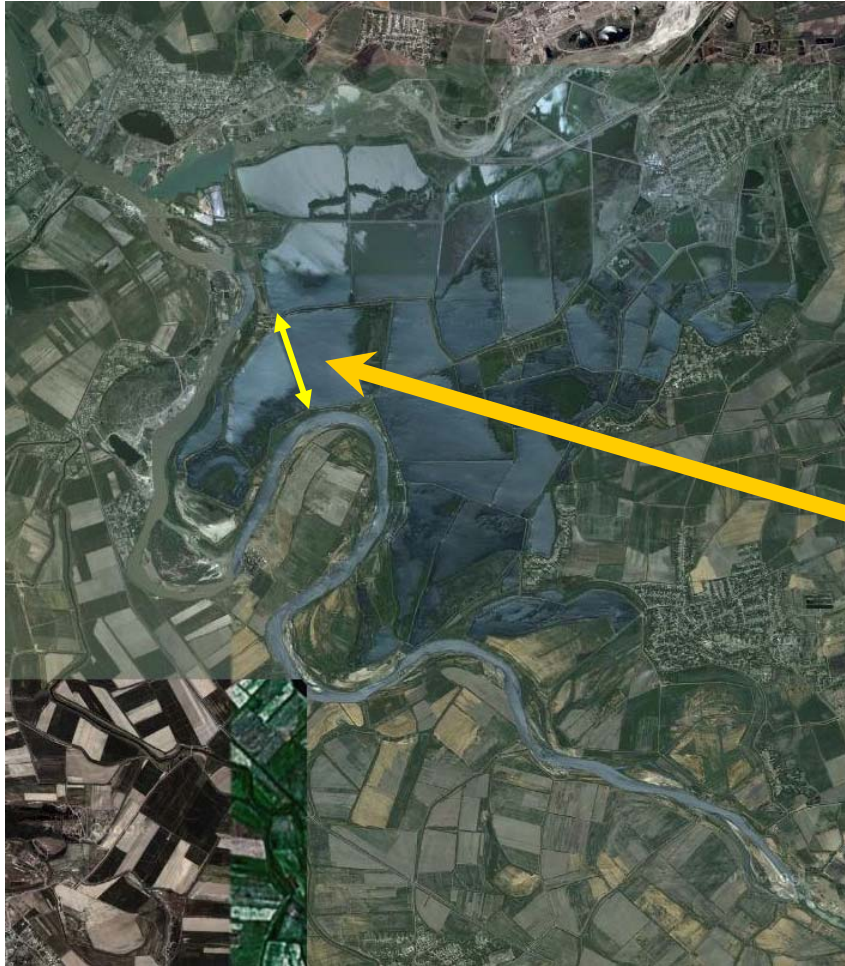
- Balykchi fish farm
- with fries of Grass carp and Silver carp:
- *Abbottina rivularis*
- *Elopichthys bambusa*
- *Hemibarbus maculatus*
- *Hemiculter leucisculus*
- *Hemiculter lucidus*
- *Hypophthalmichthys nobilis*
- *Megalobrama terminalis*
- *Mylopharyngodon piceus*
- *Opsariichthys uncirostris*
- *Pseudorasbora parva*
- *Rhodeus ocellatus ocellatus*
- *Oryzias latipes* probably from Kazakhstan
- *Micropercops cinctus*
- *Misgurnus anguillicaudatus*
- *Siniperca chuatsu*
- *Percottus glenii* probably misidentification
- *Rhinogobius brunneus*
- *Channa argus* probably also from Moscow

Unintentional release



- Balykchi fish farm
- with fries of Grass carp and Silver carp:
 - prawn *Macrobrachium nipponense*
 - 8 mollusk species
 - parasites and fish diseases

Escape from fish farms



- Fish escapes:
 - via discharge canals
 - because of break of a dam
- Balykchi fish farm
 - Area of the each pond ~ 100ha
 - 1 km

Fish seed handling between fish farms



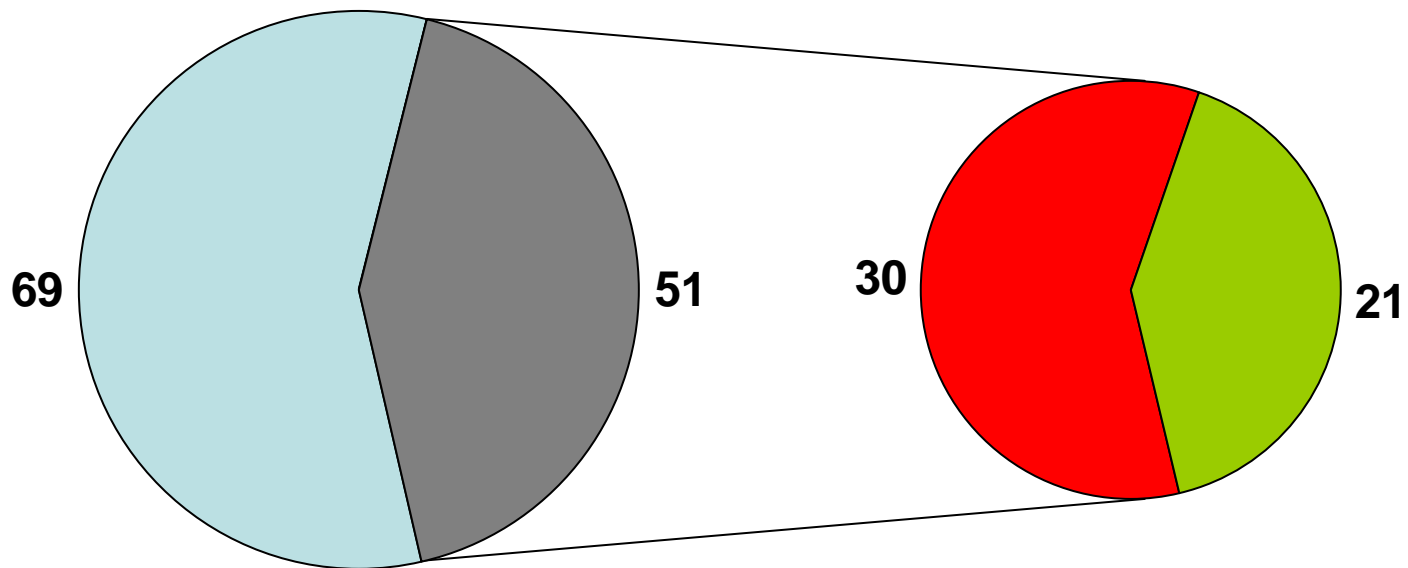
- Some basins were not “infected” by alien species:
 - Zarafshon River
 - Surkhan-Darya River
- Aliens were introduced only to fish farms :
 - Karamet-Niyaz
 - Balykchi
- With fish seed aliens were transported to different farms
- Aliens escaped in wild in other basins

Expansion via irrigating canals



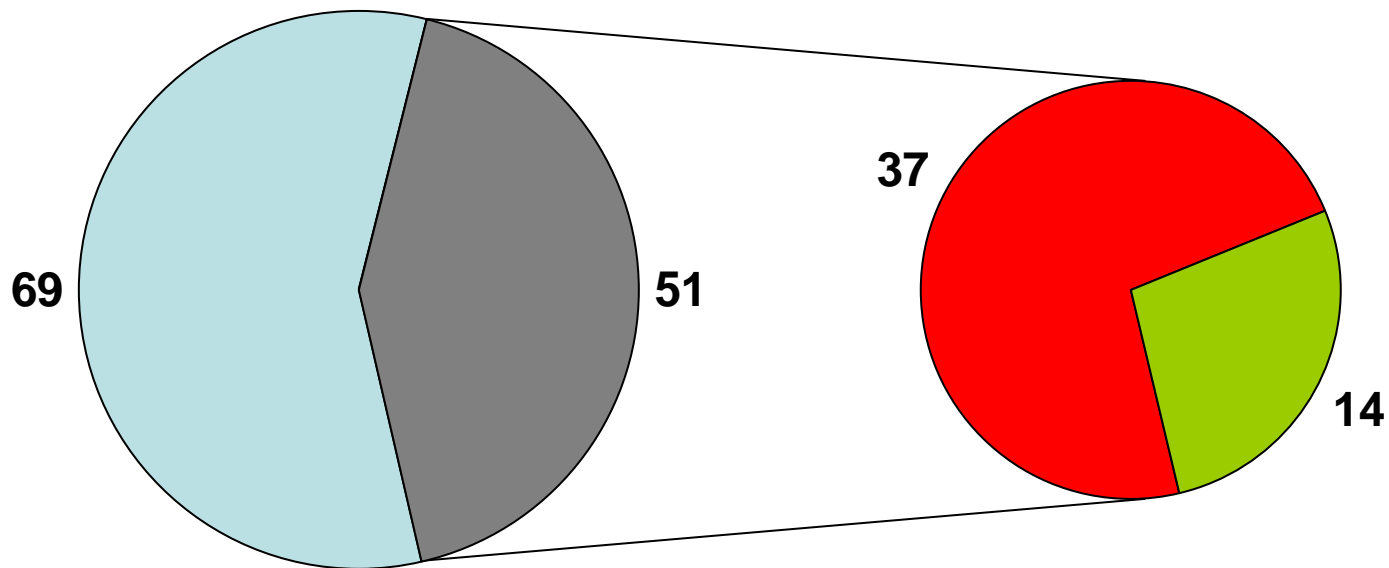
- A wide irrigation network in the Aral Sea basin allowed the aliens to colonize basins of other rivers and expand their area.

Aliens ratio



■ Indigenous ■ Pest & Noncommercial ■ Commercial

Aliens ratio



■ Indigenous ■ Naturalized ■ Not naturalized

Risks and Impacts

- Competition with native species
- Pests
- Predation
 - *Channa argus*, *Opsariichthys uncirostris*
 - *Pseudorasbora parva*, *Hemiculter leucisculus*, etc.
- Parasites and diseases
- Landscape changing
 - Grass carp can eliminate vast areas of macrophytes that provide spawning and nursery areas for native fishes.
- Threatening gene pool

Threatening gene pool

- Natives introduction:
 - *Abramis brama* and *Sander lucioperca* inhabit low Syr-Darya and Amu-Darya
 - ◆ Introduced in the Zeravshan River basin and Mid-Syr-Darya from the Ural River, Russia.
 - *Carassius auratus gibelio* inhabits low Syr-Darya and Amu-Darya
 - ◆ Introduced 1950s from Moscow region (Savino fish farm) in the Kattakurgan reservoir and fish farms in Tashkent region. Later it was stocked in other water bodies.

Feral populations



- Common carp
Cyprinus carpio
- Native
- Domesticated breeds stocked in wild
- Hybridization
wild+domesticated
- Domesticated carp is more competitive
 - High growth rate
 - More predator resistant

Competition

- Most of the indigenous species are endemic.
- Small indigenous species were so numerous that they considered as pests:
 - *Alburnoides oblongus*
 - *A. taeniatus*
 - *Capoetobrama kuschakewitschi*
 - *Cobitis aurata aralensis*
 - *Gobio gobio lepidolaemus*
 - several *Noemacheilus* species and others.

Competition



- *Gobio gobio lepidolaemus*



- *Abbottina rivularis*

Competition



- *Alburnoides oblongus*
(endemic of the Tashkent region)



- *Hemiculter leucisculus*

??

- Taxonomy
 - Misidentification impede the study
- Ecology
 - Only commercial species were studied
- Interactions with native fauna
- Impact on native fauna and biocenosis
- **NEW INTRODUCTION PROJECTS!!!**

Thank you