

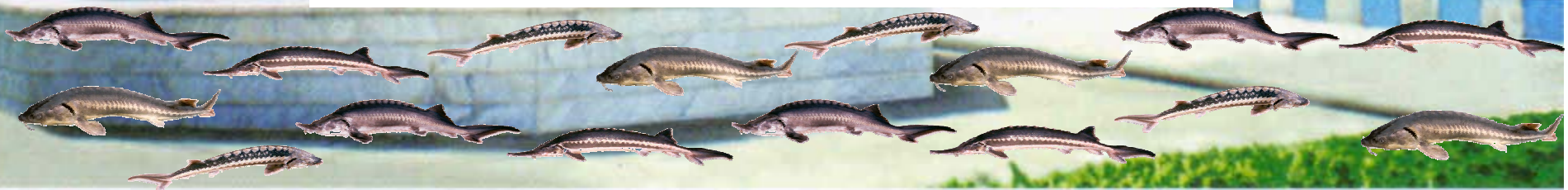


# International Sturgeon Research Institute Leading Center for Sturgeon Aquaculture in NACA



International Sturgeon Research Institute

Rasht - IRAN



# NACA Sturgeon Lead Center

## Sturgeon species found in Asia and the world

Out of the 27 sturgeon species living in the world, 15 species are found in Asia (Iran, China, Japan etc.). Therefore this center can meet the scientific needs of the mid Asian region as well as Caucasus region.

No	Scientific	English	No	Scientific	English
1	<i>Acipenser dabryanus</i>	Yangtze (or Changjiang) sturgeon	8	<i>Acipenser stellatus</i>	Stellate sturgeon
2	<i>Acipenser gueldenstaedtii</i>	Russian sturgeon	9	<i>Acipenser baerii</i>	Siberian sturgeon
3	<i>Acipenser nudiventris</i>	Ship sturgeon	10	<i>Huso dauricus</i>	Kaluga
4	<i>Acipenser persicus</i>	Persian sturgeon	11	<i>Huso huso</i>	Beluga
5	<i>Acipenser ruthenus</i>	Sterlet	12	<i>Pseudoscaphirhynchus fedtschenkoi</i>	Syr-Dar shovelnose sturgeon
6	<i>Acipenser schrenckii</i>	Amur sturgeon.	13	<i>seudoscaphirhynchus hermanni</i>	Small Amu-Dar shovelnose sturgeon
7	<i>Acipenser sinensis</i>	Chinese sturgeon	14	<i>Pseudoscaphirhynchus kaufmanni</i>	Large Amu-Dar shovelnose sturgeon
			15	<i>Psephurus gladius</i>	Chinese paddlefish

## NACA Sturgeon Lead Center

### **Vindications and Objectives**

- ✓ **About 90 % of the world caviar is produced in the Caspian Sea. The I. R. of Iran is the leading producer of caviar and has been allotted more than 50 % of the export quotas for caviar.**
- ✓ **The I. R. of Iran has about 50 years experience in sturgeon breeding and rearing activities.**
- ✓ **Sturgeons are important species in the biodiversity of the Caspian Sea and in studies regarding taxonomy and evolution.**
- ✓ **By developing sturgeon aquaculture we can:**
  - a) Save these species from extinction (decrease fishing pressure in the sea and rivers)
  - b) Meet the caviar and meat demands of domestic and international markets
  - c) Create job opportunities, meet protein requirements and increase revenue in foreign exchange

# NACA Sturgeon Lead Center



**Geographical**

**location of**

**the Institute**



# **Research and Aquaculture Potentials**

## **A) National potentials include:**

**Artificial breeding programs on sturgeons in Iran were initiated in 1922.**

**The Shahid Beheshti Sturgeon Hatchery was established in 1971 in the vicinity of the Sepidroud River with a surface area of 100 ha that released 1.6 million sturgeon fry.**

**At present 5 sturgeon hatcheries with a surface area of over 1000 hac and an average production of 20 million fry belonging to different sturgeon species are operating in Iran**

- ❖ Two hatcheries in the Gilan Province**
- ❖ One hatchery in the Mazandaran Province**
- ❖ Two hatcheries in the Golestan Province**

**The sixth sturgeon hatchery is under construction.**



## NACA Sturgeon Lead Center

### Eighth Technical Advisory Committee meeting

1-3 October 2005, Ramsar- Iran

- ❖ Iran requested that the **Sturgeon International Research Center** be designated as a **NACA reference center** for sturgeon research. The Secretariat appreciated the offer and advised that was possible and would have to follow a similar process as other centers nomination as Regional Lead Center, that include assessment of the capabilities of the institution. The request will need to be endorsed to the Governing Council.
- ❖ Iran would like to offer further assistance in sturgeon aquaculture. Iran would also like assistance from **NACA in stock enhancement research, particularly in research programs that effect sturgeon fingerling release into the Caspian Sea.** Iran also mentioned it was necessary to assess the progress in terms of **social and economic aspects, for fishers, as well as conservation.**

# NACA Sturgeon Lead Center



## A) Sturgeon breeding facilities



# NACA Sturgeon Lead Center



**B) Sturgeon rearing facilities**



# NACA Sturgeon Lead Center



Sturgeon rearing facilities



# NACA Sturgeon Lead Center

**C) Seven sturgeon species exist in Iran that are suitable for rearing that include:**



**Beluga sturgeon**



**Persian sturgeon**



**Russian sturgeon**



**Ship sturgeon**



**Stellate sturgeon**



**Siberian sturgeon**



**Sterlet**

# NACA Sturgeon Lead Center

**D) Hybrids produced by crossing beluga with Persian sturgeon**



**E) Bester**

## NACA Sturgeon Lead Center

# Research Potentials

### A) Human labor

Having more than 60 years experience working on different aspects of sturgeons

Establishment of the International Sturgeon Research Institute in Rasht \

National research centers situated along the margins of the Caspian Sea that include:

- Aquaculture Research Center in Anzali
- National Processing Center in Anzali
- Caspian Sea Ecology Research Center in Sari
- National Research Center on Coldwater Fishes in Tonekabon
- Inland Water Research Center in Gorgan
- The Mirza Koochek Khan Training center

The Iranian Fisheries Research Organization in Tehran and affiliated centers

State College of Fisheries and Environment

# NACA Sturgeon Lead Center

## **B) Regional and International Potentials**

**Objectives: Make efforts to utilize available potential in the region and world to enhance technical knowledge in order to 1) conserve stocks and 2) develop aquaculture**



**Chairman of the Sturgeon Specialist Group in IUCN (with 60 sturgeon specialists throughout the world)**

**Foundation and Board Member of the World Sturgeon Conservation Society (WSCS) (350 members)**

**In close collaboration with:**

**CITES, CEP, GEF/World Bank, FAO, Commission on Caspian Sea Aquatic Bioresources**

# NACA Sturgeon Lead Center

Research departments specializing on sturgeons



International Sturgeon Research Institute

Fish Breeding and Rearing

Stock Assessment

Physiology & Biochemistry

Ecology

Genetics & Biotechnology

Fish Processing Technology

Health & Diseases

Scientific Information

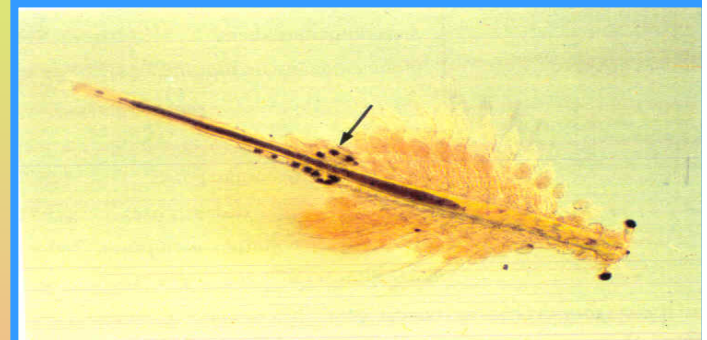
# NACA Sturgeon Lead Center

**Rearing & Breeding Dept., sections, laboratories and equipment**

**1. Rearing section**

**2. Breeding section**

**3. Live food production laboratory**



# NACA Sturgeon Lead Center

**Determining nutritional requirements of beluga from larval stage up to marketable size**



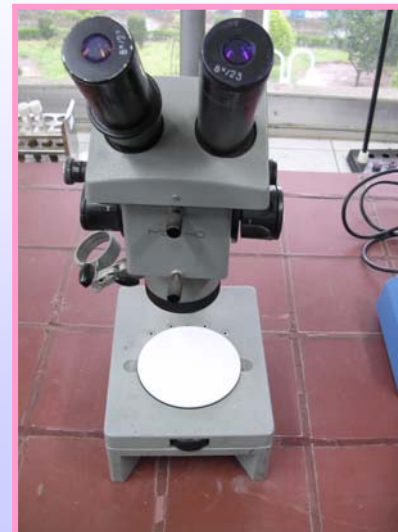
# NACA Sturgeon Lead Center

Freshwater Sturgeon Farming using different species  
(*A. persicus*, *H. huso*, *A. nudiventris* and *A. stellatus*)



# NACA Sturgeon Lead Center

**Creating and rearing brood fish shoals from farmed breeders**



# NACA Sturgeon Lead Center

Beluga (*Huso huso*) culture in Caspian Sea water



# NACA Sturgeon Lead Center



**Rearing beluga (*Huso huso*) fry in the southern shores of the Caspian Sea using brackish water**

**(Joint project with the World Bank)**

**Rearing 9000 beluga fry from an initial weight of 3 g to a final weight of 450 g**

**Rearing 7500 Persian sturgeon fry**

**Rearing and releasing 6000 beluga fry weighing 1480 g**



**Rearing 16 tons of beluga and Persian sturgeon in earthen ponds**



# NACA Sturgeon Lead Center

**Dept. of Physiology & Biochemistry, laboratories, equipment**

- 1. Ecophysiology Lab.**
- 2. Histology Lab.**
- 3. Biochemistry & Hematology Lab.**



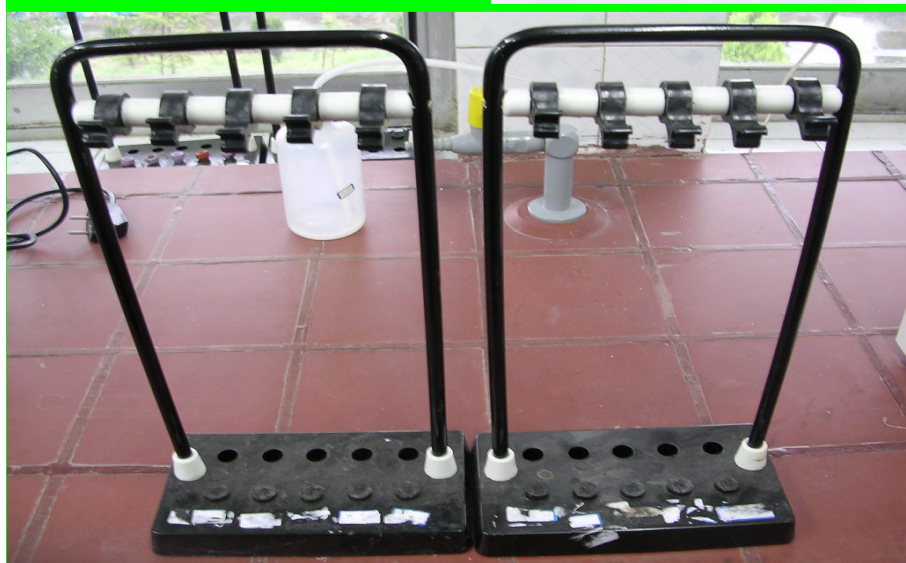
# NACA Sturgeon Lead Center

## Histology Lab.



# NACA Sturgeon Lead Center

## Biochemistry & Hematology Lab.



# NACA Sturgeon Lead Center

## Novel formulation of GnRH for artificial breeding of stellate sturgeon *Acipenser stellatus*



Collecting blood samples from caudal vein in *A. stellatus* spawners



Intra-muscular injection of GnRH in *A. stellatus* spawners



Synthetic formula of GnRH

# NACA Sturgeon Lead Center

## Production of farmed *A. stellatus* spawners



## Farmed Caviar from *A. stellatus* , Iran-2006



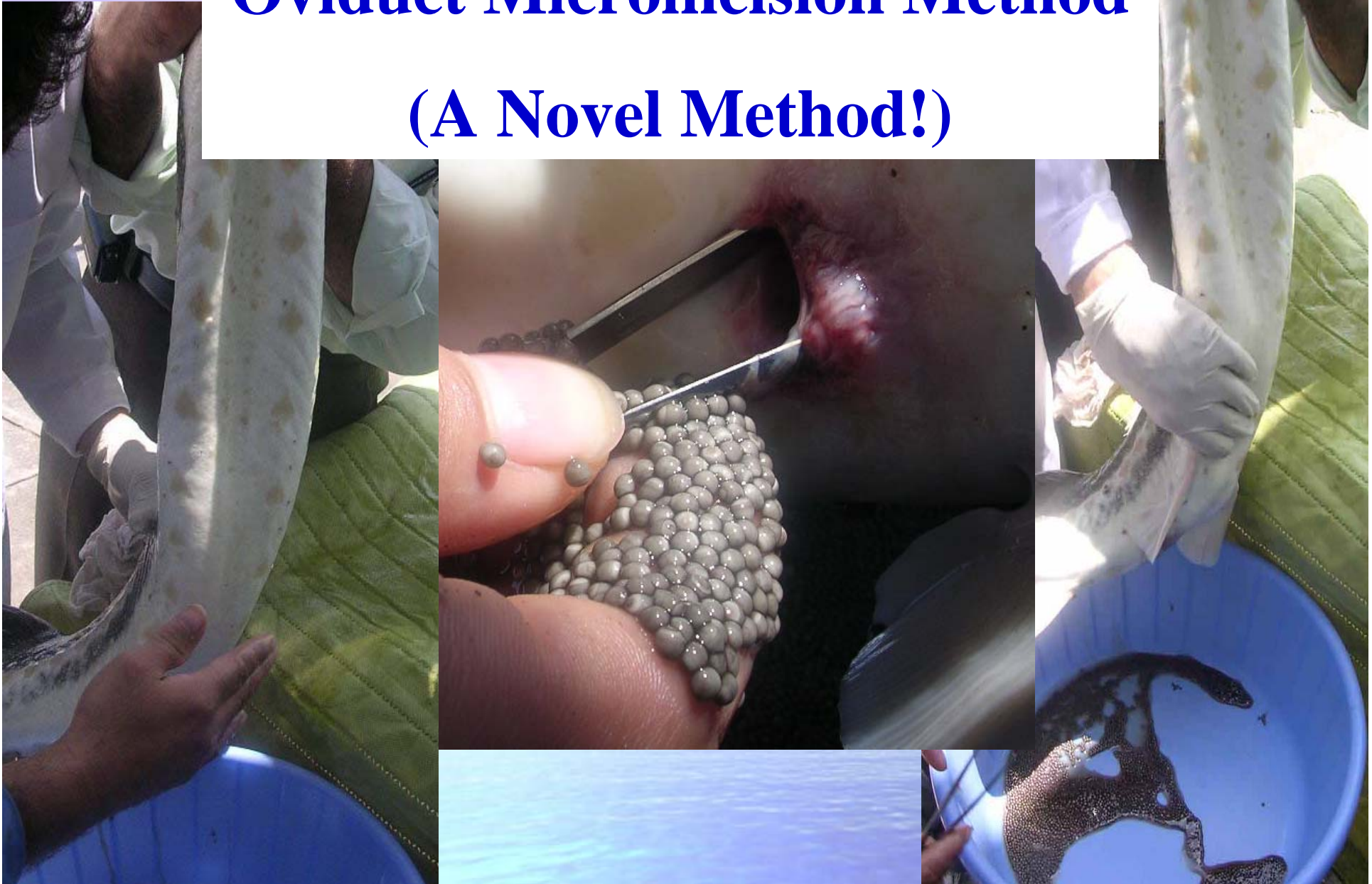
# NACA Sturgeon Lead Center

## Potential for the artificial breeding of stellate sturgeon



NACA Sturgeon Lead Center

# Oviduct Microincision Method (A Novel Method!)



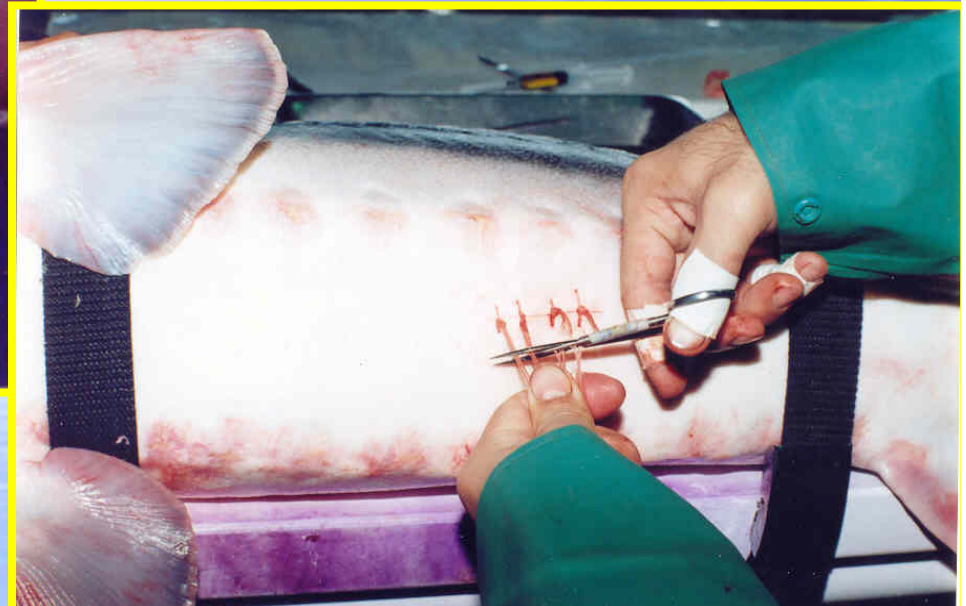
## NACA Sturgeon Lead Center

### Production of Larvae and Fingerling of *A. stellatus* from Farmed Stellate Breeders



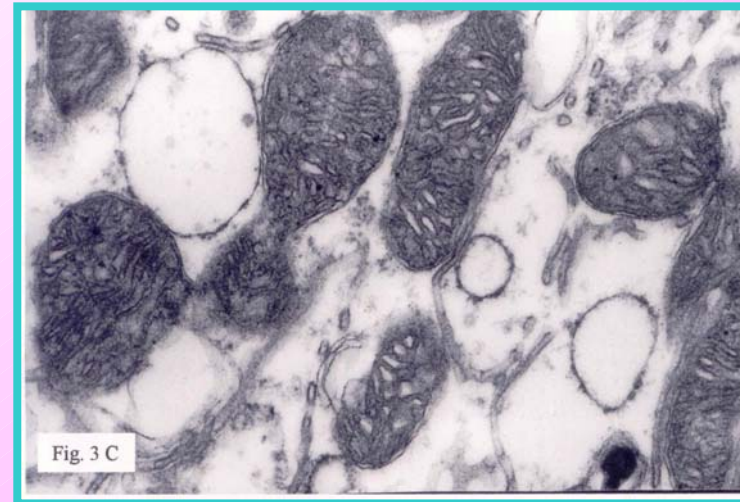
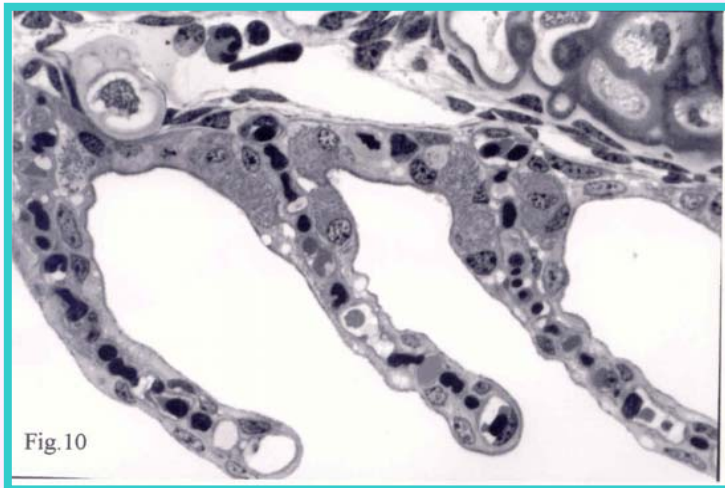
# NACA Sturgeon Lead Center

**Sex determination of more than 1500 beluga (*H. huso*)  
specimens in the sturgeon hatcheries**



# NACA Sturgeon Lead Center

**Osmoregulation in *Acipenser persicus* for determining the best weight & length for release into the Caspian Sea**



# NACA Sturgeon Lead Center

## Dept. of Genetics & Biotechnology, Laboratories, equipment

1. Genetic Engineering and gene transfer lab.
2. Cytogenetics lab.
3. Tissue culture lab.
4. Molecular genetics & race improvement



## NACA Sturgeon Lead Center

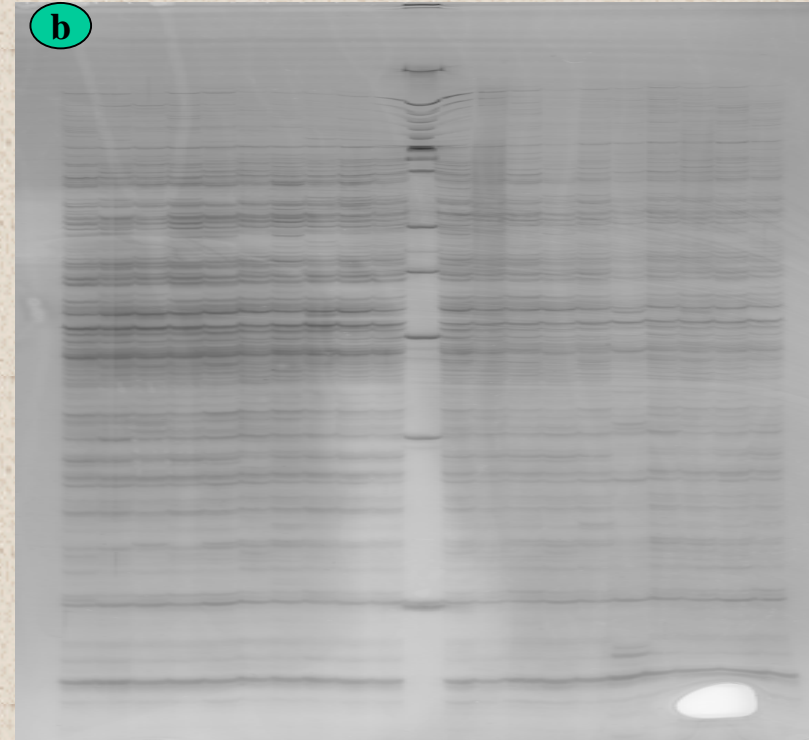
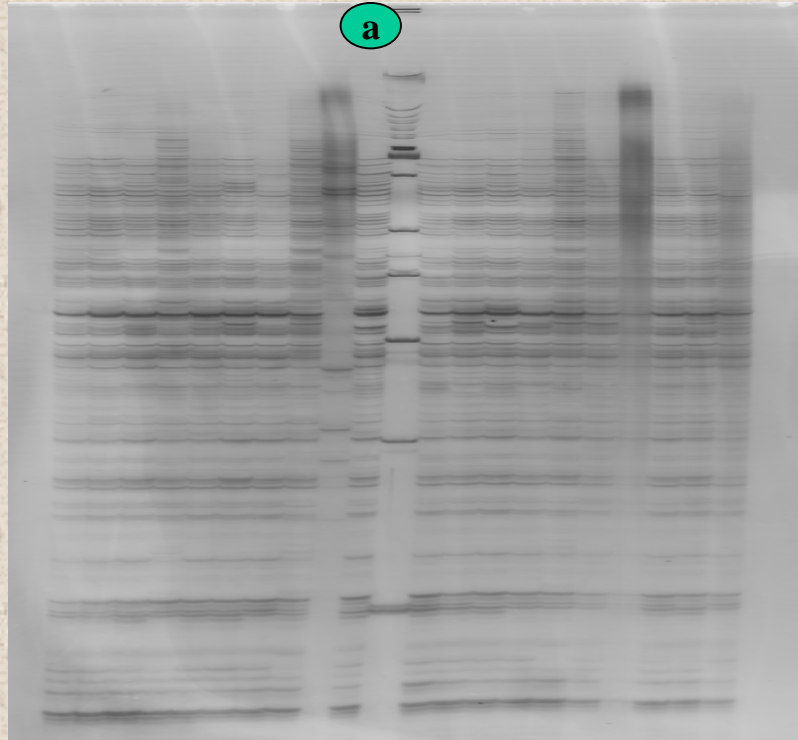


Production of bester (female *H. huso*  
x male *A. ruthenus*)  
and comparison of growth in hybrids  
with that in *H. huso* under culture  
conditions in Iran



## NACA Sturgeon Lead Center

Study the potentials to determine sex markers in  
*Huso huso* and *Acipenser persicus* using molecular methods

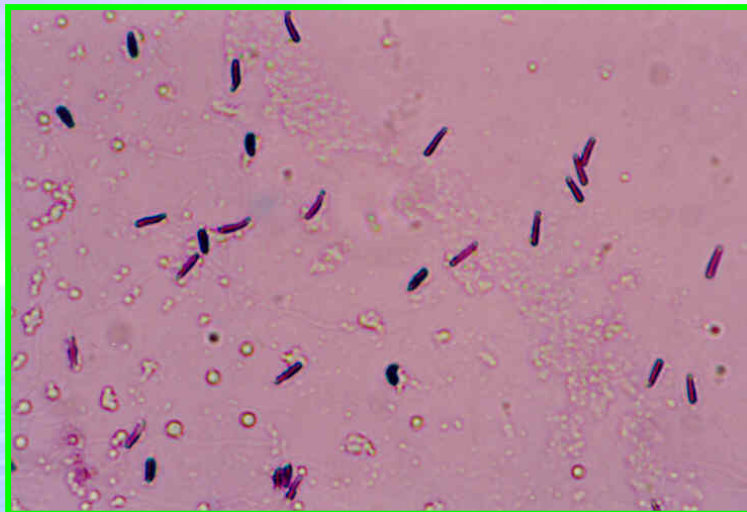
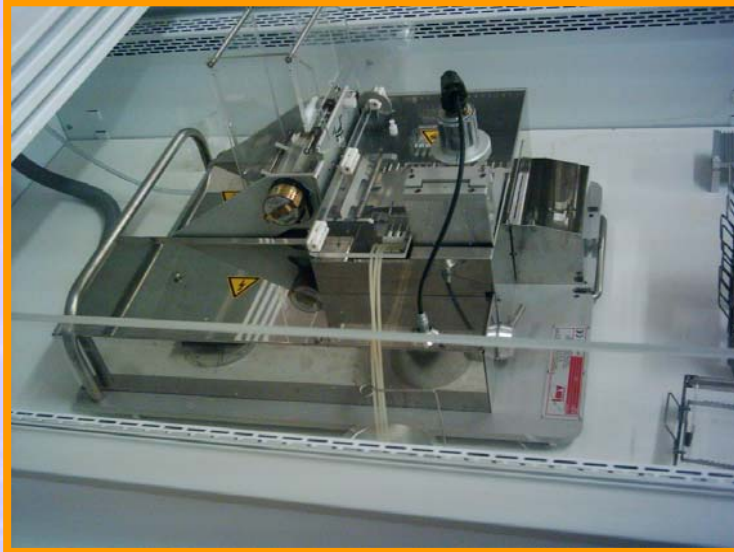


**AFLP technique with a combination of Mse+4 & Eco+3 primers in**

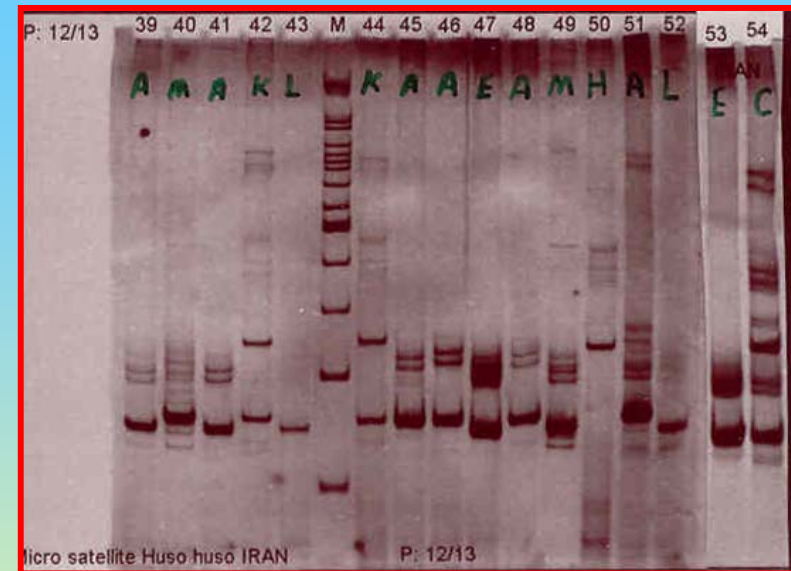
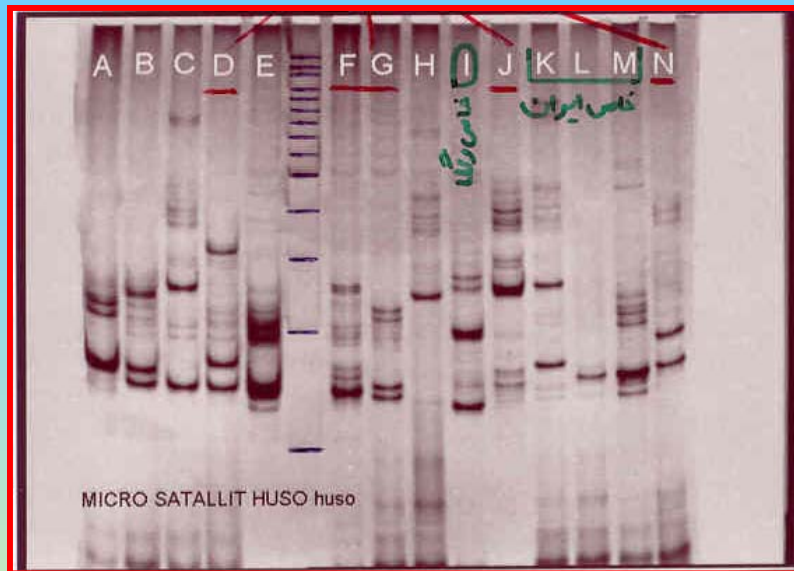
**a) *Huso huso* and b) *Acipenser persicus***

# NACA Sturgeon Lead Center

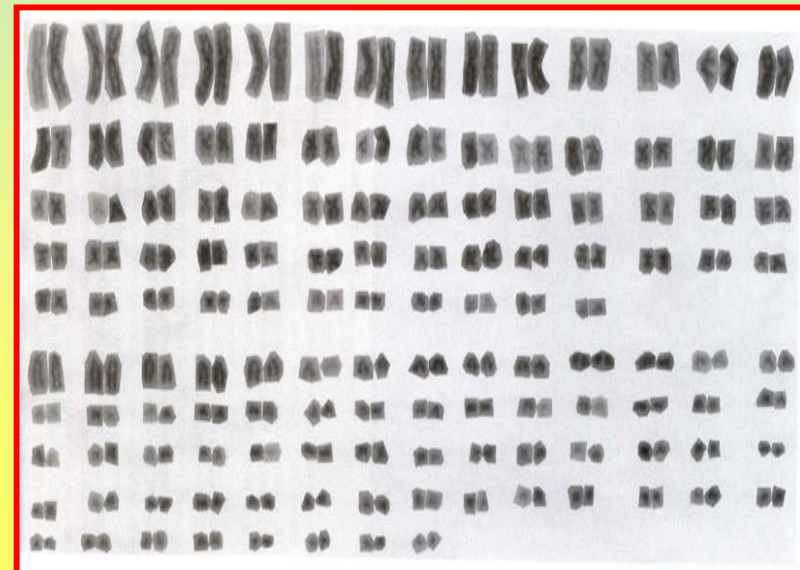
Cryopreservation of sperms in *H. huso* and *A. nudiventris*  
during off-breeding season



# NACA Sturgeon Lead Center



## Molecular population genetics and cytogenetic studies on Sturgeon



# NACA Sturgeon Lead Center

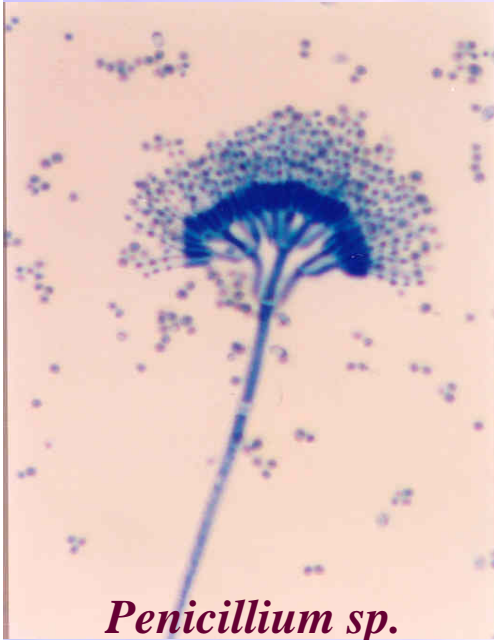
**Dept. of Health & Diseases, laboratories,  
equipment**

- 1. Parasitology lab.**
- 2. Bacteriology lab.**
- 3. Fungal studies lab.**
- 4. Viral studies lab.**



# NACA Sturgeon Lead Center

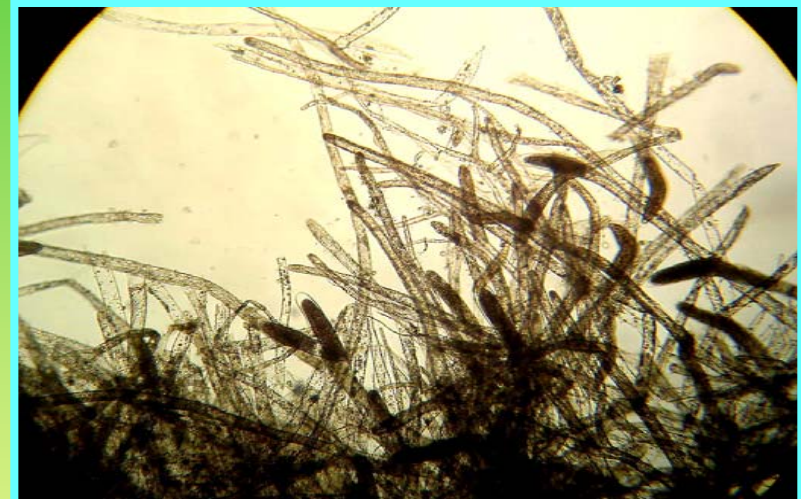
## Sturgeon pathogens



## NACA Sturgeon Lead Center

### Quality control of sturgeons from breeding up to their release

The bacterial and fungal flora was identified in different stages of sturgeon breeding and rearing.

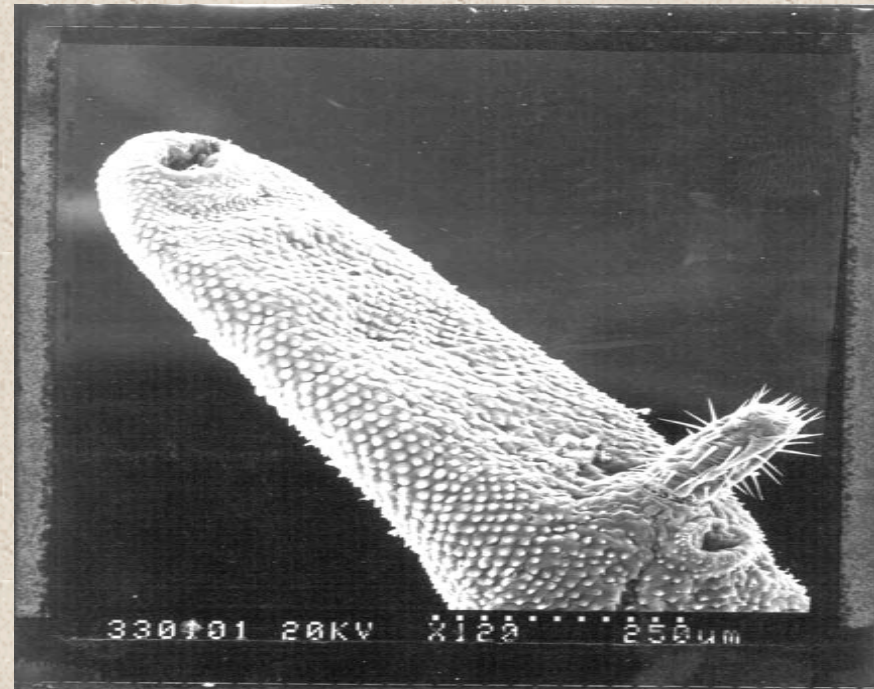


## NACA Sturgeon Lead Center

**Bacterial flora in sturgeon eggs, larvae and fingerlings and parasitological fauna in sturgeon fry in the Shahid Beheshti hatchery**



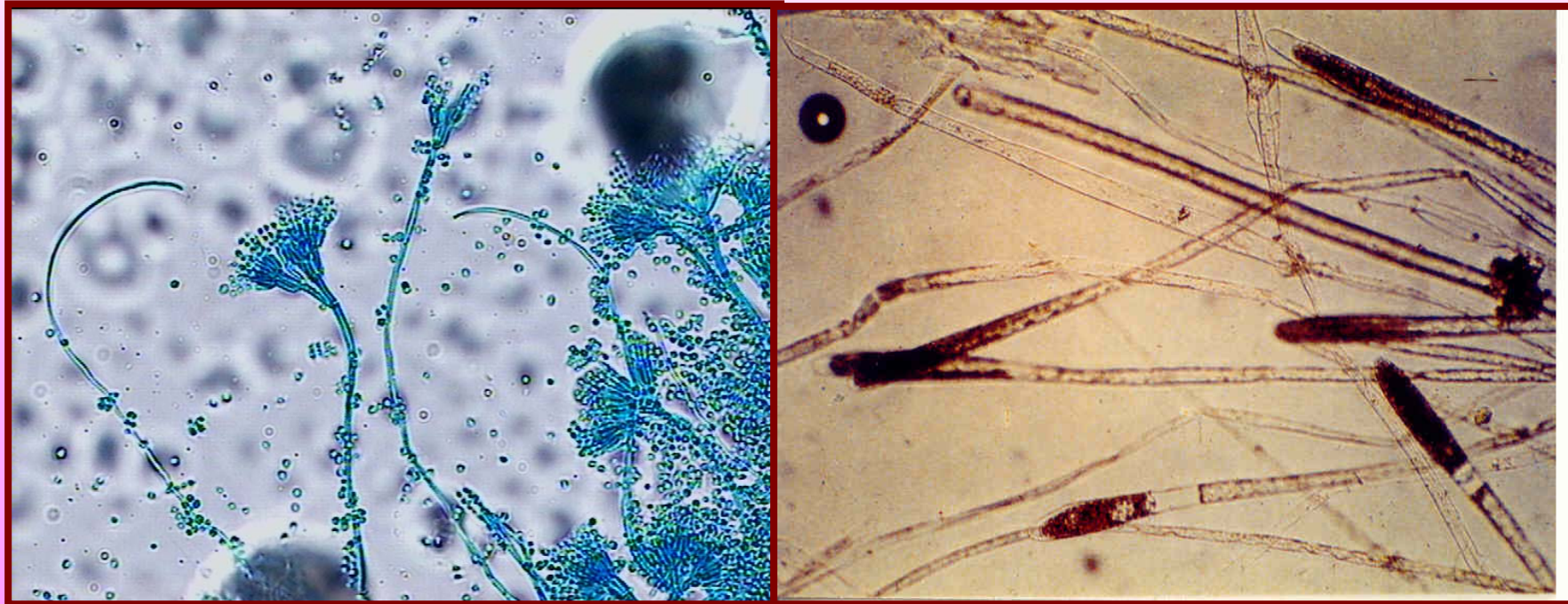
**Study of internal worm epidemic in sturgeons caught in the southwest Caspian Sea**



## NACA Sturgeon Lead Center

### Fungal flora in different stages of breeding in sturgeons in the Shahid Beheshti Hatchery

The fungi found in different stages of breeding (eggs, larvae with yolksac, larvae without yolksac, fingerlings) in two species *A. persicus* and *A. stellatus* were identified using the commonly used methods of fungal identification.



# NACA Sturgeon Lead Center

Dept. of Ecology, laboratories, equipment

1. Phycology lab.

2. Benthic organisms lab.

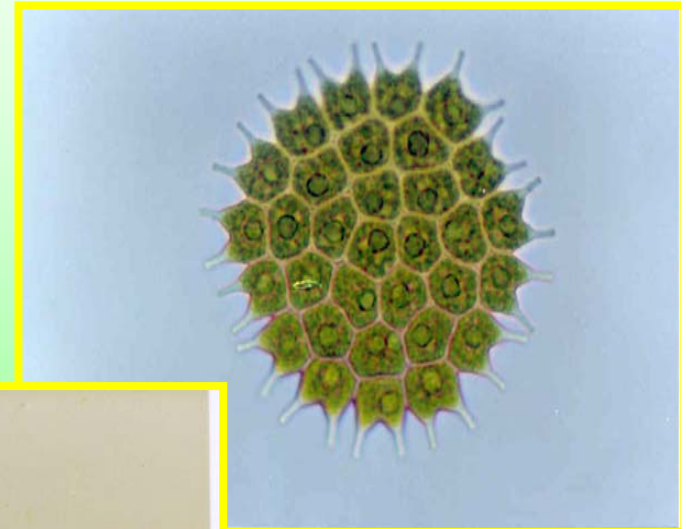
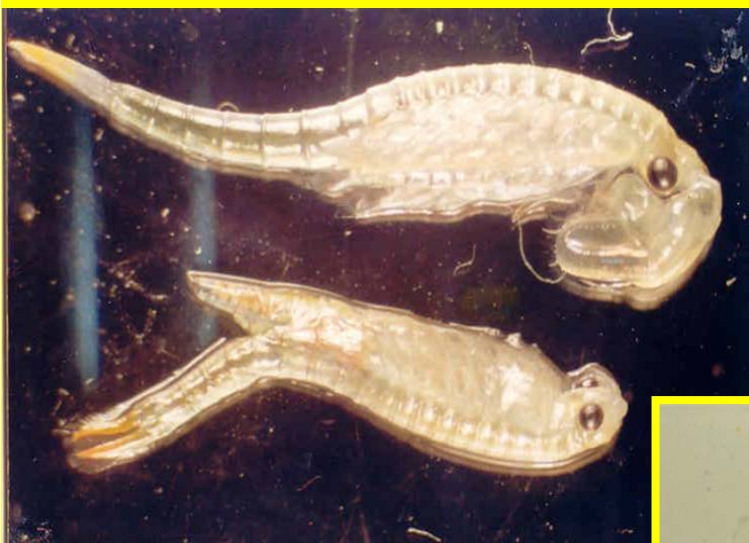
3. Biology lab.

4. Toxicology lab.



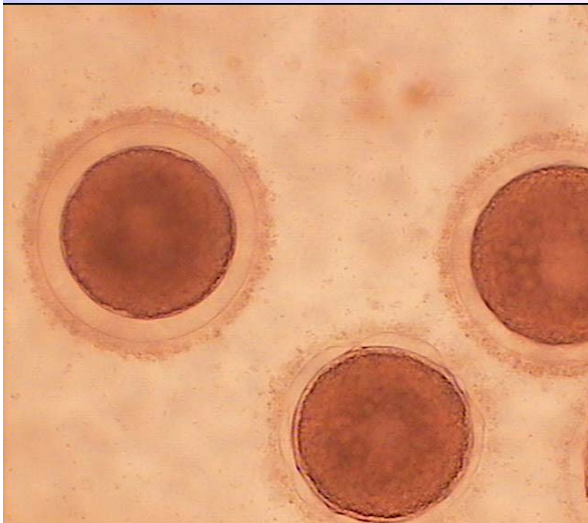
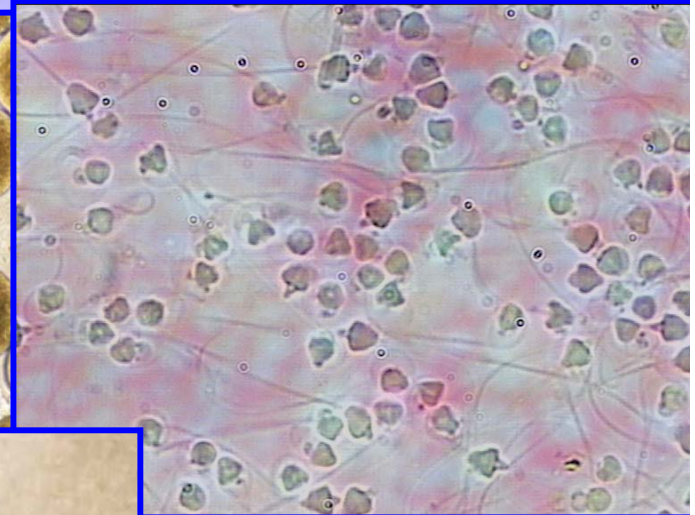
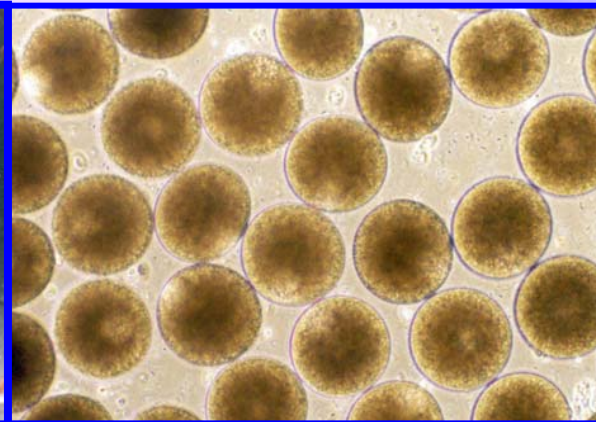
# NACA Sturgeon Lead Center

## Life food culture for sturgeon larvae



# NACA Sturgeon Lead Center

## Reproduction and mass culture of *Nereis diversicolor*



## NACA Sturgeon Lead Center

**Equipment used to study migration and natural reproduction in surgeons**

**Budget for purchase of equipment: USD 22000**

**Tracking in freshwater to a radius of 2 km and up to a depth of 5 m**

**Tracking outside water up to 80 km (without any barriers)**

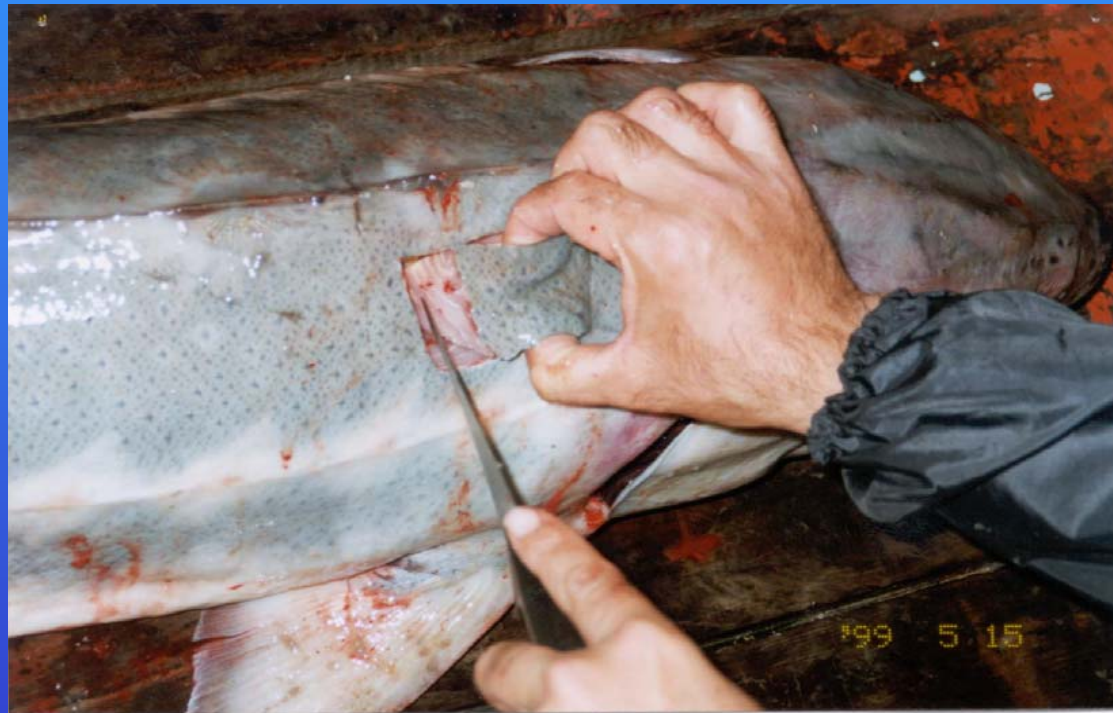
**Tracking in brackish water to a radius of 600 m**

**Tracking sturgeons in the Sepidrud River: Radio tags and ultrasonic tags**



## NACA Sturgeon Lead Center

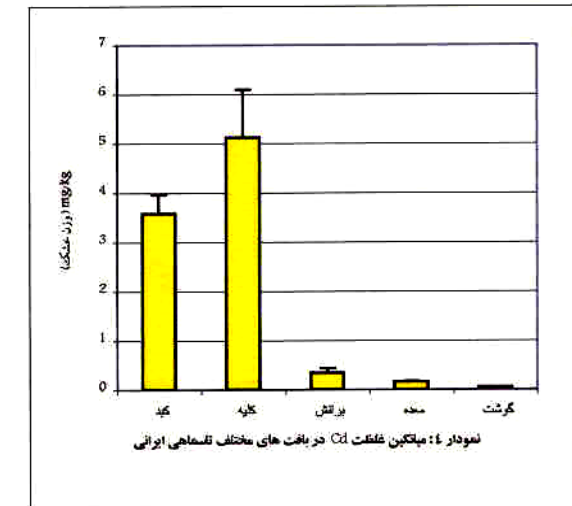
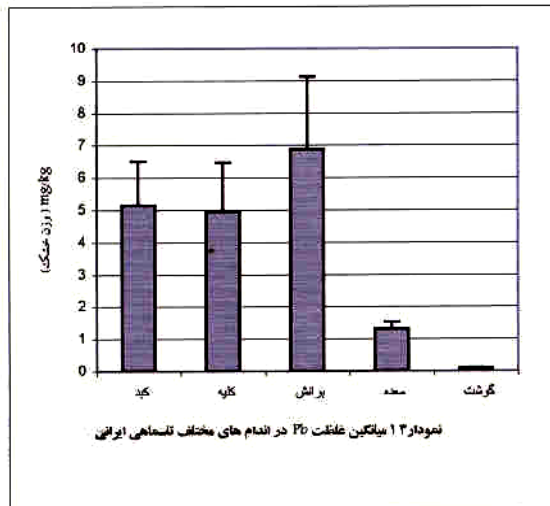
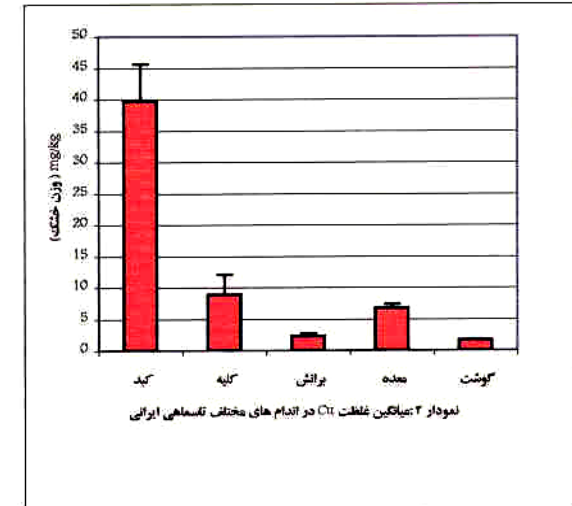
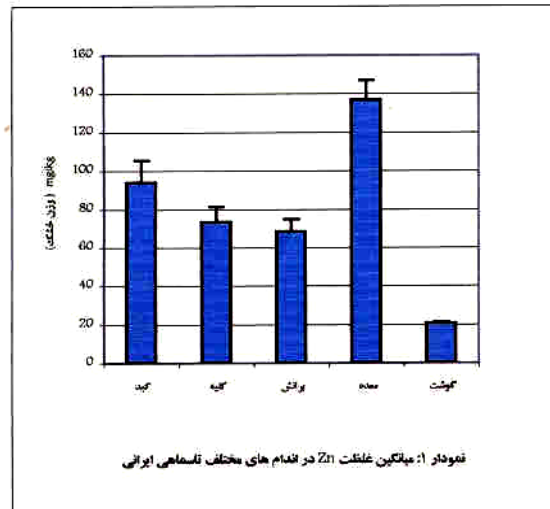
Determination of heavy metals in muscle tissue and caviar in *Acipenser persicus* and *Acipenser stellatus* in the southern shores of the Caspian Sea



Collecting muscle tissue sample from sturgeon specimen

# NACA Sturgeon Lead Center

## Bioaccumulation of heavy metals (Cd, Pb, Cu, Zn) in kidney, gills, liver, stomach and muscle tissue in *Acipenser persicus*



## NACA Sturgeon Lead Center

**Dept. of Stock Management, laboratories, equipment**



### **Date of survey:**

**Winter: 28.01.2006 to 17.02.2006**

**Summer: 08.07.2006 to 02.08.2006**

### **Vessel type:**

\* <10 m. : Sisara R/V (250 hp)

\* >10 m. Guilan R/V (1000 hp)

### **Trawl type:**

\* < 10 m depth: 9 m trawl

\* >10 m depth: 24.7 m trawls

### **Trawling time:**

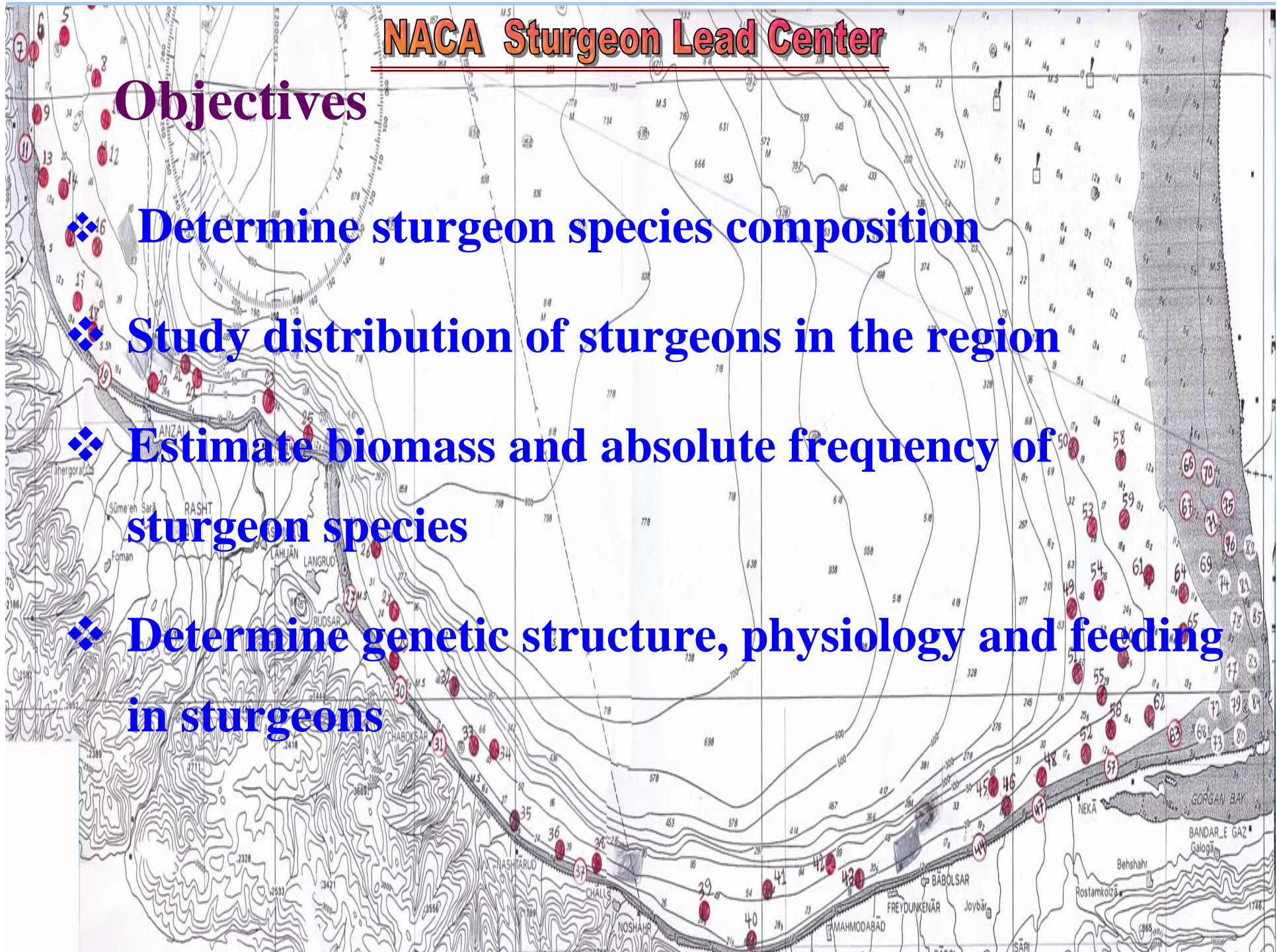
**30 min. each, at daytime.**

**Trawling velocity: 2.5 kts**

# NACA Sturgeon Lead Center

## Objectives

- ❖ Determine sturgeon species composition
- ❖ Study distribution of sturgeons in the region
- ❖ Estimate biomass and absolute frequency of sturgeon species
- ❖ Determine genetic structure, physiology and feeding in sturgeons



## NACA Sturgeon Lead Center

### Number of trawl stations in the study area ( 2-100 m depth)

study area	Fishery catch zone	2-10	10-50	50-100	Total
Western region	1	5	11	6	22
	2	3	4	1	8
Middle region	5	2	6	3	11
	3	3	15	3	21
Eastern region	4	21	2	0	23
<b>Total</b>		<b>34</b>	<b>38</b>	<b>13</b>	<b>85</b>

# NACA Sturgeon Lead Center



## Stock assessment of sturgeons in the Caspian Sea



## NACA Sturgeon Lead Center

### estimating fishery return co-efficient in sturgeons using marking methods



About 290000 sturgeon fingerlings marked using coded wire tags and 192000 fingerlings marked by clipping barbels were released into the sea. Totally 312 fingerlings have been re-captured as of today.



# NACA Sturgeon Lead Center

## Tagging sturgeons using modern methods



## Sturgeon age determination lab.



# NACA Sturgeon Lead Center

## **Dept. Processing Technology, laboratories, equipment**

- 1. Processing and biological products lab.**
- 2. Food microbiology lab.**
- 3. Food chemicals & quality control lab.**



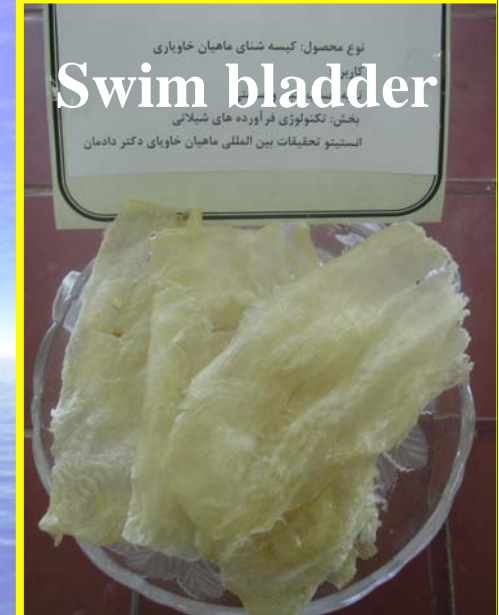
# NACA Sturgeon Lead Center

Improving over ripe caviar during breeding using osmosis and physical methods



# NACA Sturgeon Lead Center

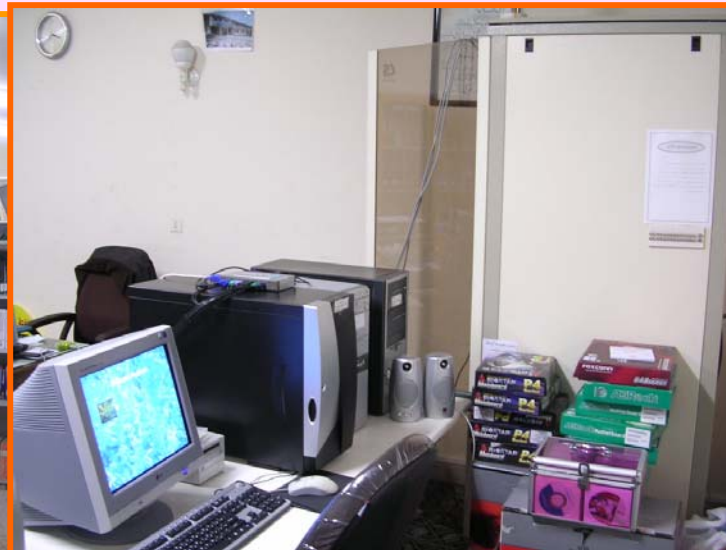
## Products from sturgeon entrails and other organs



# NACA Sturgeon Lead Center

**Dept. of Scientific Information & Training:  
Facilities, equipment**

- 1. Internet online communication, computer systems**
- 2. Well equipped data base with more than 1500 scientific books (internal and overseas publications)**



# NACA Sturgeon Lead Center

## Workshops

Workshops held during 1995 to 1999	Workshops held during 2000 to 2004
<b>Biology and culture of <i>Streptocephalus</i> in 1997 – Dr. Javahar Ali, University of Ghent (Belgium)</b>	<b>Application of GnRH in sturgeon breeding in 2002- Prof. Habibi &amp; Dr. Bahmani (Canada)</b>
<b>Electrophoresis in 1997 – (Russia)</b>	<b>Cryopreservation of sturgeon sperms in 2002 – Prof. Billard &amp; Dr. Cosson (France)</b>
<b>Fish Nutrition in 1998 – Prof. Mosa Noor (FAO)</b>	<b>Third Round of Matched Small Grant Project in 2002 – Dr. Abdollayev, CEP (Azerbaijan)</b>
<b>Sturgeon Physiology in 1998 – Prof. Barannikova (Russia)</b>	<b>Planning and preparation of proposal for Joint Project on Sturgeon Stock Assessment in the Caspian Sea in 2003 – Dr. Shotton (FAO)</b>
<b>Osmoregulation in 1999 – Prof. Krayushkina- University of St. Petersburg (Russia)</b>	<b>Introducing GnRH in sturgeon breeding programs in 2003 - Prof. Habibi &amp; Dr. Bahmani (Canada)</b>
<b>Reproduction Physiology in 1999 – Prof. Habibi (Canada)</b>	<b>Reproduction Physiology in 2004 – Prof. Habibi &amp; Dr. Bahmani (Canada)</b>
	<b>Application of GnRH in sturgeon breeding in 2004- Prof. Habibi &amp; Dr. Bahmani (Canada)</b>

# NACA Sturgeon Lead Center

## Workshops

Workshops held during 2005-2006

**Cryopreservation of sturgeon sperms**

**Caviar Processing**

**Sturgeon sexing and gonadal staging**

**Sturgeon diseases and parasites**

**Stocking for rehabilitation of sturgeon in the Caspian Sea**

**Cryopreservation of fish sperms**



## **International potentials**

The International Sturgeon Research Institute works in close association with international organizations such as:

- **The Caspian Environment Programme (CEP)**
- **GEF/World Bank**
- **Commission on Aquatic Bioresources of the Caspian Sea (CAB)**
- **Food and Agriculture Organization (FAO)**
- **Sturgeon Specialist Group in IUCN (IUCN/SSG)**
- **World Sturgeon Conservation Society (WSCS)**

## **Programs to provide services to other countries and Asia**

1. Conducting regular training courses on:  
**Sturgeon Aquaculture: Meat and Caviar Production**  
**Fingerling production for restocking**
2. Conducting routine training courses on reproduction physiology of sturgeon
3. Conducting routine training courses on live food culture for sturgeon
4. Organizing workshops on caviar processing, molecular genetics, sperm crypreservation,
5. Creating Sturgeon data bank

NACA Sturgeon Lead Center

**Proposal for workshops  
to be staged in 2007  
(Future vision)**

# NACA Sturgeon Lead Center

## 1. Sturgeon farming

**Proposed date:** 10-20 June 2007

**Number of participants:** 20 (10 from NACA member countries and 10 from Iran)

**Period:** 7 days

**Brief description:** Scientific discussions, practical demonstrations and toured visits to sturgeon hatcheries and scientific laboratories at the International Sturgeon Research Institute

**Issues to be addressed:**

Significance of sturgeon culture, commercially important species and hybrids, formulation of diets, feeding, culture systems (concrete tanks, earthen ponds, fiber glass tanks), biotechnology for commercial culture of sturgeons

**Expenses:** All expenses including boarding and lodging, transport, laboratory experiments, training aids and visits and tours in Iran will be sponsored by the Iranian Fisheries Research Organization, International Sturgeon Research Institute, Iranian Fisheries Organization and NGOs in Iran. Travel expenses for overseas NACA members and honorarium for speakers at workshop to be provided by NACA.

## NACA Sturgeon Lead Center

### 2. Sturgeon sexing and gonadal staging

**Proposed date:** 25 October -3 November 2007

**Number of participants:** 20 (10 from NACA member countries and 10 from Iran)

**Period:** 7 days

**Brief description:** Scientific discussions, practical demonstrations and toured visits to sturgeon hatcheries and scientific laboratories at the International Sturgeon Research Institute

**Issues to be addressed:**

Gonadal staging in sturgeons, different methods for sex determination, biopsy, surgery, histological sections, staining tissue slides, identifying physiological state in males and females, taking pictures of microscopic observations, determining size of sexual cells.

**Expenses:** All expenses including boarding and lodging, transport, laboratory experiments, training aids and visits and tours in Iran will be sponsored by the Iranian Fisheries Research Organization, International Sturgeon Research Institute, Iranian Fisheries Organization and NGOs in Iran. Travel expenses for overseas NACA members and honorarium for speakers at workshop to be provided by NACA.

# NACA Sturgeon Lead Center





Thank You  
For Your  
Attention