NEW DATA REGARDING CAPTIVITY FEEDING OF PINNIPEDS-OTARIA BYRONIA (Shaw, 1800) (OTARIIDAE/PINNIPEDIA/CARNIVORA)

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Key words: sea lions, captivity, diet, vitamins.

1. INTRODUCTION

Knowledge on the food habits of pinnipeds facilitates a better understanding of their interaction with prey populations and their impact upon fishery (THOMPSON, MACKEY, BARTON, DUCK, & BUTLER, 2007; KÖNIGSON, 2007; GULLAND, J. 1987). This knowledge represents an essential source of data useful in order to maintain proper live conditions in captivity for these peculiar mammals.

This paper is based on the results of the pinnipeds monitoring, carried out between 2005 and 2008, in the pools of the Natural Sciences Museum Complex Constanța.

2. SPECIES TAXONOMY

2.1. Scientific classification

Kingdom: **Animalia**
Phylum: **Chordata**
Class: **Mammalia**
Order: **Carnivora**
Suborder: **Caniformia**
Suprafamily: **Pinnipedia**
Family: **Otariidae** (Gray, 1825)
Genus: **Otaria** (Péron, 1816)
Species: **Otaria byronia** (syn. Otaria flavescens) (Shaw, 1800)

According to various determination keys used for species' assignation, Suprafamily Pinnipedia can be:

- traditionally, it is subdivided into subfamilies: **Otariinae** (sea lion) and **Arctocephalinae** (fur seal);

- according to Rice (1998) otariids are marine mammals belonging to Otariidae family. This family comprising 15 species plus two species with **binomial name**, pertain to 7 genera. They are commonly known as: **eared seals**, walking seals, **sea lions** and **fur seals**.

The name *otariid* issued from the **greek** *otarion* meaning "little ears".

1.2. Anatomy and physiognomic features

The most known sea lions are from Otaria and **Arctocephalus** genus.

For a fast recognition of genus, a very simple identification key is needful (JEFFERSON, 1993):

- the **external ears** pinnae to **Otariinae** are small and lie close to the side of head, to **Arctocephalinae** are long and proeminent;
- the muzzle – blunt although relatively short - **Otariinae**; pointed and flat to slightly upturned - **Arctocephalinae**;

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- the fur - short and stiff, except the neck of males whereon the hairs is long and erectile - **Otariinae**; thick and long with dense underfur present- **Arctocephalinae**;
- terminal flaps on hind flipper digits all approximately equal in length and shape- Arctocephalinae; hind flipper digits unequal in length, with the hallux and the 5th digit longer than digits 2 to 4 - **Otariinae**.

Size of sea lions (JEFFERSON, 1993):

- *Otaria byronia* (Shaw, 1800) – the adult males can grow over 2.6 m and weigh up to 300 kg. Adult females grow up to 1.8–2 m and weigh about half the weight of the males, around 150 kg;
- *Arctocephalus pusillus* (Schreber, **1775**): males grow up to 2.2m and weigh around 200-360 kg. Females grow up to 1.7m and weigh on average 120kg.

According to systematic classification (Jefferson, 1993), all pinnipeds are **carnivorous**.

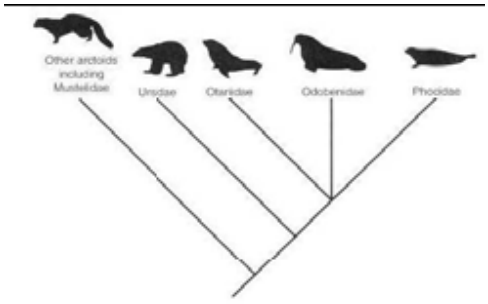
Recent molecular evidence suggests that pinnipeds evolved from a bearlike ancestor about 23 million years ago during the late Oligocene or early Miocene epochs, a transitional period between the warmer Paleogene and cooler Neogene period.

But through most of the last hundred years, there has been a debate over whether the pinnipeds (seals, sea lions and walruses) are monophyletic or paraphyletic (specifically diphyletic).

The researchers bring different arguments to each one of these theory (FLYNN J., FINARELLI, J., ZEHR, HSU, J., NEDBAL, M., 2005). For example:

▪ **Monophyletic Argument**

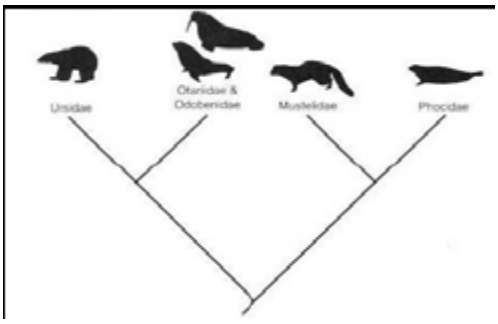
- All pinnipeds evolved from an **ursid** (bear-like) ancestor
- In particular, the **phocids** (true seals) evolved from the **otariids** (sea lions)



- **Molecular, karyological, recent morphological evidence**

▪ **Diphyletic Argument**

- The **otariids** evolved from an **ursid** ancestor
- The **phocids** evolved from a **mustelid** (weasel-like)



- **Biogeographical (phocids first in Atlantic, otariids & odobenids in Pacific),**
- **Paleontological, morphological evidence (similarities due to convergence)**

*(whitelab.biology.dal.ca/tw/**Pinniped**%20**evolution**.)*

Between Pinnipeds, the Otariidae and Odobenidae skull appear to have a specific sister relationship to the Ursidae, while the Phocidae appears to have dose affinities to the Mustelidae (Takao NOJIMA, 1990).

Fig.1. *Otaria byronia skull* (**www.skullsunlimited.com/pinnipedia.htm).**

The diet of pinnipeds, in the wild, is compound from: fish, shellfish, squid and other marine invertebrates.

Most pinnipeds are generalist feeders, but some are specialists.

For example:

- Ross Seals - *Ommatophoca rossii* (Gray, 1844) (PHOCIDAE /PINNIPEDIA/CARNIVORA), mainly feed on cephalopods, mostly squid. Additionally eat fish and krill.

- Crabeater - *Lobodon carcinophagus* (Hombron and Jacquinot, 1842) (PHOCIDAE/PINNIPEDIA/ CARNIVORA) - mainly feed on krill;

- Leopard seal - *Hydrurga leptonyx* (Blainville, 1820) (PHOCIDAE/PINNIPEDIA/CARNIVORA) – is probably the most carnivorous and predatory of all the pinnipeds, also eating penguins (King and Emperor Penguins) as well as Crabeater and Ross Seals. Sometimes attacks humans too.


(www.mclaren.gs/leopard_seal.htm)

The diet of sea lions, from which make part also *Otaria byronia* - **South American Sea Lion** and *Arctocephalus pusillus pusillus* - **Cape fur seal**, varying by location as well as seasonally and annually. Sea lion diet is composing from: African Maasbanker- *Trachurus delagoa* (Nekrasov, 1970), Pacific sardine - *Sardinops sagax* (Jenyns, 1842), Atlantic Mackerel - *Scomber scombrus* (**Linnaeus**, 1758) and sometimes they eat gastropods, cephalopods, crustaceans and algae (CIAPUTA & SICIŃSKI, 2006).

Human activities assault upon marine environment, specially the commercial fishing industry, determinate changes in food habits of sea lions. Such as the sea lions became opportunistic predatory

and broad-spectrum feeders. They are easily to find near to the shore, occasionally in estuary and near the gillnet fisheries (THOMPSON, MACKEY, BARTON, DUCK, & BUTLER, 2007; KÖNIGSON, 2007; GULLAND, 1987). There are numerous interactions between sea lions and line, trawl and purse-seine fisheries (PAPADOPOL, CURLISCA, CRISTEA, FAGADAU, 2007)

3. RESULTS AND DISCUSSION

The results regarding the diet in captive South American Sea Lion (*Otaria byronia*) are very important when new and wild exemplary arrive in Oceanarium for a short or a longer period.

Food habits of the sea lion to feed closer trawl and purse-seine fisheries with fish and offal provide from processing fish technology make the passage from one diet to another be much easier.

In European aquaria the diet of these marine mammals is more or less varied, according to administrator's skills. So, it is still representing a dilemma. So that:

IN THE WILD	**IN CAPTIVITY**
1. The diet is varied	1. Diet is reduced to two species (in our case)
- different fish species	- Atlantic mackerel - *Scomber scombrus* (Linnaeus, 1758);
	- Atlantic Herring - *Clupea harengus* (Linnaeus, 1758)
- invertebrates	
- algae	
2. The food is consuming fresh	2. The food is preserved to 18^0C;
	- The fish is distributed after defrosting in the cold water. These processes diminish the nutritional quality of fish.
	-The fresh and the flash-frozen fish can't be distributed at once to the sea lions. Is necessary to keep them on the deepfreeze to avoid disease transmission (parasite, bacteriological, etc.)
3. The feeding is not constant and equally every day. It depends from different factors like: season, physiologic condition, food abundance in the area, etc.	3. The feeding is constant (daily) in equally ration. The quantity of this rations depend by: season, physiologic condition, and effort make.

The sea lions from our institution were adapted in time to a very low food spectrum. To avoid the vitamin deficiency own to this diet, poorly in species, how lose nutrients during the freezing and defrosting process, the sea lions' fish diet is supplemented with vitamins such B Complex, Multivitamins, etc. We administrate these vitamins supplements according to veterinary indications. He establishes a schedule according to: appetite, behavior, season, physiologic condition, etc.

In the last two years, we try to improve the diet of ours sea lions introducing the refrigerate fish. In the summer we continue to administrate fresh fish from Black Sea - European flounder - (*Platichthys flesus luscus* Pallas, 1811 syn. *Pleuronectes flesus luscus* Pallas, 1811). But, we administrate the flounder in small quantity because the sea lions prefer to play with the fresh fish, maybe because this species don't make part on the usual diet in wildness.

CONCLUSIONS

Because the diet in captivity is poorly in species, the sea lions possibly could to become sensitive to a new disease, which normally they are immune, and, in these circumstances, it is desirable to find new ways to improve the sea lions diet and provide them the energy necessary to a normal metabolism and implicitly improving the immunitary system.

Is useful, even necessary, to learn the sea lions to accept in their food local fish species, with high nutritional value, comparable to the species from sea lions origin area. The advantages of these

species are: easy to obtain; can be administrate fresh; is possible to avoid the vitamin deficiency.

Further research is required to better understand the sea lions etology in captivity.

The aim of this research is obtained a general principle necessary to use like base in the diet of captive sea lions in European Aquaria.

Thereby we are able to provide the physiological requirements for the animals to evolve similar as good in captivity as well as in wildness and not to survive in captivity.

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