

INCREASING THE SURVIVAL RATE FOR MEDITERRANEAN MONK SEAL PUPS UNDER TREATMENT



*TECHNICAL WORKSHOP
ORGANIZED BY*



**MOM/ HELLENIC SOCIETY FOR THE STUDY AND
PROTECTION OF THE MONK SEAL**

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MEETING AGENDA

09:00- 09:20 Welcome. Introduction of the participants

09:20 - 09:30 Scope of the meeting by MOM

09:30-10:00 "History of monk seal rehabilitation in Greece. Facilities, cases treated, problems, results" by Jeny Androukaki

10:00 - 10:30 "Rehabilitation of stranded phocid seals in northern California" by Marty Haulena

10:30 - 11:00 "Rehabilitation of Hawaiian monk seals. Nutritional support of undersized weaners" by Bob Brown

11:00 - 11:30 "Successful Rehabilitation of a Mediterranean monk seal in Mauritania" by Danny Morick

11:30 - 12:00 Coffee break

12:00-12:30 "Case studies of monk seal pups treated in the Monk Seal Rehabilitation Center in Alonissos" by Natassa Komnenou

12:30-13:00 "Feeding regime in Mediterranean monk seal pups in the center: Problems, development, and current standard feeding program" by Jeny Androukaki

13:00- 14:00 Lunch Break

14:00 - 16:00 Round table. Discussion of current practices and recommendations on:

- a. Food: content (substitutes, fish species), quantities, schedule
- b. Food additives to:
 - Increase caloric content
 - Improve digestibility
- c. Treatment of digestive problems

16:00- 16:30 Coffee Break

16:30 - 17:30 Round table "Best practices for the effective rehabilitation of monk seals: facilities, treatment, stress, release"

17:30- 18:00 Conclusions

MINUTES OF THE MEETING

INTRODUCTION

The workshop was opened by Dr. Spyros Kotomatas, MOM's Scientific Coordinator, who welcomed the participants and introduced them (see list of participants).

SCOPE OF THE MEETING

Mrs Jeny Androukaki, Coordinator of MOM's Rehabilitation Program explained that the meeting's scope is to collect external seal rehabilitation expertise, from scientists dealing with Mediterranean monk seals, *Monachus monachus*, or relative species (Hawaiian monk seal, *Monachus schauislandii*, Northern Elephant Seals, *Mirunga leonina*), in order to discuss and consult MOM on increasing the survival probabilities of orphan monk seal pups. More specifically, the key issue to be discussed is how to improve the currently used feeding protocols, along with the existing veterinary treatment procedures and to identify other issues that may play a significant role in the early survival of orphan monk seal pups.

PRESENTATIONS

The following presentations were given by the participants so as to provide background information useful in the round tables that were scheduled to take place later in the workshop (see Annex I. for PDFs presentations).

- The first presentation entitled "History of monk seal rehabilitation in Greece. Facilities, cases treated, problems, results" was given by Mrs Jeny Androukaki and provided an overview of the rehabilitation efforts in Greece, for the past 16 years, describing also briefly the cases encountered.
- The second presentation entitled "Rehabilitation of stranded phocid seals in northern California" was given by Dr. Marty Haulena and described the rehabilitation efforts and practices of The Marine Mammal Center in California, dealing with various pinniped species and especially with Northern Elephant seals.
- The third presentation entitled "Rehabilitation of Hawaiian monk seals. Nutritional support of undersized weaners" was given by Dr. Bob Brown and focused on rehabilitation efforts on Hawaiian monk seals, the closest surviving species to the Mediterranean monk seal.

- The fourth presentation entitled "Successful Rehabilitation of a Mediterranean monk seal in Mauritania" was given by Dr. Danny Morick and described the case study of a Monk seal pup rehabilitated in Mauritania, with the collaboration of SRRC and CNORP.
- The fifth presentation entitled "Case studies of monk seal pups treated in the Monk Seal Rehabilitation Center in Alonissos" was made by Dr. Natassa Komnenou and presented four characteristic cases of monk seal pups treated in the Monk Seal Rehabilitation Center in Alonissos, describing the overall problems in such patients and their treatment.
- The last presentation entitled "Feeding regime in Mediterranean monk seal pups in the center: Problems, development, and current standard feeding program" was given by Mrs Jeny Androukaki and introduced the participants on the issues of the round tables that followed.

ROUND TABLES

ROUND TABLE A. DISCUSSION OF CURRENT PRACTICES AND RECOMMENDATIONS ON FOOD, FOOD ADDITIVES AND TREATMENT OF DIGESTIVE PROBLEMS

Dr. Ian Robinson, who chaired the round table, opened the discussion requesting from all participants to identify key parameters and address all relevant issues that can be added to the current protocols and Standard Operation Procedures of the Monk seal rehabilitation. All participants agreed that considering the highly endangered status of the species, the lack of knowledge in a number of key issues in the developmental biology of the species and the various logistical difficulties in such programs, the rehabilitation program for monk seal pups in Greece has been a considerable success. This is further supported by the successful rate of animals released healthy in their natural environment. During the discussion, the following issues were addressed as they were considered to play a significant role in the rehabilitation process:

- Pup factors
- Diet factors
- Facility factors
- Research topics
- Practical steps to be taken

The key recommendations discussed on each topic are summarized as follows:

Pup factors (factors related to status of stranded pups)

- **Health status of the animals.** **Pathogens, deficiencies and immune status** are the most important issues. Especially for **pathogens, parasites** seem to play an important role in underweighted monk seal pups, probably transmitted transplacental or transmammary. Upon identification of the parasite causing the problem, specific treatment is necessary. For **viruses**, vaccination against Morbillivirus is essential after stabilization of the animal's condition. Hygienic procedures are a measure for reducing the risk of virus contamination of the seal patients. However, in case animals sicken from viruses, only symptomatic treatment is possible. **Bacteria** can be confronted with antibiotics. Sensitivity tests are important, but they are time consuming and when the veterinarian considers it necessary may use a wide range antibiotic, prior to the results of the sensitivity test, to fight the pathogen; in enteritis cases (usually observed in monk seal pups) the presence of clostridia and campylobacter should be investigated. There is a question whether antibiotics should be used prophylactically and the rehabilitation team should be aware of the probable toxicity of the antibiotics, or the probable creation of resistant bacteria.
- **Body condition of the animals.** **Starvation** might be a non-reversal situation in some cases, and this should be evaluated at the time of finding an animal; however, since this may not be possible to precisely assess, the rescue effort should continue. **Blubber thickness** in the beginning and in the treatment process is a useful parameter to know. Since it can be measured by ultrasound techniques, it should be examined whether this measurement is possible and cost-effective to use. Sea Mammal Research Unit (SMRU), specialized in this measurement should be consulted on the matter. **Gastrointestinal changes** should be examined through fecal sampling/ wet mounts, in order to investigate the response to treatment and the digestibility of the food. External experts can transmit digital imaging of the samples microscopy electronically for examination and assessment. Energetics of the first months of development should also be researched in collaboration with experts on the issue. SMRU, Texas A& M University have active research program on this issue and could be contacted.
- **Crunch time.** The rehabilitation team should be aware of this parameter, since in many cases pups seem to improve on the first days (although they gain no weight), while they collapse at the end of the first week, when they start to use the provided food for their metabolism. It should be examined if elemental IV diets are possible to be used initially in order to

pass gradually to real food, after a long period of starvation. In any case, gradual introduction of food with adequate amount of fluids is suggested.

- **Physiology.** Physiology of monk seal pups at lactation and weaning is practically unknown in the wild. It is important to know the possible changes in GI tract, what happens in the natural period of weight loss after weaning and what is the immune status of the seals at that age. Considering the lack of data on this species, comparisons with other species may prove useful.
- **Individual variation.** Individual variation of each animal and of its response to treatment is frequently observed in this species and other pinnipeds; therefore, the feeding protocol and treatment should be altered, if necessary. Especially at the time when animals switch to self-feeding, they behave variably and this might need different methodology to stimulate them accordingly.

Diet factors

- **Calorific content.** This issue is extremely important for the weight increase of the animals. Apart from the provision of adequate fat, one should be concerned with the overall nutritional value of the food, including proteins. The nutritional value of the initial fish-soup can be increased by rehydration salts, which should be gradually cut down, while oatmeal extract in some species has been proved useful in the nutrition of the animals, in early stage. Digestibility of the food is also important in order for the animal to receive the maximum calories of the food content, while high fat concentrations might be difficult to digest. It should be stressed that at this stage changes in the pup's diet should be slow.
- **Additives.** Vitamins and mineral supplements should be used with caution on the real needs of the animals (in terms of food variation and developmental stage).
- **Main constituents of the food.** Artificial substitutes may cause serious digestive problems, while they require good storage facilities to keep them fresh. Fish is recommended as food, but one should be extremely careful to remove bones and scales, since they might cause problems in the hindgut. In addition, there are calorific changes with season and species. Good quality fish oil is recommended for increasing calories in food (sardine, salmon, herring oil). It can be stored frozen for 2 years, while air should be kept out of the storing vials. Emulsifiers (e.g. lecithin) might make food to pass more easily through the tract and make it more

digestible. In cases with serious problems of indigestion, pancreatic enzymes may assist.

Facility Factors

- Animals should be given a **choice** in the facility to select the proper environment for them in terms of temperature, humidity, light and place to be (pool or platform). **Exercise** helps **digestibility**, however, it should be used carefully with weak animals, preferably in warm environment/water. **Humanization** should be avoided and “false mothers” could be used as alternative in the early stages. **Fully diagnostic facilities** are essential for the quick diagnosis of the digestive problem, however their cost is considerable.

Research topics

- The existing protocol for **sampling** during the rehabilitation period should be continued, and **fecal samples** from wild animals should be included, as well. The sample bank should be well organized and easily accessible.
- **Metabolic issues, physiology, seroepidemiology** of pathogens (parasites, viruses, bacteria) are important research topics for the development of the rehabilitation program.
- In terms of **parasites: sarcocysts, toxoplasma, giardia and coccidia** should be further investigated since they play an important role in marine mammals' health and they are usually connected with GI problems as well.

Practical steps

After the above recommendations the participants advised MOM to proceed with the following practical steps:

- A **matrix of success versus failure** should be carried out, taking into account the reasons why the animals died in the centre. **Pathology, in conjunction with clinical signs and progress**, is essential for this evaluation, while age and location of pup finding should also be issues of consideration.
- Involve an **expert in metabolic processes** to investigate the metabolic changes, including also data from previous cases.

- **Feecal analysis** for diagnostic purposes should be included in the routine and non-routine health examinations, while clotting time relative to anaemia is also essential to know for each pup.
- **Fish oil** should be added in the seal pup feeding protocol.

ROUND TABLE B: BEST PRACTICES FOR THE EFFECTIVE REHABILITATION OF MONK SEALS

Dr. A.D.M.E. Osterhaus, who chaired the round table, opened the discussion requesting from all participants to identify key parameters and address all relevant issues that can be added to the current Standard Operation Procedures of the Monk seal rehabilitation. All participants agreed that MOM, taking into account the recommendations of the participants, should continue developing the effective Monk seal rehabilitation program. During the discussion, the following issues were addressed as they were considered to play a significant role in the rehabilitation process:

- Quality assurance system
- Facilities
- Veterinary treatment
- Stress
- Release
- Research priorities

Quality assurance system

- **Standard Operation Procedures** are important for the effective operation of a seal centre, however, it requires flexibility since it is important to allow treating animals as individuals.
- **Accreditation** In Greece, the Ministry of Agriculture issues the legal authorization for the operation of a rehabilitation centre. However, in addition to this, ISO or other external quality assurance systems are useful in standardizing and ensuring effective operation and international accreditation of the Greek Monk Seal Rehabilitation Centre.
- **Internal and external review of the Standard Operation procedures (SOP)** has to be performed regularly. In view of the above, the recently elaborated contingency plan for mass mortality events in the E. Mediterranean drafted by MOM and the Turkish team SAD/AFAG will be distributed for review to external expert bodies and individual scientists.

Facilities

The following recommendations have to be taken into account in the designing and construction of the **new facilities** planned by MOM:

- **Housing:** Animals should be allowed to choose their optimal environment, not exceeding though the limits necessary for their condition: e.g. keeping them in warm temperature, when they exhibit Herpes symptoms; keeping swimming time short when they run out of energy, etc. Within the centre quarantine, an outdoor pool and transport facilities are recommended, while air and water quality and waste disposal systems should be installed so as to ensure public and animals' health. Nursing staff intervention should be limited at the absolutely necessary actions, when observing, catching and handling the seals, while visitors should have minimum access to patients (one way glass is a good idea for closed pools).
- **Stress factors** should be minimized at possible when handling/restraining animals.
- There should be enough room in the centre for **easy access for the staff to restrain the animal for veterinary care**
- Finally, the Monk seal rehabilitation facility should be **managed and controlled by MOM**, the only experienced and accredited body in Greece, without managerial interventions by other governmental or private agencies since this will secure its effective operation.

Veterinary treatment

- **Diagnostics and veterinary care** can be further advanced by collaboration with external experts. Accessibility can be achieved with the use of Internet.
- **Pathology**, already being a routine for animals dying in the centre, this should be performed by a specialized pathologist based on a pre-existing agreement between MOM and the relative external institute. The collection of duplicate samples for histopathology is recommended; it needs previous agreement between the pathologists involved.
- **Regular reporting** of the data of the treated cases is necessary. The current database should be upgraded and updated to include all data relative to symptoms, veterinary examinations and applied therapy. Data should be transparent to collaborators, while the ownership of the data remains with MOM.
- **A good communication system** is necessary between the centre staff that are on site, where the animal is found and the veterinarian and/or

the centre manager or external consultants, who might be off site, to allow for timely decisions relative to the intervention or non-intervention, the transport of the animal to the centre. The system should be designed so as to allow the transfer of all relative information to appraise the animal's condition, including diagnostics.

Stress

- **Inside the facilities** there should be caution to avoid unusual sounds (pumps, human talks or other sounds) that might disturb the patients, while natural sounds (sea, other seals) might help animals to feel comfortable.
- **At treatment regimes** the staff should balance cost and benefit; sometimes, stressful procedures are necessary for diagnosis and treatment, while at other times they could be avoided.
- **Human contact** should be in general avoided and replaced in young animals by appropriate objects. **Humanization** can cause severe behavioural problems, affecting the release success and should be avoided.

Release

- There is a **dilemma** between a **"quiet" release**, which is beneficial for each animal, and **publicity**, which raises awareness and may promote funding important for the centre's operation. A small ceremony, without disturbing the animal, for invited people followed by a quiet release of the animal, might be the appropriate solution.
- There is also a question between **hard and soft release** (not commonly practiced internationally). However, at present there is no evidence that hard releases, that have been applied on this and other species hinder the successful reintroduction of the animals. Staying in an intermediate pen may improve physical fitness before the actual release, while hunting fish can be learnt also in the wild.
- The **collection of information** after release through **post release monitoring** is indispensable, to assess whether the animal survives and contributes to the wild population. This can be achieved by satellite tracking, which gives additional data useful to evaluate its gradual adaptation to the wild and by conventional methods (e.g. paint spots, flipper tags etc.) which either provide sightings from the public or information on the animal's death. In such cases a full necropsy is necessary to determine the cause of death.

Research priorities

- **Data and sample collection** should be considered a priority in all phases of the rehabilitation program.
- **The banking of samples collected** should be considered a priority. The scientific community should have access on samples for research purposes under MOM's supervision and based on formal collaborative agreements.
- **Blood values** should be compared with normal values (taken from animals pre-release and have as point of reference the Hawaiian monk seal blood values). However, the team should be cautious since weaners' values differ from pre-weaned animals. In addition, the particular conditions of collection and the differences in values due to labs' variation should be taken into account.
- **Physiological values, biometrics and nutrition** should be considered as research priorities for the effective operation of the rehabilitation program (see also previous round table)
- **Introduction of pathogens into the wild** should be avoided by screening animals prior to release. Screening of animals on admission can provide information on the pathogens they carry from the wild.
- **Clinical research** is also necessary to evaluate the outcome of treatment.
- **Post release data** provide evidence on the benefit of contributing to the population with the individuals released and also on the potential danger posed by the released animals to the wild population (which can be limited by pre-release screening).
- **Genetics** should be investigated in this species mainly for genetic diversity and comparative studies with other populations or species.

CONCLUSIONS

Dr. Osterhaus in summarizing the results of the meeting concluded that this has been a successful meeting since it provided all participants with the opportunity to assess the current practices of the Rehabilitation program for the Mediterranean monk seal in Greece and to contribute with concrete recommendations on how to improve the already successful work of the monk seal rehabilitation centre.

Building on its success and utilizing the above recommendations, funds allowing, MOM's monk seal rehabilitation program in Greece can further improve its effectiveness and thus contribute to the efforts for the conservation of the largest population of the critically endangered *Monachus monachus*.

In closing the meeting, on behalf of MOM, Mrs Androukaki, coordinator of the Monk seal rehabilitation centre, thanked all participants for their enthusiastic contribution to the meeting and added that this is only the beginning of a fruitful collaboration between MOM and the organizations involved.

PARTICIPANTS

Jeny Androukaki, biologist
Monk Seal Rehabilitation Center Coordinator
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: e.androukaki@mom.gr

Robert Braun, DVM MS,
47-928 Kamakoi Rd, Kaneohe,
Hawaii 96744
Tel. 808.239.0440
Fax. 808.239.0770
e-mail: rbraun@synack.net

Charles Alison, veterinary assistant/Manager
RSPCA East Winch Wildlife Centre
Station Road, Eats Winch,
Norfolk, PE32 1NR
Tel. 08709061420
Fax. 08707539450
e-mail: eastwinch@rspca.org.uk

Chatzisprou Ada, marine biologist MS,
Monk Seal Rehabilitation Assistant
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: a.chatzisprou@mom.gr

Daijkema Richard, veterinary assistant,
Seal Rehabilitation and Research Centre
Hoofdstraat 94a, 9968 AG
Pieterburen, The Netherlands
Tel. 0595.526.526
Fax. 0595.528.389
e-mail: richard@zeehondencreche.nl

Natassa Komnenou, DVM PhD,
Monk Seal Rehabilitation Center Veterinarian
Veterinary Faculty of Thessaloniki
St,Voutyra 11, 54627 Thessaloniki, Greece
Tel. +30.2310.994.443
Fax. +30.2310.994.400
e-mail: natakomn@vet.auth.gr

Spyros Kotomatas, biologist PhD
Scientific Coordinator
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece,
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: s.kotomatas@mom.gr

Morick Danny, DVM,
Seal Rehabilitation and Research Centre
Hoofdstraat 94a, 9968 AG
Pieterburen, The Netherlands
Tel. 0595.526.526
Fax. 0595.528.389

Osterhaus A.D.M.E., DVM PhD, Prof.
Erasmus University Rotterdam
Head Department of Virology
Dr. Molewaterplein 50, P.O.Box 1738
3000 DR Rotterdam
The Netherlands
Tel. +31.10.408.8066
Fax. +31.10.408.9485
e-mail: a.osterhaus@erasmusmc.nl

Robinson Ian, DVM,
International Fund for Animal Welfare
Emergency Relief Manager
Wildlife Rescue Rehabilitation & Sanctuaries
Division
87-90 Albert Embankment
London, SE1 7UD
Tel. +44.020.7587.6762
Fax. +44.020.7587.6718
e-mail: irobinson@ifaw.org

Dendrinos Panos, biologist,
Field Research Coordinator
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece,
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: p.dendrinos@mom.gr

Haulena Marty, DVM, TMMC
The Marine Mammal Center
1065 Fort Cronkhite
Sausalito, CA 94970
California, USA
Tel. + 415.289.7370
Fax. + 415.289.7376
e-mail: haulenam@tmmc.org

Smith Dawn, veterinary assistant,
International Fund for Animal Welfare
87-90 Albert Embankment
London, SE1 7UD
Tel. +44.020.7587.6762
Fax. +44.020.7587.6718
e-mail: dmsvn@aol.com

Tounta Eleni, biologist
NMPANS Management Activities Coordinator
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece,
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: e.tounta@mom.gr

OBSERVERS

Adamantopoulou Stella, biologist
Kimolos/Karpathos Conservation Activities
Coordinator
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece,
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: s.adamantopoulou@mom.gr

Karamanlides Alexandros, biologist MS,
Field Researcher
MOM/Hellenic Society for the Study and
Protection of the Monk Seal
18, Solomou str. 106 82 Athens, Greece,
Tel. +30.210.5222888
Fax. +30.210.5222450
e-mail: alkar@bio.auth.gr

Eleni Dotzika, MD
Pasteur Institute
V.Sofias Ave. 127,
115 26 Athens Greece

Vrassidas Zavras, environmental consultant Piraeus
Bank
Amalias Ave. 20 & Souri 5
10557 Athens Greece
Tel. +30.210.3335760 (direct line)
Fax. +30.210.3220097 (shared line)
e-mail: v.zavras@piraeusbank.gr

Anja Husack, Policy Advisor,
Seal Rehabilitation and Research Centre
Hoofdstraat 94a, 9968 AG
Pieterburen, The Netherlands
Tel. 0595.526.526
Fax. 0595.528.389
e-mail: anja@zeehondencreche.nl

The meeting was hosted by Divani Acropolis Palace Hotel, Parthenonos 19-25

Annex I: The presentations of the participants

Annex II: Mind Manager Charts of the round tables keynotes