

The Elasmobranch Husbandry Manual: Captive Care of Sharks, Rays and their Relatives

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Chapter 36

Record-keeping for Elasmobranch Exhibits

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Abstract. Record keeping is critical to providing state of the art aquatic animal care. Aquarium management depends on accurate and up-to-date information about animal collections. Recorded data is used by aquarists for husbandry programs and research projects, while administrative staff use data to fulfill reporting requirements for legal documentation and permits. Management of elasmobranchs will improve more rapidly, if data can be shared efficiently between institutions; sample record-keeping templates have been provided accordingly.

Standardized, comprehensive, and accurate record-keeping is important for all animal care facilities. The maintenance of records is crucial for basic animal management and welfare; compliance with regulatory agencies; and to achievement of basic conservation, research, and education goals. Sharing data will improve husbandry practices, increase breeding success, and support conservation initiatives. The objective of this chapter is to outline the basic record-keeping requirements of an aquarium that maintains elasmobranchs.

REGISTRATION

Registration refers to the process of assigning a unique registration number to an animal upon its acquisition and incorporation into a collection.

Individual registration

It is recommended that each individual elasmobranch be registered. The most extensive record-keeping can be done with individually recognizable animals (refer to Chapter 9 of this manual). Data that should be recorded when an animal is initially acquired and registered has been outlined in Table 36.1.

Group registration

When individual identification is not possible, registration may be made for a group which may be identified by a number of different parameters (e.g., sex, species, exhibit or life support system (LSS), age class, etc.). The collection management procedures at the aquarium will

determine what defines an appropriate group. Group registration should include the information outlined in Table 36.1, for individually registered animals, plus group composition (i.e., sex ratio, age class ratio or total number in group).

1. Medical treatments
2. Histological analyses
3. Parasitological analyses
4. Anesthesia
5. Postmortems or Necropsies
6. Nutritional assays
7. Animal training
8. Scientific research

RECORDS

Routine (daily and weekly)

Hard-copy daily records should be filed systematically to facilitate retrieval. An example daily record form is presented in Appendix 36.1. All staff should use standardized terminology when reporting observations to facilitate analysis and historical interpretation. The data for water quality and LSS may be recorded on a weekly or monthly record form (Appendix 36.2). The number and type of water quality and LSS parameters are dependent on the aquarium management system.

Sample record forms for medical treatments and postmortems are given in Appendix 36.3 and Appendix 36.4, respectively.

COMPUTERIZATION

Computerized record-keeping is preferred as it facilitates data storage and analysis. Many zoos and aquariums use their own database or spreadsheet program in order to meet their unique requirements.

Non-routine

In addition to routine record-keeping practices, there are many events that may require further data collection, for example:

Individual animal record-keeping

One animal registration program, available for use with animals that are individually identifiable, is the Animal Records Keeping System (ARKS)

Table 36.1. Data to record when an individually identifiable animal is initially acquired

Data fields or item	Description of data to record
Registration number	Unique number assigned to individual or group
Taxonomic Classification	Class, family, genus, species, subspecies
Gender (m / f / u)	
Date of birth	
Location of birth	
Lineage	Sire, Dam, and their respective institutions.
Identifiers	Tags, transponders, physical markings, etc.
Acquisition date	
Acquisition source	Wild caught, captive born, etc.
Acquisition type	Purchase, donation, loan, birth, etc.
Terms of agreement	
Collection type	
Shipping information	
Permits	Federal, local, transport, CITES, etc.

(Flesness and Mace, 1988). ARKS is supported by the International Species Inventory System (ISIS). Founded in 1974, ISIS is an international non-profit organization serving 550 zoological institutions members from 54 countries. ISIS ([www1](#)) serves as a central repository for animal data which is annually pooled together and distributed to members (Flesness, 2001). The newest version of ARKS (v 4.0) is Windows-based and has some group registration possibilities, though extensive data analyses on a population level are not possible. A large portion of required fish taxonomy is included in the taxonomic list provided with ARKS.

ISIS provides an application, SPARKS, for maintaining single-species studbooks, that may be used for demographic and genetic analyses (Flesness and Mace, 1988). MedARKS, another ISIS product, is a medical record-keeping system that makes use of the ARKS inventory. MedARKS can be used to record clinical notes, lab results, anesthesia, parasitology, and fecal records (Flesness and Mace, 1988).

Group animal record-keeping

Although groups of animals can be registered in the ARKS database, this application is limited in tracking dynamics within and between groups. Computerized Registration for Captive Invertebrates (CERCI), developed by the London Zoological Society (London, UK), is a computerized record-keeping system designed specifically for grouped species such as invertebrates, fishes, and amphibians. CERCI provides analysis of demographic and genetic data (Burlingham-Johnson et al., 1994). The latest version is called Ectolink (Anon., 2000).

There is currently an effort underway to develop a new global animal database system that can handle both groups and individuals, as well as integrate data from medical, inventory, behavioral, nutritional, and other animal husbandry management information. The International Animal Data Information Systems Committee (IADISC) is spearheading this effort, known as the Zoological Information Management System (ZIMS). The goals of this initiative include the development of standards for animal data management, and the creation of an integrated and computerized animal management system ([www2](#)).

CONCLUSION

In conclusion, each facility must decide which method of record-keeping works best for the resources they have available. Standardized records would provide consistency among facilities during data collection and allow a more effective and meaningful exchange of information. Captive animal management for elasmobranchs would progress more rapidly if data can be shared and used in a timely and efficient manner.

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- Flesness, N. R. and G. M. Mace. 1988. Population databases and zoological conservation. *International Zoo Yearbook* 27: 42-49.
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INTERNET RESOURCES

- [www1](#) www.isis.org
- [www2](#) <http://www.zims.org>

Appendix 36.1: Daily data record sheet for an elasmobranch exhibit

Daily animal record						
Aquarium number					Date	
Aquarium name						
Temperature						
Collection						
Species	Reg. number	In	Out	Transfer	Mortality	Medical treatment
Food						
Species / specimen	Food (type 1)	Amount	Food (type 2)	Amount	Supplementation	
Behavior and Health						
Species / specimen	OK	Specification				
	<input type="checkbox"/>					
	<input type="checkbox"/>					
	<input type="checkbox"/>					
	<input type="checkbox"/>					
	<input type="checkbox"/>					
	<input type="checkbox"/>					
Remarks						
Refer record number(s):						

Appendix 36.2: Weekly data record sheet for water quality and LSS

Weekly water quality and LSS records								
Aquarium number							Week starting	
Aquarium name								
Water Quality								
	Units	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temperature	°C							
Salinity	‰							
pH								
Dissolved oxygen	%							
NH ₄ ⁺ (ammonia)	mg l ⁻¹							
NO ₂ ⁻ (nitrites)	mg l ⁻¹							
NO ₃ ⁻ (nitrates)	mg l ⁻¹							
PO ₄ ⁻ (phosphates)	mg l ⁻¹							
ORP (oxidative redox potential)	mV							
TRO (total residual oxidants)	mg l ⁻¹							
Heavy metals (optional)	µg l ⁻¹							
LSS (life support system)								
	Units	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Seawater out	m ³							
Seawater in	m ³							
Demi-water in	m ³							
Sand filter	#							
Backwash	y / n							
Pressure	kPa							
Ozone	mg l ⁻¹							
UV								
Surface skimmer								
Protein skimmer								
Salt Addition	kg							
Remarks								

Appendix 36.3: Data record sheet for medical treatment

Medical treatment report						
Report number		Species				
Name of aquarist		Reg. number				
Aquarium number		Gender				
Aquarium name						
Problem description						
Disease name						
Medical treatment						
Treatment number	Date	Medication	Dose (mg kg ⁻¹)	Conc. (mg l ⁻¹)	Method	Duration
Results						
Date	Observations					
Remarks (LSS changes, recent introductions, husbandry observations, etc.)						
Post-mortem report number						

Appendix 36.4: Data record sheet for post-mortem

Post mortem - I			
Specimen data			
Date		Common name	
Report number		Species name	
Necropsied by		Registration #	
Aquarium name		ISIS / ZIMS #	
Aquarium #		PIT #	
Origin aquarium #		Gender	
Time found		Total length (cm)	
Time since death		Weight (kg)	
Sent for histopathology?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Entered in Database?		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Preliminary observations			
Water quality parameters		<input type="checkbox"/> Observed	<input type="checkbox"/> Not observed
<input type="checkbox"/> Cloudy	<input type="checkbox"/> Discolored	<input type="checkbox"/> Foul	<input type="checkbox"/> Surface scum
<input type="checkbox"/> Temp.	<input type="checkbox"/> pH	<input type="checkbox"/> Salinity	<input type="checkbox"/> Oxygen
<input type="checkbox"/> Ammonia	<input type="checkbox"/> Nitrites	<input type="checkbox"/> Copper	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LSS parameters		<input type="checkbox"/> Observed	<input type="checkbox"/> Not observed
<input type="checkbox"/> Normal	<input type="checkbox"/> Air supply off	<input type="checkbox"/> Water off	<input type="checkbox"/> Electrical failure
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
History		<input type="checkbox"/> Observed	<input type="checkbox"/> Not observed
<input type="checkbox"/> Scratching	<input type="checkbox"/> Rubbing	<input type="checkbox"/> At surface	<input type="checkbox"/> On bottom
<input type="checkbox"/> Erratic swimming	<input type="checkbox"/> Fighting	<input type="checkbox"/> Rapid ventilation	<input type="checkbox"/> Jumped out
<input type="checkbox"/> Injured	<input type="checkbox"/> Predation	<input type="checkbox"/> Not eating	<input type="checkbox"/> New arrival
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment history			
Samples taken			
Pictures		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Blood		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Biopsies		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Swab cultures		<input type="checkbox"/> Yes	<input type="checkbox"/> No
		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Digital photo:		File name:	

Post mortem - II			
Preliminary laboratory examination			
Body surface		<input type="checkbox"/> Normal	<input type="checkbox"/> Swelling
<input type="checkbox"/> Growths	<input type="checkbox"/> HLLLE	<input type="checkbox"/> Open lesions	<input type="checkbox"/> Necrotic areas
<input type="checkbox"/> Cysts	<input type="checkbox"/> Nodules	<input type="checkbox"/> Spots	<input type="checkbox"/> Exopthalmos
<input type="checkbox"/> Cloudy skin	<input type="checkbox"/> Cloudy eyes	<input type="checkbox"/> Fungus	<input type="checkbox"/> Parasites
<input type="checkbox"/> Discoloration	<input type="checkbox"/> Hemorrhage	<input type="checkbox"/> Decomposed	<input type="checkbox"/> Scarred
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gills - general			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Hemorrhagic
<input type="checkbox"/> Cysts	<input type="checkbox"/> Parasites	<input type="checkbox"/> Mucus	<input type="checkbox"/> Flared
<input type="checkbox"/> Decomposed	<input type="checkbox"/> Scarred	<input type="checkbox"/>	<input type="checkbox"/>
Gills - filaments			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Swollen
<input type="checkbox"/> Fused	<input type="checkbox"/> Clubbed	<input type="checkbox"/> Cottony tufts	<input type="checkbox"/>
Gills - coloration			
		<input type="checkbox"/> Deep red	<input type="checkbox"/> Pale red
<input type="checkbox"/> Pale pink	<input type="checkbox"/> White	<input type="checkbox"/> Brown	<input type="checkbox"/>
Fins			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Opaque
<input type="checkbox"/> Frayed	<input type="checkbox"/> Parasites	<input type="checkbox"/> Hemorrhagic	<input type="checkbox"/> Decomposed
<input type="checkbox"/> White spots	<input type="checkbox"/> Black spots	<input type="checkbox"/> Eroded	<input type="checkbox"/>
Body cavity			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Ascites
<input type="checkbox"/> Spots	<input type="checkbox"/> Fatty infiltration	<input type="checkbox"/> Cysts	<input type="checkbox"/> Tumor
<input type="checkbox"/> Worms	<input type="checkbox"/> Hemorrhagic	<input type="checkbox"/> Edema	<input type="checkbox"/>
Liver			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Spots	<input type="checkbox"/> Inflammation	<input type="checkbox"/> Parasites	<input type="checkbox"/> Cysts
<input type="checkbox"/> Fatty	<input type="checkbox"/> Friable	<input type="checkbox"/> Hemorrhagic	<input type="checkbox"/> Decomposed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Color:		Consistency:	
Gall bladder			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Green-yellow	<input type="checkbox"/> Black	<input type="checkbox"/> Clear	<input type="checkbox"/> Enlarged
<input type="checkbox"/> Ruptures	<input type="checkbox"/> Decomposed	<input type="checkbox"/>	<input type="checkbox"/>
Spleen			
		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Spots	<input type="checkbox"/> Swollen	<input type="checkbox"/> Cysts	<input type="checkbox"/> Parasites
<input type="checkbox"/> Shriveled	<input type="checkbox"/> Decomposed	<input type="checkbox"/>	<input type="checkbox"/>

Post mortem - III			
Preliminary laboratory examination			
Stomach		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Fused	<input type="checkbox"/> Swollen	<input type="checkbox"/> Cysts	<input type="checkbox"/> Parasites
<input type="checkbox"/> Mucus	<input type="checkbox"/> Decomposed	<input type="checkbox"/>	<input type="checkbox"/>
Intestine		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Empty	<input type="checkbox"/> Filled with food	<input type="checkbox"/> Filled with mucus	<input type="checkbox"/> Hemorrhagic
<input type="checkbox"/> Nematodes	<input type="checkbox"/> Trematodes	<input type="checkbox"/> Edema	<input type="checkbox"/> Decomposed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cloaca		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Bloody	<input type="checkbox"/> Swollen	<input type="checkbox"/>	<input type="checkbox"/>
Pancreas		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Spots	<input type="checkbox"/> Swollen	<input type="checkbox"/> Cysts	<input type="checkbox"/> Shriveled
<input type="checkbox"/> Decomposed	<input type="checkbox"/> Parasites	<input type="checkbox"/>	<input type="checkbox"/>
Color:		Consistency:	
Kidney		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Pinpoint spots	<input type="checkbox"/> Swollen	<input type="checkbox"/> Large	<input type="checkbox"/> Small
<input type="checkbox"/> Pustules	<input type="checkbox"/> White	<input type="checkbox"/> Gray	<input type="checkbox"/> Decomposed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thyroid		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Spots	<input type="checkbox"/> Swollen	<input type="checkbox"/> Cysts	<input type="checkbox"/> Parasites
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gonads		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Male	<input type="checkbox"/> Female	<input type="checkbox"/> Egg-bound	<input type="checkbox"/> Swollen
<input type="checkbox"/> Mucus	<input type="checkbox"/> Decomposed	<input type="checkbox"/>	<input type="checkbox"/>
Central Nervous System		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/> Swollen	<input type="checkbox"/> Cysts	<input type="checkbox"/> Parasites	<input type="checkbox"/> Edema
<input type="checkbox"/> Hemorrhagic	<input type="checkbox"/> Decomposed	<input type="checkbox"/>	<input type="checkbox"/>
Other		<input type="checkbox"/> Normal	<input type="checkbox"/> Not observed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Post mortem - IV			
Histopathological tissues collected			
<input type="checkbox"/> Skin	<input type="checkbox"/> Fin	<input type="checkbox"/> Gills	<input type="checkbox"/> Brain
<input type="checkbox"/> Heart	<input type="checkbox"/> Spleen	<input type="checkbox"/> Liver	<input type="checkbox"/> Stomach
<input type="checkbox"/> Intestine	<input type="checkbox"/> Kidneys	<input type="checkbox"/> Spiral valve	<input type="checkbox"/> Rectal gland
<input type="checkbox"/> Eyes	<input type="checkbox"/> Esophagus	<input type="checkbox"/> Cartilage	<input type="checkbox"/> Nares
<input type="checkbox"/> Gall bladder	<input type="checkbox"/> Pancreas	<input type="checkbox"/> Muscle	<input type="checkbox"/> Lateral line
<input type="checkbox"/> Mouth	<input type="checkbox"/> Gonad	<input type="checkbox"/>	<input type="checkbox"/>
Laboratory		Date sent	
Contact		Date returned	
Bacterial and Fungal cultures collected - tests requested			
<input type="checkbox"/> Kidneys	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Liver	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Spleen	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Stomach	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Intestine	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Brain	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Blood	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/> Gonad	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/>	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
<input type="checkbox"/>	<input type="checkbox"/> Aerobe	<input type="checkbox"/> Anaer.	<input type="checkbox"/> Fungi
Laboratory		Date sent	
Contact		Date returned	
Parasitological examination			
Parasite location		Parasite ID	
Parasite location		Parasite ID	
Parasite location		Parasite ID	
Parasite location		Parasite ID	
Conclusions (inc. probable cause of mortality) and Remarks			