

Two South American palaeontological collections in the Natural History Museum of Denmark

Deux collections paléontologiques d'Amérique du Sud au Musée d'histoire naturelle du Danemark

KASPER LYKKE HANSEN*

*Kasper Lykke Hansen - Postdoc, Evolutionary Genomics Section, GLOBE Institute, Faculty of Health and Medical Sciences, University of Copenhagen, Denmark - klhansen@sund.ku.dk

Citation : Hansen K.L., 2020. Two South American palaeontological collections in the Natural History Museum of Denmark *Colligo*, 3 (3). <https://perma.cc/B6HV-VUC2>

KEY-WORDS

*P.W. Lund
Dr. V. Lausen
Fossils
Mammals
Quaternary
XIXth century
Natural History Museum of Denmark*

MOTS-CLÉS

*P.W. Lund
Dr. V. Lausen
Fossiles
Mammifères
Quaternaire
XIXe siècle
Musée d'histoire naturelle du Danemark*

Summary: Two large South American palaeontological vertebrate collections are housed in the Natural History Museum of Denmark, the V. Lausen Collection and the P.W. Lund Collection. Both were collected in the 19th century. During the last ten years these two collections have been reviewed, reassessed and digitized. New information has been gathered from museum archives, letters, interviews and newspapers. Fossil material has been identified through morphological analysis. The research into the V. Lausen Collection in particular yielded much that was virtually unknown to the public before. Today the collections are kept in a storage facility and are very rarely accessed or studied.

Résumé : Deux grandes collections de vertébrés fossiles sud-américains sont conservées au Musée d'histoire naturelle du Danemark, la Collection V. Lausen et la Collection P.W. Lund. Les deux ont été rassemblées au 19^e siècle. Au cours des 10 dernières années, ces deux collections ont été revues, réévaluées et numérisées. De nouvelles informations ont été recueillies dans les archives du musée, des lettres, des interviews et des journaux. Le matériel fossile a été identifié par analyse morphologique. La recherche sur la collection V. Lausen en particulier a produit beaucoup d'informations qui étaient pratiquement inconnues du public auparavant. Aujourd'hui, les collections sont conservées dans une installation de stockage et sont très rarement consultées ou étudiées.

Introduction

The Natural History Museum of Denmark (NHMD) houses two relatively large fossil vertebrate collections from South America of historical and scientific importance. The less well-known of the two collections is Dr. Lausen's. Valdemar Lausen (1834-1889) was a Danish medical doctor who worked and lived for most of his adult life in Buenos Aires, Argentina. He had a general interest in palaeontology and fossils, and acquired a substantial number of

specimens from various "fossil dealers" during his time in Argentina (on the concept of "fossil dealers" and the trade in fossil bones from the Pampas see Podgorny 2013). The combined value paid by Lausen is estimated at no less than 100,000 Francs, the equivalent of 1,600,000 – 1,700,000 Euros in today's money. Some very impressive almost complete skeletons of ground sloths and glyptodonts, skulls of sabre-toothed cats and remains of rare Miocene mammals are among the highlights of this collection. Dr. Lausen donated his entire collec-

tion to Copenhagen University. The more famous of the two is the P.W. Lund Collection from Lagoa Santa, Brazil. The natural historian Peter Wilhelm Lund (1801-1880) excavated limestone caves, and, over the course of a 10-year period, collected and studied vast quantities of Late Pleistocene vertebrates which he eventually donated to King Christian VIII of Denmark. Lund's personal history, as well as most of his scientific collection, has previously been studied in some detail (Reinhardt, 1880; Holten & Sterll, 2010). In the years following the collection's arrival in Denmark, zoologist Herluf Winge (1857-1923) described most of the mammal species in the five-volume monograph *E Museo Lundii* (1888-1915). Somewhat more recently, Carlos de Paula Couto, a very well-known Brazilian paleontologist, reviewed Winge's monograph and translated Lund's works. In 1950 he published a monumental book, *Memórias sobre a Paleontologia Brasileira*, that today is still regarded by many as the primary reference literature for studying Brazilian paleontology (Couto, 1950; Lopes, 2008). The collection itself includes almost 300 species of vertebrates and around 45 type specimens.

Both collections have been reviewed in their entirety. Previously unidentified fossil material was examined morphologically and classified to species level whenever possible. Previously identified materials were re-examined when their classification seemed doubtful or incomplete. The collections were re-packed and placed in new cardboard boxes and given new museum numbers. A digital file was created for each lot number for future reference.

Considerable effort went into tracing the origins of Dr. Lausen's purchases of fossils. Various sources were reviewed, including letters written by Dr. Lausen that are today kept at the Royal Library (Copenhagen), acquisition journals from the collections of the Natural History Museum of Denmark, personal correspondence with living relatives from the Lausen family and old newspaper articles.

Today, these two historical collections are kept in a storage facility at the Natural History Museum of Denmark, under Copenhagen University, in Denmark.

The V. Lausen Collection

This collection comprises more than 3,000 fossil skulls, teeth, bones and bone fragments divided into approximately 450 lot numbers. The

fossil material was originally excavated in Argentina during the years 1875-1888, primarily and independently from each other by the two "fossil-dealers" Santiago Roth and José Larroque. The former was born in Switzerland in 1850. Soon after having immigrated to the Swiss colony in Baradero near Buenos Aires in 1866, Santiago began excavating and collecting fossils. As early as 1870 he started selling these fossils to various collectors and museums in Europe. In his later years Santiago Roth pursued an academic career and among other things functioned as Head of the Department of Palaeontology at the La Plata Museum in Buenos Aires (Saffer, 2009). José Larroque belonged to a French family of farmers settled in San Antonio de Areco and Mercedes, where they harvested fossils to sell in Buenos Aires and abroad (Podgorny, 2020). A few pieces were collected by other unnamed people. As far as is known, everything in the collection was bought by Dr. Valdemar Lausen (Fig. 1) and donated to Copenhagen University (NKS 3460, Royal Danish Library). As Lausen bought more and more fossils, he began dispatching them to Denmark. The larger fossil specimens were wrapped in newspaper and packed in wooden crates and transported by many different ships, beginning in 1877 and ending in 1889.

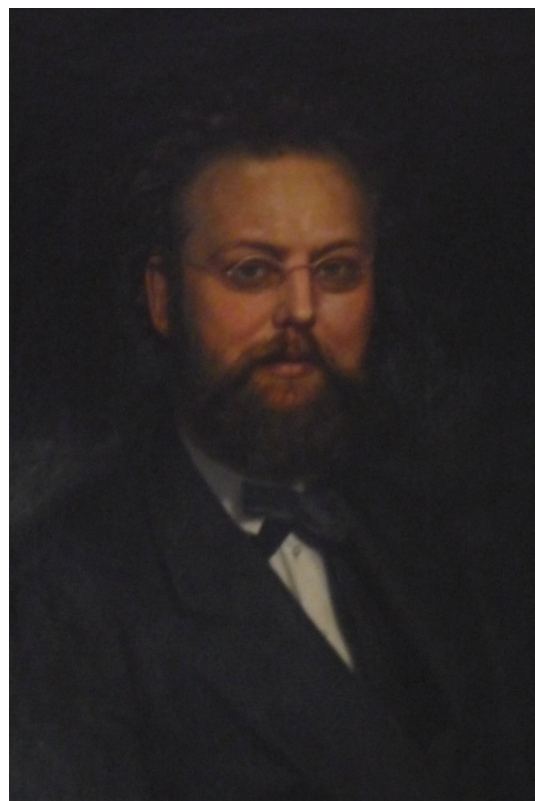


Fig. 1. Portrait of Valdemar Lausen, signed C. Rasmussen 1874 (Photo: Kasper Lykke Hansen).

Santiago Roth Pampas layer	Period	Epoch	Estimated age in millions of years BP
Superior	Quaternary	Pleistocene	0.085 – 0.12
Intermedium	Quaternary	Pleistocene	0.12 – 0.5
Inferior	Quaternary	Pleistocene	0.5 – 2.0

Table 1. Santiago Roth's system of Pampaen stratigraphic layers, here simplified from Damian Voglino (Voglino).

The provenance of the bones is generally not very well documented. Santiago Roth did not supply much information on his earliest pieces that were sold to Dr. Lausen. Most are labelled “Plata-landene” (in Danish), which roughly translates into something along the lines of: areas of land in the vicinity of the La Plata River. This should probably be interpreted in its widest form. Upon closer examination from the museum's historical registration journals (Z.M. acquisition journals) one can learn that Roth had excavated both within the city limits of Buenos Aires as well as hundreds of kilometres up the Parana River (which flows into the Rio de La Plata) all the way up to Santa Fe, 300 km to the northwest of Buenos Aires. This information pertains to Roth's later activities, but according to Roth's biography (Saffer, 2009) there is no reason to believe that his earlier finds came from outside of this general area. The fossils were mainly excavated from the banks of riverbeds and aside from supplying a vague geographical location for some of these finds, Roth sometimes placed a subtext of “Pampas Superior”, “Pampas Intermedia” or “Pampas Inferior” to the location (Table 1).

The material excavated by José Larroque also has almost no information, except that it is from the area of Mercedes, located around 50 km due west of Buenos Aires. The specific details of how and where the material was recovered by Larroque are unknown.

The age of the material in the Lausen Collection ranges from Late Miocene to Late Pleistocene age, with a few Holocene specimens as well. At least six species are from the Miocene. A few attempts at radiocarbon-dating pieces from the Lausen Collection have been made, but only a single one has been successful (T.W. Stafford, personal communication). This was a human phalanx dated to approximately 1950 years BP (14C Age: 1985 \pm 15), corresponding to a pre-Columbian age, but not particularly interesting with regard to the colonisation of the New World by humans, as was originally hoped.

With regard to the present condition of the ma-

terial in the V. Lausen Collection, the majority of the bones are intact or almost intact. Approximately 10-15% have fallen apart into smaller fragments or almost completely turned into a coarse-textured powder. Several individual skeletons are nearly complete and intact (Fig. 2).



Fig. 2. Edentates from the V. Lausen Collection on exhibit at the Natural History Museum of Denmark, The Evolution Exhibit 2018 (Photo: Kasper Lykke Hansen).

The V. Lausen Collection holds at least 55 mammalian species which are spread over 13 mammalian orders. The represented species are relatively diverse, ranging from aquatic dolphins and seals to sabre-toothed cats and enormous ground sloths. There are also a number of species that have not been adequately identified. This is due to either the bones being too fragmented to properly identify or in a few instances a lack of a higher level of expertise required for a final determination. A datasheet for each of app. 450 lot numbers containing about 3,000 fossil pieces in total has been produced for future incorporation into the Natural History Museum of Denmark's species data-

base. There is also a single unidentified species of turtle (Testudines) and a number of unidentified fish and shark species in the collection.

The V. Lausen Collection includes three rediscovered type specimens: a piece of the right mandible of the rodent-like notoungulate *Protypotherium antiquum* Ameghino, 1882 (Fig. 3) and the left maxilla of the litoptern *Scalabrinitherium rothii* Ameghino, 1882 (Fig. 4), both of Miocene age (9.0 – 6.8 million years BP). *Neoprocavia mesopotamica* Ameghino, 1889 (Fig. 5), related to the capybara and of Miocene-Pliocene age, is under revision (Moreira *et al.*, 2012). This species is represented by a piece of the left mandible.



Fig. 3. *Protypotherium antiquum* Ameghino, 1882, Z.M.K. 21/1887, lingual view (Photo: Kasper Lykke Hansen)



Fig. 4. *Scalabrinitherium rothii* Ameghino, 1882, Z.M.K. 116/1887, buccal view (Photo: Kasper Lykke Hansen)



Fig. 5. *Neoprocavia mesopotamica* Ameghino, 1889, Z.M.K. 111/1887, buccal view (Photo: Kasper Lykke Hansen)

During his time in Argentina, Dr. Lausen also found time to send various other specimens of a more recent age back to Copenhagen. These

reptiles and amphibians were probably caught by himself in and around the vicinity of Buenos Aires (Fig. 6). Around 10 species were received in alcohol through different couriers.



Fig. 6. *Liophis poecilogyrus* (*Erythrolamprus poecilogyrus* (Wied-Neuwied, 1825)) a small and common colubrid snake (Photo: Kasper Lykke Hansen).

As mentioned earlier both Roth and Larroque sold their fossils to museums around the world, but on occasion they sold to private investors as well. As a way of presenting their finds to potential buyers they produced catalogues. These ranged from hand-written lists of fossils to beautifully illustrated printed booklets in several different language versions (Fig. 7). Usually the fossils were individually priced, but on occasion one could buy the entire assemblage for a bundle price. Santiago Roth made the most elaborate catalogues and even numbered his later printed ones chronologically. Lausen bought everything in catalogues Nr. 2 and Nr. 3. Catalogue numbers 4-6 were sold to Swiss Museums, Nr. 5 for example is in Zürich. These catalogues not only display their role as scientific tools and knowledge bearers but also as crucial for the long-distance trade in fossil bones (Findlen, 1994; Alberti, 2005; Podgorny, 2013).

The total physical volume of the V. Lausen Collection is somewhat difficult to calculate, especially given the fact that four relatively large skeletons of ground sloths and glyptodonts are mounted. This increases their volume in sto-

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L. Multidigités.

(a) Une tête d'un très-grand **Toxodon** avec les deux premières vertèbres cervicales. Vu la mauvaise conservation des dents d'un côté, celles-ci ont été réparées avec du plâtre, celles de l'autre côté sont dans l'état où elles ont été rencontrées; une photographie de cette tête accompagne le catalogue.

Je crois que cette tête appartient à une espèce qui n'a pas encore été décrite; elle a été trouvée dans le pampéen inférieur, au bord de l'Arroyo del medio. La mâchoire inférieure était distante d'environ dix mètres de la tête, les vertèbres se rencontraient également à une assez grande distance des autres pièces; j'ai trouvé, répandu dans le terrain, à une grande distance, une quantité de débris d'os.

(b) Une mâchoire inférieure d'une espèce très-petite, trouvée dans le terrain pampéen inférieur; comme elle était cassée en deux morceaux, une des pièces se trouvait à plus de deux mètres de distance de l'autre et plus profondément enterrée. *Reposit. 573 Kott. 5 Forth.*

(c) Un humérus trouvé dans le pampéen inférieur. *Reposit. of specimens.*

(d) Un morceau de mâchoire inférieure. *mid to Kott. Mistr.*

(e) Quelques dents isolées. *2 Kott.*

(f) Un cubitus et quelques dents isolées, trouvées ensemble dans le pampéen inférieur. *At Tandora, born 2. 2. 1881. de la forenne, alle été trouvées.*

M. Proboscidiens.

(a) 1. Une défense de 0,83 cm. de longueur et 0,38 cm. de circonférence à sa base. *At Tandora, born 2. 2. 1881. de la forenne, alle été trouvées.*

2. Quelques molaires et quelques os de la patte. *At Tandora, born 2. 2. 1881. de la forenne, alle été trouvées.*

Ces ossements proviennent d'un **mastodon** trouvé dans le pampéen inférieur, au bord de l'Arroyo dulce.

(b) Une défense de **mastodon** de 0,77 cm. de longueur et 0,20 cm. de circonférence à sa base. *At Tandora, born 2. 2. 1881. de la forenne, alle été trouvées.*

Ces pièces proviennent du bord de l'Arroyo de Pavon.

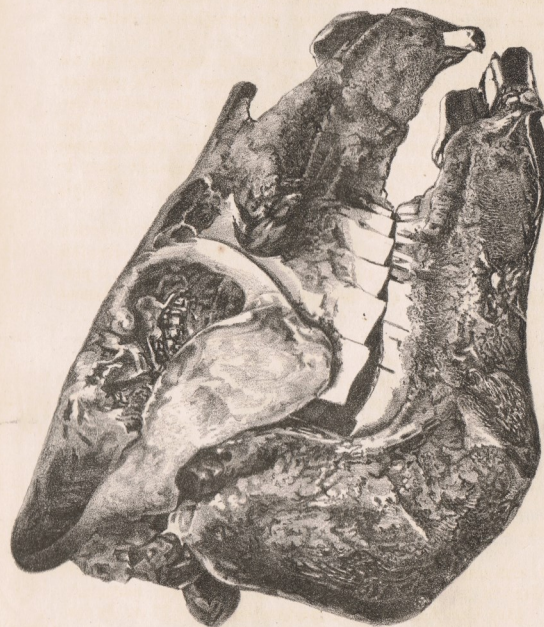


Fig. 7. Example from S. Roth's catalogue Nr. 2. (Natural History Museum of Denmark).

rage significantly as compared to if their individual bones were packed tightly together in appropriately sized boxes. The rest of the collection is generally stored into around 360 white cardboard boxes (14.5 cm x 32 cm x 49 cm) and a number of smaller white boxes of varying sizes (Fig. 8).

Today, the fossil V. Lausen Collection is kept in storage at the Natural History Museum of Denmark. The collection will probably not be kept as a single unit in the future and it will be integrated into the general collections of foreign origin. Depending on future storage dispositions, the collection will be physically accessible by guest scientists as well as digitally in the museum database.

The P.W. Lund Collection

The fossil collection consists of more than 100,000 fossil bones distributed in 14,000 lots, as well as more than 2,000,000 small bones from owl regurgitation pellets and around 1,300 breccia samples. Lund also sent many other samples to Denmark, including the skins of birds, various small animals in alcohol in



Fig. 8. Storage facility at the Natural History Museum of Denmark showing parts of the V. Lausen Collection (Photo: Kasper Lykke Hansen).



Fig. 9. P.W. Lund (Natural History Museum of Denmark).

glass containers, invertebrates, plants and even some ethnographical items. However, when the Lund Collection is referred to today, it is normal practice to only include the fossil material, which is kept together as one large unit in the storage facility. The subfossil specimens were collected by Lund himself (Fig. 9) in limestone caves near the town of Lagoa Santa in Minas Gerais, Brazil. The material was collected during the years 1834-1845. The material dates to the late Pleistocene and early Holocene age, and is similar to what has been found in large areas of Brazil (Eisenberg & Redford, 1999). C-14 dates taken from various mammal species yield dates of between 20,610 and 7580 YBP (calibrated age) (W. Neves, personal communication).

The limestone caves that Lund studied are integral parts of the karst terrain that covers large areas of Minas Gerais (Fig. 10). Most of this karst terrain has its origins in the Cambrian Period, around 500 million years ago (Auler & Farrant, 1996; Auler & Pessoa, 2020). Isolated linear limestone cliffs, often hundreds of meters long, spread across undulating dry grasslands with single standing trees and small lakes characterise the landscape. Rainfall is minimal and occurs in the late summer season. The caves have been established by the flow of slightly acidic water from nearby lakes and

small rivers. Most of the caves that Lund explored were quite small compared to others in Brazil. Aside from the limestone itself, the karst terrain near Lagoa Santa consists of sandstone and a reddish-coloured clay/soil. The caves were rich in minerals, everything from diamonds to gold to nitre has been mined, and this field of work has been so intensive that it has given name to the region of Minas Gerais.

It was in these caves that Lund uncovered his many fossils, most of which were embedded into a matrix of sandstone and the reddish soil. Speaking from personal experience, the work of extracting the bones from the matrix must have been immensely difficult for Lund and his assistants, as this combination of the sandstone and reddish clay is rock hard.

What Lund discovered and later described, was a fossil fauna primarily consisting of vertebrates, but also including a few invertebrates. The vertebrates had ended up in the caves in different ways. Some had been dragged in by carnivores, some had fallen through a crack in the roof of the cave and others, probably the majority (Eisenberg & Redford, 1999), had drifted in with the current of a stream or the rise of local water level during the rainy season. There is also evidence of *Homo sapiens* being buried in the caves (Piló *et al.*, 2005). The invertebrates had probably entered the caves via waterways.

Fig. 10. The limestone cave Lapa da Cerca Grande, Brazil (Photo: Kasper Lykke Hansen).



Due to these special circumstances, the material in the Lund Collection is generally in a relatively poor condition. The majority of the bones are broken or fragmented and few, if any, skeletons are complete.

With a grand total of 293 vertebrate species in this fossil collection, one must consider it to be among the largest in the Natural History Museum of Denmark in this respect. Currently, the list (especially the rodents and marsupials) is in dire need of reclassification, as nearly all species are kept under Herluf and Oluf Winge's nomenclature from *E Museo Lundii* (1888-1915). One would assume that a reclassification would slightly alter the number of species in the collection. The list of vertebrates includes eight species of fish (Osteichthyes), one species of amphibian (Amphibia), 12 species of reptiles (Reptilia), 125 species of birds (Aves), and 147 species of mammals (Mammalia). Only a limited number of invertebrates (Invertebrata) are represented, probably less than 10 species (many have not yet been identified).

As mentioned above, reclassification may alter the number of species represented in the collection. However, there also exists a potential for discovering entirely new species in the col-

lection from two different sources. To date, nobody has analysed the 28 boxes of owl-regurgitated small bones and fragments in detail (**Fig. 11**). Such an analysis would most likely expand the list of species within the rodent and marsupial groups, since these are by far the most commonly represented specimens based on a superficial examination of the boxes. The list can be further expected to grow as a more or less complete overview of small mammal fauna from Brazil is still a work in progress. New species are described regularly, both recent and extinct. A second source for discovering new species could be the more than 1,300 breccia samples Lund sent back to Denmark together with a small catalogue. In this catalogue, many of the major bones and bone fragments in the breccias are ascribed to various species by Lund. This catalogue, however, cannot be a completely satisfactory description, since many more bones are hidden inside the very hard clay and limestone matrix that holds the breccia together.

The P.W. Lund Collection currently holds 47 type species (**Fig. 12**) of which at least 25 have retained Lund's authorship. All of these are mammals except for one species of bird (*Chenalopex pugil* Winge, 1887). More than half

Fig. 11. Owl regurgitation sample (Photo: Kasper Lykke Hansen).





Fig. 12. *Smilodon populator* Lund, 1842, (Z.M.K. 1/1845:2554) canine tooth from upper jaw, one of several type specimens (Photo: Kasper Lykke Hansen)

of the type species are from Rodentia. The South American members of this order are currently under a massive process of revision, which has already impacted on the status and total number of Lund's type specimens and this trend is likely to continue in the years to come.

When Lund eventually decided to send his collection to Denmark it was accompanied by a number of catalogues handwritten by the artist Peter Brandt (Fig. 13). One of the catalogues (Katalog over Dr. P.W. Lund's palæontologiske Samling I) contained a list of 12,623 individual fossil bones, bone fragments, teeth and skulls, along with information on the cave from which they were excavated. An almost exact copy of this catalogue is also in existence, the only difference being a single less entry for a total of 12,622 items. This minor discrepancy remains a mystery. However, it is important to understand that none of these catalogues should be considered complete insofar as encompassing the entire fossil collection. They should rather be considered as the highlights. This is because many of the most impressive and unique specimens are included in the cata-

logues, whereas literally thousands of more mundane bones such as those from the deer (*Mazama*) have been omitted. As mentioned earlier, the fossil collection of P.W. Lund contains at least 100,000 individual fossil bones, bone fragments, teeth and skulls (personal information gathered during digitalisation). It is unfortunately a very common mistake made when describing Lund's works to only include the 12,623 items listed in the old catalogue. For the sake of completeness, it should be mentioned that a smaller catalogue including 1,337 breccia samples also exists (Katalog over Dr. P.W. Lunds palæontologiske Samling II Breccier.).

Another smaller curiosity observed from reviewing the Lund Collection is the fact that very few rib bones are present – it appears as if Lund purposely neglected to collect these. Out of the many figures depicted in Lund's work *Blik på Brasiliens Dyreverden før sidste Jordomvæltning* (1836-1847), only one rib is displayed. The lack of illustrations can, of course, be a coincidence, but the extremely low representation in the collection is so blatantly obvious, that this must be on purpose. In hind-

8.			
220.	Metab. fr.	Cerv. af. simplic.	Periperi. 1.
221.	Vert.	Smil. pop.	Engenho.
222.	Cale. d.	Chlam. Humb.	Vermelha.
223.	Ulna.	Dicot.	d.
224.	Cranium. fr.	Aucheria.	Soares.
225.			Vermelha.
226.	Humb.	^ Smil. pop.	d.
227.	Tibia.	Dasypr. capreolus.	Bento.
228.	Dens mol.	Palaeo. trogl.	Indios. 1.
229.	Metab. fr.	Cerv. af. simplic.	Cerca grande.
230.	Ulna d. fr.	Chlam. Humb.	Vermelha.
231.			d.
232.			d.
233.	Thal. 1. d. 4. max. d.	Scelid. Ow.	d.
234.	Max. s.	Palaeo. trogl.	Indios. 1.
235.	Femur. d.	^ Dicot.	Vermelha.
236.	Mand. d. fr.	Palaeo. trogl.	Indios. 1.
237.	d.	d.	Vermelha.
238.	Dens mol. 1. max. d.	d.	Indios. 1.
239.	Humb. s.	Dicot.	Vermelha.
240.	Can. mand. s.	Palaeo. trogl.	Indios. 1.
241.	Axis.	Scelid. Ow.	Vermelha.
242.	Vert. cerv.	Cerv.	d.
243.	Dens mol.	Hydroch. sulcid.	Bento.

Fig 13. Example of a page from Lund's catalogue, specifying lot number, type of material, species and location.

More than 12,000 lots were catalogued (Natural History Museum of Denmark).

sight it seems that the most likely reason for this anomaly is the tendency for mammal ribs to be relatively uninformative from a systematic point of view and therefore were disregarded by Lund.

The physical volume of this collection is quite extensive. The majority of the material is kept in approximately 300 brown cardboard boxes (16 cm x 37 cm x 60 cm) and 25 wooden boxes (20 cm x 38 cm x 38 cm). However, an additional special cupboard includes 30 cardboard boxes with skulls from *Homo sapiens*.

Today, the entire fossil P.W. Lund Collection is kept together as one unit in storage at the Natural History Museum of Denmark. Here it can be accessed physically by guest scientists as well as digitally in the museum database. It is planned that this database will be available via the Internet sometime in the near future.

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Conclusion

Many interesting scientific facts as well as fascinating personal stories can be discovered in

the storage facilities and archives of old museums.

The importance of the Lund and Lausen fossil collections in the Natural History Museum of Denmark cannot be underestimated. Historically they have been a way for the two protagonists to display strange and wonderful treasures from distant lands, where they themselves decided to settle and live, to the population of Denmark. And more recently, the scientific value of these unique fossils has again become centre of attention, as new technological advances within the field of ancient DNA testing has emerged.

It is hoped that this review may be found useful to anyone wishing to delve further into the collections of P.W. Lund and V. Lausen.

Acknowledgements

I owe my deepest gratitude to the staff at the Natural History Museum of Denmark (NHMD). I especially appreciate the assistance and/or advice from Tom Gilbert, Morten Meldgaard and Kristian Murphy Gregersen. I would like to thank Waldemar D. Lausen whose extraordinary help has been invaluable in mapping out the story of Dr. Lausen. I also appreciate the assistance from Ulysses Pardiñas and Damián Voglino.

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