

4) 剥製標本の安定化処理

動物考古学からの剥製の安定化処理

動物考古学が専門の私にとって、汚れた遺体から脱骨し、汚損された貝殻をクリーニングすることはよく行うことです。これまでの経験を生かし、津波で被災した陸前高田市立博物館所蔵剥製をクリーニングし、安定化処理する作業を、陸前高田市立博物館をはじめとする関係機関と連携し、実施してきました。

陸前高田からの移送と第1次水洗と内部の観察

2011年5月4日に、岡山理科大学へ最初の剥製標本の移送を行い、剥製標本に付着した泥や砂をブラシで払った後、水道水で水洗し、表面の汚泥を取り除きました(図1)。その後無水エタノールを噴霧し、扇風機で風乾しました。

剥製の内部は針金等の金属が骨格の代わりとなり、紙・糸・脱脂綿・木毛・ウレタン樹脂・発泡スチロールなどが体形の成形に利用され、変色しやすいクチャシや爪には絵具による彩色等が施されています。さらにガラスや樹脂で作られた義眼が施されることも多くあります。吸水し易い素材が多用されていること、錆を発生させる素材も使用されていることから、脱塩は重要と判断し、破損が深刻な剥製については水洗を徹底して行いました。一方、修復が困難と判断された標本は解体し、標本内部の状態を詳細に観察しました(図2)。破損が軽微な剥製は全身を水道水で洗った後、縫い目や接合部から内部の状況を観察し、必

4) Stabilization of Stuffed Specimens

Stabilization of stuffed specimens from the viewpoint of zooarchaeology

As a zooarchaeologist, I have many opportunities to remove bones from the dirty bodies of dead animals and clean damaged shells. By relying on this experience, we have performed work to clean and stabilize stuffed specimens from the RTCM damaged by the tsunami in conjunction with the museum and other related organizations.

Transfer of specimens from Rikuzentakata, primary washing, and observation of the interior

On May 4, 2011, the first set of stuffed specimens was sent to Okayama University of Science. After removing silt and sand from the surface of the specimens by using a brush, the specimens were washed with tap water to remove sludge from the surface (Fig. 1). Dehydrated ethanol was sprayed, and the specimens were air-dried by blowing air onto them with an electric fan.

In taxidermy, metal wires or similar materials are used to replace bones. Paper, thread, absorbent cotton, wood wool, urethane resin, and styrene foam are used to shape a specimen. Bills, claws and other parts that are easily discolored are painted. Glass or resin eyes are also widely used. As stuffed specimens contain materials that absorb water and that rust, desalination was judged to be indispensable. Severely damaged specimens were thoroughly washed with water. On the other hand, specimens that were judged too difficult to repair were opened, and the condition inside the specimens were carefully observed (Fig. 2). Slightly damaged specimens were washed with tap water, and the inside was observed from the seam and joint. These specimens were also opened when necessary.

要に応じて解体しました。

第二次水洗と協力体制の構築

岡山に移送されてから約1ヶ月の間に、水洗した資料を乾燥させ、剥製の破損と汚損の状況の把握を行いました。第一次水洗では汚泥をすべて除去できなかったため、6月中旬より界面活性剤を含む洗剤を利用した第二次水洗作業を実施しました。

その作業と前後して、関係機関から安定化処理のアドバイスと協力を得ることが出来ました。剥製の安定化処理については、特に(株)西尾製作所から指導・援助を頂きました(図3)。処理作業や記録は陸前高田市立博物館に報告し、被災文化財等救援委員会・岩手県立博物館からも助言を頂くこととなりました。この時点から、破損状況の把握・内部の汚損状況の把握・二次水洗・応急的補修を岡山理大が担当、展示物としての仕上げを西尾製作所にお願ひし、終了後は岡山理大が保管して、経時変化を確認する流れを構築することが出来ました。

黴と錆

被災直後は陸前高田の外気温が低かったことに加え、塩分を含む海水による被災であったことから、腐敗の進行やカビの発生が抑制されていたようです(注1)。ただし、その状況は剥製ごとの劣化耐性の違いに左右されていました。この黴と錆との闘いは、気温の上昇した6月になって本格化しました。

Secondary washing, and construction of a cooperative system

About one month after the transfer to Okayama, washed specimens were dried, and examined for damage and contamination. Because the sludge could not be entirely removed by the first washing, which only used tap water, the specimens were washed again by also using surfactant this time. The second washing was started in mid-June.

We obtained advice on stabilization and cooperation from specialists. Particularly, indispensable advice and support was provided by Nishio Biological Models Co., Ltd. (Fig. 3). Advice was provided also by the Committee and IPMM. Since that time, a work routine has been established in which Okayama University of Science examines the overall damage and the state of contamination and damage inside the specimens, and performs secondary washing and temporary repair, Nishio Biological Models performs further repair and finishes the specimens, and then the university stores them and checks for time-dependent changes.

Not losing to mold and rust

Putrefaction and propagation of mold was suppressed, probably because the outdoor temperature in Rikuzentakata was low immediately after the disaster and the specimens were contaminated with sea salt (Note 1). However, the conditions differed by specimen depending on its resistance to deterioration. At the temporary storage in Rikuzentakata, the full-scale struggle with mold and rust started in June when the temperature started to occur.

In taxidermy, it is desirable to thoroughly remove the muscles from the back of the skin in terms of specimen preservation. However, thorough removal of the muscles increases the risk of damaging the surface of skin, and also requires a complex shaping process. Therefore, mammals



図1 水道水による津波汚損鳥類剥製の第一次水洗。2011年5月6日岡山理大にて撮影
Fig. 1 Primary washing of tsunami-affected stuffed birds with tap water, taken at Okayama University of Science on May 6, 2011.



図2 カビの発生した汚損鳥類剥製の内部。2011年5月16日撮影
Fig. 2 Moldy interior of a damaged Whooper Swan *Cygnus cygnus*, taken on May 16, 2011.



図3 剥製造形師（右より常和彰さん、宮本邵吉さん）のお二人との剥製資料トリアージ作業。2011年6月6日西尾製作所（京都市）にて。武内周撮影
Fig. 3 Discussing the triage of damaged stuffed animals with taxidermists (Mr. Akira Tokiwa and Mr. Shokichi Miyamoto), taken by Meguru Takeuchi at Nishio Biological Models Co., Ltd. (Kyoto City) on June 6, 2011.



図4 アカショウウビンの陸前高田市立博物館への帰還。2011年8月12日立石和也撮影。
Fig. 4 Return of a Ruddy Kingfisher *Halcyon coromanda*, to a temporary building of Rikuzentakata City Museum, taken by Kazuya Tateishi on August 12, 2011.

例えば剥製の皮革の裏の筋肉を徹底的に除去することは、標本の保存に望ましいことですが、筋肉を全て除去すると皮革を傷める可能性が高まり、成形の手間は増大します。そのため、破れやすい皮革をもつ動物の剥製では筋肉を一部残し、代わりに強い防腐剤を浸透させて製作されていました。そうした剥製は、津波で水没し、防腐剤が弱まったことによって劣化が一層進んだものと推定されました。腐敗が深刻な剥製については、筋肉を解剖用ハサミ・メス・ピンセットで切除し、腐敗が及んだ皮革は過酸化水素水で殺菌し、剥製全体も0.25%の次亜塩素酸ナトリウム水溶液に1時間浸し、扇風機で風乾しました。このような作業で皮革に孔が出来た場合は、和紙で裏打ちして補強しました。接着剤はデンプン糊、アクリル系接着剤、ニトリルゴム系接着剤等、何種類か試したのですが、木工用ボンドが適していることが分かりました。

7月にはアクリルケースに入ったエビ・カニ類の剥製に深刻なカビの発生がみられ、ケース中の綿の黒色化と硫化水素臭の発生も深刻となりました。

博物館資料としての質の確保に向けて

このような事態を改善するために、8月に2tトラックで岡山と陸前高田との往復を実行しました。行きの便で既に修復が終了したアカシヨウビンの剥製とその展示ケースを届け(図4)、剥製の埃払い(図5)と回収作業を行い(図6)、帰りの便で残りの剥製と動物遺存体標本を岡山へ移送しました(注2)。

and birds that have weak skin have been commonly prepared as specimens by leaving part of the muscles and applying a strong preservative. The tsunami-affected specimens prepared in that way suffered rapid deterioration, probably because the seawater reduced the effect of the preservative. For specimens with serious putrefaction, the muscles were removed by using autopsy scissors, scalpel, and forceps. The putrefying skin was sterilized with a hydrogen peroxide solution, and the entire specimen was immersed in a 0.25% aqueous solution of sodium hypochlorite for over an hour, and air-dried by blowing air with an electric fan. Any hole that developed on the skin due to such treatment was closed by lining and reinforcing the skin and leather with Japanese traditional paper ("washi"). Various kinds of adhesives were tested, including starch paste, acrylic adhesives, and acrylonitrile-butadiene rubber adhesives; Wood glue (polyvinyl acetate emulsion adhesive) was found to be most appropriate adhesive.

In July, considerable mold growth was observed on specimens of shrimps and crabs stored in acrylic cases. Blackening of the cotton inside the cases and the odor of hydrogen sulfide also became serious problems at the storage.

Toward ensuring quality of museum specimens

To resolve these problems, we made a trip between Okayama and Rikuzentakata on a 2-ton truck. On the way to Rikuzentakata, a repaired specimen of Ruddy Kingfisher Halcyon *coromanda* and the exhibition case were transferred (Fig. 4). In Rikuzentakata City, dust was brushed off from specimens at the temporary storage facility (Fig. 5), and the specimens that remained in the damaged museum were collected (Fig. 6). The remaining stuffed specimens and animal specimens were transported to Okayama (Note 2).

The crocodile specimen appeared to be in good condition.

爬虫類のメガネカイマンの剥製は、外見での保存状態はやや良好に見えましたが、解体したところ、内部では縫い目に接した木毛・おがくず・新聞紙にカビの発生がみられました。このような巨体を浸漬させることは困難なため、剥製の内外面に0.25%の次亜塩素酸ナトリウム水溶液をガンスプレーで噴霧した後、無水エタノールで拭き、外面は皮革油を塗り、皮が破れた部分は和紙と木工用ボンドで補修しました(図7)。

アクリルケースに入ったエビ・カニ類の剥製は、慎重に次亜塩素酸ナトリウムの0.05%水溶液で水洗しながら折れた部品を回収し、汚損した綿は取り除きました。

剥製資料の台帳は失われましたが、学術的情報を記したラベルが残った剥製については、その内容をコンピュータに入力し、台帳の復元を試みています。また、記録がない剥製も新たに整理番号を付与し、学名、画像、保存状況等を登録し、博物館資料としての質の確保を図っています。

注1) 海水によるカビや細菌の生育抑制効果は、赤沼(2012a: p.33)に指摘されている。

2) 移送は山階鳥類研究所と倉敷市の御協力を頂いた。展示ケースは倉敷市教育委員会に提供頂いた。

富岡直人(岡山理科大学)

However, when opened, mold was found to have developed on the wood wool, sawdust and newspaper along the seams inside each specimen. Because it was difficult to immerse such big bodies in a disinfecting solution, a 0.25% aqueous solution of sodium hypochlorite was sprayed over the interior and exterior surfaces of the specimens with a spray gun. The surfaces were then wiped with dehydrated ethanol. Leather oil was applied on the exterior surface, and tears on the skin were repaired with Japanese traditional paper and wood glue (Fig. 7).

The specimens of shrimp and crabs were carefully washed with a 0.05% aqueous solution of sodium hypochlorite. The detached parts were collected and glued to the right side of the bodies by taxidermists in the Nishio Biological Models, and the moldy cotton was removed.

Although a record of the stuffed specimen was lost, those specimens for which labels remained, data was inputted to recreate the database. Specimens with no label were also registered by giving a reference number and data such as the scientific name, image, and preservation state in order to maintain its quality as a specimen for museum collection.

Notes:

- 1) The inhibition of mold and bacterial growth by seawater was observed by Akanuma [2012: p.33].
- 2) The Yamashina Institute for Ornithology and the City government of Kurashiki helped to transport the specimens. An exhibition case was provided by the Kurashiki City Board of Education.

Naoto Tomioka (Okayama University of Science)



図5 移送前の被災剥製の埃払い。2011年8月12日撮影。
Fig. 5 Brush cleaning of dirty stuffed animals before transport, taken on August 12, 2011.

図6 天然記念物樺島ウミネコ繁殖地を示したジオラマからの剥製の切り離し作業。2011年8月12日撮影。
Fig. 6 Removing the stuffed specimens of the Black-tailed gull *Larus crassirostris*, a natural treasure, from a diorama representing a breeding area in Tsubakishima Island in Rikuzentakata City, taken on August 12, 2011.



a. クリーニング処理前。旧生田小学校にて撮影。
Before cleaning, in the former Oide Elementary School.



b. 保革油での表面クリーニング作業。
Surface cleaning with leather oil.



c. 劣化した木屑の取り出し。
Removing damaged stuffing (saw dust), from body.



d. カビの発生した内部のエタノールでの洗浄と和紙での補強
Cleaning the moldy interior with ethanol and reinforcing the skin with Japanese traditional paper.



e. ワニの表面と内部の洗浄終了
Cleaned up surface and interior of a Caiman skin.

図7 被災メガネカイマンのクリーニング作業
Fig. 7 Cleaning of the damaged specimen of spectacled caiman *Caiman crocodiles*, taken on June 2012.