

2) 昆虫標本の安定化処理と修復

昆虫標本とは

昆虫標本は、採集し薬品等で固定した昆虫をステンレス製の針に刺し、自然乾燥させたものです。チョウやハエなどの標本は、展翅板と呼ばれる板の上で翅を広げ、乾燥して固まるまで紙製のテープやピンなどで押さえておくのが一般的です(図1)。また微小な昆虫の場合は針に刺さず、標本を台紙に貼り付け、台紙の端を針に刺して取り扱います。採集地・採集年月日・採集者名等を記した標本ラベルは、針の下部と一緒に刺しておきます(図2)。完成した標本は、虫害等を防ぐため、内側の底面にコルク板や合成樹脂製のスポンジを貼った桐製の箱や、ガラス製の蓋のついた木製の箱(ドイツ式標本箱)に保管します(図3)。

被災した昆虫標本

東北地方太平洋沖地震の津波被災地域には、多数の個人所有の昆虫標本があったと考えられますが、その数は把握されていません。公的機関では、陸前高田市立博物館が特に多く、230箱を超える標本箱に約27,000点の昆虫標本を所蔵していました。

陸前高田市立博物館の1階収蔵庫では、標本箱を収納していた金属製の棚が津波で押し寄せた瓦礫によって歪み(図4)、半分以上の標本箱は蓋のガラスが割れ、内部に泥混じりの海水が浸入しました(図5)。ガラスが割れなかった箱でも、木の継ぎ目などから内部に海水が浸透したと考えられます。

2) Stabilization and Restoration of Insect Specimens

What are insect specimens?

Insect specimens are prepared by fixing samples of insects using chemicals, and pinning each insect with a stainless steel needle, which is then left to dry naturally. Butterflies and flies are dried on a spreading board with the wings spread and held with paper tape (Fig. 1). Small insects are glued on a card, which is pinned at the end. A label showing the collection date, location, and the name of the collector is pinned under the needle (Fig. 2). The completed specimen is stored in a paulownia box with cork or polyethylene foam at the bottom of the box, or in a wooden box with a glazed lid (Fig. 3).

Damage to insect specimens by tsunami

While it was likely that there were many personally collected specimens of insects in the area affected by the tsunami, their number is unknown. Of the public institutes, the RTCM had an especially large collection of insect specimens, approximately 27,000 specimens in over 230 boxes.

In the repository on the first floor of the RTCM, the steel shelves that stored the specimen boxes were deformed by rubble (Fig. 4). In more than half the boxes, the glass cover broke, and muddy seawater contaminated the specimens (Fig. 5). Seawater also seeped into boxes that did not suffer breakage of the glass cover possibly through the wooden joints.

Like other items, the insect specimens were retrieved about one and half a month after the tsunami, mold had already propagated, and decomposition had set in. The specimens were transferred to the IPMM by the end of May, 2011. Since late May, the specimens were stored in a large outdoor freezer at

他の資料と同様に、津波から約1ヶ月半後に救出された昆虫標本は、カビが発生し腐敗が始まっていました。それらを2011年5月までに岩手県立博物館へ輸送し、5月下旬からは-20℃に設定された屋外の大型冷凍庫に保管し、カビ・腐敗の進行を防止しました(藤井2011)。

それと並行して、西日本自然史系博物館ネットワークや昆虫担当学芸員協議会の支援のもと、汚れた昆虫標本の洗浄方法や作業の優先順位などについて、専門家による議論を重ねました。6月半ばまでに、比較的被害が少ない岩手県産の標本約12,000個体の入った標本箱95箱を、協力を申し出た全国の博物館等機関のうち17ヶ所に宅配便で送り、洗浄と修復を依頼しました。また、被害が大きく宅配便輸送に耐えない状態の標本が入った標本箱135箱は、県内の3機関で分担し、処理を行いました(図6)。

昆虫標本の洗浄

海水で汚れた昆虫標本の洗浄は過去に例がなく、処理方法は未確立です。特にチョウ・ガ類標本については、水につけると翅が傷むため、細心の注意を払いつつ最小限の作業にとどめることが必要となります。ただし、肉眼では汚れがほとんど見えない場合でも、付着している塩化ナトリウムの結晶や微細な有機物が、長期的には標本の変色・変形やカビ、昆虫針の錆などを引き起こす可能性も考えられます。

今回、洗浄作業による傷みの少ない甲虫などの標本に対して採用された方法は概ね次のとおりです。

1) 3%の過酸化水素水または水に、濃度5%となるようエ

-20℃ to prevent the mold and decomposition from further progressing.

At the same time, methods for washing the contaminated insect specimens and priority of treatment was discussed by experts with the support of the Natural History Museum Network in West Japan and the Association of the Entomological Staffs of the Natural History Museums of Japan. By mid June, 95 specimen boxes that contained about 12,000 specimens of insects that were only damaged slightly were sent via private delivery service to the 17 museums which had offered assistance, for washing and repair of the specimens. The 135 boxes that were severely damaged and could not be sent by delivery service were treated at three institutes within the prefecture (Fig. 6).

Washing insect specimens

There has been no previous examples of washing insect specimens contaminated with seawater, and there is no established method. In particular, butterflies and moths cannot be washed with water because their wings will be damaged, and require extreme care and attention in their treatment. However, extremely small crystals of sodium chloride and organic matter may cause the specimen to deform, undergo color changes, develop mold, and/or the pins will rust as the time elapses.

The methods implemented here to wash and repair specimens of beetles and other insects that were little affected are described below.

1) Ethanol was added to a 3% solution of hydrogen peroxide solution or water to a concentration of 5%. A small amount (about 2 drops per 100 ml) of surfactant (dishwasher

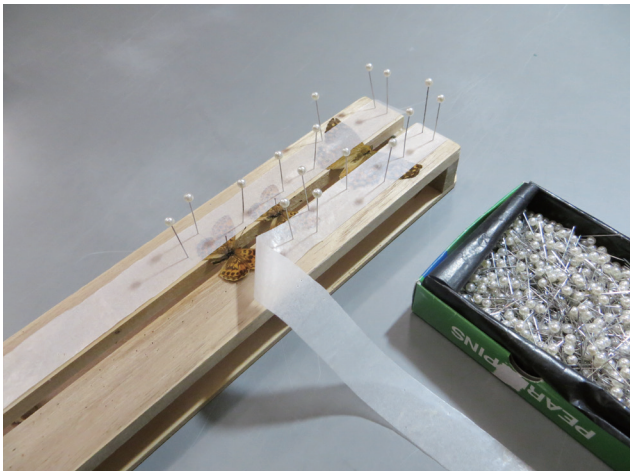


図1 チョウの標本の展翅
Fig. 1 Spreading the wings of a butterfly specimen



図2 昆虫標本のラベル
Fig. 2 Labelling of an insect specimen



図3 ドイツ式標本箱
Fig. 3 Insect specimen boxes



図4 陸前高田市立博物館収蔵庫の棚に収蔵されていた昆虫標本箱
Fig. 4 Insect specimen boxes stored on shelves in the repository of the Rikuzentakata City Museum



図5 泥をかぶった昆虫標本箱
Fig. 5 Insect specimens covered with mud



図6 泥の中からの昆虫標本の取り出し
Fig. 6 Salvaging insect specimens from mud

タノールを加える。これに少量の界面活性剤(食器用洗剤)を加える(100mlあたり2滴程度)。これを洗浄液と呼び、脱塩に用いる。エタノールおよび合成洗剤は水の浸透性を高めるため、過酸化水素水は殺菌のために加える。

- 2) 深さ10cm程度の浅い容器にゴム板などを敷き、洗浄液を深さ約5cmまで入れる。
- 3) 針に刺したままの昆虫標本を洗浄液に沈め、ゴム板等に針を刺して一晩置く(図7)。針に刺していない台紙貼り標本等の場合は、洗浄液を入れた浅い容器に沈め、上から紙タオルなどで押さえて液を浸透させる。標本ラベルが水溶性のインクで書かれている場合は、記述内容を新しいラベルに鉛筆で書き写し、その標本の針に刺しておく。
- 4) 標本に付着する空気の泡は脱塩を妨げるので、ピンセット等で時々振動を加えるなどして除去する。また、肉眼で見える泥汚れは細い筆などで除去する。ラベルも同様に洗浄する(図8)。
- 5) 洗浄液として過酸化水素水でなく水を用いた場合には、洗浄後にオスバン液(塩化ベンザルコニウム水溶液)等の消毒薬を薄めたものに標本を浸し、殺菌を行う。
- 6) 洗浄と殺菌が完了した標本を取り出し、展翅板等の上で形を整え、自然乾燥させる。乾燥中に塩類等が析出する場合には、洗浄液で再度脱塩する。形を整える前に80%エタノールに浸すと乾燥しやすくなる。
なお、具体的実施方法は各機関でそれぞれ工夫されて

detergent) was added to the solution. This solution was used as the washing solution and also for desalination. Ethanol was added to increase the permeability of the solution, and hydrogen peroxide was added as a disinfectant.

- 2) In a shallow container of about 10 cm depth, a rubber plate was placed at the bottom, and the washing solution was poured in to a depth of about 5 cm.
- 3) The pinned insect specimens were immersed in the washing solution by pinning them on the rubber plate at the bottom, and were left alone overnight (Fig. 7). Specimens that were not pinned but glued on a card were immersed in the washing solution in a shallow container, and were covered by paper towel, to allow the solution to soak inside the specimens. For labels that were written in water-soluble ink, the information was copied to a new label with pencil, and the new label was pinned along with the specimen.
- 4) Air bubbles on specimens inhibit desalination, and thus were removed by softly shaking the specimen with forceps. Visible dirt was removed by using a thin brush. The labels were washed using a similar method (Fig. 8).
- 5) If water was used instead of a hydrogen peroxide solution, the washed specimens were sterilized by soaking them in a thin solution of a disinfectant (such as an aqueous solution of benzalkonium chloride).
- 6) The washed and sterilized specimen was removed from the solution, restored to its proper position on a spreading board, and dried naturally. If eduction of salts was observed during the drying process, the specimen was desalinated in the washing solution again. Immersing a specimen in 80%

いて異なります。詳細は、大原(2011)、金杉(2012)、斉藤(2012)などを参照してください。

チョウ・ガ類標本の処理

チョウ・ガ類標本では、水に浸けると翅が変形するなどの問題がありました。そこで、傷みを最小限に抑えるため、洗浄液を浸した筆で翅をそっと拭う(図9)(八尋・榊永2014)、スプレーで翅に洗浄液を吹き付ける(伊丹市昆虫館2011)といった方法が採られました(図10)。

チョウ・ガの標本で、肉眼に見える汚れがない場合は、洗浄せず経過観察を行っているものもあります。それらの中には、翅や触角が垂れ下がってきているものもあり、微細な汚れの影響が推測されます。

昆虫標本の修復

洗浄が完了した標本のうち、脚や触角・翅が取れているものについては可能な限り修復を行いました(図11、12)。洗浄による傷みの影響で、輸送中に触角などが落下した標本もありました。元の個体が特定できるものについては、木工用ボンド等を用いて取り付けるか、または台紙に貼り付けて同じ針に刺しました。

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ethanol before repairing its shape accelerated dehydration.

The actual methods differed between institutes as they implemented their own measures. Please refer to Ohara (2011), Kanasugi (2012), and Saito (2012), for details.

Treatment of butterfly and moth specimens

Butterfly and moth specimens suffered wing deformation when they were immersed in water. To minimize damage, the wings were cleaned by softly wiping them with a brush immersed in the washing solution (Fig. 9) (Yahiro and Masunaga 2014), or spraying the washing solution (Itami City Museum of Insects 2011) (Fig. 10).

Some butterfly and moth specimens with no visible contamination were not washed, but have been carefully observed. Among them, there are specimens in which the wings and antennae started to droop, suggesting the effects of a small level of contamination.

Repair of insect specimens

After completion of washing, specimens from which a leg, antenna or/and wing had detached were repaired as fully as possible (Figs. 11 and 12). There were specimens from which an antenna dropped during transport due to damage by the washing treatment. Those for which the owner could be identified were glued to the specimen or to a card, and pinned together with the specimen.

Suzuki Mahoro (Iwate Prefectural Museum)



図7 昆虫標本を洗浄液に沈める
Fig. 7 Immersing an insect specimen in a washing solution



図8 ラベルの洗浄 撮影：伊丹市昆虫館 長島聖大氏
Fig. 8 Washing a label, taken by Seidai Nagashima (Itami City Museum of Insects)



図9 昆虫標本の翅の汚れを筆で拭う 撮影：八尋克郎氏（琵琶湖博物館）
Fig. 9 Removing dirt from the wings of an insect specimen using a brush, taken by Katsuro Yahiro (Lake Biwa Museum)



図10 昆虫標本の翅に洗浄液をスプレーで吹き付ける
撮影：伊丹市昆虫館 長島聖大氏
Fig. 10 Spraying a washing solution on the wings of an insect specimen, taken by Seidai Nagashima (Itami City Museum of Insects)



図11 昆虫標本の修復
Fig. 11 Restoration of an insect specimen



図12 ボランティアの専門家による昆虫標本の修復
Fig. 12 Restoration of insect specimens by volunteer experts