

(3) 自然史標本の安定化処理および修理

1) 植物標本の安定化処理と修復

植物標本とは

維管束植物の押し葉標本とは、採集した植物を古新聞紙等の吸湿紙に挟み、平らな板と重しを載せて上から圧迫しつつ吸水し、完全に乾燥させた後、A3版ほどの大きさの台紙に植物を載せ、紙製のテープで上から押さえ、固定したものです(図1a)。海藻類の場合は水道水で洗い、台紙の上に広げてすくい取り、圧迫しながら冷風乾燥させると、それ自身の粘性で台紙に貼り付きます(図1b)。

植物標本の被災

東北地方太平洋沖地震の津波により、日本では推定11万点以上の押し葉標本が被害に遭いました。岩手県山田町所蔵の約8万点の海藻標本は、プレハブの保管倉庫ごと押し流され、約7万点が流失しました(北山2011)。一方、陸前高田市立博物館が所蔵する約1万5千点の標本は、鉄筋コンクリート製の建物の窓のない部屋に収納されていたため、流失を免れました(図2)。この他に、個人の収集家が所蔵していた押し葉標本の少なくとも数万点が流失したと推測されます。

陸前高田市立博物館が所蔵する押し葉標本1万5千点は、2011年4月下旬と5月中旬に、盛岡市にある岩手県立博物館の車庫へ搬入されました(図3)。ほぼ全てがビニール製の

袋に入っていたため、約半数は濡れずに済みましたが、残りは海水に濡れてから2ヶ月近くが経過しており、腐敗が進んだものやカビが生えたものが多くありました(図4)。可能であれば、速やかにビニール袋に入れて密封し、冷凍または冷蔵すべきですが、当時は大型の冷蔵庫や冷凍庫がなく、日平均気温の上昇も手伝ってカビは急速に増えていきました。

そこで岩手県立博物館は2011年5月上旬、全国の博物館学芸員や研究者に対し、汚れた押し葉標本を洗浄・乾燥して返却してほしい、という依頼の電子メールを送り、同時に洗浄マニュアルを作成して公開しました。この呼びかけに対し、全国から30件を超える協力の申し出がありました。そこで、ボランティアの助力を得て汚れのひどい標本を選別し、袋の外側の砂泥を落として段ボールに詰め、北海道から福岡県まで29の博物館・研究機関へ宅配便で発送しました。依頼先では、職員やボランティアが集まり、洗浄作業を行いました(佐久間2011)。

押し葉標本の洗浄

洗浄に使われた主な材料・道具は次のとおりです。

- ・大量の水道水
- ・底面の大きさがA3版以上の浅い容器
- ・A3版程度の大きさに切った目の粗い生ゴミ用水切り網(ポリエチレン製)、または金網、クッキングシート等

(3) Stabilization and Repair of Natural History Specimens

1) Stabilization and Restoration of Plant Specimens

What are plant specimens?

Vascular plant specimens are prepared by spreading a plant sample between sheets of absorbent paper, such as newspaper, dehydrating by pressing with a flat plate and weight, mounting the completely dried plant on a sheet of thick paper of approximately A3 size, and fixing the specimen on the mount with paper tape (Fig. 1a). Marine algae specimens are prepared by washing algae with tap water, spreading it onto a sheet of pasteboard, and drying it in a cold air drier while pressing. The algae adheres itself to the mount (Fig. 1b).

Damage to plant specimens by tsunami

The tsunami in 2011 is believed to have damaged over 110 thousand botanical specimens in Japan. In Yamada Town of Iwate Prefecture, about 70 thousand marine algae specimens out of a total collection of 80 thousand were lost when a prefabricated storage warehouse was swept away by the tsunami (Kitayama 2011). On the other hand, the 15 thousand herbarium specimens in the RTCM were salvaged because they were stored in a room without a window in a reinforced concrete building (Fig. 2). Besides these, tens of thousands of botanical specimens in personal collections are believed to have been lost.

The 15 thousand specimens from the RTCM were transferred to a garage of the IPMM in late April and mid May of 2011 (Fig. 3). Almost all the specimens had been stored in plastic bags and about half stayed dry, but the rest was wet with seawater. For almost two months the specimens were left soaking wet, and many suffered from putrefaction and mold propagation (Fig. 4). The best step to take was to immediately seal them in plastic bags and preserve them in a freezer. However, no large

freezer was available at that time, and mold rapidly spread as the average daily air temperature rose.

IPMM sent e-mails to museum curators and researchers in Japan requesting them to wash and dry the contaminated specimens, and send the specimens back to the IPMM. The museum also prepared a manual for washing plant specimens and released it to the public. It received more than 30 responses from all over Japan, so, with the cooperation of volunteers, it selected specimens with severe damage, removed sand and silt from the exterior of the bags, packed the specimens in cardboard boxes, and sent them to 29 museums and research institutes from Hokkaido to Fukuoka Prefectures by private delivery. At the museums and institutes, staff and volunteers washed the specimens (Sakuma 2011).

Washing plant specimens

The main materials and tools used for washing botanical specimens included: A large amount of tap water, shallow containers with a bottom surface larger than A3 size, large-meshed polyethylene nets for draining kitchen garbage cut to about A3 size or a cooking sheet, thin plates of about A3 size, writing brushes or paint brushes, a large amount of old newspaper (torn longitudinally in half), corrugated cardboard sheets of about A3 size, and paper towels.

The procedure for washing a botanical specimen is outlined below:

- 1) The degree of contamination was assessed, and the condition of the specimen was photographed.
- 2) If the specimen was only slightly wet and slightly contaminated, the specimen was heated at 85°C for several hours to kill the mold and dry by heating.
- 3) If the specimen was severely contaminated, the label was



図1a 維管束植物の押し葉標本
Fig. 1a Vascular plant specimen



図1b 海藻類の押し葉標本
Fig. 1b Marine algae specimen

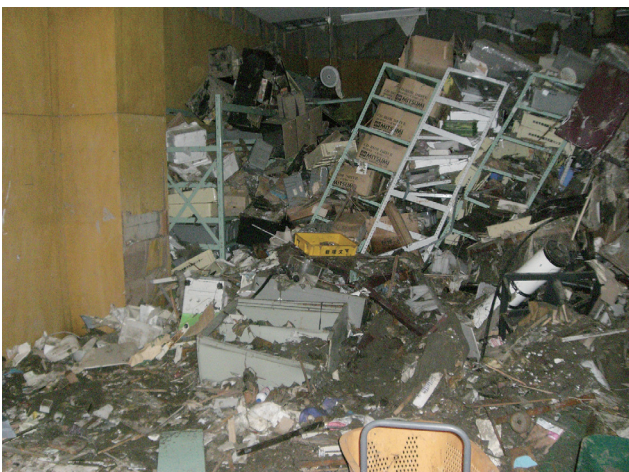


図2 被災後の陸前高田市立博物館の1階収蔵庫の様子。2011年5月12日撮影。
Fig. 2 The repository on the first floor of the Rikuzentakata City Museum after being struck by the tsunami, taken on May 12, 2011



図3 岩手県立博物館の車庫に搬入された陸前高田市立博物館所蔵押し葉標本
Fig. 3 Botanical specimens of the Rikuzentakata City Museum collection transferred to a garage at the Iwate Prefectural Museum



図4 カビの生えた押し葉標本
Fig. 4 Mold growing on a plant specimen



図5 押し葉標本の洗浄1：水に沈めて台紙を剥がす
Fig. 5 Washing process 1: Immersing a specimen in water, and detaching it from the pasteboard

- ・ A3版程度の大きさの薄い板
- ・ 筆または刷毛
- ・ 大量の古新聞（縦に2つに裂いたもの）
- ・ A3版程度の大きさの段ダンボール板多数
- ・ 紙タオル

洗浄の手順は概ね次のとおりです。

- 1) 汚れの程度を見極め、状態を撮影する。
- 2) 水濡れや汚れが軽微な場合は、カビを殺すために85°C数時間で加熱乾燥する。
- 3) 汚れがひどい場合は、標本ラベルの部分を切り取った後、水道水をはった浅い容器に台紙ごと標本を沈め、標本を留めている紙テープを剥がす（図5）。
- 4) 標本が剥がれたら、容器の中から汚れた台紙を取り除き、脱塩のため、標本を10分以上、きれいな水道水に浸ける。
- 5) 板を水に沈め、上に水切り網を載せる。その上に標本を掬い取るように載せ、もう1枚の水切り網をかぶせ、一辺をクリップでとめる（図6）。板の上で、標本についている泥やカビなどの汚れを、筆を使ってそっと洗い落とす（図7）。
- 6) 標本を板と水切り網ごと水から上げ、斜めに立てかけて水を切る。
- 7) 水切り網ごと標本を持ち上げ、ペーパータオルと新聞紙に挟んで一晩置き、吸水させる（図8）。
- 8) ラベルが水溶性インクで書かれたものでない場合は、ラベルも水に沈め、筆などで汚れを落とした後に水を切り、標本とともに新聞紙に挟む。
- 9) 吸水が概ね完了したら、標本を挟んだ新聞紙を乾いた

cut off, the specimen was placed in a shallow container filled with tap water, and the tape that was affixed to the specimen was removed in the water (Fig. 5).

- 4) After the specimen was detached from the mount, the contaminated mount was removed from the container, and the specimen was soaked in clean tap water for at least 10 minutes to remove salt.
- 5) A plate was inserted in the water, and a piece of netting for draining was mounted on the plate. The specimen was scooped and spread out on the net, and covered with another piece of netting. They were clipped together on one side (Fig. 6). In the water, silt and mold were gently removed from the specimen by using a brush (Fig. 7).
- 6) The specimen was removed with the netting and plate from the water, then drained by leaning it against a wall.
- 7) The specimen was taken with the netting from the plate, and drained by placing them between sheets of paper towels and newspaper, and leaving them overnight (Fig. 8).
- 8) If the label was not written or printed with water-soluble ink, the label was also immersed in water, and silt was removed by with a brush. The label was drained and placed together with the specimen, between the newspaper.
- 9) The following day, the moistened newspaper was replaced with dry sheets of newspaper. Several more sheets of newspaper were placed on the top and bottom of the specimen, and then cardboard plates were placed on the top and bottom (Fig. 9). They were tied up with rubber bands, and the specimen was dried with a hot air dryer set at 85°C

ものに替え、ラベルとともに挟む。これを数枚重ねて、上下を段ボール板で挟む（図9）。段ボール板をゴム紐などで縛り、上下から軽く圧迫した状態を保った標本を、庫内を85°Cに調整した熱風乾燥機に6時間程度入れ乾燥させる。

- 10) 乾いたら新聞紙を開いて水切り網を除去し、標本とラベルを新聞紙に挟んだまま、チャック付きポリ袋に保管する。
- 11) 新しい台紙に標本とラベルを貼り付ける（図10）。

実際の作業では、機関ごとにそれぞれ独自の工夫を行っています。その詳細については、布施ほか（2011）・小川（2012）などを参照してください。脱塩のために必要な浸水時間については今後厳密な検証が必要ですが、今のところ御巫・尾崎（2011）が参考になります。

海藻標本の場合は、加熱による変色・変性を避けるため、側面から扇風機等で風をあてるなどして室温で乾燥させます（北山2011）。

蘚苔類標本の洗浄と修復

蘚苔類標本は、採集後に風乾し、紙を折って作った袋の中に入れ、袋の外側に標本ラベルを貼り付けて保管する方法が一般的です（図11）。

濡れた蘚苔類標本は、袋からラベルが剥がれ易く、その点について注意が必要です。汚れた標本は水道水に沈め、汚れを落とした後に水を切り、乾燥機で乾かしてから新しい袋に収納し、ラベルを貼り直します。

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for about 6 hours.

- 10) After the specimen dried out, the pieces of netting were removed. While keeping the specimen and label between sheets of newspaper, they were stored in a plastic bag with a fastener.
- 11) The specimen and label were mounted and fixed on a new mount (Fig. 10).

Each institute has implemented its own protocols for washing specimens. Please refer to Fuse et al. (2011) and Ogawa (2012) for details. Although the length of the immersion period necessary for desalination needs to be carefully determined, the study by Mikanagi and Ozaki (2011) is informative.

Marine algae specimens are dried at room temperature by blowing air sideways from an electric fan to avoid color change and deformation by heat (Kitayama 2011).

Washing and repair of bryophyte specimens

Bryophyte specimens are commonly prepared by air drying a collected specimen, placing it in a paper bag, and attaching a label to the outside of the bag (Fig. 11).

The label is prone to detach from the bag when it becomes wet, and thus care should be taken with its handling. The contaminated specimen is immersed in tap water, and then silt and mold are removed. The specimen is then drained and dried. The dry specimen and the old label is placed in a new bag, and a new label is attached.

Suzuki Mahoro (Iwate Prefectural Museum)

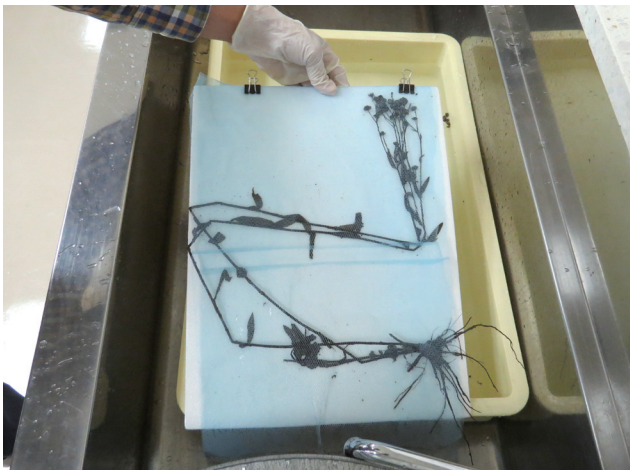


図6 押し葉標本の洗浄2：水切り網で挟む
Fig. 6 Washing process 2: Placing the specimen between two pieces of netting for draining



図7 押し葉標本の洗浄3：筆で汚れを落とす
Fig. 7 Washing process 3: Removing silt and mold using a brush



図8 押し葉標本の洗浄4：吸水する
Fig. 8 Washing process 4: Water absorption



図9 押し葉標本の洗浄5：標本を束ねて上下を新聞紙と段ボール板で挟む
Fig. 9 Washing process 5: Specimens are placed between newspaper and corrugated cardboard sheets

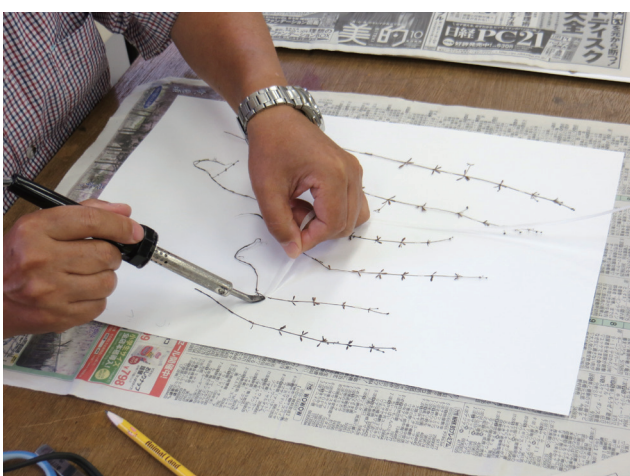


図10 押し葉標本を台紙に貼り付ける
Fig. 10 Mounting and fixing a botanical specimen on a piece of pasteboard



図11 蘚苔類標本
Fig. 11 Bryophyte specimen