### 7）地質標本の安定化処理および整理

津波災害で被災した地質標本を再生させる作業の説明をするにあたり、ここでは岩手県沿岸で被災した陸前高田市立博物館所蔵の古生代後期の化石等の事例（図1）を述べることになりますが、他県の地質標本の事例についても少し補足することとします。

地質標本は、元来野外のあらゆる環境の元に存在していたものです。そのため、一時的に海水や泥などに覆われても容易に物理化学的損傷を受けるものではありません。しかし、新生代の貝類化石や植物化石、脊椎動物化石のように脆弱な標本もあります。また、ラベルなどの紙類は他の文化財と同様に情報が失われる危険にさらされます。

陸前高田市立博物館所蔵地質標本の大半は、陸前高田市内から採集されたものです。陸前高田市は、地質学的には南部北上山地に位置し、主として先シルル紀（約4億4300万年前以前）の花崗岩や変成岩、上部古生界、白亜紀花崗岩（約1億2500万年前）が分布しています。南部北上山地の古生界は化石の豊富な浅海成堆積物からなり、陸前高田市では古生界の中でも石炭系（約3億5900万年～2億9990万年前の地層）やペルム系（約2億9900万年～2億5200万年前の地層）が広く分布しています。これらの地層はわが国のこの時代の地史を明らかにする上で重要な位置を占めています。所蔵標本の大部分は古生代の化石からなりますが、市内以外のものでは、新第三紀中新世（約2300万年～533万年前）の魚類化石などがあります。

地質標本は個々の標本が重量物であること、専門知識を持った者が扱えば迅速かつ適切な判断で作業ができることから、専門家が現地に来て作業を行うことになりました。2011（平成23）年の活動は、地質標本を洗浄、乾燥させて整理し、室内で扱うことができるようにすることを目的とし、標本管理に熟達した全国の地質系学芸員等の参加を募って2011年8月と10月に行われました。作業は、旧生出小学校校舎軒下に木箱などがブルーシートに包まれて保管された状態（図2）から始められました。手順は、大石（2012）、大石ほか（2013）、奥村ほか（2013）が記録していますが、以下に概要を示します。

**＜樹脂製コンテナへ詰め替え＞**　収蔵庫で樹脂製コンテナなどに収納されていた標本のほかに、砂泥が堆積した博物館内で拾い集められた標本もあり、コンテナによっては多くの標本が詰め込まれた状態になっていたので、これを数箱に分配し（図3）、新たなコンテナに枝番号をつけます。
**＜記録＞**　標本ラベルに記録されている標本番号・学名・産地・採集者名などの資料情報をできるかぎり転記し（図4）、ラベルや標本の紛失・混入を防ぎます。
**＜洗浄と除菌＞**　土砂を歯ブラシやたわしなどを使って水道水でざっと落とします。コンテナ内にあるメモや袋等をできるだけ元の標本と一緒に扱います。そして、標本とラベルを次亜塩素酸ナトリウム400倍希釈水溶液（有効塩素

### 7) Stabilization and organization of geological specimens

Work for repairing geological specimens that were affected by the tsunami is analyzed here mainly by using the example of late Paleozoic fossil specimens from the collection of the RTCM (Fig. 1), and also by looking at geological specimens in other prefectures.

Geological specimens originally existed in outdoor conditions. Therefore, they are not easily physicochemically damaged by temporary exposure to seawater or silt, etc. However, there are also fragile specimens such as Cenozoic fossils of shells, plants and vertebrates. Labels and records are also prone to damage and exposed to the risk of lost information.

The majority of items in the geological specimen collection of RTCM were collected in Rikuzentakata City. Geologically, the city is located in the South Kitakami Mountains where Pre-Silurian granite and metamorphic rocks (dating back to 443 million years ago), upper Paleozoic strata, and Cretaceous granite (dating back to about 125 million years ago) spread. The upper Paleozoic strata in the South Kitakami Mountains consist of neritic facies rich in fossils; Carboniferous strata (359 to 299 million years ago) and Permian strata (299 to 252 million years ago) spread over a large area of Rikuzentakata. These strata are important for clarifying the geological history of these periods in Japan. Most of the collection was Palaezoic fossils, but there were also fish fossils from the Miocene Epoch of the Neogene Period (about 23 to 5.33 million years ago) collected from areas other than Rikuzentakata.

Because geological specimens are heavy and can be quickly and appropriately treated by a person with knowledge, experts planned to visit the site to repair the specimens. Activities in 2011 aimed to wash, dry and organize the specimens so that they could be handled indoors. Geological curators, who were skilled in controlling specimens, were called, and arrived in August and October 2011. At the start of the project, the specimens were stored in wooden boxes, which were placed under the eaves of the former Oide Elementary School, and covered by blue plastic sheet (Fig. 2). The procedure has been described by Oishi (2012), Oishi et al. (2013), and Okumura et al. (2013), and is outlined below.

#### Transfer to plastic containers

Besides specimens that were stored in plastic containers at the repository of the museum, there were specimens that were collected from the floor of the museum, where sand and silt had accumulated. There were containers in which specimens were crammed. Such specimens were divided into new boxes (Fig. 3), each with a branch number.

#### Recording

Information about the specimen described on the label, such as specimen number, scientific name, place of collection and name of the collector, was transcribed as much as possible (Fig. 4) to prevent labels and specimens from becoming lost and mixed up.

#### Washing and sterilizing

Soil was removed by washing specimens with tap water while brushing with a toothbrush or a scrubbing brush. Memos and bags in the same container were handled along with the specimen as much as possible. The specimen and label were immersed in a 1:400 dilute solution of sodium hypochlorite (effective chlorine concentration: 0.03%) for 2 to 3 minutes.


図1　救出されたペルム紀頭足類化石。2011年5月29日撮影。
Fig. 1　Permian fossil cephalopod recovered, taken on May 29, 2011

図2　回収された地質標本の旧生出小学校校舎軒下への移動作業。2011年5月7日撮影。
Fig. 2　Transfer of recovered geological specimens to under the eaves of the former Oide Elementary School, taken on May 7, 2011

図3　樹脂製コンテナへの標本の移替え。2011年8月2日遠藤大介氏撮影。
Fig. 3　Transferring rescued specimens to plastic containers, taken by Mr. Daisuke Endo on August 2, 2011

図4　ラベルデータの記録作業。2011年8月2日遠藤大介氏撮影。
Fig. 4　Transcribing label information to a new card, taken by Mr. Daisuke Endo on August 2, 2011

図5　標本の洗浄作業。2011年8月2日遠藤大介氏撮影。
Fig. 5　Washing specimens with fresh water, taken by Mr. Daisuke Endo on August 2, 2011

図6　アイロンによる標本ラベルの乾燥作業。遠藤大介氏撮影。
Fig. 6　Ironing and drying a specimen label, taken by Mr. Daisuke Endo

濃度0.03%）に２～３分浸けます。紙、袋類もあわせて除菌します。残った砂や泥の汚れを水道水で落とします（図5）。細かな隙間の汚れは、歯ブラシなどを使って除去します。ヘドロや油分を含む場合は、中性洗剤水溶液を使って取り除きます。

**＜乾燥＞**　水分を拭き取り、水切りかごなどで乾燥させます。ラベルはキッチンペーパーの上に置いてアイロンがけをします（図6）。乾燥には１日または数日かけます。

**＜収納・整理＞**　乾燥後、チャック付きポリ袋にラベルと標本を別々に収納し、さらにそれらを大きな袋にまとめて収納します。もとのコンテナと同じ標本構成で収納し、同じ箱に入っていたものを一か所にまとめておきます。

**＜コンテナごとに写真撮影・記録＞**　コンテナごとに写真撮影を行い、標本の種類の概要と点数をA4判１枚のカードに略記します（図7）。この作業は、上記「乾燥」「収納・整理」と前後することもあります。

このようにして室内で扱うことができるようにした後は、標本の大分類とコンテナの組み替え、専門家による標本の同定と産地の推定などが必要です。これらは（1）基礎的整理作業１、（2）専門的同定作業、（3）基礎的整理作業２の３段階に分け、2012年度以降に行いました。「基礎的整理作業１」は一次的ラベルを印字して標本に配置し（図8、図9）、大分類ごとに樹脂製コンテナを組み替える作業です（図10）。「専門的同定作業」ではそれぞれの専門家が標本の同定を行います。そして「基礎的整理作業２」では、同定結果を個別ラベルとして出力し、標本に配置します。

大分類の組み替えにより、3,286点のうち20％を越える標本が腕足類化石となり、次に軟体動物とサンゴ類が続くことがわかりました。2014年3月現在で、腕足類化石と魚類化石、古生代軟体動物化石の同定が終了しました。

次に他県の状況を紹介します。宮城県では、マリンパル女川で重油まじりのヘドロに汚染された化石標本を合成洗剤等で洗浄した事例や、歌津魚竜館で大型の魚竜化石レプリカの修復事例が報告され（佐々木ほか2013）、レプリカの修復にあたって現状に即した柔軟な対応や周辺機関の協力、そして修復システムの確立の必要性が指摘されています（松本・河原2013）。福島県では、博物館のある市街地が段丘上にあり、地質標本の津波による被害はなかったようですが、個人所蔵の標本の損失が大きく、原発事故による標本救出の遅れの問題や地震動による脊椎動物化石標本破損の修復等について報告されています（竹谷2013）。

**大石雅之（岩手県立博物館研究協力員）**

Paper and bags were also sterilized together. Sand and silt that remained on the specimen were removed by washing with tap water (Fig. 5). The dirt in minute gaps and openings was removed by using a toothbrush or similar implement. Dirt containing sludge and/or oil was removed by using an aqueous solution of detergent.

### Drying

The specimen was wiped and dried on a dish drainer. The label was placed on kitchen paper and ironed (Fig. 6). Drying took from one to several days.

### Storing and organizing

After the specimen dried, the specimen and label were placed in separate plastic bags each with a fastener, and the bags were placed together in another larger bag. The bag was then stored so as to arrange the specimen in the same way as that of the original container. Specimens that were in a box were stored together.

### Photographing each container and recording

Each container was photographed. The type of and an overview of the specimens in the container was entered on a single piece of A4-size paper (Fig. 7). This was sometimes done before the procedure of drying, storing and organizing described above.

Cleaned and organized specimens can be handled indoors. They need to be classified into broad categories, rearranged into containers of that category, identified, and have their origin estimated by a specialist. The work was divided into three stages, (1) basic organization 1, (2) identification by specialist, and (3) basic organization 2, which was performed in and after 2012. “Basic organization 1” involved printing out and assigning primary labels to specimens (Figs. 8 and 9), and rearranging containers by broad category (Fig. 10). In “Identification by specialist”, specialists in the fields identified specimens. “Basic organization 2” involved printing out specimen labels containing the results of identification, and assigning the correct label to each specimen.

The broad classification showed that over 20% of the total 3,286 specimens were fossil brachiopods. The second largest number of specimens was molluscs, followed by corals. As of March 2014, the identification of brachiopods, fish and Paleozoic molluscs has been completed.

The situation in other prefectures will be briefly described here. In Miyagi Prefecture, fossil specimens that were contaminated with sludge plus crude oil at Marine Pal Onagawa were reported to have been washed with detergent, and a large replica of an ichthyosaur fossil was repaired at Utatsu Gyoryukan (Sasaki et al. 2013). The need for a flexible response in repairing a replica, as well as the cooperation of peripheral organizations and establishment of a repair system, has been pointed out (Matsumoto and Kawahara 2013). In Fukushima Prefecture, the urban areas where museums are located are on terraces, and no geological specimens were affected by the tsunami. However, many specimens of private collections were lost. Delays in rescuing specimens due to the nuclear accident and repair of vertebrate fossil specimens that were damaged by earthquake motion have been reported (Taketani 2013).

**Masayuki Oishi (Research collaborator, Iwate Prefectural Museum)**

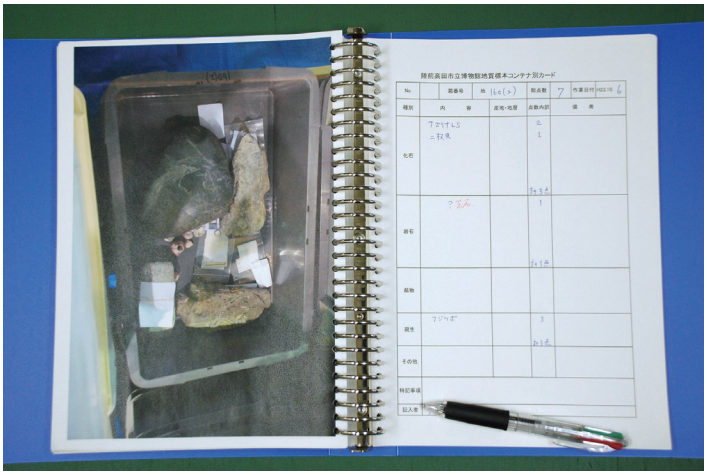

図7　地質標本救済事業で作成したデータカードと樹脂製コンテナ写真の例。
Fig. 7　Data card prepared by the geological specimen rescue project, with a photograph of specimens in a plastic container

図8　標本への一次的ラベル添付作業。2012年6月9日撮影。
Fig. 8　Attaching temporary labels to specimens, taken on June 9, 2012.

図9　樹脂製コンテナの中の標本整理状況。
Fig. 9　Organizing specimens using plastic containers


図10　大分類ごとに標本が配置された樹脂製コンテナ。2012年6月26日撮影。
Fig. 10　Rows of plastic containers filled with specimens arranged according to major classification, taken on June 26, 2012