Use of disposable lighters as an indicator item to monitor marine debris.

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Purpose of study

To clarify the outflow factors and sources of marine debris,
we have been monitoring the marine debris on the coasts of Japan
and East Asia region, using disposable lighters as an indicator item.

Characteristics of this method

Disposable lighters as the indicator item have the following characteristics.
(1) They can easily be found on the beach due to their popularity in the society.
(2) They can drift for a long period on the sea because of robust hollow construction.
(3) Their outflow (production and consumption) regions can be distinguished by the tank type and punched marks on the tank bottom.
(4) Their outflow locations can also be identified by printed information (for example, shop address) on the tank surface. (**Fig.1**)

Methodology

We asked nation-wide beachcombers to collect lighters washed up on beaches.
A total of 55,889 lighters were collected from 1,237 beaches on the coasts of Japan, Taiwan, Korea, China, Russia and Midway Island, USA in the East China Sea, Sea of Japan and the Pacific Ocean from 1998 to 2011. (**Fig.2**)
They were classified into 79 regions based on the prefectures and islands.
The outflow regions were distinguished by the tank type and punched marks on the tank bottom. (**Fig.2**)
And in this method, their outflow locations also were identified by printed shop address on the tank surface. (**Fig.3**)

Korea

Coasts of Korea are affected by marine debris that flowed out of China, but it was most strongly affected by own country.

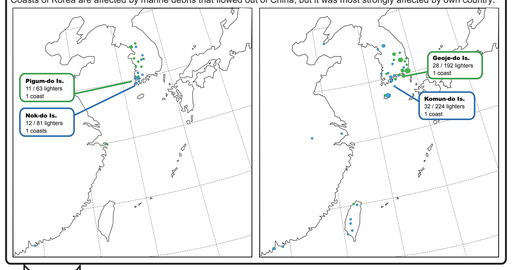
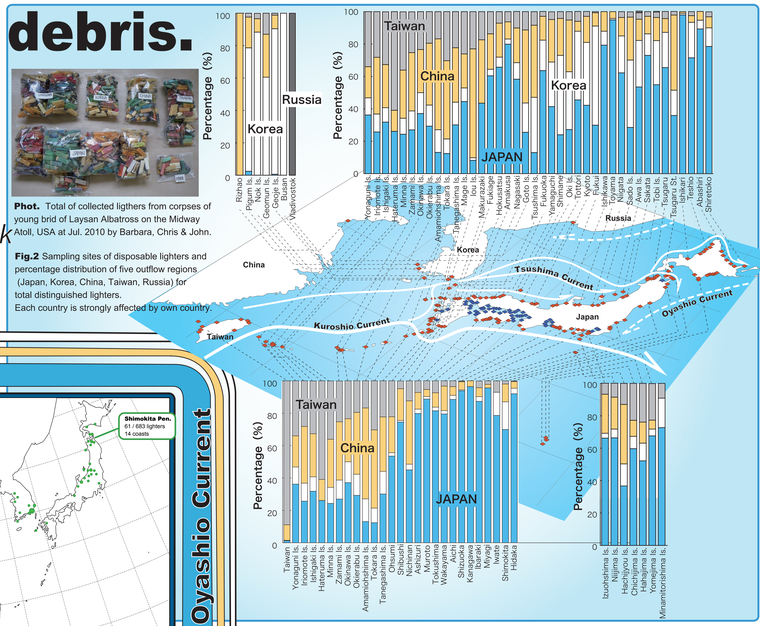


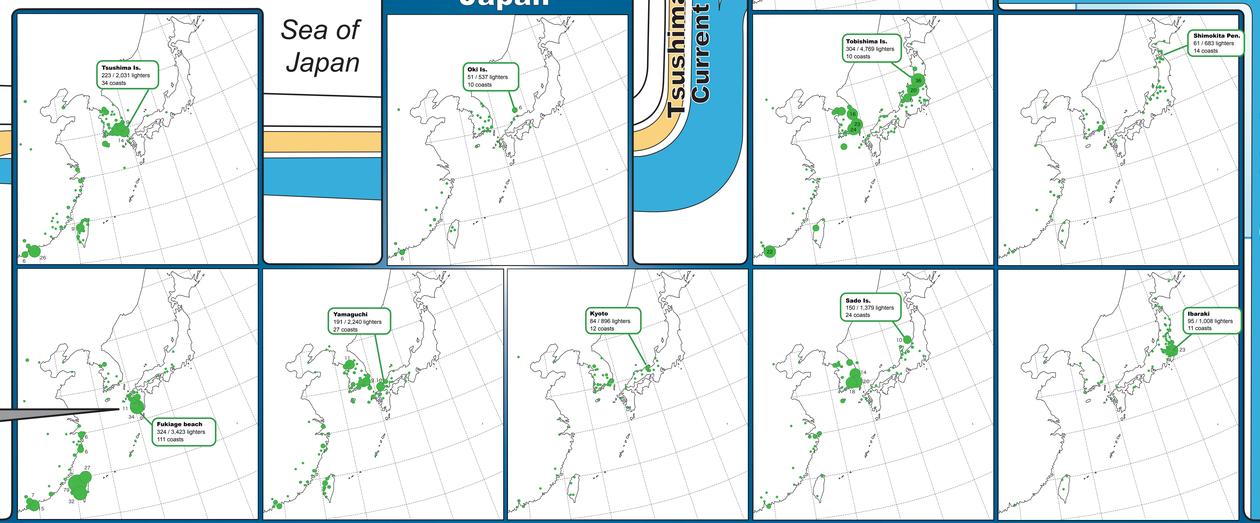
Fig.1 Disposable lighters that had printed characters on the tank surface (From left, Korea, Japan, Taiwan, China, Hong-Kong).
These are part of collected ligthers from corpses of young brid of Laysan Albatross on the Midway Atoll, USA at Jul. 2010.



Phot. Total of collected ligthers from corpses of young brid of Laysan Albatross on the Midway Atoll, USA at Jul. 2010 by Barbara, Chris & John.

Fig.2 Sampling sites of disposable lighters and percentage distribution of five outflow regions (Japan, Korea, China, Taiwan, Russia) for total distinguished lighters.
Each country is strongly affected by own country.

Japan



China

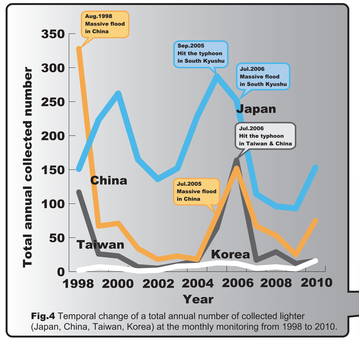
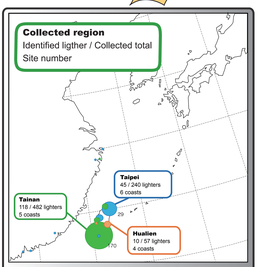


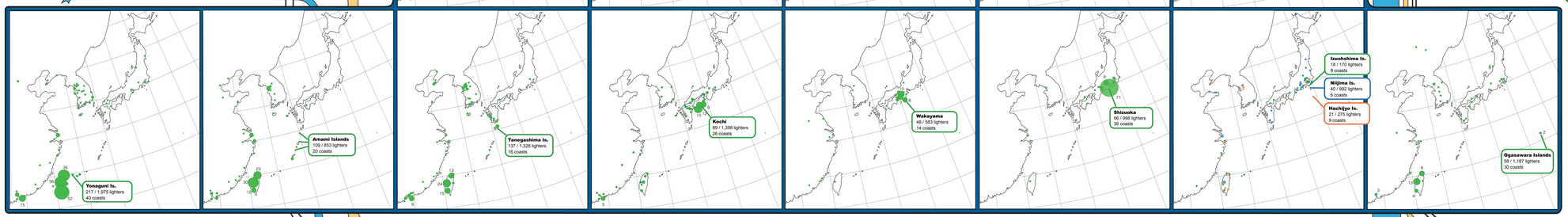
Fig.4 Temporal change of a total annual number of collected lighter (Japan, China, Taiwan, Korea) at the monthly monitoring from 1998 to 2010.

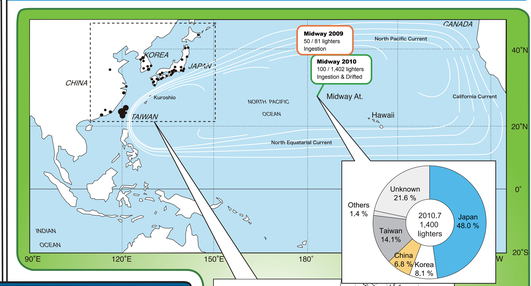
China & Taiwan



Coasts of Taiwan are strongly affected by own country.

Taiwan





Phot. by Barbara Mayer
Many young birds eat the plastics and die in a nest.

Midway Atoll

Kuroshio Current

Japan

Pacific Ocean

Fig.3 Relation between the outflow locations and the typical collected region of disposable lighters in the Nouthwest Pacific region (Taiwan, China, Japan, Midway at. in USA).

Outcome & Priority actions

1) So the lighter has only an information of outflow regions, it is possible to reveal the outflow locations and to understand the flow of marine debris (Fig.3).
2) And it is possible to monitor annual change of marine debris from each countries (Fig.4).
3) Lighters from the East Asia are not only affected by own country and reach neighboring countries, but also be transported as far away as the Central North Pacific.
Therefore East Asian countries must step up joint efforts to solve the problem of marine debris in the Northwest Pacific.

14, Mar. 2011 / S.Fujieda / 5IMDC Mar. 2011 in Hawaii

Special thanks to
Barbara Mayer, Chris Woolaway, John Klavitter (Hawaii), Charles Moore (USA), Ted Chang (Taiwan), Jongmyeong Lee, Sunwook Hong (Korea)