

The trends of the marine debris problem in Japan

Kayo KURASHIGE

Kagoshima Women's Junior College
1-59-1 Murasakibaru, Kagoshima, 890-8565, Japan

Introduction

The marine debris problem was not previously considered a serious social issue because it was not thought to directly affect the lives and the health of people. Sites were chosen as suitable for refuse disposal if they were located in other regions. Generally, people intended to render refuse invisible and more remote. The sea is an ideal place within which to isolate large quantities of waste and hide it from modern society. However, as the quantity and quality of refuse exceeds the capacity for artificial treatment and degradation by natural means, marine pollution caused by refuse has become a serious social problem in our society.

This paper outlines the very broad problems associated with marine debris, and offers suggestions regarding the future management thereof. It is through the activities of nonprofit organizations that tackle this problem that the severity of the issue has received attention.

The Waste Disposal Law (1970) considers "refuse" to apply to all non-industrial wastes. However, in this paper the term "refuse" has been considered as "any material that is regarded as unnecessary, or that is considered to have a negative value by the recognized owner, and that the owner has seemingly relinquished ownership" (Komatsu, 2000). Furthermore, marine pollutants were taken to include oil, hazardous liquids and liquid industrial wastes. The problems associated with solid wastes were also investigated.

The present state of marine pollution by refuse

Pollution attributed to refuse is considered problematic primarily because the discarded plastics and other petrochemical wastes, derived from mass consumption and disposal in cities, are conspicuous components of drifting and stranded matter. This is not a new problem. Natural materials, such as driftwood have impacted upon marine navigation of ships in the past. However, floating plastic products can cause new problems for ships and safe navigation. For example, water inlet ducts of high-speed watercraft can become blocked by plastic drift, and it can also become entwined about the propellers of ships.

In the natural environment, the increased amount of plastic pollution derived from fishing industry in the North Pacific Ocean resulted in increased sightings of fur seals that had become entwined in discarded fishing nets in the 1960s. In 1967, the North Pacific Ocean Fur Seal Committee, which consists of four nations

(the former U.S.S.R., Canada, U.S.A. and Japan), officially reported the extent to which fur seals were becoming entangled in discarded fishing nets and plastic packaging. This prompted the governments of the U.S.A. and Canada to recognize the problem of marine debris (Sao, Tango and Nemoto, 1995) and various laws and treaties aimed at the prevention of marine pollution were subsequently promulgated. At an international level, these include The Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter (London Convention) adopted in 1972, and the International Convention for the Prevention of Pollution by Ships promulgated in 1973 (amended in 1978 and referred to as the MARPOL 73/78 Conventions). In Japan, the Waste Disposal Law (1970), the Law Relating to the Prevention of Marine Pollution and Maritime Disaster (1970), the Water Pollution Control Law (1970), and a variety of other legal instruments have been made for the prevention of marine pollution. Nonetheless, it cannot be said that the marine pollution situation has improved.

Visual observations of floating marine debris, conducted by the Japan Coast Guard since 1991, found 2,569 pieces of debris consisting of expanded polystyrene (38%), vinyl (22%), plastic (9%) along a 2,010-sea-mile transect off the coast of Japan in 2001 (Japan Coast Guard, 2001). In another survey, 3,078 primary and junior high school students participating in 50 beaches in Japan, June, 2001, collected 3.6 tons of refuse that had washed up on the coast. Of this total, plastic/vinyls accounted for 53%, and expanded polystyrene for 14% of that (Japan Coast Guard, 2001). The nonprofit organization, JEAN (Japan Environmental Action Network), which seems to have collated most of the data on ocean refuse in our country, carried out an investigation along the 112 beaches in Japan, in autumn, 2001, plastic/vinyls accounted for approximately 54% of the 431, 622 items of debris.

Plastic is a material with many advantages: it is cheap, flexible, light and it does not decay. However, these excellent properties all contribute to the disasters that follow its disposal. Its flexibility contributes its broad application, and low production costs mean that it is disposable. Furthermore, because plastics do not decay, they remain in the ecosystem indefinitely without contributing anything to the overall circulation of materials within the ecosystem, and because plastic refuse is light, it can be carried around the world by ocean currents.

Plastics are widely used to make marine products, and like plastic, the properties that make expanded polystyrene a useful material, also contribute to it being a problematic pollutant. It has excellent heat retaining properties, it is very light, it is water resistant and it does not decay. However, since the surface of expanded polystyrene is fragile, it is highly susceptible to producing smaller pieces (potsherd) under conditions of normal use or when left to the elements. Untreated marine refuse is degraded by the action of direct sunlight and seawater. If it does not get washed up on shorelines, or float in the ocean, it eventually sinks to the ocean floor where it accumulates and gathering becomes very difficult.

Harmful effects and sources of marine debris

Kanehiro (1995) lists the damage caused by ocean refuse as follows:

- (1) The effect on marine organisms: Fish, sea turtles, seabirds, and fur seals become trapped or entwined by nets, fishing lines, plastic bands. These animals also ingest plastic film and particulate matter.
- (2) The effect on fisheries: Inhibition of growth of marine species by the entanglement of fishing lines and nets around natural and artificial reefs, respectively. Ghost fishing and the devastation of fishing grounds caused by the disposal fishing gear (fishing nets, cages and pipes) and plastic waste. Injuries to fishermen from fishing lines. Decreased catch efficiency and damage to fish caused by refuse contamination in fishing nets.
- (3) Interference with ship navigation: Propellers and water-intake vents for cooling are rendered inoperable due to entanglement with, among other things, fishing nets, ropes and vinyl bags.
- (4) In addition: Lowering the aesthetic value of the coast by scattered refuse.

Sources of ocean refuse that effect beaches stem primarily from refuse left by tourists, recreational fishing and unlawful disposal.

In 2001, there were 103 confirmed cases of marine pollution in the seas around Japan (Japan Coast Guard, 2002). It is known that the unlawful disposal of construction waste and sludge occurs, and that there are industrial waste traders who violate the Waste Disposal Law exist even in now. Furthermore, the disposal of resin pellets (small, plastic resin granules of about 2~6mm in diameter), used as a raw material in the production of plastics, has been particularly problematic. Point sources for these resin pellets are probably plastic processing facilities that dispose of the pellets via their sewage outlets into the sea. There is the problem that the wildlife mistakes the pellet for a bait and swallows it. And while the pellet drifts in the ocean, endocrine disrupter which is included for it is diffused, and the possibility in which the pellet adsorbs PCB and DDT has been indicated. Fishing equipment, such as fishing nets, oyster culture pipes and expanded polystyrene potsherd also contribute to the drift and scatter.

Illegal disposal of medical wastes is also a problem. In a cleanup in 2001, JEAN collected a total of 131 syringes, 194 packages of medicine and 86 miscellaneous items of medical refuse (excluding syringes). In Kotobikihama, Amino town, in Kyoto prefecture, 184 syringes are collected from August 1995 to November 1996. The Higashiyama High School Drifted Goods Club discovered that the syringes were not only from Japan in origin, but also from China and Korea. The club concluded that, "this is not a case of small-scale disposal of syringes such as could be expected from insulin use that the patients administer themselves when using the Japanese product. Rather, given the large capacity of the syringes, it seems likely that medical personnel, or traders who were entrusted with legally disposing the syringes, did so unlawfully by dumping them in a hilly area from where they entered a river and then flowed to the sea" (Higashiyama High School Drifted

Goods Club, 1997). The small medical institution on the Sakishima Islands in Okinawa Prefecture was not considered a likely source of medical waste. However, there are reports confirming the discovery 28 syringes of and 447 medicine bottles along 14 beaches in Okinawa in August 1998, and in March-April of the next year, 50 syringes of and 149 medicine bottles were discovered along on 32 Beaches in Okinawa (Yamaguchi, 2002). Medical waste that has the potential to cause infection is classified as "specially controlled industrial waste". Despite legal requirements for special disposal measures when processing such wastes, the unlawful disposal of such wastes has continued and medical wastes still drift to the coast.

The source of ocean refuse is not limited to people who do not follow proper refuse disposal practices near the coast and marine environment. In the ocean, accidental pollution occurs frequently. It is very difficult to recover materials that escape by accident and inadvertently cause pollution.

Ocean refuse can also be derived from household refuse that was not adequately disposed on land. Such refuse might enter rivers or canals that may flow to the sea. For example, although tobacco filters are often found along the coast, it does not mean that they were discarded there initially. Many investigations have revealed that much of the refuse generated by households flows into the ocean.

Ocean refuse also moves. It is not uncommon to find that refuse dumped in one place is transported to another by ocean, and tidal currents and wind action. Consequently, the refuse found on one coast may not necessarily have been dumped there. Tidal currents and wind action can concentrate debris in a specific place from where they are, washed up on the coast. Conversely, refuse dumped at a specific location is scattered and dispersed along the coast and the marine environment. What is referred to as "transboundary refuse", or refuse that crosses borders, has become a large problem and drift of foreign products has been confirmed in along much of Japan's coast. While transboundary refuse, such as industrial, medical and radioactive wastes, are often dumped intentionally, most ocean-borne wastes are transported by wind and tidal currents.

Mitigation of the marine debris problem

A variety of mitigation measures directed at the recover the refuse that scatters the coast and the marine environment are available. Municipalities, neighborhood associations, enterprises, schools, nonprofit organizations, maritime sports clubs, and similar organizations that are involved in cleaning activities along the coast, exist in great numbers. However, such beautification activities of both coast and ocean do not constitute a drastic solution to the problem. It is very difficult to recover all the refuse that scatters the coast and ocean. Furthermore, even if all such debris was recovered it might become again after a few days. It is therefore necessary to trace the source of the refuse in order to solve the coast garbage problem.

The idea of identifying point sources of pollution, and how they contribute to the marine debris problem, has been adopted by the nonprofit organization, JEAN.

An International Coastal Cleanup was launched, the first such global initiative directed at collecting refuse from the marine environment, by the Center for Marine Conservation (renamed The Ocean Conservancy

in 2001) in the United States in 1986¹. According to the CMC system, people not only undertake cleaning activities, but they also characterize the recovered refuse on a data card. In Japan, a cleanup campaign using this system for the first time took place in 1990 at 80 locations along the coast with 800 participants.

JEAN was represented at each location by a person (captain) and the Cleanup Zenkoku Jimukyoku began in Tokyo. The Cleanup Zenkoku Jimukyoku has publishes "The JEAN Communication", a campaign report, asked people to participate in the campaign, collect data, and they correspond with The Ocean Conservancy. JEAN carries out a domestic campaign in the spring, and the International Coastal Cleanup campaign in the autumn of every year. The data for the international campaign is compiled and sent to The Ocean Conservancy. For the International Coastal Cleanup campaign in the autumn of 2001, participants numbered about 18,000 in Japan, and 755, 221 in the 77 participating nations around the world (JEAN, 2002). The activity is carried out on a considerable scale.

The completion of the data cards might seem a laborious task, even to some participants, particularly since the primary objective of the exercise was the collection of refuse. However, the simultaneous collection of data supports the long-term goal that is the beautification of the coast that it is carried out together with refuse recovery. The survey result itself cannot be utilized as scientific statistical data, because it is influenced at weather and proficiencies of the investigator. However, the real value in the collection of data is that the interest of the participants into the problem is raised more when each piece of refuse can be accounted for.

This activity, which has been undertaken in Japan for 14 years, has gradually generated results.

For example, large quantities of expanded polystyrene potsherd washed up on the coast of Hiroshima Prefecture where oyster farming is popular. The result of the cleanup campaign showed that expanded polystyrene potsherd accounted for 60% of the coastal refuse recovered, and that plastic pipes used for oyster farming were a large component of drifting refuse.

The Cleanup Kansai Jimukyoku asked the Hiroshima Prefecture authorities, related groups and enterprises to act against the scattering of expanded polystyrene and oyster farming pipes in 1993. Consequently, local firms developed, manufactured and promoted the sale of floats and collision bumpers made of hard resin (called "Eco Float"), which has replaced the need for floats made of expanded polystyrene. A local firm also initiated a program to reduce the v of expanded polystyrene floats and to return pipes used in oyster farming that were collected at the beach cleanup to the fishermen cooperative for recycling (Clean up Kagoshima Jimukyoku, 2001).

Kagoshima Bay is scattered with expanded polystyrene potsherd. The source of the potsherd is probably related to improper management practices, misuse, neglect and the inadequate disposal methods for expanded polystyrene has contributed to its abundance in the local marine environment. Cleanup Kagoshima Jimukyoku questioned both, the float manufacturer which made the expanded polystyrene, and the Japan Expanded Polystyrene Recycling Association (JEPSRA) in April 2001 (Clean up Kagoshima Jimukyoku, 2002). Cleanup Zenkoku Jimukyoku and Kagoshima Jimukyoku subsequently convened meeting titled,

“Expanded Polystyrene Problem Review”, and called the relevant stakeholders, government ministries and agencies and academics in June, 2002, to form a workgroup that is still active.

The garbage problem along coast was addressed for the first time at a national level by the Committee on Land and Environment in the House of Councilors in August 2000. Subsequently, The Environment Agency, The Ministry of Construction, The Ministry of Transport, The Japan Coast Guard, The Meteorological Agency, The Fisheries Agency, The Ministry of Health and Welfare, The Ministry of International Trade and Industry have participated in a Refuse Liaison Conference between the various ministries and agencies. At these meetings, the data that has been accumulated by JEAN is used as working material. In September 2000, the Plastics Industry League was established, and together with JEAN, set about establishing a commission to discuss marine pollution by plastic.

On the matter of transboundary refuse, JEAN sponsored the “Stranding refuse in Japan and Korea Cooperation Project Tsushima Conference” in Kamitsushima Town, Nagasaki Prefecture, in December 2002. Through the exchange of information and cooperation, Japan and Korea will be able to tackle this problem².

Conclusion

The marine debris problem described in this paper is very variously complicated by the type, and the source, of the refuse. Effective mitigation measures require an understanding of the different types, and source, of refuse. An example of such a mitigation measure involved floats made of the expanded polystyrene. The one reason why a recovery and disposal system for the floats does not function well is the cost of disposal. Expanded polystyrene is a highly porous product with a high air content (98%), and consequently, the transportation of the unnecessary expanded polystyrene to treatment facility seems to carry the air. Therefore, the conveyance cost is very useless. Conveyance costs could be considerably reduced, if volumes of expanded polystyrene were reduced was realized in areas of the coast that use the floats. However, expanded polystyrene floats used in the marine environment can not be recycled as well as expanded polystyrene products used on land, because the floats become fouled by impurities, moisture and salinity. It is thus important to develop and use non-potsherd floats, and to manage the use of floats made from expanded polystyrene effectively in the future (Clean up Kagoshima Jimukyoku, 2002).

One of the reasons behind the continued unlawful disposal of floats is the high disposal costs involved. It is thus important that the costs of disposal and recycling be reduced. For a holistic solution to the marine debris problem, conversion from an industrial society centered on mass disposal, into a society focused on reduction of the refuse production and the establishment of appropriate recycling programs. By doing so, society is likely to improve their lives and production activities.

It is not always easy for an individual to realize the effectiveness of their environmental protection activities. There is the mental conflict of feeling ineffective and despair at being an individual tackling an enormous problem (Hasegawa, 2000).

The similar feeling occurs in the activity to the marine debris problem. Refuse will continually surge toward the coast, irrespective of the degree of cleaning activity that is done. When JEAN was first formed, a member said that “After 10 years, there will not be any refuse along the coast and we will be able to break up JEAN happily”. Notwithstanding, there is still refuse along the coast and the problem persists³.

However, the activities of JEAN should be viewed from a different perspective. Collaborative and partnerships have been formed between administrative bodies, enterprises and nonprofit organizations. The Conservation of the Marine Environment Group has an influential voice. It has asked government administration and enterprises to tackle the problem together, and there are plans to cooperate with nonprofit organizations in the future. Enterprises and administrative bodies have also participated in various Cleanup Campaigns. If these enterprises and government administration examine countermeasures to the problem on the basis of the results of the Cleanup Campaigns, then the sensation feeling ineffective and of despair are reduced to some degree.

At present, coastal refuse cleaning initiatives currently depend on the dedication and labor of volunteers. Further cooperation with government administration and enterprises are required in order to improve the situation and relieve the burden on the part of the people.

Notes

1 CMC was established as environmental education center for marine organisms in 1972. Subsequently, the scope of their activities involving marine organisms, their habitat, ocean nature conservation of coastal zones, scientific research, fishery management, international coast cleanups were extended, and it grew into the largest ocean nature conservation group in the United States.

The main activities of the organization can be summarized as follows: Contribute relevant data to the formulation policies that effect the marine environment, promote public awareness o through environmental education, encourage citizen participation in policy decision making, encourage adherence, and suggest improvements, to the domestic and international laws for the conservation of the marine environment, and, support for projects. In addition to its other activities, JEAN is also involved in the Clean Up the World Campaign that began in Australia in 1989 and it also acts as a facilitator for the exchange of information (JEAN, 2001).

2 The following materials are suggested reference materials for the activities and future direction of JEAN: “The JEAN Communication” No.86 (September, 2000), No.87 (October, 2000), No.106 (September, 2002), No.109 (December, 2002).

3 According to a public opinion survey on sea shore needs, undertaken by the Prime Minister Secretariat Information Bureau of the Prime Minister’s Office in August, 2000, 57.2% of the people who visited the sea shore in past year was dissatisfied by the refuse scattered along the coast. 59.6% of the people who responded said that refuse and oil on the sea surface had increased, and 62.4% of respondents said that refuse on the beach had increased compared to 10 years previously. However, despite their disapproval, people are not always prepared to take the action that is required to clean the coast.

References

- Clean up Kagoshima Jimukyoku. 2001. *Kagoshima Clean up Campaign 2000 Report*. Kagoshima.
- Clean up Kagoshima Jimukyoku. 2002. *Kagoshima Clean up Campaign 2001 Report*. Kagoshima.
- Hasegawa, Koichi. 2000. “Shimin ga kankyo boranthis ni naru kanousei (the Possibility in Which the Citizen Becomes the Environmental Volunteer)”. in *Kankyo boranthis / NPO no syakaigaku (Sociology of environmental Volunteer / NPO)* edited by Torigoe, Hiroyuki. Shinyosha. Tokyo.
- Higashiyama High School Drifted Goods Club. 1997. “Kotobikihama ni hyothakusuru iryo haikibutsu oyobi chigakubu no

- katsudo (Medical Waste Which is Washed up to the Kotobikihama and Activity of Drifted Goods Club)". *Higashiyama Gakuen Kenkyu Kiyo*. 42: 1-20. Kyoto.
- Japan Coast Guard. 2002. *Mirai ni nokosou aoi umi, Kaiyo osen no genjo (Let's Keep the Blue Sea to the Future, Present State of Marine Pollution (from January to December, 2001))*.
- Japan Environmental Action Network. 2001. *Clean up Campaign 2001 Report*. Tokyo.
- Japan Environmental Action Network. 2002. *Clean up Campaign 2002 Report*. Tokyo.
- Kanehiro, Haruyuki. 1995. "Kaiyo no gomimondai: Purasutikku haikibutsu ni yoru kaiyo osen no genjyo to torikumi (Waste Problem of the Ocean: Present State and Challenge-of the Marine Pollution by Plastic Garbage)". *Gekkan Haikibutsu (Monthly The Waste)*. 21-7: 124-131.
- Komatsu, Hiroshi. 2000. "The Waste Management Crisis as a Social Problem: What Sociologist Can Do for This Kind of Problem". *Journal of Environmental Sociology*. 6: 133-147.
- Nakanishi, Hiroki. 1995. "The Change of Debris to Plastic Debris". Edited by Sao, Kazuko, Tango, Reiko and Nemoto, Minoru. *The Sea of Plastic: Marine Life Threatened and Endangered*. Ocean Engineering Research. Tokyo.
- Ohtake, Chiyoko. 2000. *Umibe no peretto wo sagashite (The Prastic Pellet of Sea Shore)*. Komineshoten. Tokyo.
- Sao, Kazuko, Tango, Reiko and Nemoto, Minoru edited. *The Sea of Plastic: Marine Life Threatened and Endangered*. Ocean Engineering Research. Tokyo.
- Yamaguchi, Hareyuki. 2002. *Hige sensei no shokan, Hyochaku gomi: Kaigansen no ima wo otte (A Letter of The Mustache Teacher, Marine Debris: The Present state of Coastline)*. Bungeisha. Tokyo.
- Cabinet Office. 2000. The Public Opinion Survey on the Sea Shore Needs. ([Http://www8.cao.go.jp/survey/h12/umibe/index.html](http://www8.cao.go.jp/survey/h12/umibe/index.html), 2002/10/6).
- Japan Coast Guard. 2001. The Refuse Map. ([Http://www.kaiho.mlit.go.jp/info/tokei/env/2001map.pdf](http://www.kaiho.mlit.go.jp/info/tokei/env/2001map.pdf), 2003/2/21).