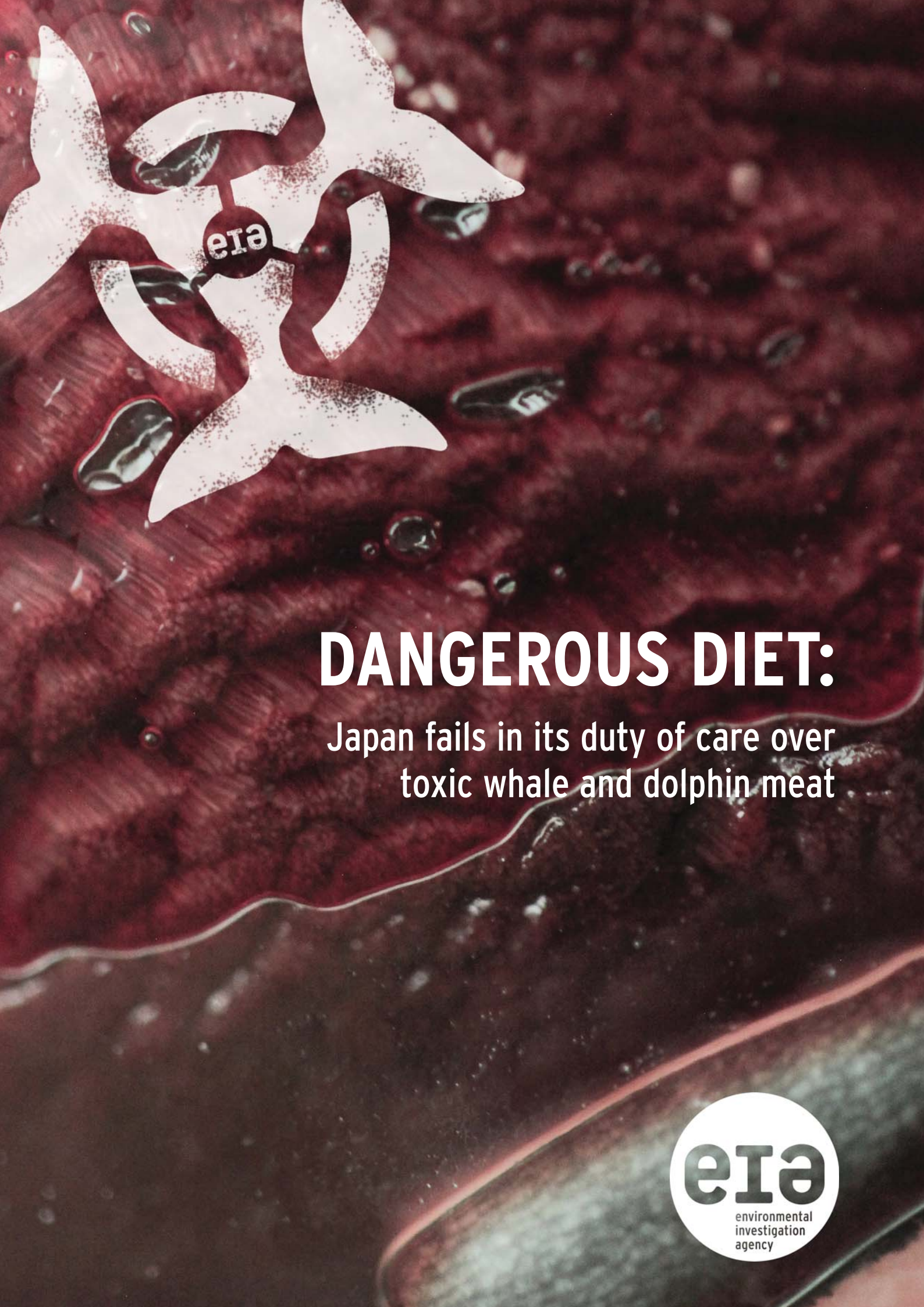


# DANGEROUS DIET:

## Japan fails in its duty of care over toxic whale and dolphin meat

environmental investigation agency

## ABOUT EIA

**EIA is an independent campaigning organisation committed to bringing about change that protects the natural world from environmental crime and abuse. As part of our work we have campaigned for three decades for effective protection for whales, dolphins and porpoises globally.**

Report design by:
www.designsolutions.me.uk

September 2015

All images © EIA unless otherwise stated.

**ENVIRONMENTAL INVESTIGATION AGENCY (EIA)**
62/63 Upper Street
London N1 0NY, UK
Tel: +44 (0) 20 7354 7960
Fax: +44 (0) 20 7354 7961
email: ukinfo@eia-international.org

**www.eia-international.org**

EIA is solely and entirely responsible for the contents of this report.

COVER IMAGE:
Packaged dolphin meat from Taiji.

# EXECUTIVE SUMMARY

## A number of independent assessments have documented the high levels of toxic pollutants present in cetacean (whale, dolphin and porpoise) products sold for human consumption in Japan.

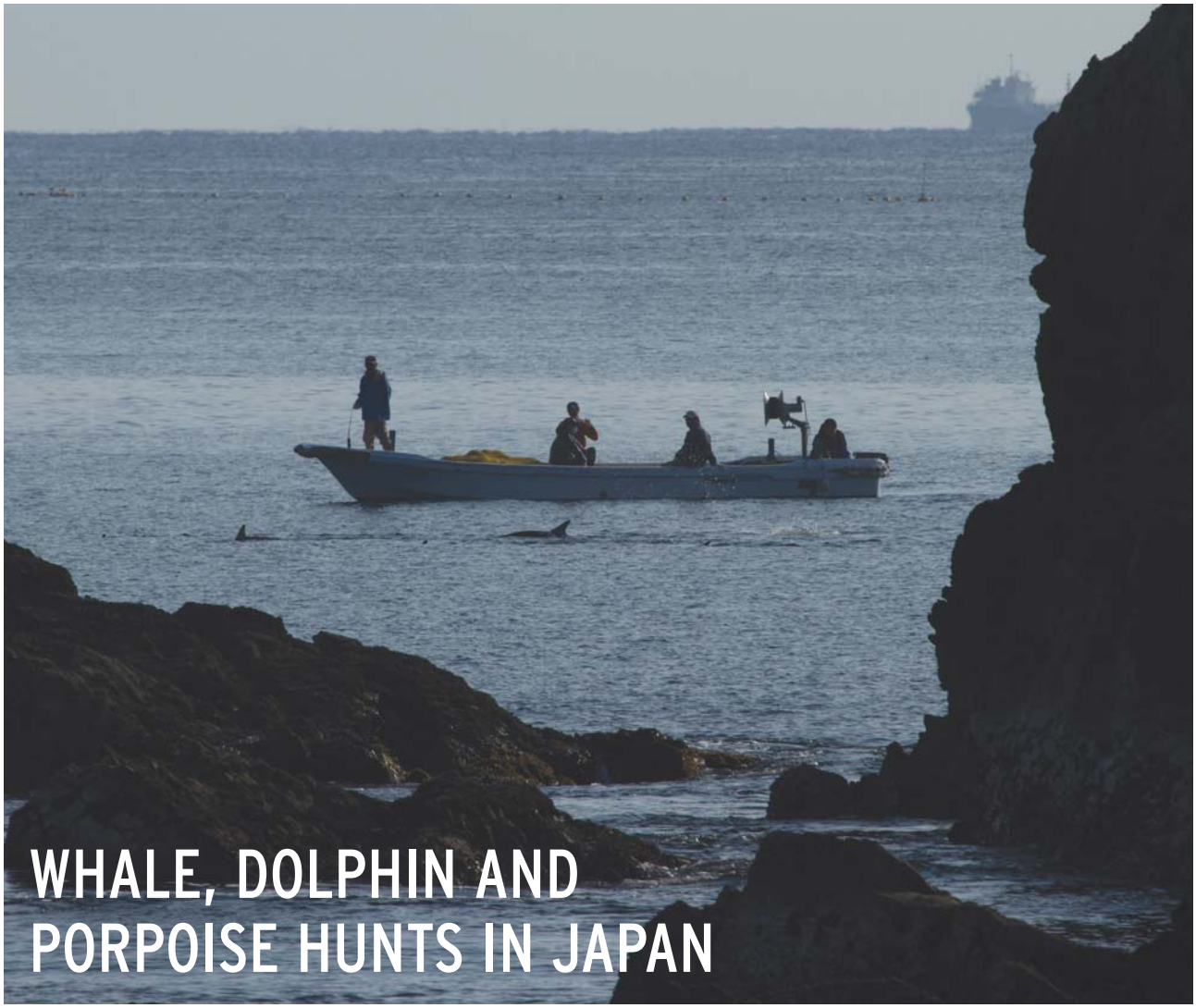
The serious health impacts of consuming such pollutants are now recognised internationally, with evidence that consumption of cetacean products with high pollutant levels is linked to impaired pre- and post-natal development as well as adverse health effects in adults.[1]

EIA's research over the past 15 years shows that cetacean products from Japan's coastal hunts consistently exceed the Government of Japan's recommended safe limits for pollutants such as mercury and polychlorinated biphenyls (PCBs). Of the 341 products tested for mercury during that period, 56 per cent exceeded the Government provisional recommended limit for fish and shellfish. In the most recent tests, conducted in 2015, all 20 products exceeded the Government limit for mercury. The maximum concentration recorded in 2015 was found in a product labelled as long-finned pilot whale; it contained 19 parts per million (ppm) total mercury, a concentration 47 times higher than the safe limit. Published studies by Japanese scientists have documented pollutant levels several hundreds of times higher than the Government's recommended levels.[2] Indeed, some products tested have carried such high pollutant loads that they could cause acute mercury poisoning from a single meal.[3]

Despite the overwhelming evidence that coastal whales and dolphins routinely exceed safe mercury levels, the Government of Japan has failed to take action to remove these products from commercial sale. Advice to consumers on safe intake levels is also wholly inadequate, leaving Japanese citizens largely unaware of the risks posed by consuming these products. Mislabelling of cetacean products further prevents informed consumer choice regarding the potential pollutant risk.

There is an urgent need for the Government to update and enforce its advisories and laws in light of changes in international guidance and the growing body of medical evidence concerning the effects of such pollutants on consumers. Given that food products from coastal whales, dolphins and porpoises almost without exception exceed advisory limits for mercury, the Government of Japan should take steps to permanently ban these products for human consumption.


鮨



# WHALE, DOLPHIN AND PORPOISE HUNTS IN JAPAN

Whales, dolphins and porpoises (known collectively as cetaceans) are targeted in a number of different hunts, including the Japanese Government's discredited 'scientific whaling' hunts. Under special permits issued by the Government, whales are purportedly killed for scientific research purposes but the hunts have been widely criticised as primarily for commercial purposes,[4] with the meat derived sold for human consumption in Japan.

In 2014, the International Court of Justice (ICJ) ruled that Japan's Antarctic special permit hunt (JARPA II) was not conducted "for purposes of scientific research".[5] As a result, the Court ordered Japan to revoke any permits in relation to JARPA II and to refrain from granting further permits in pursuance of that programme.

Although the Government of Japan withdrew the permit for the Antarctic hunt in 2014, it has published a new proposal for a 12-year scientific Antarctic whaling programme scheduled to commence in 2015.[6] A new special permit whaling proposal for the North Pacific is also expected to be developed.[7]

In addition to the hunts of baleen whales, three other hunts kill toothed cetaceans (dolphins, porpoises and toothed whales) in Japan's coastal waters. Small-type coastal whaling, drive hunts and hand harpoon hunts are permitted to kill (or live capture) 15,224 cetaceans from nine different species to supply a domestic market for their meat as well as the market for live animals for aquaria.[8] In the past 70 years, more than a million cetaceans have been killed in these coastal hunts and there is evidence that a number of the exploited populations are significantly depleted.[9] Despite this, the Government of Japan continues to set catch limits at unsustainable levels, threatening coastal populations with localised extinction.[10]

Notwithstanding the grave conservation concerns,[11] Japan's cetacean hunts provide consumers with products unfit for consumption due to high levels of toxic pollutants.[12] These products pose serious health risks but official guidance remains inadequate, outdated and often unseen by consumers.

# POLLUTANTS IN THE MARINE ENVIRONMENT

During the past century, levels of man-made contaminants have increased in the marine environment as a result of pollution from agricultural and industrial activities. Persistent organic pollutants (POPs), heavy metals and emerging pollutants such as brominated flame retardants pose a threat to marine organisms and those who consume them. Known collectively as Persistent, Bioaccumulative and Toxic (PBT), these chemicals are resistant to degradation and are ingested by organisms in the marine food chain, accumulating in fatty tissues. Through a process of biomagnification, concentrations become increasingly elevated at higher levels of the food chain. As cetaceans possess large lipid stores in the form of blubber, are long-lived and, in many cases, are apex predators at the top of the food chain, they often accumulate high levels of contaminants which can be passed on to human consumers. Although cetaceans and other marine organisms accumulate a wide range of PBTs, studies have focused on the effects of mercury and polychlorinated biphenyls (PCBs).

## HUMAN HEALTH IMPACTS OF POLLUTANTS

### Mercury

Mercury and mercury compounds have long been known to be toxic to humans. While inorganic mercury has significant health impacts, methylmercury is considered the most dangerous form in relation to food contamination as it comprises the majority of the total mercury ingested through contaminated seafood.[13] A major mercury poisoning incident in Japan in the 1950s drew attention to the issue when methylmercury was discharged by industry into rivers and coastal waters, bioaccumulating in fish and shellfish consumed by the local population. Symptoms of severe mercury poisoning, known as Minamata Disease after the Japanese city in which it was diagnosed, include damage to vision and hearing, neurological damage and, in severe cases, paralysis, coma and death.

Since Minamata, large-scale studies have assessed the impact of long-term exposure to low levels of methylmercury from ingestion of seafood, particularly the risks of prenatal and childhood exposure, which are considered the most sensitive endpoints. In a 2006 review, the Joint FAO/WHO Expert Consultation concluded that there is convincing evidence of adverse neurological/ neurodevelopmental outcomes in infants and young children associated with methylmercury exposure during foetal development, due to maternal fish consumption during pregnancy. Furthermore, it found that there is possible evidence for cardiovascular harm and other adverse effects (e.g. immunological and reproductive effects) associated with methylmercury exposure.[14]

### PCBs

PCBs are carcinogens as well as having a variety of immune, nervous and cardiovascular effects. Perinatal exposure via maternal ingestion of PCB-contaminated fish has been found to cause neurobehavioural and developmental deficits, while in adults it has been associated with adverse effects on memory and IQ, hypertension, reduced thyroid function and an increased risk of cancer and diabetes.[15]

## INTERNATIONAL CONCERN AND LEGISLATION

The level of international concern about the environmental and health impacts of mercury and POPs is such that international conventions have been established to regulate and reduce anthropogenic emissions of these pollutants. The Stockholm Convention on Persistent Organic Pollutants requires parties to take measures to eliminate or reduce the release of POPs into the environment, while the Minamata Convention (adopted in Minamata in 2013) requires signatories to regulate and reduce anthropogenic emissions of mercury and encourages parties to take measures to protect vulnerable populations from adverse health effects.[16] Japan was one of the initial signatories to the Convention but has yet to ratify the treaty.[17]

Article 16 of the Minamata Convention concerns 'Health Aspects' and encourages parties to develop

**"... there is convincing evidence of adverse neurological/ neurodevelopmental outcomes in infants and young children associated with methylmercury exposure during foetal development"**

programmes to identify and protect populations at risk, which may include adopting science-based health guidelines relating to mercury exposure and setting targets for mercury exposure reduction. It also calls for promotion of appropriate healthcare services for prevention, diagnosis, treatment and monitoring of health risks and public education.

In 2014, the World Health Organisation (WHO) adopted a resolution regarding its role and that of public health ministries in the implementation of the Minamata Convention, which encourages Member States to promote appropriate health care services for prevention, treatment and care for populations affected by exposure to mercury, including effective risk communication strategies targeted at vulnerable groups such as children, women of childbearing age and pregnant women.

The issue of human health in relation to the consumption of cetacean products has also been raised repeatedly at the International Whaling Commission (IWC), most recently in a 2012 Resolution which recognised that some communities may be faced with health problems arising from the high level of contaminants in cetacean products and encouraged the WHO to conduct reviews of contaminants in certain cetacean products and give updated advice for consumers. The Resolution, which was passed by consensus, also urged governments concerned to responsibly inform consumers about health effects related to consumption of some cetacean products and to take steps to counter negative effects, based on rigorous scientific advice and clear risk assessments.[18]

There are multiple international and national advisories in place aimed at protecting consumers from polluted food products. Limits are set internationally by the Food and Agriculture Organisation (FAO) and WHO, as well as nationally (see Table 1), with different levels often set for predatory fish species and other fish species. Those for mercury and methylmercury take two forms, a guideline level for amounts in food and provisional tolerable weekly intake (PTWI) levels. Japan's guideline level, called a 'provisional limit' for fish and shellfish products is lower than international and European limits, but excludes cetaceans and predatory fish species.

Advice on safe weekly intake levels also varies between countries (see Table 1). The European advisory on methylmercury (MeHg) is slightly more conservative than that set internationally by the Joint FAO/WHO Expert Committee on Food Additives (JECFA), while the United States intake limit is significantly lower than both. Japan's advice on tolerable intake is set at 3.4μg MeHg/kg body weight for the general population, with an additional limit of 2.0μg/kg body weight for pregnant women, both of which exceed the international advisory level as well as those set in Europe and the US. Both the European and US intake advisories are undergoing review and there are discussions about revision of the WHO/FAO advice. A recent review for the European Environment Bureau (EEB) has indicated that even the US limit is not adequate to protect public health against methylmercury damage and is outdated in light of recent studies.[19] The EEB review proposes a new guideline of 0.025μg/kg/day, which is 75 per cent lower than the current US limit.

Similarly for PCBs, there are variations between national limits, with Japan's limit of 0.5ppm for fish and shellfish products being lower than the US limit (2ppm) and significantly higher than the European limit (6.5ppt-7.5ppb, depending on type of PCB compound).[20]

**TABLE 1.** Advisory limits for methylmercury

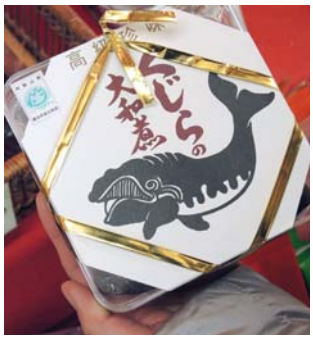
| Type of Limit | FAO/WHO | Europe | United States | Japan |
|---|---|---|---|---|
| Limits for fish products (mg/kg or ppm) | Predatory fish species: 1.0<br>Other fish species: 0.5 [21] | Predatory fish species: 1.0<br>Other fish species: 0.5 [22] | 1.0 [23] | 0.3 excl. predatory species [24]<br>(0.4 for total mercury) |
| Provisional tolerable weekly intake (PTWI: μg/kg body weight, or ppb) | 1.6μg/kg [25] | 1.3μg/kg [26] | 0.7μg/kg [27] | 3.4μg/kg for adults<br>2.0μg/kg pregnant women [28] |

# LEVELS OF POLLUTANTS IN WHALE, DOLPHIN AND PORPOISE PRODUCTS SOLD IN JAPAN

Levels of pollutants in small cetacean products being sold for consumption in Japan far exceed domestic and international 'safe' levels for seafood. In seven published studies covering nine different species and over 350 samples, average levels of total mercury exceeded Japan's provisional permitted levels for total mercury (0.4ppm) and methylmercury (0.3ppm) in all nine species in all studies. Mean total mercury levels varied between 0.9ppm in Dall's porpoise and 39.5ppm in false killer whale red meat.[29] For comparison, in the Joint FAO/WHO Expert Committee on Food Additives and Contaminants (JECFA) review of mercury in fish species, marlin was found to have an average concentration of 0.49-1.76ppm.[30] In some cetacean species, total mercury levels exceed Japanese Government limits by a huge degree – up to 5,000 times higher than the limit in a sample of dolphin liver (1,980ppm) and 240 times higher than the advisory limit in a sample of dolphin meat (98.9ppm).[31]

Since 2001, EIA has submitted more than 300 cetacean products to independent Japanese laboratories for testing of pollutant levels (see Tables 2 and 3). In each year EIA sampled cetacean products, average mercury concentrations exceeded the Government's safe limit. The highest level found was 22.5ppm mercury in a product labelled as 'whale' purchased in 2001, more than 50 times higher than the provisional limit. DNA analysis confirmed the meat was actually bottlenose dolphin. Of the 341 products submitted for mercury testing, 56 per cent exceeded the Government safe limit with an average concentration of 1.7ppm across all samples, some four times higher the safe limit. In EIA's most recent tests in 2015, all 20 products tested exceeded the limit for total mercury, with a maximum mercury concentration of 19ppm (47.5 times Japan's advisory limit) found in a product labelled as long-finned pilot whale.

A large proportion of products were also tested for methylmercury and PCBs. For methylmercury, the maximum concentration recorded was from a sample of pilot whale meat purchased in 2009 which had a concentration of



**TOP:**
Dall's porpoise landed in Iwate.

**ABOVE:**
Whale meat on sale near Taiji.

"In EIA's most recent tests in 2015, all 20 products tested exceeded the limit for total mercury"

11.25ppm, more than 35 times Japan's advisory limit. Across all 236 samples tested for methylmercury, 54 per cent exceeded the safe limit. A total of 251 products were tested for PCBs, with 14 per cent exceeding the safe limit and a maximum of 6.3ppm recorded, 12 times higher than the regulatory limit.

While products from toothed cetaceans killed in Japan's coastal hunts typically carry the highest levels of pollutants, six per cent of products confirmed to be derived from baleen whale species through DNA testing exceeded the limit for mercury.

## Human health impacts from consumption of cetacean meat

More than 25 years of studies by medical scientists in the Faroe Islands have provided overwhelming evidence of negative human health effects from consuming pilot whale meat and blubber. The studies found that mercury from pilot whale in the maternal diet adversely effects foetal development of the nervous system, as well impacting the immune system later in childhood.[32] In adults, contaminants appear to increase the risk of developing Parkinson's disease, as well as hypertension and arteriosclerosis of the carotid arteries.[33] Further evidence of adverse impacts due to prenatal mercury exposure from consumption of marine mammal meat is available from aboriginal communities in the Arctic, where negative impacts on immune, neurophysiological and intellectual function have been documented.[34]

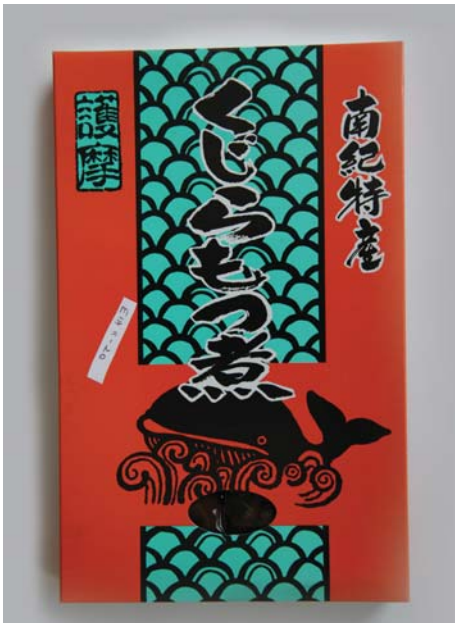
In Taiji, Japan, where consumption of cetacean products is traditionally high, health studies are now being undertaken by the National Institute of Minamata Disease. A 2014 study indicated that 12 subjects tested in Taiji had hair mercury concentrations higher than 50μg/g, the WHO level for men above which neurological effects have been observed. It also showed that hair mercury levels significantly correlated with daily whale meat intake, indicating that exposure was due to ingestion of contaminated cetacean products, supporting the results of a previous study.[35]

The average hair mercury levels of 14.9ppm recorded in Taiji are significantly higher than those in Europe (approximately 0.17-1.45ppm) and in the Faroe Islands (approximately 4-5ppm) where whale meat and blubber is also consumed and significant health impacts have been recorded.[36] Hair mercury levels in Taiji ranged between 1.1-101.9ppm, with a higher average in males (17.2) than females (12.1ppm).[37] No studies of the effects on foetal development in Taiji residents have been published.

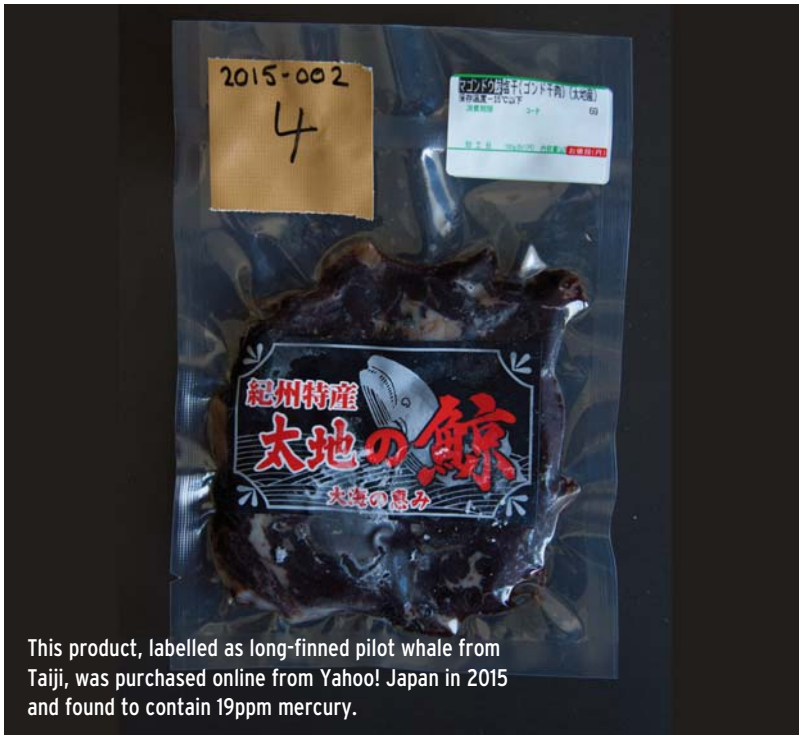
**TABLE 2.** Summary of annual results of EIA tests for mercury, methylmercury and PCBs

| Year | Average total mercury (min-max) (ppm) | Average methylmercury (min-max) (ppm) | Average PCB (min-max) (ppm) |
|---|---|---|---|
| 2001 | 2.69 (0.02 - 22.5) | 1.62 (0.01 - 10.88) | 0.33 (0 - 2.85) |
| 2002 | 0.43 (0.02 - 0.87) | 0.25 (0.01 - 0.60) | 0.31 (0.001 - 1.97) |
| 2003 | 1.20 (0.01 - 6.93) | 0.56 (0.01 - 3.35) | 0.40 (0.0 - 5.85) |
| 2004 | 0.83 (0.0 - 3.61) | 0.57 (0.55 - 2.32) | 0.26 (0.0 - 3.15) |
| 2005 | 1.38 (0.91 - 2.12) | 0.92 (0.55 - 1.33) | 0.15 (0.03 - 0.24) |
| 2006 | 0.85 (0.0 - 3.2) | 0.62 (0.0 - 2.52) | 0.27 (0.00 - 4.02) |
| 2007 | 0.75 (0.0 - 6.9) | 0.44 (0.0 - 3.77) | 0.20 (0.00 - 2.62) |
| 2009 | 1.22 (0.0 - 16.3) | 4.34 (0.22 - 11.25) | 1.44 (0.00 - 3.13) |
| 2010 | 0.52 (0.0 - 2.0) | 0.83 (0.34 - 1.29) | 0.68 (0.00 - 6.32) |
| 2011 | 2.55 (0.0 - 21.0) | - | - |
| 2013 | 4.02 (0.26 - 11.0) | - | - |
| 2015 | 5.89 (0.45 - 19.0) | - | - |
| **Average** | **1.7** | **0.78** | **0.38** |
| **Min - Max** | **0 - 22.5** | **0 - 11.25** | **0 - 6.3** |
| **Total sample size** | **341** | **236** | **251** |

**NB:** No testing of methylmercury or PCB levels was conducted after 2010.

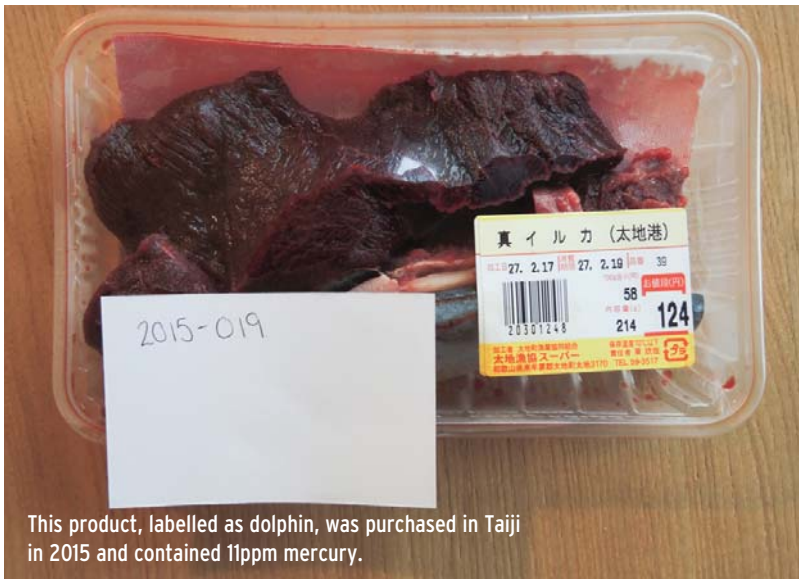


Whale giblets purchased from Amazon.co.jp, found to contain 21ppm mercury, over 50 times higher than the regulatory limit.



This product, labelled as long-finned pilot whale from Taiji, was purchased online from Yahoo! Japan in 2015 and found to contain 19ppm mercury.

Despite the high mercury levels in Taiji residents, linked to the consumption of cetacean products, the study found no significant correlations between hair mercury levels and neurological outcomes in adults and the authors suggested that sufficient selenium intake may delay and attenuate the onset of toxic effects of methylmercury.[38] Conversely, studies in Nunavik Inuit and Faroese populations have found little evidence of a protective effect of selenium from the effects of mercury.[39] Indeed, research indicates that the effects of selenium with respect to mercury toxicity are complex and may vary according to factors such as the sensitivity of specific organs or the developmental stage (e.g. *in utero* versus adult).[40] Hence, even if there is evidence that selenium can offset some toxic effects of mercury, it may be inefficient against all mercury-mediated effects and it is recommended that preventive actions should continue to focus on reducing mercury exposure rather than increasing selenium status.[41]



This product, labelled as dolphin, was purchased in Taiji in 2015 and contained 11ppm mercury.

Medical studies in the past 10 years have shown that while the health consequences of consuming seafood products contaminated with mercury and other contaminants may be most severe for the developing foetus, they extend to all parts of the population. Discussions are ongoing regarding further revision to international and national advisories, with studies indicating a much lower limit may be required to protect public health against methylmercury damage.

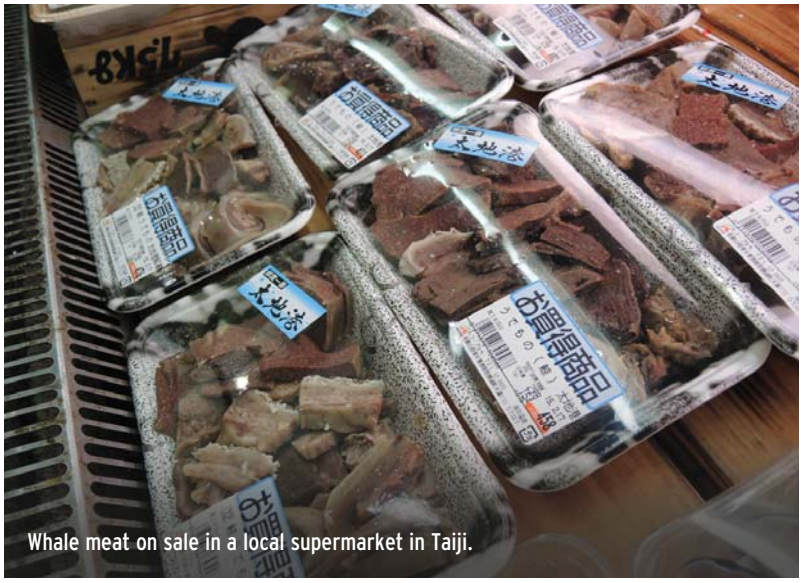
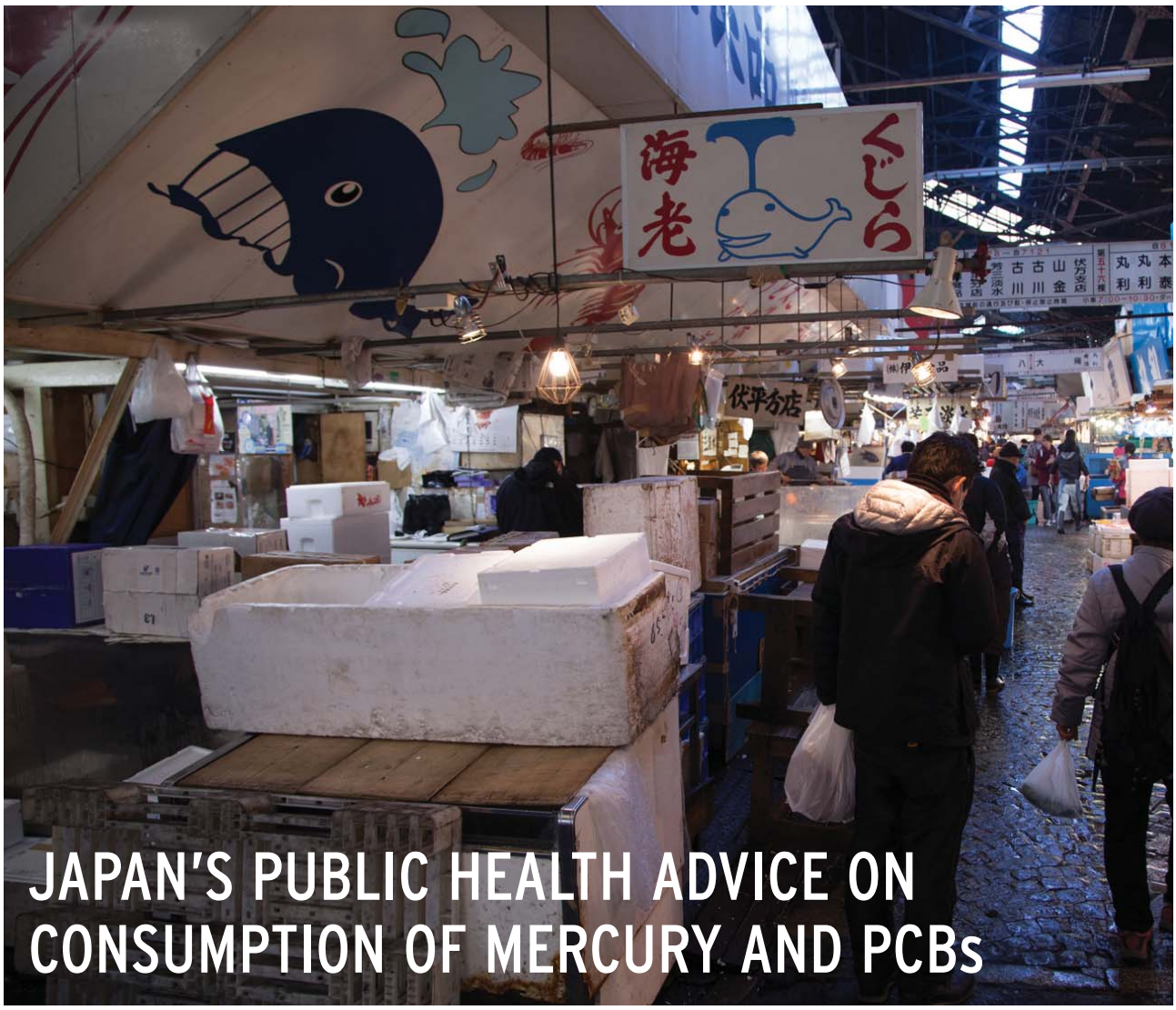

Whale meat on sale in a local supermarket in Taiji.

**TABLE 3.** Results of tests of cetacean products conducted by EIA from 2009-15

| Year | EIA label | Species (as labelled) | Origin (as labelled) | Total Mercury (ppm) | Supermarket |
|---|---|---|---|---|---|
| 2009 | EIA 09-1 | Bryde's / Minke | Antarctic | 0.03 | Kohyo |
| 2009 | EIA 09-2 | Minke whale | Antarctic / North Pacific | ND | Kohyo |
| 2009 | EIA 09-3 | Sei whale | Antarctic / North Pacific | 0.10 | Kohyo |
| 2009 | EIA 09-4 | Pilot whale | Wakayama | ND | Kohyo |
| 2009 | EIA 09-05 | Minke whale | Unknown | 0.05 | Familymart |
| 2009 | EIA 09-06 | Minke whale | Antarctic | 0.04 | Kohyo |
| 2009 | EIA 09-07 | Minke whale | Antarctic | ND | Kohyo |
| 2009 | EIA 09-08 | Minke / Sei / Bryde's whale | Antarctic / North Pacific | 0.02 | Kohyo |
| 2009 | EIA 09-09 | Minke / Bryde's whale | Antarctic / North Pacific | 0.03 | Kohyo |
| 2009 | EIA 09-10 | Minke / Sei / Bryde's whale | Antarctic / North Pacific | 0.03 | Kohyo |
| 2009 | EIA 09-11 | Minke whale | Antarctic | 0.11 | Kohyo |
| 2009 | EIA 09-12 | Minke whale | Antarctic | 0.26 | Kohyo |
| 2009 | EIA 09-13 | Pilot whale | Wakayama | ND | Kohyo |
| 2009 | EIA 09-14 | Pilot whale | Wakayama | ND | Kohyo |
| 2009 | EIA 09-15 | Pilot whale | Wakayama | ND | Kohyo |
| 2009 | EIA 09-16 | Pilot whale | Wakayama | ND | Kohyo |
| 2009 | EIA 09-17 | Bryde's whale | North Pacific | 0.13 | Daiei |
| 2009 | EIA 09-18 | Minke / Sei / Bryde's whale | Antarctic / North Pacific | 0.05 | Maruetsu |
| 2009 | EIA 09-19 | Minke whale | Unknown | 0.05 | Maruetsu |
| 2009 | EIA 09-20 | Minke whale | Antarctic | ND | Kasumi |
| 2009 | EIA 09-21 | Bryde's whale | North Pacific | 0.07 | Familymart |
| 2009 | EIA 09-22 | Minke whale | Antarctic | 0.02 | KASUMI |
| 2009 | EIA 09-23 | Minke / Sei / Bryde's whale | Antarctic / North Pacific | 0.05 | Maruetsu |
| 2009 | EIA 09-24 | Minke whale | Antarctic | ND | Maruetsu |
| 2009 | EIA 09-25 | Baird's beaked whale | North Pacific | 1.35 | Service area |
| 2009 | EIA 09-26 | Baird's beaked whale | North Pacific | 1.32 | Service area |
| 2009 | EIA 09-27 | Pilot whale | North Pacific | 15.82 | Service area |
| 2009 | EIA 09-28 | Pilot whale | North Pacific | 16.33 | Service area |
| 2009 | EIA 09-29 | Sei whale | North Pacific | 0.06 | Hakudai |
| 2009 | EIA 09-30 | Sei whale | North Pacific | 0.05 | Hakudai |
| 2009 | EIA 09-31 | Sei whale | Unknown | 0.08 | Hakudai |
| 2009 | EIA 09-32 | Baird's beaked whale | off Honshu | 3.06 | Hakudai |
| 2010 | EIA10-01 | Whale | Unknown | 0.07 | Coop Tokyo Toyama |
| 2010 | EIA10-02 | Baird's beaked whale / Pilot / Minke whale | Unknown | 0.07 | Santoku Tokyo Toyama |
| 2010 | EIA10-03 | Baird's beaked whale / Pilot / Minke whale | Unknown | 0.11 | Coop Fukushima Shimachi |
| 2010 | EIA10-04 | Bryde's whale | Unknown | 0.06 | Coop Fukushima Shimachi |
| 2010 | EIA10-05 | Sei / Minke / Bryde's whale | Antarctic / North Pacific | 0.08 | Coop Fukushima Izumi |
| 2010 | EIA10-06 | Baird's beaked whale / Pilot / Minke whale | | 0.07 | Coop Fukushima Izumi |
| 2010 | EIA10-07 | Baird's beaked whale / Pilot / Minke whale | | 0.18 | Coop Fukushima Houkida |
| 2010 | EIA10-8 | Minke whale | Antarctic | 0.04 | Coop Fukushima Houkida |
| 2010 | EIA10-9 | Dolphin | Produced in Iwate | 1.05 | Maiya Mast |
| 2010 | EIA10-10 | Dolphin | Produced in Iwate | 1.66 | Maiya, Mast fish shop |
| 2010 | EIA10-11 | Dolphin | Unknown | 0.53 | Maiya, Mast fish shop |
| 2010 | EIA10-12 | Dolphin | Produced in Iwate | 0.60 | Jois, Otsuchi |
| 2010 | EIA10-13 | Dolphin | Produced in Iwate | 1.25 | Jois Otsuchi |
| 2010 | EIA10-14 | Dolphin | Produced in Iwate | 1.27 | Jois Yamada |
| 2010 | EIA10-15 | Dolphin | Produced in Iwate | 1.03 | Jois Yamada |
| 2010 | EIA10-16 | Dolphin | Produced in Iwate | N.D. | Jois Yamada |
| 2010 | EIA 10 - 17 | Dolphin | Produced in Iwate | 0.87 | Jois Yamada |
| 2010 | EIA 10-18 | Dolphin | Produced in Iwate | 1.18 | Jois Yamada |
| 2010 | EIA 10-19 | Sei whale | North Pacific | 0.08 | Jois Yamada |
| 2010 | EIA 10-20 | Whale | Antarctic | 0.04 | Jois Miyako Sentoku |
| 2010 | EIA 10-21 | Dolphin | Produced in Iwate | 2.00 | Maiya, Kamaishi |
| 2010 | EIA 10-22 | Dolphin | Produced in Iwate | 1.76 | Maiya, Kamaishi |
| 2010 | EIA 10-23 | Minke whale | Unknown | 0.06 | Coop Ayashi |
| 2010 | EIA 10-24 | Baird's beaked whale / Pilot / Minke whale | Unknown | 0.13 | Coop Ayashi |
| 2010 | EIA 10-25 | Minke / toothed whale | Antarctic / North Pacific | 0.05 | Miyagi coop |
| 2010 | EIA 10-26 | Baird's beaked whale / Pilot / Minke whale | Unknown | 0.08 | Coop Ayashi |
| 2010 | EIA 10-27 | Minke / Sei / Bryde's whale | Antarctic / North Pacific | 0.06 | Miyagi Coop Iwanuma |
| 2010 | EIA 10-28 | Minke whale | Antarctic | 0.08 | Coop Natorinishi |
| 2011 | EIA11-01 | Pilot whale | Unknown | 1.00 | Yahoo |

**NB:** For the full results of EIA's tests prior to 2009 please see the 2008 report: Poisonous Policies. Available at: https://eia-international.org/report/poisonous-policies
Since surveys were undertaken, Amazon, Rakuten and 95 per cent of all AEON stores (including Kohyo, Daiei, Maruetsu and Kasumi) have stopped selling all cetacean products; five per cent of AEON stores sell products from Japan's Special Permit hunts but do not sell any small cetacean products from the coastal hunt
**ND** = Not detected
Figures in red are those exceeding the Japan's provisional limit for mercury in seafood.

| Year | EIA label | Species (as labelled) | Origin (as labelled) | Total Mercury (ppm) | Supermarket |
|---|---|---|---|---|---|
| 2011 | EIA11-02 | Pilot whale | Unknown | 6.50 | Yahoo |
| 2011 | EIA11-03 | Minke whale | North Pacific | 0.22 | Yahoo |
| 2011 | EIA11-04 | Baird's beaked whale | Unknown | 0.89 | Yahoo |
| 2011 | EIA11-05 | Baird's beaked whale | Unknown | 0.89 | Yahoo |
| 2011 | EIA11-06 | Whale | Unknown | 0.31 | Yahoo |
| 2011 | EIA11-07 | Minke whale | North Pacific | ND | Yahoo |
| 2011 | EIA11-08 | Whale | Unknown | 4.40 | Yahoo |
| 2011 | EIA11-09 | Whale | Unknown | ND | Amazon |
| 2011 | EIA11-10 | Whale | Unknown | 1.30 | Amazon |
| 2011 | EIA11-11 | Baird's beaked whale | Unknown | 2.90 | Amazon |
| 2011 | EIA11-12 | Pilot whale | Unknown | 1.60 | Amazon |
| 2011 | EIA11-13 | Fin whale | Iceland | 0.13 | Amazon |
| 2011 | EIA11-14 | Fin whale | Iceland | ND | Yahoo |
| 2011 | EIA11-15 | Fin whale | Iceland | 0.17 | Rakuten |
| 2011 | EIA11-16 | None displayed | Unknown | 5.70 | Circle K, Taiji |
| 2011 | EIA11-17 | Dall's porpoise | Iwate | 0.94 | Shimonoseki Fishmarket |
| 2011 | EIA11-18 | Dolphin | Unknown | 1.20 | Maiya Mast supermarket, Otsuchi, Iwate |
| 2011 | EIA11-19 | None displayed | Unknown | 0.47 | Amazon |
| 2011 | EIA11-20 | None displayed | Unknown | 21.00 | Amazon |
| 2011 | EIA11-21 | None displayed | Unknown | 6.20 | Amazon |
| 2011 | EIA11-22 | Baird's beaked whale | Unknown | 0.22 | Yahoo |
| 2011 | EIA11-23 | None displayed | Unknown | 2.50 | Shimonoseki fishmarket |
| 2013 | EIA-001 | Long-finned pilot whale | Wakayama | 9.50 | Rakuten |
| 2013 | EIA-002A | Long-finned pilot whale | Wakayama | 6.80 | Rakuten |
| 2013 | EIA-003 | Baird's beaked whale | Chiba | 4.40 | Rakuten |
| 2013 | EIA-004 | Baird's beaked whale | Chiba | 4.90 | Rakuten |
| 2013 | EIA-005 | Baird's beaked whale | Chiba | 1.20 | Rakuten |
| 2013 | EIA-006 | Baird's beaked whale | Unknown | 0.92 | Rakuten |
| 2013 | EIA-007 | Baird's beaked whale | Chiba | 5.10 | Rakuten |
| 2013 | EIA-008 | Baird's beaked whale | Chiba | 4.70 | Rakuten |
| 2013 | EIA-009 | Long-finned pilot whale | Wakayama | 2.10 | Yahoo |
| 2013 | EIA-010 | Baird's beaked whale | Unknown | 0.91 | Yahoo |
| 2013 | EIA-011 | Baird's beaked whale | Unknown | 4.40 | Yahoo |
| 2013 | EIA-012 | Baird's beaked whale | Unknown | 0.66 | Yahoo |
| 2013 | EIA-013 | Baird's beaked whale | Chiba | 1.90 | Yahoo |
| 2013 | EIA-014 | Long-finned pilot whale | Wakayama | 2.10 | Yahoo |
| 2013 | EIA-015 | Long-finned pilot whale | Wakayama | 1.60 | Yahoo |
| 2013 | EIA-016 | Baird's beaked whale | Chiba | 5.30 | Yahoo |
| 2013 | EIA-017 | Minke | Wakayama | 11.00 | Yahoo |
| 2013 | EIA-018 | Long-finned pilot whale | Wakayama | 8.60 | Yahoo |
| 2013 | EIA-019 | Long-finned pilot whale | Unknown | 0.26 | Rakuten |
| 2015 | 2015-001 | Long-finned pilot whale | Wakayama | 18.00 | Yahoo |
| 2015 | 2015-002 | Long-finned pilot whale | Wakayama | 19.00 | Yahoo |
| 2015 | 2015-003 | Long-finned pilot whale | Wakayama | 1.70 | Yahoo |
| 2015 | 2015-004 | Baird's beaked whale | Chiba | 3.70 | Yahoo |
| 2015 | 2015-005 | Baird's beaked whale | off Honshu | 0.69 | Yahoo |
| 2015 | 2015-006 | Baird's beaked whale | Unknown | 7.20 | Yahoo |
| 2015 | 2015-007 | Baird's beaked whale | Coastal Japan | 3.20 | Yahoo |
| 2015 | 2015-008 | Sperm whale | North Pacific | 0.49 | Yahoo |
| 2015 | 2015-009 | Long-finned pilot whale | Wakayama | 13.00 | Yahoo |
| 2015 | 2015-010 | Long-finned pilot whale | Wakayama | 1.30 | Yahoo |
| 2015 | 2015-011 | Toothed whale | Wakayama | 1.50 | Yahoo |
| 2015 | 2015-012 | Toothed whale | Wakayama | 10.00 | Yahoo |
| 2015 | 2015-013 | Toothed whale | Wakayama | 7.40 | Yahoo |
| 2015 | 2015-014 | Porpoise | Iwate | 3.20 | Numazu Ganyudo Gyokyo Sokabaijo, Numazu harbour |
| 2015 | 2015-015 | Porpoise | Iwate | 0.45 | Maruichi, purchased at Shimizu seafood centre |
| 2015 | 2015-016 | Porpoise | Iwate | 1.10 | Marumori suisan, Shimizu seafood centre |
| 2015 | 2015-017 | Dolphin | Wakayama | 2.80 | Food Park Kinokuni |
| 2015 | 2015-018 | Dolphin | Wakayama | 2.10 | Taiji gyokyo super |
| 2015 | 2015-019 | Dolphin | Wakayama | 11.00 | Taiji gyokyo super |
| 2015 | 2015-020 | Toothed whale | Wakayama | 10.00 | Food Park Kinokuni |




# JAPAN'S PUBLIC HEALTH ADVICE ON CONSUMPTION OF MERCURY AND PCBs

Japan's public health advice on consumption of mercury and PCBs remains inadequate and outdated in light of developments in medical understanding of the health impacts over the past decade. In addition to the advisories on provisional regulatory limits in seafood and tolerable weekly intake limits, Japan's Ministry of Health, Labour & Welfare (MHLW) provides advice to pregnant women on consumption of certain fish and cetacean products (see Box 1).[42] This guidance on consumption is limited in several ways:

- it excludes a number of species (e.g. striped dolphin, Risso's dolphin and false killer whales) that are hunted and consumed and known to typically carry pollutant loads as high or higher than those species included in the guidance;
- it has not been revised in light of changes to the international provisional tolerable weekly intake (PTWI) of mercury that occurred in 2003.[43] Japan's tolerable weekly intake limits for mercury and methylmercury exceed the international advisory levels;
- in its analysis of consumption levels, MHLW assumes an even spread of whale meat consumption throughout Japan and therefore concludes there was little risk to the Japanese population. However, it is known that levels of whale meat consumption vary significantly between different areas of Japan and that some sectors of the population consume significantly more whale meat than others. Such local populations may therefore be at higher risk of adverse health effects;
- the advisory is only applicable to pregnant women. International advisories give recommendations for adults and children whereas Japan's advice states that "children and other adults than the pregnant women are unlikely to have a health risk from mercury in fish and shellfish they eat normally". In the US, women and children are advised not to consume

species with high mercury content (e.g. shark, swordfish). Advice from medical scientists in the Faroe Islands, where whales typically have similar or lower levels of pollutants than those in Japan,[44] is that pilot whale meat is not consumed by humans at all.[45]

The advice issued by the Japanese Government has been criticised by the Japanese Consumer Cooperative Union (JCCU), the country's largest consumer union, for viewing the effect of mercury too lightly, being difficult to understand and impractical. The JCCU also points out that there is no advice for infants who are sensitive to the impacts of mercury exposure.[46]

Compared to the MHLW advice that 40g of short-finned pilot whale is acceptable for pregnant women, Japanese scientists calculated that just 17g would exceed the FAO/WHO PTWI safe limit and this amount assumes no other consumption of mercury-tainted products (e.g. tuna, swordfish, other cetaceans).[47]

According to hair mercury levels, 25 per cent of Japanese women of child-bearing age across 10 coastal and inland districts were estimated to be exposed to methylmercury above the WHO/FAO safe PTWI limit (1.6µg/kg/week),[48] while a recent study in Tohoku, Japan, has found adverse effects on neonatal neurobehavioural function as a result of prenatal exposure to methylmercury via seafood.[49]

Japan's public health advice is not only less precautionary than international advisories but public awareness of its existence is low. In informal polls of more than 700 Japanese university students (2005-13), 67.4 per cent were completely unaware of the guidance while a further 19.6 per cent were aware of it but had little understanding of what it comprised.[50]

There remains an urgent need for the Government to extend its advisory to all cetacean product consumers, update it in light of recent medical studies and to include other species of small cetaceans. Most importantly, the Government should ensure consumers are aware of the guidance via clear labelling on products and health education programmes. Routine monitoring of mercury and levels of POPs in fish and cetacean products should be conducted and published by Government agencies, with products measuring above the Government's safe limits removed from the market.

## Labelling issues

Inadequate and incorrect labelling of cetacean products has long been recognised as a problem in Japan. Products often lack species information or have been found to be incorrectly labelled as whale when they actually comprise dolphin meat. This makes it difficult for consumers to make an informed choice about the products they are purchasing and the pollution risks they pose. Baleen whale products typically carry lower levels of pollutants, whereas toothed cetacean products from Japan's coastal hunts consistently carry very high levels of pollutants. If choosing a product labelled as whale which is in reality derived from a toothed cetacean species, consumers may be unwittingly ingesting much higher levels of toxins.

Following a MHLW investigation in 2003 which found that only 16-25 per cent of products were correctly labelled, the Japanese Fisheries Agency produced guidance in 2007 to aid retailers.[52] However, EIA's analysis of cetacean products on sale in Japan indicates that mislabelling continues to be an issue. Of 63 products purchased between 2001-07 in which DNA analysis was conducted and a species or family identifiable, 17 per cent of products were found to be a different species to that labelled. EIA surveys of three e-commerce sites in 2013 found 11 per cent of cetacean products were listed without any species information.

"If choosing a product labelled as whale which is in reality derived from a toothed cetacean species, consumers may be unwittingly ingesting much higher levels of toxins"

**BOX 1.** Japan's advice for pregnant women on fish consumption and mercury[51]

| Recommended amount (muscle) | Species |
|---|---|
| Up to about 80g (average one meal) per two months (10g per week) | Bottlenose dolphin |
| Up to about 80g (average one meal) per two weeks (40g per week) | Short finned pilot whale |
| Up to 80g (average one meal) per week (80g per week) | Baird's beaked whale<br>Sperm whale<br>Alfonsino, swordfish, bigeye tuna, finely striate buccinu |
| Up to 160g (average two meals) per week (160g per week) | Dall's porpoise<br>Yellowback seabream, marlin, Hilfendorf saucord, southern bluefin tuna, blue shark |

# CONCLUSIONS AND RECOMMENDATIONS

## Whale, dolphin and porpoise products sold for human consumption in Japan continue to consistently exceed the country's provisional regulatory limits for mercury, methylmercury and PCBs, at levels tens to thousands of times higher than domestic and international safe limits.

These pollutants pose significant health risks to consumers. Despite this, there appears to be no regular monitoring of pollutant levels in cetacean products on sale in Japan. National guidelines on weekly intake limits are less precautionary than those set internationally and public awareness of the Government's limited guidance on intake limits is worryingly low.

Through such negligence and inaction, the Government of Japan is comprehensively failing in its duty to inform and protect its citizens and is failing to implement the new global treaty on mercury, symbolically named the Minamata Convention at Japan's request. That the Japanese Government would again risk failing to protect its citizens from mercury is incomprehensible.

Given that food products from coastal whales, dolphins and porpoises almost without exception exceed advisory limits for mercury, the Government should take steps to permanently ban these products for human consumption. EIA urges the Government of Japan to phase out all whale, dolphin and porpoise hunts, working with hunters to find alternative livelihoods. Until the phase-out is complete, it should:

- immediately update its advice on safe intake levels in light of the changes in international guidance and medical knowledge so that it covers all sectors of the population, not just pregnant women, and includes clear guidance in relation to all species of cetacean consumed in Japan;
- ensure widespread public awareness of Government guidance on safe intake levels;
- enforce legislation to ensure products are labelled with the correct species information and amend existing laws to require warnings on products advising of the potentially high pollutant levels;
- conduct and publish further medical studies of the health status of coastal communities most at risk due to high consumption rates of cetacean, fish and shellfish products;
- routinely conduct and publish surveys of pollutant levels in cetacean products sold for consumption and remove from sale products with pollutant levels exceeding the provisional Government limits.

**" Given that food products from coastal whales, dolphins and porpoises almost without exception exceed advisory limits for mercury, the Government of Japan should take steps to permanently ban these products for human consumption"**

© H Nuuttila

# REFERENCES


1. Weihe, P. & Joensen, H. D. 2012. Dietary recommendations regarding pilot whale meat and blubber in the Faroe Islands. International Journal of Circumpolar Health, Vol. 71.
2. Endo, T. *et al.* 2004. Contamination by mercury and cadmium in the cetacean products from Japanese market. Chemosphere 54, 1653–1662.
   Endo, T. *et al.* 2005. Total mercury, methylmercury and selenium levels in the red meat of small cetaceans sold for human consumption in Japan. Environmental Science and Technology 39:5703-5708.
3. Endo, T., Haraguchi, K. & Sakata, M., 2003. Renal toxicity in rats after oral administration of mercury-contaminated boiled whale livers marketed for human consumption. Archives of Environmental Contamination and Toxicology 44, 412–416
4. http://www.theguardian.com/environment/2014/sep/15/japans-whaling-has-produced-more-sushi-than-science
5. ICJ, 2014. Press Release: Whaling in the Antarctic (Australia v. Japan: New Zealand intervening, 31 March 2014. Available at: http://www.icj-cij.org/docket/files/148/18162.pdf
6. Catches taken under special permit. Available on the IWC website at: http://iwc.int/table_permit.
7. IWC, 2015. Report of the 2015 meeting of the IWC Scientific Committee (SC66a). Available at: https://iwc.int/scientifc-committee-reports
8. EIA report, 2013. Toxic Catch, available at: http://www.eia-international.org/wp-content/uploads/EIA-Toxic-Catch-report-FINAL.pdf
9. Kanaji, Y., Okamura, H. and Miyashita, T. 2011. Long-term abundance trends of the northern form of the short-finned pilot whale (Globicephala macrorhynchus) along the Pacific coast of Japan. Marine Mammal Science 27:477-492.
   IWC, 2014. Report of the Meeting of the Scientific Committee from its Annual Meeting, 3-15 June 2013. Journal of Cetacean Research & Management, volume 15, pp. 46-52.
   Baulch, S. & Perry, C. 2013. Status review of small cetacean species targeted by direct hunts in Japan. Document SC/65a/SM12rev submitted to the 65a meeting of the Scientific Committee. Available online at: http://iwc.int/sc65adocs
   Baulch, S. & Perry, C. 2013. Review of data available on the Dall's porpoise (*Phocoenoides dalli*) in Japanese waters. Document SC/65a/SM11 submitted to the 65a meeting of the Scientific Committee. Available online at: http://iwc.int/sc65adocs
10. Funahashi, N. & Baker, C. S. 2011. Japan's hunting of dolphins – Is it sustainable? Presentation at the 2011 Society for Marine Mammalogy conference.
    Kanaji, Y., Okamura, H. and Miyashita, T. 2011. Long-term abundance trends of the northern form of the short finned pilot whale (*Globicephala macrorhynchus*) along the Pacific coast of Japan. Marine Mammal Science 27:477-492
    Wade, P. R., Bass, C. L. & Kasuya, T. 2008. A comparison of methods for calculating thresholds for evaluating levels of catch of Japan's Dall's porpoise (*Phocoenoides dalli*) hand-harpoon hunt. SC/60/SM24 presented to 60th annual meeting of the IWC Scientific Committee in Santiago, Chile.
11. IWC, 2014.Report of the Meeting of the Scientific Committee from its Annual Meeting, 3-15 June 2013. Journal of Cetacean Research & Management, volume 15, pp. 46-52.
12. The Institute of Politics and Economy, 2010. How Thorough is the Risk Management of Mercury in Fish and Shellfish? No.14-2 (2010.12). http://www.seikeiken.or.jp/
13. Bose-O'Reilly, S. B. *et al.* 2010. Mercury exposure and children's health. Current Problems in Paediatric and Adolescent Health Care. 40 (8): 186-215.
14. Evaluations of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). 2007. Available at: http://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=3083
15. WHO, 2003. Polychlorinated biphenyls: Human health aspects. Concise International Chemical Assessment Document 55. http://www.who.int/ipcs/publications/cicad/en/cicad55.pdf
    Grandjean, P. *et al.* 2011. Marine food pollutants as a risk factor for hypoinsulinemia and type 2 diabetes. Epidemiology, 22(3):410-417.
    Carpenter, D. 2006. Polychlorinated Biphenyls (PCBs): Routes of Exposure and Effects on Human Health. Reviews on Environmental Health, 21 (1), 23pp.
    EPA. Public health implications of exposure to polychlorinated biphenyls (PCBs). Available at: http://water.epa.gov/scitech/swguidance/fishshellfish/techguidance/pcb99.cfm
16. http://www.mercuryconvention.org/Convention
17. http://www.mercuryconvention.org/Countries
18. IWC, 2012. Resolution 2012-1: Resolution on the importance of continued scientific research with regard to the impact of the degradation of the marine environment on the health of cetaceans and related human health effects. Annual report of the international whaling commission 2012. Annex D: Resolutions Adopted at the 64th Annual Meeting. https://iwc.int/resolutions
19. Groth, E. 2012. An overview of epidemiological evidence on the effects of methylmercury on brain development, and a rationale for a lower definition of tolerable exposure. http://www.zeromercury.org/phocadownload/Developments_at_UNEP_level/INC5/groth_report_zmwq%20rev.pdf
20. Commission Regulation (EC) No 1881/2006, setting maximum levels for certain contaminants in foodstuffs.
21. JEFCA, 2013. Joint FAO/WHO food standards programme codex committee on contaminants in foods, Seventh Session Moscow, Russian Federation, 8 – 12 April 2013. Discussion paper on the review of the guideline levels for methylmercury in fish and predatory fish.
22. Commission Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006R1881-20100701&from=EN
23. FDA action level for mercury in fish: http://mercuryfactsandfish.org/?page_id=67
24. JEFCA, 2013. Joint FAO/WHO food standards programme codex committee on contaminants in foods, Seventh Session Moscow, Russian Federation, 8–12 April 2013. Discussion paper on the review of the guideline levels for methylmercury in fish and predatory fish. ftp://ftp.fao.org/codex/meetings/cccf/cccf7/cf07_16e.pdf
25. http://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=3083
26. EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on the risk for public health related to the presence of mercury and methylmercury in food. EFSA Journal 2012;10(12):2985. [241 pp.]
27. Groth, E. 2012. An overview of epidemiological evidence on the effects of methylmercury on brain development, and a rationale for a lower definition of tolerable exposure. http://www.zeromercury.org/phocadownload/Developments_at_UNEP level/INC5/groth_report_zmwq%20rev.pdf
28. FAO/WHO, 2010. Report of the joint FAO/WHO expert consultation on the risks and benefits of fish consumption, 25-29 January 2010, Rome. FAO Fisheries and Aquaculture Report No. 978.
29. Endo, T. *et al.* 2005. Total mercury, methylmercury and selenium levels in the red meat of small cetaceans sold for human consumption in Japan. Environmental Science and Technology 39:5703-5708.
30. FAO/WHO, 2010. Report of the joint FAO/WHO expert consultation on the risks and benefits of fish consumption, 25-29 January 2010, Rome. FAO Fisheries and Aquaculture Report No. 978.
31. Endo, T., Haraguchi, K. & Sakata, M., 2003. Renal toxicity in rats after oral administration of mercury-contaminated boiled whale livers marketed for human consumption. Archives of Environmental Contamination and Toxicology 44, 412–416.
32. Grandjean, P. *et al.* 2003. Attenuated growth of breast-fed children exposed to increased concentrations of methylmercury and polychlorinated biphenyls. The FASEB Journal express article 10.1096/fj.02-0661fje.
    Weihe, P. & Joensen, H. D. 2012. Dietary recommendations regarding pilot whale meat and blubber in the Faroe Islands. International Journal of Circumpolar Health, Vol. 71.
33. Weihe, P. & Joensen, H. D. 2012. Dietary recommendations regarding pilot whale meat and blubber in the Faroe Islands. International Journal of Circumpolar Health, Vol. 71.
34. Van Oostdam *et al.* 2005. Human health implications of environmental contaminants in Arctic Canada: A review. Science of the Total Environment 351–352: 165–246.
    INAC, 2003a: Human health. Canadian Arctic contaminants assessment report II. Northern Contaminants Program. Ottawa.
    Nunavik regional board of health and social services 2011. Nunavik child development study. Available at: http://www.rrsss17.gouv.qc.ca/index.php?option=com_content&view=article&id=191&Itemid=139&lang=en
    Weihe, P. *et al.* 2002. Neurobehavioural performance of Inuit children with increased prenatal exposure to methylmercury. International Journal of Circumpolar Health. 61(1): 41-49.
35. Nakamura, M. *et al.* 2014. Methylmercury exposure and neurological outcomes in Taiji residents accustomed to consuming whale meat. Environment International 68: 25-32.
    Endo, T. & Haraguchi, K. 2010. High mercury levels in hair samples from residents of Taiji, a Japanese whaling town. Marine Pollution Bulletin, 60:743-7.
36. EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on the risk for public health related to the presence of mercury and methylmercury in food. EFSA Journal 2012;10(12):2985. [241 pp.] doi:10.2903/j.efsa.2012.2985. Available online: www.efsa.europa.eu/efsajournal
37. Groth, E. 2012. An overview of epidemiological evidence on the effects of methylmercury on brain development, and a rationale for a lower definition of tolerable exposure.
38. Nakamura, M. *et al.* 2014. Methylmercury exposure and neurological outcomes in Taiji residents accustomed to consuming whale meat. Environment International, 68: 25-32.
39. Clarkson, T. 2002. The three modern faces of mercury. Environmental Health Perspectives, 110 (1): 11-23. Yang, D. Y. *et al.* 2008. Selenium and mercury in organisms: interactions and mechanisms. Environmental Reivews, 16, 71-92.
    Khan, M. & Wang, F. 2009. Mercury-selenium compounds and their toxicological significance: toward a molecular understanding of the mercury-selenium antagonism. Environmental Toxicology and Chemistry, 28 (8): 1567-1577.
    Wagemann, R. *et al.* 1998. Methyl-mercury and total mercury in tissues of Arctic marine mammals. Science of the Total Environment. 18(1):19–31.
    Booth, S. & Zeller, D. 2005. Mercury, food webs and marine mammals: Implications of diet and climate change for human health. Environmental Health Perspective, 113(5): 521-526.
    Mergler, D. *et al.* 2007. Methylmercury exposure and health effects in humans: A worldwide concern. Ambio 36:3–11.
    Valera, B., Dewailly, E. & Porier, P. 2009. Environmental mercury exposure and blood pressure among Nunavik Inuit adults. Hypertension, 54:981-986.
    Choi, A. *et al.* 2008. Selenium as a potential protective factor against mercury developmental neurotoxicity. Environmental Research 107, 45-52.
    Despres, C. *et al.* 2005. Neuromotor functions in Inuit preschool children exposed to Pb, PCBs and Hg. Neurotoxicology and Teratology 27: 245-257.
40. Ref. 39, ibid; Zhang, H. 2014. Impacts of Selenium on the Biogeochemical Cycles of Mercury in Terrestrial Ecosystems in Mercury Mining Areas, Springer Theses.
41. Lemire, M. 2011. Influence of selenium. Environmental Health Perspectives. 119(4): 159-160; Zhang, H. 2014. Impacts of Selenium on the Biogeochemical Cycles of Mercury in Terrestrial Ecosystems in Mercury Mining Areas, Springer Theses.
42. JMHLW, 2005. Advice for pregnant women on fish consumption concerning mercury contamination. Joint-sub-committees on animal origin foods and toxicology under the food sanitation committee and the pharmaceutical affairs and food sanitation council. Japanese Ministry of Health, Labour and Welfare, 3rd June, 2005. http://www.mhlw.go.jp/topics/bukyoku/iyaku/syoku-anzen/suigin/dl/051102-1en.pdf
43. JECFA. 2003. Joint FAO/WHO expert committee on food additives. 61st meeting, Rome.
44. Endo, T. & Haraguchi, K. 2010. High mercury levels in hair samples from residents of Taiji, a Japanese whaling town. Marine Pollution Bulletin, 60: 743-747
45. Weihe, P. & Joensen, H. D. 2012. Dietary recommendations regarding pilot whale meat and blubber in the Faroe Islands. International Journal of Circumpolar Health, Vol. 71.
46. EIA, 2008. Poisonous policies: Japan's failure to stop the sale of polluted whale, dolphin and porpoise products.
47. Endo, T. & Haraguchi, K. 2010. High mercury levels in hair samples from residents of Taiji, a Japanese whaling town. Marine Pollution Bulletin, 60: 743-747
48. Yasutake, A., *et al.* 2004. Current hair mercury levels in Japanese for estimation of methylmercury exposure. Journal of Health Science, 50(2): 120-125.
49. Suzuki *et al.* 2010. Neurobehavioral effects of prenatal exposure to methylmercury and PCBs, and seafood intake: neonatal behavioural assessment scale results of Tohoku study of child development. Environmental Research, 110(7): 699-704.
50. Anon. pers. comm.
51. MHLW, 2005. Advice for pregnant women on fish consumption and mercury. http://www.mhlw.go.jp/topics/bukyoku/iyaku/syoku-anzen/suigin/dl/051102-1en.pdf
52. Important guidelines relating to the consumption of seafood containing mercury. June 3rd 2003. Pharmaceutical, Food Safety Inquiries Commission. Joint Committee of Dairy and Seafood, Toxicology Division; Seafood naming guide: www.mhlw.go.jp/shingi/2002/06/s0607-8e.html



**ENVIRONMENTAL INVESTIGATION AGENCY (EIA)**

**EIA - LONDON**

**62/63 Upper Street**
**London N1 ONY, UK**
**Tel: +44 (0) 20 7354 7960**
**Fax: +44 (0) 20 7354 7961**
**email: ukinfo@eia-international.org**

**www.eia-international.org**

**EIA - WASHINGTON, DC**

**PO Box 53343**
**Washington, DC 20009 USA**
**Tel: +1 202 483-6621**
**Fax: +1 202 986-8626**
**email: info@eia-global.org**

**www.eia-global.org**