The sale of illegal products from protected whales under the guise of Japan's scientific whaling program is discussed by those on both sides of the issue, including representatives from Japan's Institute of Cetacean Research; both groups agree that inclusive registration of DNA profiles is critical to address this problem: "Should whaling nations want the confidence...of other nations, the potential cover now provided for illegal whaling must be made fully transparent to international scrutiny." And the editor of *Immunology Today* comments on publication of two review articles in that journal, as it pertains to the topic of publication rights of sequence data producers who make their data publicly available before they publish primary papers from the data.

Scientific Whaling: Source of Illegal Products for Market?

Japan's scientific whaling program, run by the Institute of Cetacean Research, receives much criticism, as Dennis Normile discusses in his News Focus article "Japan's whaling program carries heavy baggage" (29 Sept., p. 2264), but Normile does not consider the most serious problem—the sale of products from this program acts as a cover for undocumented or illegal products from protected whales (*1*). Using molecular genetic methods, we have identified eight species of baleen whales, as well as sperm whales, beaked whales, killer whales, dolphins, porpoises, domestic sheep, and horses, among nearly 700 "whale" products purchased in Japanese markets from 1993 to 1999 (*2, 3*) (see the supplementary table available at www.sciencemag.org/cgi/content/full/290/5497/1695/DC1). This diversity of baleen whale species is contrary to the expectation that scientific hunting of minke whales is the only source of products since the 1986 global whaling moratorium (products from the scientific hunting of Bryde's and sperm whales initiated in 2000 have not yet been released to the market).

Six of the baleen whale species (the fin, sei, Bryde's, blue/fin hybrid, gray, and humpback) and the sperm whale are protected by international agreements dating to 1989 or earlier. Overall, these protected species accounted for about 10% of whale products from the Japanese markets (excluding products from small cetaceans). The documented sale of products from gray and humpback whales, protected since 1937 and 1966, respectively, is particularly disturbing. The Asian gray whale is considered one of the most endangered population of whales in the world, yet is being sold under cover of products from scientific whaling. The Asian humpback whale lags well behind other populations in recovery, perhaps as a consequence of this hidden exploitation.

Scientific hunting of an abundant population can also act as a cover for continued exploitation of a protected or endangered population of the same species. Using population-level molecular markers, we estimate that up to 43% of market products from the North Pacific minke whales do not originate from the reported scientific hunt in pelagic waters but, instead, from the illegal or unregulated exploitation of a protected population in the Sea of Japan (*2*). At this rate of exploitation, the genetically unique Sea of Japan population is predicted to decline toward extinction over the next few decades.

Arguments concerning the ethics and validity of scientific whaling have progressed little in the 14 years since the global moratorium. In contrast, the technology for a verifiable system of observation and inspection of scientific or commercial whaling has rapidly progressed. Molecular monitoring allows the tracking of each product derived from an individual whale (*4*), regardless of its source. An inclusive register of DNA profiles from regulated hunts could be used to evaluate the legitimacy of any product found in trade. Advances in bioinformatics can make this information available instantly through the World Wide Web. Should whaling nations want the confidence, if not the blessings, of other nations, the potential cover now provided for illegal whaling must be made fully transparent to international scrutiny.

Products from protected species such as the humpback whale are showing up in Japanese markets.

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References

1. C. S. Baker and S. R. Palumbi, *Science* **265**, 1538 (1994).
2. C. S. Baker, G. L. Lento, F. Cipriano, S. R. Palumbi, *Proc. R. Soc. London B* **267**, 1191 (2000).
3. G. M. Lento, M. J. Dalebout, C. S. Baker, "Market survey, 1999: Molecular genetic identification of whale and dolphin products for sale in Japan and Korea" (report SC/52/SD17 to the Scientific Committee of the International Whaling Commission, 2000).
4. F. Cipriano and S. R. Palumbi, *Nature* **397**, 307 (1999).

Response

Baker and colleagues suggest that the sale of whale by-products from Japan's scientific whaling program acts as a cover for undocumented or illegal products from protected whales. Their suggestion is based on DNA surveys of products in the Japanese retail market that revealed that the sources of the products included protected whale species in addition to the minke whale, which is legally sampled during the Japanese Whale Research Program under Special Permit in the Antartic (JARPA) and in the North Pacific (JARPN). Although it is true that whale species protected by the International Whaling Commission (IWC) have been identified as sources of whale products examined in these surveys conducted by Baker and his colleagues and also by the government of Japan, it is difficult to establish whether a whale product from other than a minke whale comes from a legal or illegal source. This is because the products from IWC-protected whale species in the Japanese market could have originated from several legal sources: whales harvested before the whaling moratorium, by-products of past scientific hunts by Iceland and Norway, and stranding.

To monitor the distribution of whale products in Japanese markets, the Japanese government has been conducting molecular genetic analyses of whale products purchased in Japanese retail markets since

1995. The species or family names of more than 800 samples have been identified, and the results have been presented to the IWC's Technical Committee or its Scientific Committee. Japan is also developing a system to detect illegal trafficking in whale products based on registration of DNA profiles, similar to the Norwegian DNA register system. In regard to western North Pacific and Antarctic minke whales sampled during scientific surveys by JARPN and JARPA, Japan has begun genetic labeling for these samples. In addition, Japan has been collecting DNA profile data from by-catches, strandings, and stockpiles of cetacean species. We believe that continuous molecular monitoring and an inclusive registration of DNA profiles will contribute to avoiding or greatly reducing illegal whale hunting and trading in whale products in Japan.

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Further Scrutiny of Scientific Whaling

Normile reports on Japan's expanded scientific whaling program and notes that "Canada, the United States, the Soviet Union, South Africa, and Japan were among several countries that [conducted scientific whaling] before 1982 [the year the IWC passed the worldwide commercial moratorium on whaling], but in recent years Japan has stood alone." Although true, this statement omits three equally important points.

First, Iceland and Norway exploited the scientific whaling provision allowed by the IWC. Between 1986 and 1994 both countries killed 651 whales in the name of science (*1*), and between 1987 and 1991 Japan imported 4146 metric tons of whale meat, including 4036 tons of research whale meat from Iceland (*2*). More meat might have been exported, but in 1986 the IWC passed a resolution on scientific whaling that recommended that "the meat as well as the other products should be utilised primarily for local consumption." Iceland withdrew from the IWC in 1992, and Norway reinitiated commercial whaling for minke whales in 1993 under its objection to the IWC commercial moratorium.

Second, the number of whales killed in scientific whaling programs before the commercial moratorium was at most in the low hundreds, and these programs were of limited duration. The Japanese started research whaling for Antarctic minke whales in the austral summer of 1987/88, which is when the commercial moratorium began. They have killed 4595 minke whales so far (*1*) and are about to start whaling for the 14th year (the first 2 years were called a "feasibility study"). The Antarctic minke whale research program is scheduled to continue until the 2003/04 season. In the North Pacific, the Japanese started research whaling on minkes in 1994 and have killed more than 500 whales (*1*). Since the 1987/88 season, Japan's research whaling program has taken 5181 whales, about 2.4 times as many as were taken between 1949 and 1987 by all other countries combined.

Third, the IWC established a Southern Ocean Sanctuary in 1994 (Japan was the only member nation that voted against it), but since then Japan has continued to take all of its annual catch of Antarctic minke whales within the sanctuary boundary, despite repeated requests by IWC that it not hunt there.

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References and Notes

1. Data available from the Secretariat of the International Whaling Commission, Station Road, Histon, Cambridge CB4 4NP, UK.
2. Japanese import statistics, Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Government of Japan, and Statistical Bureau of Iceland, Foreign Trade, Reykjavik, Iceland.

Publication Rights for Sequence Data Producers

Lee Rowen and colleagues highlight in their Policy Forum (15 Sept., p. 1881) their concerns with the publication of articles containing information derived from publicly available sequence data that have not yet been published in peer-reviewed primary papers. They refer to two review articles (*1, 2*) on the murine major histocompatibility complex (MHC) that were published before any primary papers from the data producers. In both cases, great care was taken to ensure that the source of primary sequence data was acknowledged in accordance with the guidelines set out by the hosting databases, the labs that produced the primary sequence were credited, and the European Molecular Biology Laboratory/GenBank accession numbers were quoted. It should be noted that Rowen's lab was one of those involved in the