

Estimation of waste from the fish retail, commercial and processing industry

The following calculations have been made for the determination of fish by-products category 3 (FBP) from the processing of fishery and aquaculture products in the retail, commercial and processing chain, which are summarized in Table 2 of the paper. Many of the fishery and aquaculture products sold in supermarkets, public markets, neighbourhood fishmongers and central markets where seafood is sold are given to customers after being processed, i.e. the common "cleaning". "Cleaning", depending on the type of fish, may include gutting, removal of scales, skinning, filleting, gill removal, head removal, etc. After this treatment, about 15-30% is discarded (offal, scales, backbone and heads).

The biomass from this procedure is difficult to be estimated accurately. In the B-Blue Project Countries, the apparent consumption of fishery and aquaculture products (fish, molluscs and crustaceans in fresh, frozen or processed form) presented in Table 2 takes into account all forms consumed, even canned or smoked products, etc.

From the production data of Supplementary Table 1 (fisheries), Table 2 (fish produced from aquaculture), Table 3 (fish imports) and Table 4 (exports) the apparent consumption (Table 5) is calculated from the following formula:

$$\text{Apparent consumption} = \text{Fish from fisheries production} + \text{Fish from aquaculture production} + \text{Imports of fish} - \text{Exports of fish.}$$

The apparent per capita consumption is calculated if the apparent consumption will be divided with the population in each Country (Eurostat data) (Table 6).

Supplementary Table 1: Fisheries production-main species grouping in the B-Blue countries (in tons - live weight). Table A shows the Mediterranean production for France and Spain whereas Table B shows the total production of France and Spain. Portugal, although not a Mediterranean Country, is added in the total figures for the purpose of the B-Blue project.

A.

| Country | Main species grouping | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|-----------------------|---------|---------|---------|---------|---------|
| Croatia | Fish | 77,127 | 70,681 | 70,352 | 67,348 | 68,038 |
| | Molluscs | 2,426 | 2,332 | 1,968 | 1,441 | 1,151 |
| | Crustaceans | 765 | 873 | 933 | 1,084 | 1,180 |
| France (Med Fisheries only) | Fish | 12,459 | 10,549 | 11,538 | 12,218 | 13,727 |
| | Molluscs | 2,409 | 2,008 | 2,336 | 2,401 | 2,858 |
| | Crustaceans | 131 | 140 | 355 | 357 | 290 |
| Greece | Fish | 50,408 | 54,199 | 61,332 | 63,267 | 62,726 |
| | Molluscs | 5,801 | 5,443 | 8,233 | 7,733 | 7,523 |
| | Crustaceans | 3,960 | 5,781 | 7,002 | 7,180 | 6,985 |
| Italy | Fish | 125,548 | 138,258 | 136,683 | 133,639 | 139,821 |
| | Molluscs | 38,389 | 38,264 | 39,362 | 39,807 | 42,283 |
| | Crustaceans | 18,699 | 21,037 | 20,690 | 22,648 | 23,549 |
| Montenegro | Fish | 1,290 | 1,219 | 1,324 | 1,011 | 1,199 |
| | Molluscs | 235 | 239 | 242 | 33 | 43 |
| | Crustaceans | 31 | 28 | 28 | 35 | 50 |

| | | | | | | |
|---|--------------------|---------|---------|---------|---------|---------|
| Portugal <i>Mainly Atlantic fishery</i> | Fish | 162,275 | 168,456 | 165,856 | 160,943 | 158,334 |
| | Molluscs | 18,843 | 18,959 | 17,165 | 17,305 | 15,714 |
| | Crustaceans | 1,749 | 1,082 | 1,134 | 1,439 | 2,235 |
| Slovenia | Fish | 370 | 315 | 271 | 256 | 229 |
| | Molluscs | 38 | 26 | 33 | 23 | 34 |
| | Crustaceans | 2 | 2 | 7 | 1 | 1 |
| Spain <i>(Med Fisheries only)</i> | Fish | 70,559 | 66,400 | 67,583 | 75,540 | 77,590 |
| | Molluscs | 6,042 | 6,125 | 6,756 | 6,186 | 7,481 |
| | Crustaceans | 2,193 | 4,779 | 4,109 | 4,578 | 6,249 |
| TOTAL | Fish | 500,036 | 510,077 | 514,939 | 514,222 | 521,664 |
| | Molluscs | 74,183 | 73,396 | 76,095 | 74,929 | 77,087 |
| | Crustaceans | 27,530 | 33,722 | 34,258 | 37,322 | 40,539 |

B.

| Country | Main species grouping | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------|-----------------------|---------|---------|---------|---------|---------|
| France | Fish | 418,082 | 407,400 | 433,777 | 419,711 | 451,422 |
| | Molluscs | 63,710 | 65,743 | 67,254 | 70,118 | 106,926 |
| | Crustaceans | 16,271 | 14,854 | 16,373 | 16,533 | 15,394 |
| Spain | Fish | 968,713 | 899,740 | 859,394 | 887,747 | 871,863 |
| | Molluscs | 74,979 | 61,422 | 39,880 | 46,631 | 37,070 |
| | Crustaceans | 18,423 | 13,696 | 13,366 | 14,701 | 16,088 |

Supplementary Table 2. Aquaculture (fish and shellfish) production in the B-BLUE countries (values in tons live weight). Figures refer to the whole Country production in France, Portugal and Spain and not only to the Mediterranean Sea.

| Country | Main species grouping | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------|-----------------------|---------|---------|---------|---------|---------|
| Croatia | Fish | 12,403 | 14,773 | 15,042 | 15,052 | 17,132 |
| | Molluscs | 746 | 798 | 763 | 982 | 935 |
| | Crustaceans | 0 | 0 | 0 | 0 | 0 |
| | Total | 13,149 | 15,571 | 15,805 | 16,034 | 18,067 |
| France | Fish | 44,654 | 38,700 | 48,690 | 47,816 | 42,953 |
| | Molluscs | 135,573 | 124,487 | 131,767 | 140,628 | 144,096 |
| | Crustaceans | 58 | 62 | 50 | 57 | 44 |
| | Total | 180,285 | 163,249 | 180,507 | 188,501 | 187,093 |
| Greece | Fish | 87,836 | 88,334 | 100,291 | 106,165 | 110,162 |
| | Molluscs | 16,701 | 18,629 | 23,291 | 19,246 | 22,010 |
| | Crustaceans | 0 | 50 | 29 | 11 | 62 |
| | Total | 104,537 | 107,013 | 123,611 | 125,422 | 132,234 |
| Italy | Fish | 48,341 | 48,402 | 56,633 | 56,634 | 50,163 |
| | Molluscs | 100,374 | 100,345 | 100,345 | 100,345 | 93,171 |
| | Crustaceans | 15 | 16 | 22 | 21 | 5 |

| | | | | | | |
|-------------------|-------------|---------|---------|---------|---------|---------|
| | Total | 148,730 | 148,763 | 157,000 | 157,000 | 143,339 |
| Montenegro | Fish | 680 | 624 | 737 | 808 | 852 |
| | Molluscs | 179 | 189 | 192 | 214 | 245 |
| | Crustaceans | 0 | 0 | 0 | 0 | 0 |
| | Total | 859 | 813 | 929 | 1,022 | 1,097 |
| Portugal | Fish | 6,488 | 4,782 | 4,851 | 5,362 | 4,556 |
| | Molluscs | 4,842 | 4,766 | 4,916 | 7,093 | 9,382 |
| | Crustaceans | 5 | 13 | 18 | 21 | 18 |
| | Total | 11,335 | 9,561 | 9,785 | 12,476 | 13,956 |
| Slovenia | Fish | 967 | 1,029 | 1,232 | 1,084 | 1,334 |
| | Molluscs | 430 | 588 | 627 | 666 | 609 |
| | Crustaceans | 0 | 0 | 0 | 0 | 0 |
| | Total | 1,397 | 1,617 | 1,859 | 1,750 | 1,943 |
| Spain | Fish | 59,533 | 61,810 | 64,111 | 66,591 | 60,535 |
| | Molluscs | 222,543 | 227,805 | 219,539 | 244,233 | 287,020 |
| | Crustaceans | 162 | 204 | 177 | 199 | 258 |
| | Total | 282,238 | 289,819 | 283,827 | 311,023 | 347,813 |

Supplementary Table 3. Imports of seafood (in tons).

| Country | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------|-----------|-----------|-----------|-----------|-----------|
| Croatia | 43,713 | 46,713 | 47,914 | 48,984 | 53,334 |
| France | 1,079,757 | 1,086,087 | 1,103,985 | 1,140,298 | 1,134,602 |
| Greece | 208,414 | 199,733 | 211,573 | 213,521 | 226,865 |
| Italy | 1,035,299 | 1,069,054 | 1,092,593 | 1,103,338 | 1,105,440 |
| Montenegro | 3,162 | 3,333 | 3,759 | 4,213 | 4,229 |
| Portugal | 475,478 | 477,588 | 502,846 | 523,319 | 512,323 |
| Slovenia | 18,455 | 19,788 | 22,818 | 22,499 | 22,501 |
| Spain | 1,578,864 | 1,625,846 | 1,673,254 | 1,729,472 | 1,708,859 |

Source: FAO

Supplementary Table 4. Exports of seafood (in tons).

| Country | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------|-----------|-----------|-----------|-----------|-----------|
| Croatia | 47,598 | 53,270 | 54,019 | 52,379 | 53,902 |
| France | 300,491 | 330,384 | 335,661 | 335,698 | 343,278 |
| Greece | 119,463 | 118,054 | 132,064 | 144,146 | 145,231 |
| Italy | 160,617 | 159,606 | 153,479 | 150,461 | 154,319 |
| Montenegro | 9 | 1 | 21 | 14 | 5 |
| Portugal | 268,700 | 272,916 | 247,669 | 259,971 | 261,906 |
| Slovenia | 6,000 | 6,890 | 11,352 | 9,052 | 8,683 |
| Spain | 1,101,402 | 1,105,226 | 1,104,597 | 1,173,009 | 1,191,664 |

Source: FAO

Supplementary Table 5: Estimation of apparent consumption (in Kg per person) for the determination of fish by-products (FBP) category 3 from the processing of fishery and aquaculture products, in the retail and processing chain. The population figures per year are as per ST6.

| Country | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------|-------|-------|-------|-------|-------|
| Croatia | 18.34 | 16.77 | 17.14 | 16.98 | 18.23 |
| France | 15.67 | 15.04 | 15.61 | 15.90 | 16.19 |
| Greece | 19.47 | 19.33 | 20.82 | 20.48 | 22.14 |
| Italy | 11.82 | 12.17 | 12.83 | 13.10 | 13.30 |
| Montenegro | 7.02 | 7.08 | 7.81 | 8.04 | 8.27 |
| Portugal | 32.24 | 32.47 | 35.38 | 35.06 | 33.95 |
| Slovenia | 5.11 | 5.25 | 4.46 | 5.48 | 5.49 |
| Spain | 25.39 | 25.11 | 25.31 | 25.61 | 24.64 |

Supplementary Table 6. Population figures for the B-Blue Countries.

| Country | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------|------------|------------|------------|------------|------------|
| Croatia | 4,246,809 | 4,225,316 | 4,190,669 | 4,154,213 | 4,105,493 |
| France | 66,165,980 | 66,458,153 | 66,638,391 | 66,809,816 | 67,026,224 |
| Greece | 10,926,807 | 10,858,018 | 10,783,748 | 10,768,193 | 10,741,165 |
| Italy | 60,782,668 | 60,795,612 | 60,665,551 | 60,589,445 | 60,483,973 |
| Montenegro | 621,521 | 622,099 | 622,218 | 622,387 | 622,359 |
| Portugal | 10,427,301 | 10,374,822 | 10,341,330 | 10,309,573 | 10,291,027 |
| Slovenia | 2,061,085 | 2,062,874 | 2,064,188 | 2,065,895 | 2,066,880 |
| Spain | 46,512,199 | 46,449,565 | 46,440,099 | 46,528,024 | 46,658,447 |

Source: EUROSTAT