

Bluefin tuna growth in farms

The Commission have requested the SCRS to update the expected growth of bluefin tuna kept in cages during commercial fattening operations in farms for different time periods. Based on data collected at harvest, tagging of fish *in situ* and stereo-camera monitoring of caged fish, the SCRS provided updated estimates of weight gain (in kg) as a function of the initial fish size at caging and the time spent in the farm. In 2022 the Commission reviewed and adopted the SCRS growth tables suggesting that they be used for monitoring reports of harvesting operations at farms.

Two tables were produced with different growth values: **Table 1** provides the mean expected round weight (kg) at harvest of bluefin tuna after 1 to 36 months (columns) as a function of their size (SFL cm) at caging, within 10 cm size bins (lower limit), for size ranges between 70 to 250 cm SFL; while **Table 2** provides the expected maximum weight (kg) from the growth model 95% upper confidence interval.

These values should be interpreted as follows: the mean fish round weight at harvest should be closer to the values shown in **Table 1**; while, 5 or less out of each 100 (5%) harvested fish, with the same size at caging and that have been kept for the same time in a given farm, will reach a round weight above the value contained in **Table 2**.

Table 1. Estimated mean weight at harvest (kg) of farmed bluefin tuna as a function of size at caging (rows) and time (number of months) in farms (columns) since caging. The 1st year estimates are provided by month, while for the 2nd and 3rd year the estimated values correspond to the mid-month of each consecutive 3-month period (Ortiz *et al.*, 2022; Ortiz and Tsukahara, 2023). SFL – straight fork length; LL – lower limit.

Group	Size and weight at caging		Time after caging (no. months)																			
	SFL LL (cm)	(kg)	1	2	3	4	5	6	7	8	9	10	11	12	14	17	20	23	26	29	32	35
small	70	6.6	6.6	9.5	12.3	22.9	28.5	29.2	33.6	35.8	37.9	28.7	29.4	44.4	43.2	49.1	50.1	51.2	56.3	64.3	72.3	75.6
small	80	9.8	9.8	14.3	18.7	29.3	34.9	35.7	40.0	42.3	44.3	35.1	35.8	50.8	49.6	55.5	56.6	57.7	62.7	75.8	78.7	78.9
small	90	13.8	13.8	11.2	28.9	39.5	45.0	45.8	50.2	52.4	54.4	45.2	46.0	61.0	59.7	65.6	66.7	67.8	72.8	86.0	88.9	89.1
medium	100	18.7	18.7	12.6	29.9	43.2	49.8	51.8	52.8	54.0	60.3	61.9	73.0	85.6	68.1	80.2	89.6	91.5	114.2	122.4	127.3	132.2
medium	110	24.7	24.7	23.6	40.9	54.3	60.9	62.8	63.8	65.1	71.4	73.0	84.0	96.6	79.1	91.3	100.6	102.5	118.0	133.4	140.4	143.2
medium	120	31.8	24.7	35.9	53.3	66.6	73.2	75.1	76.1	77.4	83.7	85.3	96.3	109.0	91.5	103.6	112.9	114.9	137.6	145.7	152.8	157.3
medium	130	40.2	40.6	51.8	69.1	82.4	89.0	91.0	92.0	93.2	99.5	101.1	112.2	124.8	107.3	119.5	125.1	130.7	153.4	161.6	168.6	171.4
medium	140	49.9	58.6	69.8	87.2	100.5	107.1	109.0	110.0	111.3	117.6	119.2	130.2	142.8	125.4	137.5	146.8	148.8	171.5	179.1	186.6	189.4
medium	150	60.9	80.5	91.7	109.0	122.3	129.0	130.9	131.9	133.2	139.4	141.1	152.1	149.7	147.2	159.4	168.7	170.6	193.4	201.5	206.4	211.3
medium	160	73.5	105.6	116.9	134.2	147.5	154.1	156.0	157.0	158.3	164.6	166.2	177.2	189.9	187.2	184.5	193.8	206.2	218.5	226.6	233.7	236.4
medium	170	87.7	130.9	142.1	159.4	169.3	179.3	181.2	182.3	183.5	189.8	191.4	202.5	215.1	197.6	209.7	219.0	221.0	243.7	251.8	258.9	267.6
large	180	103.5	117.9	142.4	175.5	195.6	204.7	207.2	206.4	206.3	215.7	216.2	237.7	238.9	224.7	238.9	249.2	266.9	270.2	273.6	278.9	298.8
large	190	121.2	145.2	169.7	202.8	222.9	232.0	234.5	233.7	233.6	243.0	243.5	265.0	266.2	252.0	264.3	276.5	294.2	281.9	294.0	306.2	326.1
large	200	140.6	175.1	199.5	232.6	252.8	258.5	264.3	263.6	263.5	272.8	273.3	294.9	296.0	281.9	296.1	310.1	324.0	311.7	330.8	343.9	357.0
large	210	162.1	207.0	231.4	264.5	284.7	293.8	294.6	295.5	295.4	304.7	305.3	326.8	327.9	313.8	328.0	338.3	341.0	343.7	362.7	367.9	387.8
large	220	185.6	239.6	264.1	297.2	317.3	326.4	328.9	331.7	334.5	337.4	337.9	359.4	360.6	346.4	360.6	370.9	388.6	391.9	395.3	400.6	420.5
large	230	211.2	272.0	296.4	329.5	349.6	358.7	361.2	360.5	360.3	368.5	376.6	384.8	392.9	378.8	393.0	403.3	420.9	408.6	427.8	433.0	452.8
large	240	239.0	304.5	333.3	362.0	382.2	391.3	393.7	393.0	392.9	402.2	402.8	424.3	425.6	428.1	432.0	435.8	453.4	441.2	460.2	465.4	482.1
large	250	269.1	330.5	354.9	388.0	408.1	417.2	419.7	419.0	418.8	428.2	428.7	450.3	451.4	437.2	451.5	456.7	461.9	467.1	486.1	491.4	511.3

Table 2. Estimated maximum growth in weight at harvest (kg) of farmed bluefin tuna as a function of size at caging (rows) and time (number of months) in farms (columns) since caging. The 1st year estimates are provided by month, while for the 2nd and 3rd year the estimated values correspond to the mid-month of each consecutive 3-month period. The values represent the upper 95% confidence interval (Ortiz *et al.*, 2022; Ortiz and Tsukahara, 2023). SFL – straight fork length; LL – lower limit.

Group Size	Size and weight at caging		Time after caging (no. months)																			
	SFL LL (cm)	(kg)	1	2	3	4	5	6	7	8	9	10	11	12	14	17	20	23	26	29	32	35
small	70	14.7	14.7	23.4	32.1	44.3	50.5	51.7	56.1	58.4	60.4	50.4	50.0	66.1	65.1	71.7	72.8	73.2	78.6	86.7	94.9	97.9
small	80	21.1	21.1	29.8	38.6	50.8	56.9	58.2	62.6	64.9	66.8	56.8	56.5	72.6	71.5	78.1	79.2	79.6	85.0	98.4	101.4	100.8
small	90	31.2	31.2	31.2	48.7	60.9	67.1	68.3	72.7	75.0	77.0	66.9	66.6	82.7	81.6	88.2	89.3	89.7	95.2	108.6	111.5	111.0
medium	100	45.3	45.3	59.6	78.8	92.5	99.2	101.1	102.2	103.4	109.7	111.2	122.0	134.7	117.4	129.6	138.9	140.0	162.0	171.0	175.6	180.1
medium	110	56.3	56.3	70.7	89.9	103.5	110.2	112.2	113.2	114.4	120.7	122.2	133.1	145.8	128.5	140.6	149.9	151.0	166.5	182.0	189.2	191.2
medium	120	88.4	68.7	83.0	102.2	115.8	122.5	124.5	125.5	126.8	133.0	134.5	145.4	158.1	140.8	152.9	162.2	163.3	185.4	194.3	201.5	205.3
medium	130	83.7	84.5	98.8	118.0	131.7	138.4	140.3	141.3	142.6	148.8	150.4	161.2	173.9	156.6	168.8	174.0	179.2	201.2	210.2	217.4	219.3
medium	140	87.2	102.5	116.9	136.0	149.7	156.4	158.4	159.4	160.6	166.9	168.4	179.3	191.9	174.7	186.8	196.1	197.2	219.3	227.4	235.4	237.4
medium	150	94.2	124.4	138.8	157.9	171.6	178.3	180.2	181.3	182.5	188.8	190.3	201.2	198.8	196.5	208.7	218.0	219.1	241.1	250.1	254.7	259.3
medium	160	104.1	149.6	163.9	183.1	196.8	203.4	205.4	206.4	207.6	213.9	215.4	226.3	239.0	236.4	233.8	243.1	254.7	266.3	275.3	282.5	284.4
medium	170	117.1	174.8	189.2	208.3	218.5	228.7	230.6	231.7	232.9	239.2	240.7	251.6	264.2	246.9	259.1	268.4	269.5	291.5	300.5	307.7	311.1
large	180	173.8	198.0	223.5	257.0	277.3	286.5	288.9	288.2	288.0	297.4	297.7	319.1	320.2	306.4	320.6	330.6	346.4	350.1	353.7	359.3	377.7
large	190	188.0	225.3	250.8	284.4	304.6	313.8	316.3	315.5	315.3	324.7	325.1	346.4	347.5	333.7	345.8	357.9	373.8	361.1	373.9	386.6	405.1
large	200	205.0	255.2	280.7	314.2	334.5	340.3	346.1	345.3	345.2	354.5	354.9	376.2	377.3	363.5	377.7	390.7	403.6	391.0	410.8	423.4	435.9
large	210	224.8	287.1	312.6	346.1	366.4	375.5	376.4	377.2	377.1	386.4	386.8	408.1	409.2	395.4	409.6	419.6	421.2	422.9	442.7	448.4	466.8
large	220	247.5	319.7	345.2	378.7	399.0	408.1	410.6	413.4	416.2	419.1	419.4	440.7	441.9	428.0	442.2	452.2	468.1	471.7	475.4	481.0	499.4
large	230	273.3	352.0	377.5	411.0	431.3	440.4	442.9	442.1	441.9	450.0	458.0	466.1	474.1	460.3	474.5	484.5	500.4	487.8	507.7	513.3	531.7
large	240	301.7	384.4	413.8	443.3	463.6	472.7	475.2	474.4	474.3	483.7	484.0	505.3	506.6	509.2	513.0	516.8	532.8	520.1	540.0	545.6	560.4
large	250	333.2	409.2	434.5	467.9	488.2	497.3	499.8	499.0	498.8	508.2	508.6	530.0	531.1	517.2	531.4	536.0	540.5	545.1	564.8	570.4	589.1

Bibliographic references

Ortiz M., Mayor C., Alemany F., Pagá A. 2022. Analysis and results of weight gain of eastern bluefin tuna (*Thunnus thynnus*) in farms. *Collect. Vol. Sci. Pap. ICCAT*, 79(3): 992-1021.

Ortiz M., Tsukahara Y. 2023. Interpolation of the growth table for farming bluefin tunas. *Collect. Vol. Sci. Pap. ICCAT*, 80(9): 231-237.