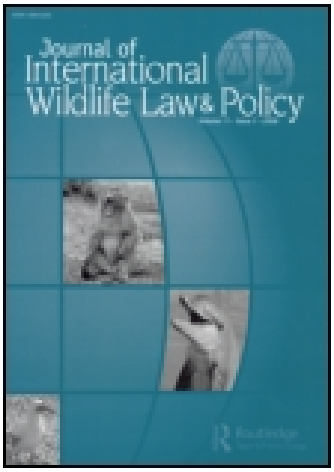


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# Sustainability and the Atlantic Bluefin Tuna: Science, Socioeconomic Forces, and Governance

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# Sustainability and the Atlantic Bluefin Tuna: Science, Socioeconomic Forces, and Governance

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## 1. INTRODUCTION

The Atlantic bluefin tuna, *Thunnus thynnus* (Linnaeus, 1758), is a large, highly migratory marine pelagic fish.[1] Atlantic bluefin tuna are fished commercially as their flesh is highly valued in the sashimi and sushi markets.[2] They are also sought after in the recreational fishery as their large size, speed (burst swimming up to 60 km/hour), and power make them a top game fish for fishers to capture using rod and reel. The International Game Fishing Association's all-tackle world record for Atlantic bluefin tuna is 679 kg, which was caught in Auld's Cove, Nova Scotia, Canada in 1979.

For many years, concerns have been expressed over the sustainability of the bluefin tuna, especially as this pertains to the impact of harvesting levels and growing market demands for sashimi and sushi.[3] The issue of governance has also risen to the fore. Since Atlantic bluefin tuna are highly migratory, the species requires international governance arrangements in the setting of quotas

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[1] W.B. Scott & M.G. Scott, *Atlantic Fishes of Canada*, 219 Can. Bull. Fish. Aquat. Sci. (1988), at 459.
[2] Sashimi is raw fish served in portion. Sushi includes rice.
[3] This market is discussed in Section 3.4.

and enforcement of harvesting levels.[4] Ultimately, the levers of governance will determine whether issues of scientific concern and socioeconomic forces are seriously considered in future harvesting plans.

This article examines the biology and ecology, and socioeconomic and governance issues surrounding the Atlantic bluefin tuna. In the following section, we turn to the biology and ecology of the bluefin tuna. Section 3 deals with the impact of socioeconomic and market forces on this species with reference to the tuna fattening and farming sector in the Mediterranean, commercial and recreational fisheries in Atlantic Canada, and the power of the Japanese market. Section 4 covers the debates and dilemmas of dealing with scientific and socioeconomic forces at the level of international governance. We conclude with an overview of where effective policy-making must occur in order to foster the long-term sustainability of the bluefin tuna.



## 2. THE ATLANTIC BLUEFIN TUNA: BIOLOGY AND ECOLOGY

Atlantic bluefin tuna are large, highly migratory, marine pelagic fish of the family Scombridae, and are one of the four members of the subgenus *Thunnus*. The three other close relative species in *Thunnus* are Pacific bluefin tuna, *Thunnus thynnus orientalis* (Temminck and Schlegel, 1844), southern bluefin tuna, *Thunnus maccoyii* (Castlenau, 1872), and albacore, *Thunnus alalunga* (Bonnaterre, 1788).[5]

Atlantic bluefin tuna migrate extensively in the North Atlantic Ocean and their range includes temperate areas, such as the southern Gulf of St. Lawrence, and tropical areas such as the Caribbean Sea and the Gulf of

[4] The International Commission for the Conservation of Atlantic Tunas (ICCAT), discussed further in Section 4 below, is the international organization with a mandate for management of Atlantic bluefin throughout its range. ICCAT was established in 1970, pursuant to the International Convention for the Conservation of Atlantic Tunas, 14 May 1966, 673 U.N.T.S. 63 [hereinafter ICCAT Convention]. Its Secretariat is based in Madrid, and as of February 2013 it included 48 Contacting Parties, including the United States, Canada, Japan, and the European Union. ICCAT has also granted status as a "Cooperating Non-Contracting Party, Entity or Fishing Entity" to Chinese Taipei, Curaçao, Colombia, Suriname, and El Salvador. For the complete list of parties *see* ICCAT, *Contracting Parties*, *at* http://www.iccat.int/en/contracting.htm (visited April 11, 2013). ICCAT first established total allowable catches (TACs) for western Atlantic bluefin in 1981: *see* G.D. HURRY, M. HAYASHI, & J.J. MAGUIRE, REPORT OF THE INDEPENDENT PERFORMANCE REVIEW: INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS (ICCAT), ICCAT PLE-106/2008 43 (2008) [hereinafter Independent Review Report].

[5] B.B. Collette, C. Reeb, & B.A. Block. *Systematics of the Tunas and Mackerels (Scrombidae)*, *in* TUNA: PHYSIOLOGY, ECOLOGY AND EVOLUTION 5 at 17 (B.A. Block & E.D. Stevens eds., 2001).

Mexico.[6] Many bluefin undergo transoceanic migrations,[7] on a seasonal basis,[8] and may cross ocean basins in a matter of days.[9]

### 2.1 Physiology

Bluefin tuna can move into temperate zones to feed as they are endothermic and use metabolic heat to maintain body temperatures that are warmer than the ambient water.[10] Metabolic heat is produced in the muscle and is partially retained by a counter-current heat exchange system. Arterial and venous blood vessels are arranged so that the flow of blood in each moves counter-current to the other.[11] Because the arterial and venous blood vessels are packed closely together, heat is transferred from the warm deoxygenated blood moving toward the gills, to the colder oxygenated blood returning from the gills. This specialization allows tuna to keep elevated internal body temperatures that have been estimated at times to be in excess of 21°C above the ambient water temperature.[12] Because of this, bluefin tuna can withstand a wide range of ambient water temperatures from as low as 3°C to as high as 30°C.[13] This adaptation allows bluefin tuna, a tropical breeding fish, to move into temperate waters to feed in highly productive areas in relatively cold temperatures.[14] In addition to the increased latitudinal range that may be accessed by bluefin tuna, endothermy also allows them to move into colder waters at great depth.[15] They have been recorded through electronic tags to regularly dive to depths in excess of 1000 m in off-shelf areas.[16] Deep diving by bluefin tuna likely allows them to access prey at great depth during the day, such as squid.



[6] F.J. MATHER III, J.M. MASON JR., & A.C. JONES. LIFE HISTORY AND FISHERIES OF ATLANTIC BLUEFIN TUNA, NOAA Technical Bulletin NMFS-SEFSC-370 (1995).

[7] B.A. Block et al., *Migratory Movements, Depth Preferences and Thermal Biology of Atlantic Bluefin Tuna*, 293 SCIENCE 1310, 1311 (2001).

[8] *Id*. at 1311.

[9] B.A. Block et al., *Electronic Tagging and Population Structure of Atlantic Bluefin Tuna*, 434 NATURE 1121, 1122 (2005).

[10] J.B. Graham & K.A. Dickson, *Anatomical and Physiological Specializations for Endothermy*, *in* Block and Stevens, *supra* note 5, at 121.

[11] F.G. Carey & J.M. Teal, *Regulation of Body Temperature by the Bluefin Tuna*, 28 COMP. BIOCHEM. PHYSIOL. 205 (1969).

[12] B.A. Block et al., *A New Satellite Technology for Tracking the Movements of Atlantic Bluefin Tuna*, 95 P. NATL. ACAD. SCI. USA 9384, at 9384 (1998).

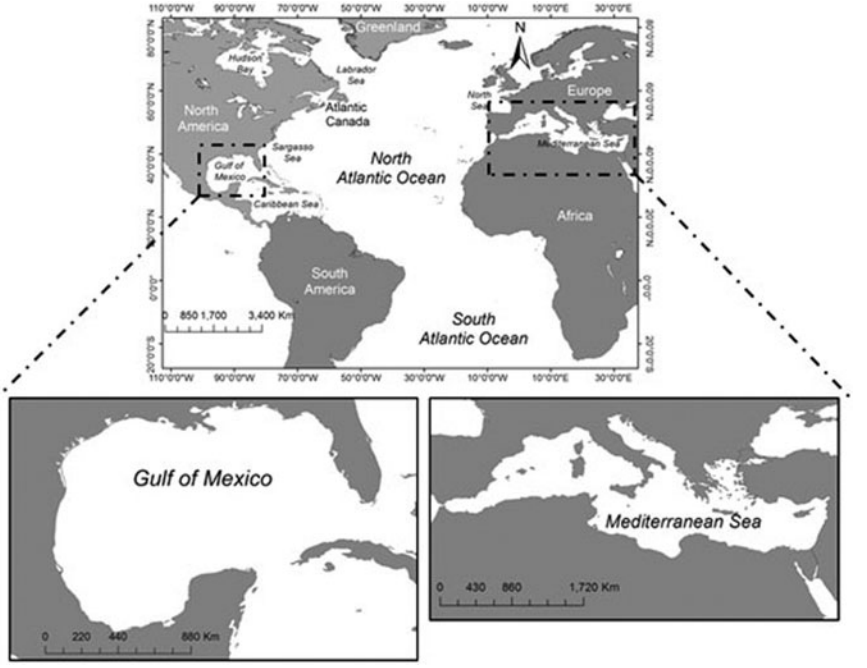
[13] Block et al., *supra* note 7, at 1314.

[14] J-M. Fromentin & J. Powers, *Atlantic Bluefin Tuna: Population Dynamics, Ecology, Fisheries and Management*, 6 FISH AND FISHERIES. 281, 282 (2005).

[15] Block et al., *supra* note 7, at 1312.

[16] *Id*. at 1312

FIGURE 1. The Atlantic Ocean showing the spawning grounds for bluefin tuna (*Thunnus thynnus*)




## 2.2 Stock Structure and Migration

Atlantic bluefin tuna in the western Atlantic Ocean range from water off Newfoundland to the Caribbean Sea, Venezuela, and Brazil. In the eastern Atlantic Ocean they range from water off northern Norway to the Canary Islands and throughout the Mediterranean and Black Seas.[17] Management of Atlantic bluefin tuna recognizes two principal areas of spawning, the Mediterranean Sea and the Gulf of Mexico.[18] Although fish from both of these populations mix in feeding areas throughout the North Atlantic Ocean, tagging studies indicate that they do not mix in the known spawning areas.[19] Therefore, Atlantic bluefin tuna are proposed to have two distinct populations, a western Atlantic stock that breeds in the Gulf of Mexico and an eastern Atlantic and Mediterranean stock that breeds in the Mediterranean Sea (Figure 1).[20]

[17] Fisheries and Oceans Canada (DFO), *Recovery Potential Assessment for Western Atlantic Bluefin Tuna (Thunnus thynnus) in Canadian Waters*, DFO CAN. SCI. ADVIS. SEC. ADVIS. REP. 2011/056 (2011), at 3.
[18] NATIONAL RESEARCH COUNCIL, AN ASSESSMENT OF ATLANTIC BLUEFIN TUNA (1994), at 1.
[19] Block et al., *supra* note 9, at 1122.
[20] *Id*. at 1121.

To clarify stock structure and define mixing of the two stocks, migration patterns of Atlantic bluefin tuna in the western Atlantic Ocean have been studied intensely by using electronic tagging technology.[21] These tagging studies have greatly increased our understanding of the migration, stock structure, and mixing of the two populations. Although most studies have been performed on fish captured and released in the western Atlantic there has been some tagging in the eastern Atlantic Ocean off Ireland,[22] and in the Mediterranean Sea, the Adriatic Sea, and off the Atlantic coast of Morocco.[23]

Early archival tagging studies used first generation archival pop-up tags produced by Wildlife Computers and Microwave Telemetry, respectively, to provide new information on movement and migration of Atlantic bluefin tuna.[24] These ground-breaking studies also provided proof of concept for gaining important information from deploying electronic tags on free-ranging oceanic large pelagic fish. Researchers in the Tag-A-Giant programme run by Dr. Barbara Block of Stanford University soon began deploying archival tags surgically implanted in Atlantic bluefin tuna. Often tags were returned to researchers when tagged fish were captured in fisheries. This cooperation between researchers and the fishers was an integral part of data acquisition. Returned tags provided a wealth of information including time series measurements of ambient temperature, pressure (depth), and light (which allowed modeling of a track through back-calculated light-based geolocation). Recapture locations and tag data from internal archival tags deployed on Atlantic bluefin tuna off the Carolinas and New England showed that they dived to depths in excess of 1000 m, and that some of the tagged fish crossed from the coastal waters off North America to the eastern Atlantic and Mediterranean Sea.[25]

Subsequent tagging studies reported that most of the summer feeding aggregation of Atlantic bluefin tuna found off Massachusetts was fish from the western stock, and therefore these fish moved south in the fall to enter

[21] Block et al., *supra* note 12; M.E. Lutcavage et al., *Results of the Pop-up Satellite Tagging of Spawning Size Class Fish in the Gulf of Maine: Do Atlantic Bluefin Tuna Spawn in the Mid-Atlantic*?, 56 CAN. J. FISH. AQUAT. SCI. 173 (1999); Block et al., *supra* note 11; M.J.W. Stokesbury et al., *Movement of Atlantic Bluefin Tuna (Thunnus thynnus) as Determined by Satellite Tagging Experiments Initiated off New England,* 51 CAN. J. FISH. AQUAT. SCI. 1976 (2004); S. Wilson et al., *Movements of Bluefin Tuna (Thunnus thynnus) in the Northwestern Atlantic Ocean Recorded by Pop-up Satellite Archival Tags*, 146 MAR. BIOL. 409, (2005); B. Galuardi et al., *Complex Migration Routes of Atlantic Bluefin Tuna (Thunnus thynnus) Question Current Population Structure Paradigm*, 67 CAN. J. FISH. AQUAT. SCI. 966 (2010).

[22] M.J.W. Stokesbury et al., *Movement of Atlantic Bluefin Tuna from the Eastern Atlantic Ocean to the Western Atlantic Ocean as Determined with Pop-up Satellite Archival Tags*, 582 HYDROBIOLOGIA 91 (2007).

[23] G. Quilez-Badia et al., *Spatial Movements of Bluefin Tuna Revealed by Electronic Tagging in the Mediterranean Sea and in Atlantic Waters of Morocco*, 123 ICCAT SCRS (2012).

[24] Block et al., *supra* note 12; Lutcavage, *supra* note 21.

[25] Block et al., *supra* note 7, at 1310.

the Gulf of Mexico spawning ground.[26] The summer feeding aggregation also happens to comprise the largest component of the U.S. commercial fishery. Tagging data have also been used to identify spawning site fidelity in the eastern Atlantic and Mediterranean Sea, and it has been reported that some Atlantic bluefin show a strong connection to the Mediterranean basin where others show a strong connection to areas of the Adriatic Sea.[27]

A comprehensive paper detailing electronic tagging results from the first ten years of the Tag-A-Giant programme reported results from the electronic tags of 772 Atlantic bluefin tuna in the western Atlantic Ocean.[28] Tagging data supported the two-stock hypothesis and revealed that bluefin tuna from the western stock frequented foraging grounds in the eastern Atlantic, were being captured in the eastern Atlantic, and counted against the eastern stock quota, instead of the western stock quota. Therefore, high quotas for bluefin tuna in the eastern Atlantic Ocean may have been impeding the recovery of the western Atlantic Ocean stock.

As a result of the varied and complex movement of Atlantic bluefin tuna, Fromentin and Powers have suggested the current paradigm of stock structure based on the member/vagrant hypothesis may not be appropriate for bluefin tuna.[29] They suggest that the bluefin tuna may form groups that congregate for reproduction, but that their population level range may expand and contract driven by environmental variables and fishing pressures.[30] More effort needs to be expended by scientists and managers to truly understand the movement and stock structure of Atlantic bluefin tuna.

### 2.3 Spawning

The age at maturity for Atlantic bluefin tuna is different for the western Atlantic stock and the eastern Atlantic stock. It has been reported that 50 per cent of female Atlantic bluefin tuna in the Mediterranean Sea are mature at age 3[31] or 3–4 years,[32] and that 100 percent are mature at age 4–5[33] or 5.[34]



[26] Stokesbury et al., *supra* note 22, at 1983.
[27] Quilez-Badia et al., *supra* note 23.
[28] Block et al., *supra* note 9.
[29] Fromentin and Powers, *supra* note 14, at 286; They are referring to the following study: M. Sinclair and T.C. Isles, *Population Regulation and Speciation in the Oceans*, 45 J. CONS. INT. EXPLOR. MER 165 (1989).
[30] Fromentin and Power, *id*. at 286.
[31] J. Rodriguez-Roda, *Fecundidad del atún, Thunnus thynnus (L.), de la Costa Sudátlantics de España*, 31 Investigacion Pesquera, Consejo Superior de Investigaciones Cientificas Barcelona, 349; Mather et al., *supra* note 6, at 92.
[32] A. Corriero et al., *Size and Age at Sexual Maturity of Female Bluefin Tuna (Thunnus thynnus L. 1758) from the Mediterranean Sea*, 21 J. APPL. ICHTHYOL. 483, at 483 (2005).
[33] Rodriguez-Roda, *supra* note 31; Mather et al., *supra* note 6, at 93.
[34] Corriero et al., *supra* note 32, at 483.

Conversely, in the western Atlantic Ocean 50 per cent maturity may not be reached until ages 11 or 12.[35]

Spawning of Atlantic bluefin tuna is likely linked to temperature and to specific physical and biological conditions of the spawning areas. One study used data from electronic tagging studies to identify spawning behaviour by western Atlantic bluefin tuna on the spawning grounds of the Gulf of Mexico by which a spawning was reported at 25.8°C.[36] Another study notes that this temperature threshold is reached earlier in the year in the Gulf of Mexico than in the Mediterranean Sea, and therefore bluefin tuna start spawning in the western Atlantic Ocean in April but do not spawn in the Mediterranean Sea until May.[37] Electronic tags have been used to determine that Atlantic bluefin tuna are present on the spawning ground in the Gulf of Mexico from December through July.[38]

It is believed that adult Atlantic bluefin tuna spawn each year. However, occasionally electronic tagging data have indicated that fish that are presumed to be of adult size (>200 cm CFL) do not visit known spawning grounds during the spawning season.[39] Therefore, there may be spawning occurring in areas outside of the known spawning locations, some bluefin may be large in size but not yet mature, or some bluefin may not be annual spawners.[40]

### 2.4 Feeding

Atlantic bluefin tuna appear to be opportunistic, ram feeders.[41] In the western Atlantic Ocean, Chase examined the stomach contents of 819 Atlantic bluefin tuna captured between 1988 and 1992.[42] Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scombrus scombrus*), sand lance (*Ammodytes* spp.), squid (Cephalopoda), and bluefish (*Pomatomus saltatrix*) were the principal components of their diet. In the eastern Atlantic and Mediterranean Sea bluefin have



[35] G.A. Diaz and S.C. Turner, *Size Frequency Distributional Analysis, Age Composition, and Maturity of Western Bluefin Tuna in the Gulf of Mexico From the U.S. (1981–2005), and Japanese (1975–1981) Longline Fleets*, ICCAT SCRS/2006/090, 60(4) COL. VOL. SCI. PAP. ICCAT 1160 (2007); J. R. Rooker et al., *Life History and Stock Structure of Atlantic Bluefin Tuna (Thunnus thynnus)*, 15 REV. FISH. SCI. 265, 273 (2007).

[36] S.L.H. Teo et al., *Movement Patterns, Diving Behaviour and Thermal Biology of Atlantic Bluefin Tuna (Thunnus thynnus) on Their Breeding Grounds in the Gulf of Mexico*, 151 MAR. BIOL. 1, 8 (2007).

[37] Rooker et al., *supra* note 35, at 267.

[38] Block et al., *supra* note 9, at 1123.

[39] Lutcavage et al., *supra* note 21; Galuardi et al., *supra* note 21, at 966.

[40] D.H. Secor, *Do Some Atlantic Bluefin Tuna Skip Spawning?,* 60 COL. VOL. SCI. PAP. ICCAT 1141 (2007); Rooker et al., *supra* note 35, at 271

[41] Rooker et al., *supra* note 35, at 247.

[42] B.C. Chase, *Differences in the Diet of Atlantic Bluefin Tuna (Thunnus thynnus) at Five Seasonal Feeding Grounds on the New England Continental Shelf*, 100 FISH. BULL. 168 (2002).

been reported to eat European sprat (*Clupea sprattus*), European anchovy (*Engraulis encrasicholus*), and European pilchard (*Sardina pilchardus*).[43]

## 3. SOCIOECONOMIC FORCES

We will examine the impact of socioeconomic forces on the Atlantic bluefin tuna by comparing the different production regimes for bluefin tuna in the eastern Atlantic and Mediterranean, and in the western Atlantic. As we shall see, the power of the Japanese market informs these production regimes and has implications for the overall sustainability of the Atlantic bluefin tuna. Prior to doing this comparison, we provide a brief history of the harvesting of this species.

### 3.1 Present and Former Abundance

Atlantic bluefin tuna have been fished in the eastern Atlantic Ocean and Mediterranean Sea for thousands of years. The Romans at Baelo Claudia in Bolonia, Spain fished them. The blood, viscera, and head of bluefin tuna were fermented for weeks in stone vats to form *Garum*, a seasoning highly valued in Rome. Since approximately the 1600s, some trap fishing for bluefin tuna in areas of Spain, Italy, and Morocco was conducted in the same manner. In an extremely interesting analysis, Ravier and Fromentin[44] examined the relative population fluctuation of Atlantic bluefin tuna captured in these trap nets in the eastern Atlantic Ocean and Mediterranean Sea with time series as long as 400 years. Some original records (from the time series) were kept by monks from local monasteries who came to the traps to record the catch. This analysis showed great natural fluctuations in population size from periods when the bluefin tuna were only accessed in traps in the near shore. This natural fluctuation of the population size gives some insight into the difficulty experienced by managers in trying to establish appropriate catch quotas for Atlantic bluefin tuna.

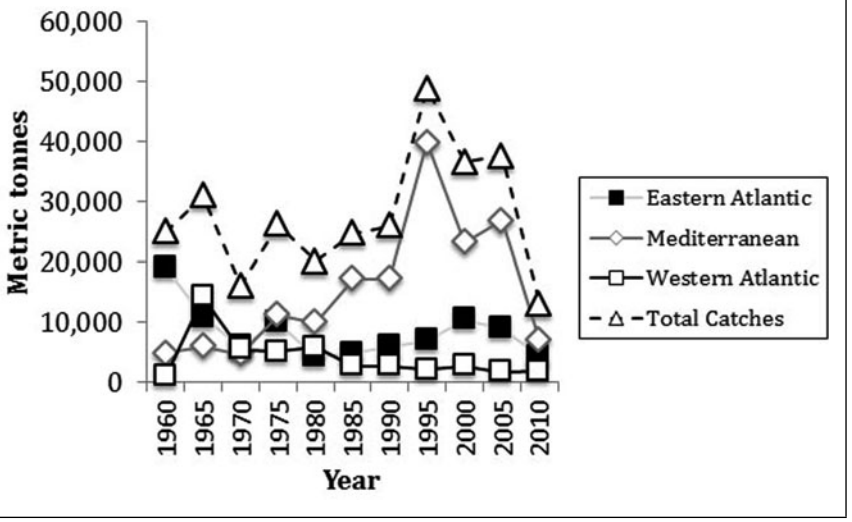
There is much concern over the current status of the eastern Atlantic Ocean and Mediterranean Sea Atlantic bluefin tuna stock as it has recently been greatly reduced by industrial fishing. The catch of Atlantic bluefin tuna in the eastern Atlantic and Mediterranean reached a peak in 1996 at approximately 50,000 metric tonnes (mt).

The fishery for Atlantic bluefin tuna in the western Atlantic is much younger than that in the east with exploitation starting in the 1950s by Japanese fishers. It is believed that spawning stock biomass (SSB) of Atlantic bluefin

[43] Rooker et al., *supra* note 35, at 274.

[44] C. Ravier and J.M. Fromentin, *Long-term Fluctuations in the Eastern Atlantic and Mediterranean Bluefin Tuna Population*, 58 ICES J. MAR. SCI. 1299 (2001).

FIGURE 2. Atlantic Bluefin tuna catches, 1960 to 2010 Source: Based upon data contained in *Table 14, Total Catch of Major Tunas, by Species, Area and Year*, ICCAT, 41 STATISTICAL Bulletin (1960–2010) (July 2012), at 36




tuna peaked in 1973 at an estimated 51,500 mt. Abundance of the western population declined sharply from 1970 to the mid-1980s and in 1985 the estimated SSB was 15,000 mt.[45] It is currently estimated that the SSB has been relatively stable, with the 2009 SSB estimated at 14,000 mt, or approximately 300,000 individuals.[46]

The remainder of this section examines the harvesting of bluefin tuna in International Commission for the Conservation of Atlantic Tunas (ICCAT) regions in the eastern Atlantic and Mediterranean (with an emphasis on tuna fattening and farming in the Mediterranean), and the western Atlantic (with an emphasis on eastern Canada). It concludes with an overview of the Japanese market for sashimi and sushi. This market influences production practices in areas under the purview of ICCAT.

### 3.2 Production in the Eastern Atlantic and Mediterranean

Figure 2 shows landings data for Atlantic bluefin tuna from 1960 to 2010. The data show that from 1970 (the date of ICCAT's founding) to 2000, bluefin tuna catches increased from over 15,000 to over 35,000 mt. The largest increases were in the Mediterranean. This was coupled with an increase and eventual

[45] DFO, *supra* note 17, at 5.

[46] ICCAT, *Report of the Standing Committee on Research and Statistics (SCRS), Madrid, Spain, 4–8 October 2010* (2010), *at* http://www.iccat.int/Documents/Meetings/Docs/2010_SCRS_eng.pdf (visited 15 December 2012).

decline in catches in the western Atlantic.[47] In 1994, official catches in the Mediterranean were 39,810 mt.[48]

Prior to the mid-1990s, gear ranging from trap nets to purse seiners was used to harvest bluefin tuna directly for the Japanese market. Around this time, harvests became linked to further rearing of bluefin tuna in industrialized tuna fattening and farming operations prior to export.[49] These operations are emphasized here.

The industrialization of bluefin tuna fishing in the eastern Atlantic, but especially the Mediterranean, reflects a shift from "traditional" trap to purse seine fishing. The European Union's Financial Instrument for Fisheries Guidance funded purse seiners and tuna cultivation.[50] In the early part of this century, more than 200 purse seiners were harvesting bluefin tuna in the Mediterranean.[51] This fleet harvests between 70 to 86 per cent of the Mediterranean bluefin tuna catch. All of this catch is dedicated to tuna fattening and farming facilities. In 2007, the potential harvest for bluefin fattening and farming facilities was 56,842 mt.[52] In 2007, the "official" catch for bluefin tuna in the Mediterranean was 26,479 mt.[53]

Since Japan imports over 90 per cent of the cultivated tuna harvest, it is not surprising that Japanese investors have joint operations with the purse seine fleet and tuna fattening facilities.[54] As bluefin tuna are harvested by purse seiners during the short fishing season, the catch is transferred to towing



[47] The data on official catches are problematic. What compounds this issue is that since 1995 ICCAT quotas have been set higher than the recommendations of its scientific committee (SCRS). For example, from 2003 to 2008, SCRS recommended 15,000 mt in the western Atlantic and Mediterranean and ICCAT set quotas that were usually more than double this figure. SCRS also estimated that catches were greater than 50,000 mt (2003 to 2007) in most years. *See* Ussif Rashid Sumaila and Ling Huang, *Managing Bluefin Tuna in the Mediterannean Sea*, 36 MARINE POL'Y 502, 507 (2012). The data are in Table 5.

[48] ICCAT, 41 *Statistical Bulletin (1960–2010)*, 2, 111 (2012).

[49] Constantinos C. Mylonas et al., *Atlantic Bluefin Tuna (Thunnus Thynnus) Farming and Fattening in the Mediterranean Sea*, 18 REV. FISH. SCI. 266, 267 (2010). For cultivated tuna, the vast majority of operations are "fattening farms." Juvenile tuna harvested by purse seiners are reared in cages for one to seven months before being slaughtered for the Japanese market. *See* Francesa Ottolenghi, *Capture-based Aquaculture of Bluefin Tuna*, *in* CAPTURE-BASED AQUACULTURE. GLOBAL OVERVIEW 169, 174 (A. Lovatelli and P.F. Holthus eds., 2008). In contrast, much smaller tuna (30 to 50 kg in size) harvested for "farming" facilities in Croatia are reared for two years *See* Mylonas, at 268.

[50] Sumaila and Huang, *supra* note 47, at 508–509. They also estimate that in the early part of this century, the EU's Financial Instrument for Fisheries Guidance provided €19 to €20 million for tuna farm expansion. These funds covered up to 75 per cent of all investments in purse seiners and tuna fattening farms. Spain, a major site for tuna fattening, received €6 million.

[51] Fromentin and Powers, *supra* note 14, at 293.

[52] Mylonas et al., *supra* note 49, at 267–268.

[53] ICCAT, *supra* note 48, at 36.

[54] Stefano B. Longo, *Global Sushi: The Political Economy of the Mediterranean Bluefin Tuna Fishery in the Modern Era*, 17 J. WORLD SYST. RES. 403, 417 (2011); Ottolenghi, *supra* note 49, at 176, 178.

vessels that may take up to a week to ship it to rearing cages.[55] It can take up to €3,000 a day to tow tuna to fattening farms. The tuna are fed a variety of fish to speed up the fattening process while in transit. The fish are fed in cages for up to eight months before being slaughtered for the Japanese market. Large fish can increase their weight up to 50 per cent in this period, and smaller tuna can increase their weight by up to 30 per cent.[56] The objective is to maximize the amount of fatty belly meat favoured during the Japanese New Year (and other feast days).[57]

As tuna fattening and farming facilities expanded after 2000 from 3 to 11 countries in the Mediterranean, the exports to Japan shifted from a fresh to frozen product (see Section 3.4 below). This results in a lower price per kilogram of harvested tuna, but is more profitable to the producer. The higher price for fresh tuna includes air transport fees, customs duties, and an auctioneer's price. These are all charged to the producer. Whole frozen tuna are shipped free on board. After tuna leave fattening facilities and are placed on a freezer vessel, subsequent costs associated with freezing, transportation, and processing, are assumed by the buyer. In addition to these costs, tuna fattening facilities have costs relating to the purchase of tuna from fishing boats, towing costs, feed, and labour.[58]

The shift to tuna fattening and farming facilities should, in theory, reduce the pressure on wild bluefin tuna stocks; however, some critics question the long-term sustainability of this practice.[59] This pertains to the "unknown" impact of targeting juveniles for cultivation for stock decline and the user conflicts accompanying such cultivation. Longo argues that the rise of the purse seiner-tuna cultivation sector has contributed to the decline of traditional small-scale tuna trap fisheries in Sicily.[60] An additional issue is that fattening farms in the western Mediterranean had insufficient stocks in 2010 for making their operations viable and ceased operations; some fattening facilities moved to the eastern Mediterranean with less stringent regulations (and closer to the breeding grounds of bluefin tuna).[61] In 2010, the "official" catch for the eastern Atlantic and Mediterranean was 11,328 mt, far below the 2009 figure of 19,700 mt.[62] The lack of sufficient stock is related to the decline in quotas for bluefin tuna as part of a 15-year recovery plan adopted by ICCAT in

[55] Due to concerns with overfishing, ICCAT shortened the season for bluefin tuna from 15 April to 15 June (2008) to 15 May to 15 June (2009). *See* Mylonas et al., *supra* note 49, at 275.
[56] *Id*. at 269, 271.
[57] *See* Section 3.4 below.
[58] Mylonas et al., *supra* note 49, at 274.
[59] *See* Longo, *supra* note 54 and Sumaila and Huang, *supra* note 47.
[60] Longo, *supra* note 54, at 415–420.
[61] Mylonas et al., *supra* note 49, at 275.
[62] ICCAT, *Compendium Management Recommendations and Resolutions Adopted by ICCAT for the Conservation of Atlantic Tunas and Tuna-Like Species* (2012), at 36.

2007. In 2011, ICCAT issued a quota of 12,900 mt for the eastern Atlantic and Mediterranean.[63] The long-term future of tuna fattening and farming may be related to moving the production cycle for bluefin tuna to "egg to plate" operations.[64]

### 3.3 Production in the Western Atlantic

Figure 2 shows that official catches for bluefin tuna in the western Atlantic also expanded in the 1970s and declined by the 1990s. In 1970 the western Atlantic (5,466 mt), eastern Atlantic (5,972), and Mediterranean (4,694) had roughly similar catches. However, by the early 1990s, catch levels (and eventually ICCAT quotas) for the western Atlantic were significantly reduced. Here, we emphasize the bluefin tuna fishery in eastern Canada.[65] This fishery has a different pattern than the industrial tuna fattening/farming operations in the Mediterranean.

Canada has traditionally received about 20 to 30 per cent of the ICCAT quota for the western Atlantic.[66] As is the case for the eastern Atlantic and Mediterranean, the commercial bluefin tuna fishery in the western Atlantic dates to the 1970s when the Japanese fleet gradually withdrew from distant waters and the Japanese market started to depend more on imports. This resulted in changes in Prince Edward Island (PEI) and Nova Scotia, the two Canadian provinces that participate the most in the bluefin tuna fishery.

Prior to the 1970s, bluefin tuna was primarily a sport and non-commercial fishery in PEI. During this period, concerns emerged over the presence of Japanese and Norwegian vessels fishing for bluefin tuna. The PEI Departments of Fisheries and Tourism and 38 charter boat operators wanted to protect this fishery from outside interests. In 1972, North Lake Storage, the buyer of most of PEI's tuna, arranged with a Japanese company to export tuna to Japan. Tuna from the Gulf of St. Lawrence (which surrounds PEI) had a higher content of fat than most of the tuna harvested by the Japanese fleet. PEI fish harvesters held over 60 per cent of the 232 bluefin tuna licences in Atlantic Canada in 1974.[67]

The PEI bluefin tuna fishery in the 1970s was fraught with controversy among fish harvesters over the use of technology. Those on the eastern end

[63] *Id*. at 54.

[64] Mylonas et al., *supra* note 49, at 275–277.

[65] This includes the provinces of Nova Scotia, Prince Edward Island, New Brunswick, Newfoundland and Labrador, and Quebec. The first four provinces are referred to as Atlantic Canada.

[66] The 2012 ICCAT quota was set at 1,750 mt for the western Atlantic. Canada received 381.66 mt (21.8 per cent of the total), Japan 301.64 mt (17.2 per cent), and the United States 923.70 mt (52.8 per cent) (ICCAT, *supra* note 62, at 49). The Canadian quota is divided into set allocations for seven fleet sectors and an offshore sector.

[67] John Kafka, *Politics of the Bluefin Tuna Fishery: Prince Edward Island*, *in* ATLANTIC FISHERIES AND COASTAL COMMUNITIES: FISHERIES DECISION-MAKING CASE STUDIES 205, 205–213 (Cynthia Lamson and Arthur J. Hanson eds., 1984).

of the island (concentrated in North Lake) used rod and reel, whereas those on the western end of the island used tended lines, a form of set gear.[68] This reflected a conflict between charter (rod and reel) and commercial harvesters (tended lines).[69] At that time, the latter were illegal. However, from 1982 to 1996, tended lines were the dominant technology used to harvest bluefin tuna (in terms of mt harvested) in Atlantic Canada. These were only surpassed by rod and reel harvests in 1997.[70]

The 1970s also witnessed the rise of the bluefin tuna fisheries in Nova Scotia. This included the southern side of the Gulf of St. Lawrence, St. Margaret's Bay (near the city of Halifax), and southwest Nova Scotia. As was the case for PEI, bluefin tuna harvesters in Nova Scotia participated in this fishery in addition to other fisheries.[71] For example, since the 1940s mackerel fish harvesters in St. Margaret's Bay were catching bluefin tuna as a bycatch. While originally considered as a nuisance that destroyed gear, bluefin tuna were harvested and placed in ranching operations, a practice that still continues. In southwest Nova Scotia, a sports fishery emerged in the late 1930s.[72] Today, this area also contains the only individual transferrable quota (ITQ) bluefin tuna fishery in Atlantic Canada.[73]

The current management regime for bluefin tuna (which includes the ITQ fleet in southwest Nova Scotia) in eastern Canada emerged at the turn of this century. From 1989 to 2000, an inshore tuna allocation system for bluefin tuna was devised to ensure the entire Canadian quota was taken. Seven fleet sectors had the opportunity to participate. Due to the highly migratory nature of bluefin tuna, the quota was not always taken. In 2001, DFO began to allocate quota based upon catch history for each of the seven sectors.[74] This system is still in place.

Today, quotas are allocated to seven inshore sectors, a pelagic longline bycatch, one offshore licence, and for scientific tagging. In 2010, over 83 per cent (432.43 mt) of the adjusted Canadian quota of 517.28 mt was allocated to



[68] Tended lines consist of a single hook attached to a length of buoyed rope tied to the vessel. *See* DFO, FISHERIES MANAGEMENT PLAN: SCOTIA-FUNDY REGION (1990), at 4.

[69] Kafka, *supra* note 67, at 218–222.

[70] Jean-Jacques Maguire and Brian Lester, *Bluefin Tuna (Thunnus thynnus) in Atlantic Canadian Waters: Biology, Status Recovery Potential, and Measures for Mitigation*, DFO CAN. SCI. ADVIS. SEC. RES. DOC. 2012/002 (2012).

[71] Near the end of this section, data will be presented on the importance of bluefin tuna harvests for the fish harvesters who also hold other licences.

[72] DFO, *supra* note 68, at 4.

[73] DFO, POLICY AND ECONOMICS BRANCH, MARITIMES REGION, POTENTIAL SOCIO-ECONOMIC IMPACTS OF ADDING AND NOT ADDING ATLANTIC BLUEFIN TUNA TO THE LIST OF WILDLIFE SPECIES AT RISK, AS ENDANGERED, UNDER THE *SPECIES AT RISK ACT* (2012), at 6.

[74] These sectors (with 2002 allocations in brackets) include: Quebec (105), Gulf New Brunswick (105), Gulf Nova Scotia (105), St. Margaret's Bay (105), Newfoundland and Labrador (105), southwest Nova Scotia (125), and PEI (180). *See* DFO, INTEGRATED FISHERIES MANAGEMENT PLAN ATLANTIC BLUEFIN TUNA (EFFECTIVE 2002) (2002), 12, 16.

the seven inshore sectors, with the remainder allocated to the other fisheries.[75] For the inshore bluefin sectors, PEI (30.02 per cent) and southwest Nova Scotia (21.7 per cent) had over half of the quota. In 2010, 441 (out of the 777) inshore licence holders caught the Canadian quota. This included: 246 PEI harvesters, 94 in Gulf Nova Scotia, and 36 in southwest Nova Scotia—the most active of the seven fleet sectors. The average value of catches also varied for these three fleet sectors. For example, the 256 harvesters in PEI averaged less than one tonne (0.53) of tuna landed and a value of C$6,506; for southwest Nova Scotia, the 36 harvesters averaged more than two mt (2.96) of tuna landed and a value of C$48,716.[76]

The greater value per license holder in southwest Nova Scotia is most likely due to the presence of 32 ITQ licenses among the 36 active licences. For southwest Nova Scotia fish harvesters with bluefin tuna licences, this species represented 12.9 per cent of their total landings; in addition, nearly 32 per cent of these fish harvesters ($n = 9$) received more than 25 per cent of their fisheries earnings from bluefin tuna. This sector and the four tuna trap fish harvesters in St. Margaret's Bay are the only sectors that are this dependent on bluefin tuna landings. By contrast, less than four per cent of PEI bluefin harvesters depended on this species for more than 25 per cent of their fisheries earnings.[77]

Thus, the tuna fishery for the Canadian side of the western Atlantic has a different history and structure than its counterpart in the Mediterranean. The four licensed tuna trap holders in St. Margaret's Bay are the closest that one comes to the tuna fattening/farming sector in the Mediterranean. The vast majority of harvesters use the rod and reel method to catch one tuna at a time. In addition, these harvesters are dealing with a much smaller ICCAT quota and combine their efforts with other fisheries in order to secure a livelihood.

Despite differences in production, bluefin tuna from Atlantic Canada (like that from the Mediterranean) is destined for the export market. Higher-grade tuna ends up in the sushi and sashimi segments of the Japanese market, and lower grade tuna ends up as steaks in the United States and Europe. In 2006, 400 mt of bluefin tuna from the three Nova Scotia fleet sectors was exported at a value of over C$8 million. Of this amount, 250 mt valued at C$5 million went to Japan with the remainder going to the United States. The vast

[75] The adjusted quota is based upon under harvests or overharvests by each of the inshore fleet sectors in 2009. For details, *see* Table 1 Bluefin Tuna Quota Allocation 2010 in DFO, *supra* note 73, at 6.

[76] These figures are derived from data contained in Table 2 Atlantic Bluefin Tuna Fishery 2010 Summary (preliminary data), *id*. at 17.

[77] These figures are based upon data contained in Table 3 Number of Bluefin Tuna Inshore Fleet Licence Holders by Dependency Level 2010 (preliminary data), *id*. at 17.

majority of the PEI catch of 100 mt (valued at under C$2 million) went to the United States.[78]

As we have seen, the rise of tuna farming in the Mediterranean over the past two decades has coincided with lower prices in the Japanese market for bluefin tuna. Factors such as this may have influenced the shift by some bluefin tuna licence holders in Atlantic Canada towards the charter boat fishery. While a sports fishery has been part of the tuna fishery since the 1930s, there is a revitalized interest in this sector. The fishery began in the southern Gulf of St. Lawrence and has since spread to several areas off Nova Scotia and Prince Edward Island.[79] For example, in 2010, 10 mt under the scientific tagging quota were allocated to a hook and release fishery for charter boats based out of North Lake, PEI. The charter boat fishery (13 vessels) in PEI receives C$1,250 to C$1,400 for each trip of six people. In addition, the ITQ fleet in southwest Nova Scotia donates 100 pounds per licence holder in support of an annual tuna fishery tournament in Wedgeport, Nova Scotia. Finally, in 2010, six boats from the Gulf Nova Scotia fleet sector participated in a hook and release charter fishery.[80] Recently, a Gulf Nova Scotia Tuna Charter Association with 18 members was formed. It operates charters from August to October. The president of the association claims local economic spinoffs from rentals to hotel accommodations will emerge from this fishery.[81]

Fisheries and Oceans Canada, in collaboration with other funding agencies, sponsored an electronic tagging study aimed at determining the post-release mortality rate for Atlantic bluefin tuna caught in an experimental recreational fishery in the southern Gulf of St. Lawrence.[82] Catch and release always has some impact on fish, as it is a stressful event. Stokesbury et al. electronic tagging data indicated that only 2 of 59 captured, tagged, and released Atlantic bluefin tuna suffered mortality.[83] This allowed managers to quantify the impact of capture and release so that hypothesized mortalities may be counted against Canada's allocated ICCAT quota.

Despite the move towards a recreational fishery connected to tourism, the Japanese market still looms large for this fishery (and other tuna fisheries) globally. It is to the structure and operations of this market that we shall now turn.



[78] DFO, *Economic Profile of Atlantic Bluefin Tuna in the Gulf Region* (2008), *at* http://www.dfo-mpo.gc.ca/Library/341276.pdf (visited 12 November 2012). The United States also re-exports some of the tuna that is received from Canada.

[79] M. J. S. Stokesbury et al., *Estimating Mortality of Atlantic Bluefin Tuna (Thunnus thynnus) in an Experimental Recreational Catch-and-Release Fishery*, 144 BIOL. CONSERV. 2684, at 2684 (2011).

[80] DFO, *supra note* 73, at 20–23.

[81] Richard MacKenzie, *Tuna Charter Business a Lift to Economy*, THE CASKET, 15 August 2012, at 11A.

[82] Stokesbury et al., *supra* note 79, at 2688.

[83] *Id*.

### 3.4 The Japanese Market

The bluefin tuna value chain is a vast network linking harvesters, buyers, and quality control inspectors in ports in Australia, New England, eastern Canada, the Mediterranean, and elsewhere, to large markets such as Tsukiji in Tokyo. Here, bluefin tuna is eventually auctioned off to intermediate buyers and on to retail markets.[84] Bluefin tuna harvesters are influenced by the structure of major importing markets such as Tsukiji, the changing dynamics of sashimi and sushi consumption in Japan, and the recent globalization of sashimi and sushi consumption.

Major Japanese fish import markets, such as Tsukiji, are indicative of buyer-driven value chains. In such chains, downstream buyers (such as distributors and retailers) have greater market concentration than upstream suppliers (such as farmers and fish harvesters) and, as a result, can exercise greater leverage when it comes to prices, quality control, and the overall governance of the chain. Light industries such as textiles, electronics, and food are normally buyer-driven value chains.[85]

In 2008, Japan was the world's largest importer of seafood with 15 per cent of global seafood imports.[86] Early in this century, the Tsukiji market in Tokyo handled 15 per cent of the fresh and frozen seafood products distributed to Japan's 54 central wholesale markets.[87] The widely dispersed multitudes of fish harvesters that export their products to Tsukiji deal with distributors who sell to seven auction houses (some of them vertically integrated in fish harvesting, processing, and distribution) who, in turn, auction the product off to 1,300 intermediate and 375 authorized wholesalers.[88] The former are licensed to sell to buyers (such as retailers) from stalls within the market, and the latter act as agents for large buyers such as supermarkets, schools, and hospitals. On a daily basis, intermediate wholesalers sell their products to 36,000 retailers, caterers, sushi buyers, and other consumers.[89]



[84] THEODORE C. BESTOR, TSUKIJI: THE FISH MARKET AT THE CENTER OF THE WORLD (2004), at 188–190.

[85] Gary G. Hamilton and Gary Gereffi, *Global Commodity Chains, Market Makers, and the Rise of Demand Responsive Economies*, *in* FRONTIERS OF COMMODITY CHAIN RESEARCH 136 (Jennifer Bair ed., 2009); Gary Gereffi and Miguel Korzeniewicz, *Commodity Chains and Footwear Exports in the Semiperiphery*, *in* SEMIPERIPHERAL STATES IN THE WORLD ECONOMY 45 (William Martin ed., 1990); John Phyne, Richard Apostle, and Gestur Hovgaard, *Food Safety and Farmed Salmon: Some Implications of the European Union's Food Policy for Coastal Communities*, *in* AQUACULTURE LAW AND POLICY: TOWARDS PRINCIPLED ACCESS AND OPERATIONS 385 (David L. VanderZwaag and Gloria Chao eds., 2006); John Phyne and Jorge Mansilla, *Forging Linkages Forging Linkages in the Commodity Chain: The Case of the Chilean Salmon Farming Industry, 1987–2001*, 43 SOCIOL. RURALIS108 (2003).

[86] DFO, *supra* note 78, at 4.

[87] Bestor, *supra* note 84, at 19.

[88] *Id*. at 249–250.

[89] *Id*. at 188–189.

Bluefin tuna harvesters sell into this concentrated distribution channel. Over 90 per cent of global bluefin tuna exports went to Japan in 2005.[90] Bluefin tuna are handled by a specific trading group (or gyokai) of 300 members.[91]

While sashimi and sushi are mainstream bluefin tuna products in the contemporary Japanese seafood market, this has not always been the case. During the Tokugawa period, sushi was sold as a snack food on street corners.[92] After the Meiji restoration in 1868, it was treated as a luxury food. "Common people" ate it at special events after World War II.[93] The peak period of consumption for sashimi and sushi are the Golden Week in May, Bon Festival in July and August, and New Year festivities.[94] A premium is placed on wild fresh tuna, especially fatty belly meat (or toro). The "traditional" Edomae (or Tokyo) style sushi involves a sushi chef standing opposite a consumer and preparing one-by-one orders.[95] After the Japanese fleet retreated from distant water fisheries in the 1970s, imports of wild and fresh bluefin tuna from places such as North America and Europe became the major source of this species destined for sushi and sashimi markets.

Beginning in the last decade of the 20th century, the market diversified alongside the decline in wild bluefin tuna catches in the Atlantic Ocean (noted above) and the shift to bluefin tuna fattening and farming operations in the Mediterranean. Sushi and sashimi have shifted from being specialty foods and are now also "fast food" items sold in restaurant chains. Here, the customer takes preferred sushi items from a conveyor belt. This fosters a higher turnover than what is possible with the Edomae style.[96] Restaurant chains cannot afford the higher prices of fatty tuna from fresh and wild sources and instead rely upon frozen fattened/farmed tuna from places such as the Mediterranean and Australia. In addition, tuna is combined with cheaper fish products in these restaurant chains in order to minimize costs. In Japan, wild tuna receives the highest price, farmed tuna from Japan is second in price, and imported frozen fattened/farmed tuna receives the lowest price.[97] From 2001 to 2009, 70 to 85 per cent of the total Mediterranean fattened/farmed tuna sold to Japan was in frozen form. The average market price for this tuna was two-thirds of what the fresh product received. Moreover, the price for both products has fallen

[90] Ottolenghi, *supra* note 49, at 181.
[91] Bestor, *supra* note 84, at 260.
[92] Theodore C. Bestor, *Supply-Side Sushi: Commodity, Market, the Global City*, 103 AM. ANTHROPOL. 76, 85 (2001).
[93] Hisashi Kurokura et al., *Tuna Goes around the World on Sushi*, 16 AQUACULT. ECON. MANAG. 155, 161 (2012).
[94] GLOBEFISH, GLOBEFISH RESEARCH PROGRAMME: WORLD TUNA MARKETS 73 (2004).
[95] Kurokura et al., *supra* note 93, at 161.
[96] *Id*. at 162.
[97] *Id*. at 165.

since 2001.[98] In Japan, the market for bluefin tuna consumed in sushi bars has peaked; younger consumers prefer fatty salmon to fatty tuna meat.[99]

Sashimi and sushi are not restricted to Japan; over the past four decades, we have witnessed the globalization of sushi consumption.[100] In the 1970s sushi grew in popularity in the United States and elsewhere and became " . . . coded as a signifier of class and educational standing."[101] What was once destined for cat food in Western societies became part of middle class consumption practices.[102] Sushi is also gaining popularity in Antigonish, a small university town in eastern Nova Scotia. It was first sold in plastic containers on the university campus in 2010; in the fall of 2012 it was listed on the dinner menus of two restaurants. Finally, tourists from mainland China have tried tuna in sushi bars in the Tsukiji market.[103]

As the quotas for Atlantic bluefin tuna have declined, the market for this species has expanded beyond Japan. If the sushi bars from Japan increase globally, the demand can only be met if bluefin tuna are fattened or farmed. This is the case for the cultivated bluefin tuna in the Mediterranean, as well for southern bluefin tuna cultivated in Australia. In North America, bluefin tuna are still largely caught wild and sold fresh to the Japanese market. Moreover, given the declining prices in this market, some licence holders are shifting to charter boat operations. However, with juvenile tuna being increasingly harvested for fattening and farming for sushi markets, what implications will this have for the future sustainability of stocks? In addition, if there is scientific evidence for the mixing of eastern and western Atlantic stocks in the mid-Atlantic, what will be the implications of harvesting juveniles for the much smaller stocks in the western Atlantic? These questions pose challenges for the governance of Atlantic bluefin tuna and the future of ICCAT.

## 4. GOVERNANCE ISSUES

The examination to this point has set out the central biological and socioeconomic characteristics of the Atlantic bluefin, as well as the fishery and the markets that drive it. The extensive geographical range of the species, crossing multiple jurisdictional boundaries and high seas areas, coupled with

[98] Mylonas et al., *supra* note 49, at 274.

[99] Kurokura et al., *supra* note 93, at 165. This is also the case for other seafood markets in Japan. For example, older Japanese prefer herring spawn-on-kelp more than younger Japanese who prefer flavoured roe. *See* Lenore Burke and John Phyne, *Made in Japan: The Japanese Market and Herring Roe Production and Management in Canada's Southern Gulf of St. Lawrence*, 32 MARINE POL'Y 89, 96 (2008).

[100] Bestor, *supra* note 92; Kurokura et al., *supra* note 97; Mylonas et al., *supra* note 49.

[101] Bestor, *supra* note 92, at 83.

[102] Longo, *supra* note 54, at 408.

[103] Kurokura, *supra* note 93, at 66.

the economic incentives arising from high value and strong markets, make Atlantic bluefin a classic example of the multi-jurisdictional management and governance challenges which have led to the near-destruction of a number of fisheries around the world. This section provides a necessarily brief overview of the particular governance issues affecting the prospects for sustainable management of Atlantic bluefin tuna, a goal which manifestly has not been achieved to date.

### 4.1 International Legal Regime for Highly Migratory Species

ICCAT operates within the legal framework established by the 1982 United Nations Convention on the Law of the Sea (LOSC)[104] and the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFA).[105] LOSC set out the general structure of state rights and responsibilities with regard to fisheries within the 200 nautical mile exclusive economic zone (EEZ)[106] and on the high seas, but did so in a manner that left significant gaps and ambiguities with regard to highly migratory species (HMS) such as tuna[107] and straddling stocks which occur within the limits of the EEZ and in adjacent high seas areas.[108]

Within the EEZ the coastal state has comprehensive jurisdiction over fisheries,[109] subject to some (largely unenforceable) obligations to have regard for the rights of other states[110] and to implement effective conservation and management measures.[111] On the high seas, comprising all parts of the sea

[104] United Nations Convention on the Law of the Sea, December 6, 1982, 1833 U.N.T.S. 396 [hereinafter LOSC].

[105] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 4, August 1995, U.N. Doc. A/CONF.164/37 (1995), 34 I.L.M 1542 (1995) [hereinafter UNFA].

[106] Coastal state jurisdiction over the EEZ is confirmed and defined in Articles 55–58, LOSC, *supra* note 104.

[107] HMS are defined by a listing at *id*., at Annex I, which includes Atlantic bluefin tuna.

[108] These stocks, which are governed under *id*., at Article 3, have been subject to similar governance issues as HMS, and are likewise the subject of the UNFA, *supra* note 105. For a review of the straddling stock management issues that contributed to development of the UNFA, *see, for example*, Edward Miles & William Burke, *Pressures on the United Nations Convention on the Law of the Sea of 1982 Arising from New Fisheries Conflicts: The Problem of Straddling Stocks*, 20 OCEAN DEV. & INT'L. L.343, 343–44 (1989); *see also* Evelyne Meltzer, *Global Overview of Straddling and Highly Migratory Fish Stocks: The Nonsustainable Nature of High Seas Fisheries*, 25 OCEAN DEV. & INT'L. L. 255, 255–257 (1994).

[109] LOSC, *supra* note 104, at Article 56(1)(i). The coastal state has "sovereign rights" to explore, exploit, manage, and conserve the living and non-living resources of the water column, seabed, and subsoil.

[110] *Id*. at Articles 56(2), 61 (including obligations to set TACs and allocate "surplus" stocks).

[111] *Id*. at Article 61(2).

beyond national jurisdiction,[112] fishing is defined as a freedom of the high seas, open to all states, and subject to flag state jurisdiction.[113]

For HMS, however, the LOSC 1982 conditions the coastal state's rights in the EEZ with a requirement of cooperation between coastal states and states whose nationals fish for a resource in a region. Under Article 64, these states are to "cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization" of the species in the region, both inside and outside the EEZ.[114]Article 64 was clearly intended to require cooperation between coastal and fishing states throughout a "region," but obligations to cooperate are notoriously difficult to define and enforce.[115] The imprecision of the Article 64 obligation, coupled with the relatively unrestricted activities of fishing interests on the high seas, sheltered by flag state jurisdiction, predictably led to conflict over the nature of the rights and obligations and to a continuing pattern of unsustainable overfishing.[116] A further round of negotiations led to the adoption of the UNFA in 1995. While a full examination of UNFA and its subsequent implementation is beyond the scope of this article,[117] several elements in the agreement are particularly relevant to the governance role of ICCAT with regard to Atlantic bluefin tuna.

First, UNFA is explicitly intended to be an implementing agreement, as is made clear in the title and in the stated objective.[118] Thus, for parties to the new agreement, its provisions are clearly the means by which the LOSC obligations are to be fulfilled. Second, several provisions in the UNFA confirm



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[112] *Id*. at Article 86.

[113] *Id*. at Article 87. This "freedom" is subject to the "conditions" set out in Part VII section 2, which includes obligations to take (or cooperate in taking) measures "as may be necessary for the conservation of the living resources of the high seas" (Article 116), and "designed . . . to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield . . . " (Article 119(1)(a)).These obligations are, however, "couched in very general and imprecise terms," and in any event, with respect to enforcement they are subject to the overriding exclusivity of flag state jurisdiction on the high seas. Dawn A. Russell & David L. VanderZwaag, *Recasting Transboundary Fishery Arrangements in Light of Sustainability Principles*, *in* RECASTING TRANSBOUNDARY FISHERY ARRANGEMENTS IN LIGHT OF SUSTAINABILITY PRINCIPLES 3, 11 (Dawn A. Russell & David L. VanderZwaag eds., 2010).

[114] *Id*. at Article 64(1). Furthermore, where no such organization is in place, coastal states and fishing states "shall cooperate to establish such an organization and participate in its work."

[115] Russell & VanderZwaag, *supra* note 113, at 11. It could also be argued that the concept of a "region" is somewhat dubious in the context of a species with the range of Atlantic bluefin tuna.

[116] The impacts of these gaps have been well documented elsewhere and will not be pursued here. *See, for example*, Miles & Burke, *supra* note 108; Meltzer, *supra* note 108.

[117] For analyses of the UNFA and later implementation, *see, for example*, Gordon R. Munro, *The United Nations Fish Stocks Agreement of 1995: History and Problems of Implementation*, 15 MAR. RESOUR. ECON. 265, 266–270, 277–278 (2001); Peter Örebech, Ketill Sigurjonsson, & Ted L. McDorman, *The 1995 United Nations Straddling and Highly Migratory Fish Stocks Agreement: Management, Enforcement and Dispute Settlement*, 13 INT'L J. MARINE & COAST. L. 119, 130–140 (1998)

[118] UNFA, *supra* note 105, Article 2. The overall objective is to "ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions" of the LOSC.

the role of regional fishery management organizations (RFMOs) as the primary means by which the Article 64 obligation to cooperate is given effect. Where an organization or "arrangement" has "competence" over a fishery, coastal and fishing states *shall* "give effect to their duty to cooperate by becoming members of such organization or participants in such arrangement."[119] Second, UNFA includes several provisions designed to strengthen and make explicit the obligations on states to comply with and enforce the international rules put in place by RFMOs, including the obligations of flag states of fishing vessels and port states.[120] Third, the issue of compatibility between measures taken on the high seas and within coastal state EEZs is addressed, although in a somewhat unsatisfactory manner. Article 7(2) provides that conservation and management measures within and beyond national jurisdiction "shall be compatible," but does not specify any hierarchy, nor how this is to happen.[121]

Finally, UNFA introduces principles of sustainable development into the fisheries regime, in recognition of the fact that the LOSC predates the development of sustainability principles associated with the 1992 United Nations Conference on Sustainable Development.[122] Article 5 sets out a number of "general principles" that should be pursued by RFMO management actions (and by coastal states within their jurisdiction), including, *inter alia*, the following: measures to ensure "long term sustainability": application of the "precautionary approach" (as it is defined in UNFA); consideration of ecosystem level effects, including impacts on associated species; and protection of biodiversity.[123] The implementation of these principles is by no means



[119] *Id*. at Article 8(3). The obligation can also be satisfied by agreeing to apply the conservation and management measures established by such an organization or arrangement. Furthermore, only states which are members or participants in such an organization or arrangement, or agree to apply its management measures, "shall have access to the fishery resources to which those measures apply" (Article 8(4)).

[120] *Id*. at Articles 18, 19 (flag states) and 23 (port state). On compliance and enforcement issues, see the discussion at David A. Balton, *Strengthening the Law of the Sea: The New Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks*, 27 OCEAN DEV. & INT'L. L. 125, 140–141 (1996). These include specific obligations related to the implementation of effective monitoring, control and surveillance measures: Transform Aqorau & Anthony Bergin, *The UN Fish Stocks Agreement—A New Era for International Cooperation to Conserve Tuna in the Central Western Pacific*, 29 OCEAN DEV. & INT'L. L. 21, 25 (1998).

[121] UNFA, *supra* note 105, at Article 7(2). The only guidance is the vague statement that states "have a duty to cooperate for the purpose of achieving compatible measures."

[122] Phillip M. Saunders, *Jurisdiction and Principle in the Implementation of the Law of the Sea: The Case of Straddling Stocks*, *in* TRILATERAL PERSPECTIVES ON INTERNATIONAL LEGAL ISSUES: CONFLICT AND COHERENCE 367, 371–372 (Chi Carmody, Yuji Iwasawa, & Sylvia Rhodes eds., 2003); Douglas M. Johnston, *UNCLOS III and UNCED: A Collision of Mind-Sets*, *in* OCEANS LAW AND POLICY IN THE POST-UNCED ERA: AUSTRALIAN AND CANADIAN PERSPECTIVES 11, 14–16 (Lorne K. Kriwoken et al. eds., 1996).

[123] UNFA, *supra* note 104, Articles 5 (principles) and 6 (precautionary approach).

complete,[124] but there is no doubt that UNFA represented an advance in the injection of sustainability thinking into the milieu of international fisheries management.

### 4.2 ICCAT: Mandate, Structure, and Decision-Making

As was noted above, ICCAT was fully established by the early 1970s, pursuant to a convention concluded in 1966, in response to growing concerns with regard to the over-exploitation of tuna and tuna-like fishes in the Atlantic Ocean. While this was well before the advent of LOSC, the ICCAT Convention can be seen as anticipating the "cooperative" intent of Article 64. The ICCAT Convention extends to "all waters of the Atlantic Ocean, including the adjacent Seas" (thus including Mediterranean stocks),[125] and encompasses over 30 species, of which Atlantic Bluefin is the most significant and politically important.[126] The general objective of ICCAT is stated in the Preamble of the Convention, which expresses the desire of the contracting parties to "co-operate in maintaining the populations of these fishes at levels which will permit the maximum sustainable catch for food and other purposes."[127]

ICCAT carries out its work through a number of constituent bodies: the Commission; the Secretariat; the Standing Committee on Finance and Administration (STACFAD); the Standing Committee on Research and Statistics (SCRS); the Conservation and Management Measures Compliance Committee (COC); the Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures (PWG); and four species Panels.[128] The Commission, comprising delegates from all Contracting Parties, is the governing body of ICCAT. It is mandated to study tuna and tuna-like fishes within the Convention area, utilizing "insofar as feasible . . . the technical and scientific services of, and information from, official agencies of the Contracting Parties" as well as information from other national and international organizations and its own independent research.[129] In addition to this statistical and scientific work, the Commission, in a very general provision, is given authority to

[124] For example, the definition of the "precautionary approach" set out in Article 6 and Annex II gives significant discretion to states and management organizations, and still relies heavily on the concept of MSY, although stressing its use as a precautionary "limit" point rather than a "target." *Id*., at Article 6 and Annex II. See also the discussion in Saunders, *supra* note 122, at 386–387.

[125] ICCAT Convention, *supra* note 4, at Article 1.

[126] As of 28 February 2013: *see* the full list at ICCAT website, *at* http://www.iccat.int/en/contracting.htm (visited 28 February 2013). There are currently 13 species subject to management recommendations.

[127] ICCAT Convention, *supra* note 4, at Preamble.

[128] *Id*. at Articles III (Commission) and VI (authority to create Panels). *See also* ICCAT, *Rules of Procedure*, *in* BASIC TEXTS (2007), *at* http://www.iccat.int/Documents/Commission/BasicTexts.pdf (visited 31 March 2013; Rules 13 (2) (SCRS), 13(3) (STACFAD); and 13(4) (Commission power to create other Committees). Panel 2 deals with bluefin tuna.

[129] *Id*. at Article IV(1) and Article IV(2), which provides that the Commission may also recommend studies to contracting parties and disseminate findings.

> make recommendations designed to maintain the populations of tuna and tuna-like fishes that may be taken in the Convention area at levels which will permit the maximum sustainable catch.[130]

Such recommendations become "applicable to the Contracting Parties" six months after notification of the recommendation by the Commission, subject to the provisions of an objection procedure.[131]

The SCRS, which "may" include all contracting parties, develops and recommends to the Commission,

> . . . such policies and procedures in the collection, compilation, analysis and dissemination of fishery statistics as may be necessary to ensure that the Commission has available at all times complete, current and equivalent statistics on fishery activities affecting stocks under ICCAT management in the Convention Area.[132]

Furthermore, the SCRS prepares regular stock assessments of managed species and provides advice to the Commission on conservation and management measures.[133] The COC has the mandate to provide a "forum for discussion of all problems related to effective implementation of, and compliance with, ICCAT conservation and management measures" and to identify and recommend means to address problem areas.[134] The PWG "compiles and reviews all available information on the fishing activities of non-Contracting Parties . . . including details on the type, flag and name of vessels and reported or estimated catches by species and area,"[135] and along with the COC makes recommendations on the compliance of parties on matters related to data submission requirements and monitoring, control, and surveillance measures.[136]



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[130] *Id*. at Article VIII 1(a). Note also that by Article VIII(1)(b), such recommendations can be made either on the Commission's own initiative or, where a panel has been established, upon proposal of the Panel.

[131] *Id*. at Article VIII(2). Under Article VIII (3), recommendations are effective on a majority vote, unless more than one-fourth of the parties object, in which case it will be effective only for non-objecting states. Where fewer than one-fourth object, the recommendation can still become effective, but not as against a party which reaffirms its objection. *See* Elizabeth deLone, *Improving the Management of the Atlantic Tuna: The Duty to Strengthen the ICCAT in Light of the 1995 Straddling Stocks Agreement*, 6 N.Y.U. ENVTL. L. J. 656, 461–462 (1997–1998). In practice, the objection procedure has rarely been used.

[132] ICCAT, *Rules of Procedure*, *supra* note 128, Rule 13. SRCS also has Subcommittees on Statistics and Ecosystems, as well as various "Species Groups," including one for Atlantic bluefin.

[133] ICCAT, *Standing Committee on Research and Statistics (SCRS)*, *at* http://www.iccat.int/en/SCRS.htm (visited 11 April 2013). *See also* Dawn A. Russell, *NAFO and ICCATT: The Implementation of Sustainability Principles and Practices in the Management of Straddling and Highly Migratory Fish Stocks*, *in* Russell & VanderZwaag, *supra* note 113, 239 at 284. SCRS advice and recommendations are reviewed by the Panels, which make proposals to the Commission for conservation and management measures.

[134] Independent Review Report, *supra* note 4, at 24, citing the mandate of the COC.

[135] ICCAT, *Organization*, *at* http://www.iccat.int/en/organization.htm (visited 11 April 2013).

[136] Independent Review Report, *supra* note 4, at 6, 31.

### 4.3 ICCAT: Conservation and Management Measures and Results

In addition to its various scientific activities (including a bluefin tagging programme), ICCAT has over the past four decades adopted a range of conservation and management recommendations applicable to Atlantic bluefin, whether directly targeted on the species or through recommendations of general effect. These have included, *inter alia*; recommended TACs; recommended size limits; time and area-based closures; allocation of TAC among the ICCAT Contracting Parties, Cooperating Non-Contracting Parties, Entities and Fishing Entities (collectively referred to as CPCs); monitoring, control, and surveillance measures, including a vessel registry and specification of flag state duties; port state inspection standards; and measures addressing incidental mortality of non-targeted species.[137] Of particular significance are the multi-year recovery plans for recovery and rebuilding of the western and eastern bluefin tuna stocks, originally adopted in 1998 and 2006, respectively (in effect in 1999 and 2007).[138] These plans involved measures such as establishment of longer-term quota forecasts, seasonal closures, adjustment of size limits and, in the western Atlantic, closing directed fishing in Gulf of Mexico spawning grounds.

By any objective measure, the management of Atlantic bluefin tuna since the inception of ICCAT in the early 1970s through to the present must be regarded as a failure. The record shows precipitous declines in estimated biomass since the 1970s and, despite the "rebuilding" programmes beginning in 1999 and 2006, only some evidence of the *potential* for recovery in the western Atlantic and a continuing failure to manage effectively in the eastern Atlantic and Mediterranean.[139] The 2009 Independent Review Panel put the point succinctly in its assessment of whether ICCAT—or more specifically the CPCs)—had met the objectives of the ICCAT Convention:

> ICCAT CPCs' performance in managing fisheries on bluefin tuna particularly in the eastern Atlantic and Mediterranean Sea is widely regarded as an international

[137] See generally consolidation of ICCAT Recommendations applicable to bluefin tuna, *at* http://www.iccat.int/en/RecsRegs.asp (visited 11 April 2013).

[138] ICCAT, *Recommendation by ICCAT to Establish a Rebuilding Program for Western Atlantic Bluefin Tuna*, ICCAT 98–07 (1998); ICCAT, *Recommendation by ICCAT to Establish a Multi-Annual Recovery Plan for Bluefin Tuna in the Eastern Atlantic and Mediterranean*, ICCAT 06–05 (2006). For the most recent amendments to these recommendations see ICCAT 12–02 (2012) for western Atlantic bluefin and ICCAT 12–03 (2012) for the eastern Atlantic and Mediterranean.

[139] *See, for example*, Independent Review Report, *supra* note 4 at 42–45; Russell, *supra* note 133, at 285; ICCAT, *Report of the Standing Committee on Research and Statistics, Madrid, Spain, 1–5 October 2012*, PLE-104/2012, 83–84, 98–99 (October 2012), *at* http://www.iccat.int/Documents/Meetings/SCRS2012/2012_SCRS_REP_EN.pdf (visited 15 April 2013); Brian R. MacKenzie, Henrik Mosegaard, & Andrew A. Rosenberg, *Impending Collapse of Bluefin Tuna in the Northeast Atlantic and Mediterranean*, 2 CONSERV. LETT. 25, 30–32 (2009); Carl Safina & Dane H. Klinger, *Collapse of Bluefin Tuna in the Western Atlantic*, 22/2 CONSERV. BIOL. 243, 245 (2008).

> disgrace and the international community which has entrusted the management of this iconic species to ICCAT deserve better performance from ICCAT than it has received to date.[140]

The Review Panel and others have identified a long list of potential improvements, to both policy development and implementation, that would enhance ICCAT's performance of its objectives.[141] While space does not permit a detailed review of all of these prescriptions, there are some issues that have been repeatedly highlighted and that are of particular relevance to future governance of these stocks. First, it is clear that ICCAT has a record of ignoring even the arguably optimistic TACs recommended by the SCRS, reflecting the fundamental conflict between science and politics inherent in RFMOs (and in national fisheries administrations).[142] In one particularly striking example, in 2006 the SCRS made strong recommendations for measures in the Mediterranean that would have resulted in an anticipated catch of 15,000 mt; the response of the Commission was to adopt the 15-year "rebuilding" programme with a 2007 TAC of 29,500 mt.[143] It must also be remembered that the scientific information on which SCRS must base its assessment is often lacking, in part because of the failure of CPCs to live up to their obligations to collect and supply timely data, and in part because of the unavailability of relevant data.[144] At a more fundamental level, the problem of "mixing" of eastern and western stocks (referred to in Section 3 above), would cast into doubt the entire management approach based on projections and management measures for two distinct entities.[145]

Second, non-compliance by CPCs with management measures remains a significant problem. The Review Panel concluded that although the formal policies and practices put in place by ICCAT "would have been expected to be effective in managing the fisheries under ICCAT's purview," the failure to



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[140] Independent Review Report, *id*. at 2.

[141] See the Conclusions and Recommendations contained in Independent Review Report, *id*. at 83–86, including recommendations with regard to, *inter alia*: improved measures to ensure compatibility of national measures with ICCAT recommendations; development of more equitable allocation criteria and polices; enhanced sanctions for non-compliance by IUU fishing interests; improvement and extension of MCS, and in particular on-board observer coverage; minimization of objections in decision-making; establishment of dispute settlement procedures; and improved capacity-building for developing state parties.

[142] For discussions of this issue *see, for example*, Tom Polacheck, *Politics and Independent Scientific Advice in RFMO Processes: A Case Study of Crossing Boundaries*, 36 MARINE POL'Y. 132, 133, 139–140 (2012); D. G. Webster, *The Irony and Exclusivity of Atlantic Bluefin Tuna Management*, 35 MARINE POL'Y 249, 249 (2011); Sumaila and Wang, *supra* note 47, at 507.

[143] Independent Review Report, *supra* note 4, at 60. Moreover, by 2010 the TAC was planned to decline only to 25,500 mt.

[144] *Id*., at 58 (addressing "disregard" of compliance with statistical submission requirements), 44–45 (regarding the Panel's "surprise" at the paucity of non-catch information and data for "an iconic species like bluefin tuna").

[145] The Independent Review singled out this issue as a priority for additional scientific study: *id*. at 45.

meet objectives "is due in large part to the lack of compliance by many of its CPCs," including the failure "to provide timely and accurate data and to implement MCS measures for their nationals."[146]

Added to the non-compliance of CPCs is the continuing problem of illegal, unreported, and unregulated (IUU) fishing, which operates entirely outside the ICCAT framework. ICCAT has had some success in the reduction of IUU fishing within the Convention Area,[147] but it remains a problem and, of course, was a significant factor in the decline of stocks in earlier years. Third, and closely related to the issues stated above, there is a persistent problem of overcapacity in fisheries subject to ICCAT management. This has been acknowledged as a significant factor in encouraging overfishing, including illegal fishing, but the measures needed to reduce overcapacity are both politically difficult and largely the domain of national authorities (for example, reducing subsidies and implementing readjustment programs.) ICCAT has taken steps in this regard, but the issue is one of perpetual difficulty for all RFMOs.[148]

More generally, it has been suggested that ICATT must move to implement key sustainability principles from UNFA, including in particular the precautionary approach and the ecosystem approach, as well as more effective delineation and enforcement of flag state and port state duties.[149] ICCAT has in fact acted, if only in a preliminary manner, with regard to some of these concerns. For example, through the SCRS Ad Hoc Working Group on the Precautionary Approach and some limited measures to deal with ecosystem impacts and protection of biodiversity have lead ICATT at least to consider itself to be largely "UNFA-compliant,"[150] but progress in actual implementation of these principles has been slow, particularly in the case of the precautionary approach. The entire management approach to bluefin, wherein TACs are set at or above levels based on highly uncertain scientific projections, and where the risk of irreversible damage is significant,[151] appears to contradict the very



[146] *Id*., at 1–2.

[147] *Id*. at 67. The uncertainties introduced by IUU fishing are compounded, as noted in the Review, by the practice of allowing "carryover" of portions of quotas not caught in a given year.

[148] See the discussion of this issue at a global level in Martín Aranda, Hilario Murua, & Paul de Bruyn, *Managing Fishery Capacity in Tuna Regional Fisheries Management Organisations (RFMOs): Development and State of the Art*, 36 MARINE POL'Y 985, 986–989 (2012).

[149] Independent Review Report, *supra* note 4, at 83–86. *See also* deLone, *supra* note 131, at 672–673. On the application of precaution in tuna RFMOs generally, *see* Paul de Bruyn, Hilario Murua, & Martín Aranda, *The Precautionary Approach to Fisheries Management: How Is This Taken into Account by Tuna Regional Fisheries Management Organisations (RFMOs),* 38 MARINE POL'Y 397, 398–401 (2013).

[150] ICCAT, *Submission to Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, 1–4 (2006), *at* http://www.un.org/Depts/los/convention_agreements/reviewconf/ICCAT_submission.pdf (visited 31 March 2013). On the limited progress with regard to precaution and the ecosystem approach, *see, for example*, Russell, *supra* note 133, at 288–295.

basis of precaution. The 2008 Independent Review suggested that the time has come for the principles set forth in UNFA, including precaution, the ecosystem approach, and more rigorous statements of flag and port state obligations, to be adopted in a "more formal and systematic manner" by ICCAT, and that this should include consideration of amendments to modernize the Convention.[152]

ICCAT responded to issues raised in the independent review in part through its Working Group on the Future of ICCAT. In addition to various other areas for improvement, the Working Group considered and endorsed, though somewhat tepidly, Convention amendments to explicitly address issues of precaution and the ecosystem approach (despite the views of some members that these issues had been adequately addressed without a legal text).[153] Despite this sign of hope, however, at the December 2012 meeting of ICCAT, a recommendation was adopted to establish a working group to develop proposals for amendments to the ICCAT Convention with regard to decision-making, non-party participation, and the scope of the Convention (particularly with regard to sharks). The precautionary approach and ecosystem considerations were also put on the table, but only as part of a secondary group, to be considered for "recommendations or amendments," but *only* for amendment "if the draft recommendations cannot address the issue."[154]

## 5. CONCLUSION

The examination in the preceding sections has shown the major factors that create both complexity and difficulty in the search for effective, sustainable governance of Atlantic bluefin tuna. The species is highly valued, and thus widely targeted by fishing efforts, with strong incentives for both legal and illegal fishing. It ranges across vast ocean areas, across multiple zones of coastal state jurisdiction and areas of high seas, making it jurisdictionally impossible for any one state, or even a small group of states, to manage the stock in its entirety. It is also clear that the socioeconomic forces affecting Atlantic bluefin, from identity of fishing interests through to the eventual markets, are global in nature. Scientific knowledge critical to management of the stock (or stocks) is incomplete, and to the extent that it has supported policy recommendations, it has often been ignored.

[151] *See, for example*, MacKenzie et al., *supra* note 143; Safina & Klinger, *supra* note 143; Sumaila & Huang, *supra* note 47, at 502–504.

[152] Independent Review Report, *supra* note 4, at 83.

[153] ICCAT, *Report of the 3rd Meeting of the Working Group on the Future of ICCAT*, 4(a) & (b) (May 2012), *at* http://www.iccat.es/Documents/Meetings/Docs/2012_FIWG_REP_ENG.pdf (visited 15 April 2013).

[154] ICCAT, *Recommendation by ICCAT to Establish a Working Group to Develop Amendments to the ICCAT Convention*, ICCAT 12–10, at A.(a) & Annex 2 (2012).

The history of mismanagement of Atlantic bluefin tuna demonstrates the essential requirement that sustainability will depend upon the integration, in a governance regime, of adequate jurisdictional powers (in this case resting both in RFMOs and coastal states), comprehensive scientific advice linked to conservation and management measures, and acknowledgement and incorporation of appropriate economic incentives and disincentives (whether through avoidance of subsidies and removal of over-capacity, or the imposition of serious sanctions for non-compliance). Progress has been made on all of these fronts through the enhancement of the RFMO approach under UNFA, the introduction of new measures to ensure port and coastal state enforcement, and the advancement of understanding of the nature of the target stocks. What is clear, however, is that no improvements in the scope of legal authority (as through amendment of the ICCAT Convention), or modernization of management principles and measures, can overcome the lack of political will on the part of coastal and fishing states, who must confront the economic interests of their own fishing industries.

In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recommended in May 2011 that the Atlantic bluefin tuna be listed as endangered under the Species at Risk Act (SARA).[155] However, a recommendation does not mean that the Government of Canada will list the species under SARA. In preparation for such a listing, the Minister of the Environment requires a recommendation from the Minister of Fisheries and Oceans. This recommendation (or rejection) of a SARA listing entails the use of scientific assessments, management scenarios, public consultations, and socioeconomic analyses "... of the potential impacts associated with respective management scenarios."[156] These studies are still underway. Even if there is a recommendation to list bluefin tuna as endangered under SARA and provide it with the necessary protection under Canadian law, it is unlikely that this will have a major impact. Since Canada harvests such a small percentage of the overall catch (see Figure 1 and Section 3.3), a SARA listing will have minimal impact upon the sustainability of the species. Such a listing is also unlikely.[157]

International cooperation in the matter of better fisheries *enforcement* is also necessary. This point was clearly stated by the ICCAT independent Review Report, which also noted that compliance by states with existing management measures could have gone some way to ensuring effective

[155] *Supra* note 73, at 3.

[156] *Id*. at 1.

[157] Maguire and Lester, *supra* note 70, at 5, note that "... there is no residence requirement for the bluefin tuna in Canadian Atlantic waters ..." based upon the SARA definition of residence. While the authors do not state this, it seems that the absence of residency requirements may count against the listing of the Atlantic bluefin tuna under SARA.

management.[158] To date, there is no clear reason to believe that this transformation, the fundamental requirement for sustainable management of Atlantic bluefin tuna, has been achieved.



[158] Independent Review Report, *supra note* 4.