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ORIGINAL ARTICLE

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Fluctuating boundaries in a changing marine environment

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Abstract

Environmental changes, such as sea level rise and coastal erosion, have an increasing impact on coastlines worldwide. Unilaterally declared maritime limits are generally determined by reference to coastlines and they are only binding insofar as they conform to the applicable law. Bilateral maritime boundaries are not equally affected by changing coastal geography because, once established, they are binding on parties to the arrangement under the *pacta sunt servanda* and *res judicata* principles. Maritime delimitation generally produces geographically stable boundaries. In principle, these remain fixed notwithstanding changes to the coastal geography that generates maritime entitlements or the ecosystems central to national interests. Indeed, stability and predictability are among the objectives of maritime delimitation. However, legal stability can be achieved without geographic stability and the requirement of predictability may be unattainable in a new world of environmental uncertainty. After all, baselines and derived outer limits fluctuate to reflect changing coastal geography and the same is true of bilateral boundaries, unless and until otherwise agreed. States have concluded boundary agreements that refer to fluctuating concepts, such as the equidistance line, instead of fixed co-ordinates. Furthermore, the International Court of Justice has left a segment of a maritime boundary to fluctuate until otherwise agreed and a Chamber of the Court has addressed the possibility of establishing a boundary by reference to a fluid oceano-biological boundary in the marine environment. This suggests that maritime boundaries can fluctuate if established by reference to sufficiently clear and relevant limits in the natural environment.

Keywords: ambulatory baselines; boundary treaties; climate change; fluctuating boundaries; maritime delimitation

1. Introduction

Coastal states are entitled to maritime zones under the United Nations Convention on the Law of the Sea (UNCLOS)[1] and the breadth of each maritime zone is measured from baselines along the coast.[2] These limits are established unilaterally by each coastal state but bilateral boundaries must be established where the entitlements of neighbouring states overlap, through agreements, mediation, conciliation or judicial settlement.[3]

Normal baselines are ambulatory as they correlate to the actual low-water line along coastlines.[4] Baselines and derived maritime limits fluctuate when coastlines, or coastal features supporting

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[1]United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3, (UNCLOS).

[2]States can establish different types of baselines and closing lines and the width of each maritime zone is measured from those limits. See UNCLOS, Arts. 3, 5, 7, 9, 10, 47, 48, 57, 76.

[3]See UNCLOS, Arts. 15, 74, 83.

[4]International Law Association (ILA) Baselines Committee, 'Conference Report Sofia 2012' (2012), at 25.

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critical basepoints, undergo changes.[5] However, straight baselines established at highly unstable deltaic coastlines remain stable until changed by the coastal state[6] and the outer limits to the continental shelf may be permanently described where the natural prolongation of the continental margin justifies such a claim.[7] Unilateral limits are only enforceable as long as they meet legal requirements concerning maritime entitlements. States have an obligation to adjust unilateral limits to changing circumstances. The only exception to that statement relates to continental shelf limits described as final and binding under UNCLOS Article 76(8) because even UNCLOS Article 7(2) (which affords provisional stability to straight baselines) assumes that such limits are adjusted at some point, by the coastal state. Therefore, maritime limits fluctuate in accordance with chartered lines and those limits are not enforceable unless they conform to the relevant law.

Bilateral boundaries, on the other hand, are permanent under the principles *pacta sunt servanda*[8] and *res judicata*.[9] They remain opposable to the parties even if they no longer correlate to the essential basis they rely on, i.e., the coastline or other relevant circumstances. This is true in principle but this article will demonstrate that extreme environmental changes may potentially justify termination, withdrawal from, suspension, or revision of bilateral maritime boundaries. Bilateral boundaries remain enforceable unless otherwise agreed, or until such a time that a court or tribunal sanctions the invocation of *rebus sic stantibus* or Article 62 of the Vienna Convention on the Law of Treaties (VCLT), providing that states can be freed from treaty obligations due to a fundamental change of circumstance.

Stability is widely considered pivotal to the establishment of international boundaries.[10] In fact, emerging state practice in the Pacific and recent proposals of the International Law Association (ILA) Committee on International Law and Sea Level Rise concerning the 'freezing' of maritime limits indicate that stability is also highly desirable for unilateral limits.[11] The marine environment is currently undergoing unprecedented changes due to climate change[12] and the earth may have already entered a new geological epoch, one characterized by instability.[13] The past 11,700 years have afforded remarkable stability in geological and environmental terms and these conditions have been 'a key factor facilitating the development of human civilisation and, ultimately, the territorial divisions of the political world as we know it'.[14] This may well have contributed to an assumption or perceived need for stability and there are certainly practical reasons behind a strong desire for stability. However, the growing instability of coastal geography may call for a new approach to the division of maritime entitlements.

Amendments to UNCLOS are subject to stringent requirements.[15] These have never been satisfied.[16] State practice that deviates from UNCLOS can support the development of new

[5]ILA Committee on International Law and Sea Level Rise, 'Sydney Conference' (2018), at 11–12.

[6]UNCLOS, Art. 7(2).

[7]UNCLOS, Art. 76(8) and (9).

[8]*Frontier Dispute (Burkina Faso v. Republic of Mali)* (Judgment), [1986] ICJ Rep. 554, para. 46.

[9]*Territorial and Maritime Dispute (Nicaragua v Colombia)* (Application by Honduras for Permission to Intervene), [2011] ICJ Rep. 348, para. 67.

[10]*Bay of Bengal Maritime Boundary (Bangladesh v. India)*, (2014) 167 ILR 1, para. 216.

[11]See 'Sydney Conference', *supra* note 5, at 16–19.

[12]See, e.g., IPCC, '2019: Summary for Policymakers', in Pörtner et al. (eds.), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (2019), available at www.ipcc.ch/srocc/.

[13]J. Zalasiewicz, P. Crutzen, and W. Steffen, 'The Anthropocene', in Gradstein et al. (eds.), *The Geologic Time Scale* (2012), at 1033–40; Williams et al., 'The Anthropocene Biosphere', (2015) 2 *The Anthropocene Review* 196–219.

[14]ILA, 'Sydney Conference', *supra* note 5, at 7, referencing Walker et al., 'Formal Definition and Dating of the GSSP (Global Stratotype Section and Point) for the Base of the Holocene Using the Greenland NGRIP Ice Core, and Selected Auxiliary Records', (2009) 24 *Journal of Quaternary Science* 3–17.

[15]See UNCLOS, Arts. 312–316.

[16]R. Churchill, 'The 1982 United Nations Convention on the Law of the Sea', in Rothwell et al. (eds.), *The Oxford Handbook of the Law of the Sea* (2015), at 24, 43.

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customary rules if sufficiently consistent,[17] or affect the interpretation of existing rules.[18] However, such practice may seriously undermine the integrity and legitimacy of UNCLOS[19] and legal reform will be time-consuming. Another option would be to apply existing rules in the context of a new reality, with increased consideration for changing coastal geography.

This article explores the possibility and desirability of establishing maritime boundaries that fluctuate in accordance with ambulatory baselines or other criteria forming the essential basis of the boundary. The purpose is twofold, to reduce legal uncertainty by explaining if, and when, bilateral boundaries fluctuate and to assess the feasibility of establishing fluctuating boundaries by reference to natural phenomena. First, UNCLOS Article 15 is analysed to determine whether it establishes provisional fluctuating boundaries. Second, relevant agreements are considered to assess state practice relating to fluctuating boundaries. Third, judicial precedents are analysed to determine whether courts and tribunals can establish fluctuating boundaries. Finally, the article addresses the feasibility of establishing final and binding fluctuating boundaries, particularly in light of the need for stability and the need to adjust to a changing environment.

2. Fluctuating boundaries by application of law

2.1 Governing Law

Maritime boundaries delimit overlapping maritime entitlements and the rules governing the delimitation process differ somewhat depending on the maritime zones in question. UNCLOS Article 15 provides that the default boundary line delimiting the territorial sea between opposite or adjacent states is 'the median line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of each of the two States is measured'. This makes the equidistance method the default method for delimitation of the territorial sea and the reference to baselines means that the location of the equidistance line can change with ambulatory baselines. An equidistance or median line can be modified 'where it is necessary by reason of historic title or other special circumstances to delimit the territorial seas of the two States in a way which is at variance therewith'.[20]

UNCLOS Articles 74(1) and 83(1) govern the delimitation of exclusive economic zone and continental shelf boundaries. Both provisions are identical, except that where the former refers to the exclusive economic zone, the latter relates to the continental shelf. Delimitation of the exclusive fisheries zone is not explicitly governed by UNCLOS but the International Court of Justice (ICJ or the Court) has held that the customary law enshrined in UNCLOS Article 74 also applies to delimitation of an exclusive fisheries zone.[21] These provisions make no reference to the equidistance method and merely instruct that delimitations 'shall be effected by agreement on the basis of international law, as referred to in Article 38 of the Statute of the [ICJ], in order to achieve an equitable solution'. Relevant international law has evolved into a relatively transparent three-step rule, hereinafter referred to as the equidistance/relevant circumstances method of delimitation. This method involves the drawing of a provisional equidistance line, its subsequent adjustment by reference to relevant circumstances and, finally, a disproportionality test to ensure that the end-result is equitable.[22] The equidistance/relevant circumstances method is generally preferred by courts and tribunals but special or relevant circumstances can justify derogation from the

[17]See, e.g., *Asylum (Colombia/Peru)* (Judgment), [1950] ICJ Rep. 266, at 277; *Right of Passage over Indian Territory (Portugal v. India)* (Merits), [1960] ICJ Rep. 6, at 40.

[18]VCLT, Art. 31(3).

[19]See *South China Sea (Philippines v. China)*, (2016) 170 ILR 1 (Merits), para. 262.

[20]UNCLOS, Art. 15.

[21]*Maritime Delimitation in the Area between Greenland and Jan Mayen (Denmark v. Norway)* (Judgment), [1993] ICJ Rep. 38, para. 47.

[22]See *Maritime Delimitation in the Black Sea (Romania v. Ukraine)* (Judgment), [2009] ICJ Rep. 61, paras. 115–16, 120–2.

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equidistance method altogether, even for delimitation of the territorial sea. The ICJ confirmed this in 2007 when delimiting a maritime boundary between Nicaragua and Honduras.[23]

A distinction can be made between the equidistance/special circumstances method under UNCLOS Article 15 and, the more elaborate, equidistance/relevant circumstances method described above. Yet, the methods are closely related and the difference not always reflected in the literature.[24] The former method involves the drawing of a provisional equidistance line and subsequent adjustment in light of relevant circumstances.[25] As such, it includes the first two steps in the equidistance/relevant circumstances approach but not the third step, the disproportionality test. Furthermore, unlike Articles 74 and 83, Article 15 refers to a line that automatically marks the limit to entitlements between states with overlapping claims in the absence of a delimitation agreement. These limits to territorial sea claims might be characterized as provisional boundaries and they arguably fluctuate with changing coastlines, unless and until otherwise agreed. Indeed, provisional arrangements may be necessary for overlapping territorial seas because all coastal states have a territorial sea without any proclamation to that end;[26] the possession of a territorial sea may even be compulsory.[27] It follows that a provisional territorial sea boundary may be necessary until a definitive boundary is established. It may be controversial to refer to such limits as 'boundaries' but the word is used here to distinguish bilateral *boundaries* from unilateral *limits*. After all, the word boundary can be broadly construed for different purposes. The ILC has explained that the fact that a line qualifies as a boundary in some respects, does not automatically make it a boundary as referred to in the law of treaties.[28]

2.2 Provisional boundaries

UNCLOS Article 15 provides that states with overlapping territorial sea entitlements cannot, failing agreement, extend their territorial sea beyond the equidistance line measured from relevant baselines, except where justified by reference to special circumstances or historic title. This provision establishes a bilateral limit to the territorial sea and explains 'how States must act failing an agreement on delimitation'.[29] Thus, an equidistance line can function as a provisional arrangement until either state initiates the delimitation of a more definitive boundary. States can also take the view that they have a lawful claim to an area beyond the equidistance or median line on the grounds of special circumstances or historic title. Compelling evidence of historic title or special circumstances might justify the exercise of territorial sea rights beyond the equidistance line, particularly if no objections are raised. However, in lieu of an agreement to the contrary, the default provisional boundary would be the equidistance or median line, midway between neighbouring states with overlapping territorial seas. Such a line would assumedly fluctuate in accordance with ambulatory baselines to continuously reflect relevant coastlines, unless and until otherwise agreed.

[23]*Territorial and Maritime Dispute between Nicaragua and Honduras in the Caribbean Sea (Nicaragua v. Honduras)* (Judgment), [2007] ICJ Rep. 659, para. 280.

[24]This distinction is reflected in *Land and Maritime Boundary between Cameroon and Nigeria (Cameroon v. Nigeria: Equatorial Guinea intervening)* (Judgment), [2002] ICJ Rep. 303, para. 288; *Nicaragua v. Honduras*, ibid., para. 271; R. Churchill, 'The Greenland-Jan Mayen Case and its Significance for the International Law of Maritime Boundary Delimitation', (1994) 9 *The International Journal of Marine and Coastal Law* 1, at 18.

[25]*Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain)* (Merits), [2001] ICJ Rep. 40, para. 176.

[26]J. Noyes, 'The Territorial Sea and Contiguous Zone', in Rothwell et al., *supra* note 16, at 91, 94.

[27]Ibid., referencing the dissenting opinion of Judge McNair in *Anglo-Norwegian Fisheries (United Kingdom/Norway)*(Judgment), [1951] ICJ Rep. 116, at 160.

[28]Yearbook of the ILC 1982, Vol. II, part 2, 'Report of the Commission to the General Assembly on the work of the thirty-fourth session' (3 May–23 July 1982) UN Doc. A/CN.4/SER.A/1982/Add.l (Part 2), at 60–1.

[29]*Maritime Delimitation in the Caribbean Sea and the Pacific Ocean (Costa Rica v. Nicaragua) and Land Boundary in the Northern Part of Isla Portillos (Costa Rica v. Nicaragua)* (Judgment), [2018] ICJ Rep. 139, para. 92.

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UNCLOS Article 15 is identical to Article 12(1) of the 1958 Convention on the Territorial Sea and the Contiguous Zone and Article 6 of the Convention on the Continental Shelf, except for minor editorial changes.[30] Therefore, Article 6 of the 1958 Convention on the Continental Shelf arguably establishes a provisional equidistance boundary to the continental shelf. This is of course the predecessor of UNCLOS Article 83(1) and might be relevant for informing the content of that provision. However, UNCLOS Articles 74 and 83 were intentionally made less explicit than the delimitation rules enshrined in the Geneva Conventions because of competing views among the drafters of UNCLOS concerning the most suitable method for delimiting the exclusive economic zone and continental shelf.[31] For the foregoing reasons (and without ruling out the possibility that equidistance lines can represent provisional boundaries to other maritime zones unless and until otherwise agreed)[32] this section focuses on provisional boundaries under UNCLOS Article 15, i.e., territorial sea boundaries.

Most commentators accept the theory of ambulatory baselines and agree that changes to coastal geography have an impact on maritime entitlements and zonal limits.[33] In the words of the ILA Baselines Committee, 'the normal baseline is ambulatory, moving seaward to reflect changes to the coast caused by accretion, land rise, and the construction of humanmade structures ... and also landward to reflect changes caused by erosion and sea level rise'.[34] This has implications for provisional equidistance boundaries under UNCLOS Article 15 since they are measured from points on relevant baselines. Caron alluded to this in 1990, noting that:

> maritime boundaries under the 1982 Convention generally are contingent upon the continued existence of the baseline. If the baseline moves, the boundary moves. If a baseline point such as an exposed rock disappears, the boundary generated by that point also disappears.[35]

Caron may have been referring to outer maritime limits as 'boundaries' but the principle applies equally to outer limits (when relevant basepoints are affected) and maritime boundaries that are contingent upon parts of the baselines.

The 2007 maritime boundary arbitration between Guyana and Suriname dealt with the legal effects of a provisional equidistance boundary established under UNCLOS Article 15. The tribunal was tasked with the delimitation of territorial sea entitlements extending from a highly unstable coastline. The adjacent states had previously agreed on a fixed location for a territorial sea boundary reaching three nautical miles (nm) seawards but no location was agreed upon when both states

[30] *Nicaragua v. Honduras*, *supra* note 23, para. 280 referencing Yearbook of the ILC, 1952, Vol. II, 'Documents of the fourth session including the report of the Commission to the General Assembly' (6 June 1952), UN Doc A/CN.4/SER.A/1952/Add.l., 38, para. 4

[31] See T. Cottier, *Equitable Principles of Maritime Boundary Delimitation: The Quest for Distributive Justice in International Law* (2015), at 216; M. Nordquist (ed.), *United Nations Convention on the Law of the Sea 1982 – A Commentary* (1993), vol. II, at 801, 954.

[32] It is difficult to reach a general conclusion in this regard, see A. Soons, 'The Effects of Sea Level Rise on Baselines and Outer Limits of Maritime Zones', in T. Heidar (ed.), *New Knowledge and Changing Circumstances in the Law of the Sea* (2020), at 358, 367.

[33] See, e.g., D. Caron, 'When Law Makes Climate Change Worse: Rethinking the Law of Baselines in Light of a Rising Sea Level', (1990) 17 (4) *Ecology Law Quarterly* 621; D. Freestone and J. Pethick, 'Sea Level Rise and Maritime Boundaries: International Implications of Impacts and Responses', in G. Blake (ed.), *Maritime Boundaries: World Boundaries* (1994), vol. V, at 73, 76; A. Soons, 'The Effects of a Rising Sea Level on Maritime Limits and Boundaries', (1990) 37 (2) *Netherlands International Law Review* 207, at 216. Only one scholar seems to cast any doubt on this theory, arguing that there is no automatic adjustment to maritime limits or related obligation, see K. Purcell, *Geographical Change and the Law of the Sea* (2020).

[34] 'Conference Report Sofia 2012', *supra* note 4, at 31. This also applies to archipelagic baselines and straight baselines established under UNCLOS Art. 7(1) because such baselines are not afforded any degree of stability. Straight baselines at highly unstable coastlines remain effective under UNCLOS Art. 7(2), notwithstanding subsequent regression of the low-water line, but only until changed by the coastal state in accordance with UNCLOS.

[35] Caron, *supra* note 33, at 634.

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extended their territorial sea limits to 12 nm in 1977 and 1978.[36] The tribunal found that a three-nm territorial sea boundary had been established by reference to the N10°E line[37] but no explicit arrangement was concluded beyond that point.[38] According to Guyana, both states relied on the 'historical equidistance line' along the N34°E azimuth, beyond the established three nm limit.[39] However, the equidistance line had shifted because relevant coasts were made up of mud banks 'constantly subjected to erosion and accretion'.[40]

Suriname sought to rely on the settled practice of the states in relation to the 10° line, allegedly amounting to a 'perfected instrument', but the tribunal held that no legal obligations had been created beyond the three nm limit.[41] Thus, the provisional arrangement concerning delimitation beyond three nm had not resulted in a permanent boundary. The tribunal concluded that the territorial sea boundary should follow the N10°E line from relevant coasts seawards to three nm and, thereafter, intersect the equidistance line as it was at the time of delimitation[42] – not the 'historical equidistance line'. Therefore, the boundary had shifted in accordance with the relevant coastal geography. This case demonstrates that the location of a lawful equidistance line, satisfying the conditions of UNCLOS Article 15, can fluctuate from the time when a provisional arrangement is established until a permanent boundary is delimited through adjudication or agreement. However, it also indicates that, in other circumstances, the practice of states could amount to a 'perfected instrument', creating a stable boundary that would be unaffected by changing baselines.

3. Fluctuating boundaries in boundary agreements

UNCLOS Articles 15, 74 and 83 are relevant for the delimitation of all maritime boundaries because, in addition to being binding on the treaty level, the provisions also reflect customary international law.[43] Courts and tribunals generally apply the three-stage equidistance/relevant circumstances method described in Section 2.1, but states can agree to divert from this method when negotiating bilateral boundaries.[44] Courts and tribunals generally establish geographically stable boundaries by reference to relevant coastal geography.[45] Yet, states often refer to economic or environmental considerations and exploitation of fish stocks or minerals in their boundary agreements[46] and they sometimes establish fluctuating boundaries.

States have established international boundaries by reference to naturally fluctuating phenomena,[47] such as baselines, median lines or river thalwegs, instead of fixed locations.[48] 'The States concerned have deliberately opted for a (potentially) fluctuating boundary line.'[49]

[36]*Award in the arbitration regarding the delimitation of the maritime boundary between Guyana and Suriname (Guyana v. Suriname)*, (2007) XXX RIAA 1, para. 310.

[37]Ibid., para. 306.

[38]Ibid., para. 310.

[39]Ibid., para. 288.

[40]Ibid., para. 133.

[41]Ibid., para. 312, referencing *Sovereignty over Certain Frontier Land (Belgium v. Netherlands)* (Judgment), [1959] ICJ Rep. 209, at 229.

[42]*Guyana v. Suriname*, *supra* note 36, para. 325.

[43]See *Denmark v. Norway*, *supra* note 21, para. 47.

[44]See, e.g., B. Magnússon, 'Outer Continental Shelf Boundary Agreements', (2013) 62(2) *International and Comparative Law Quarterly* 345, at 350.

[45]Fisheries and economic interests were also taken into account in *Delimitation of the Maritime Boundary in the Gulf of Maine Area (Canada/United States of America)* (Judgment), [1984] ICJ Rep. 246 and *Denmark v. Norway*, *supra* note 21.

[46]See B. Kwiatkowska, 'Economic and Environmental Considerations in Maritime Boundary Delimitations', in J. Charney and L. Alexander (eds.), *International Maritime Boundaries*, vol. I (1993), at 75–6.

[47]See Freestone and Pethick, *supra* note 33, at 78.

[48]J. Lisztwan, 'Stability of maritime boundary agreements', (2012) 37 *Yale Journal of International Law* 153, at 190.

[49]Soons, *supra* note 33, at 227.

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Fluctuating boundaries can result from explicit treaty provisions or omission of geographic co-ordinates. This is true not only of maritime boundaries[50] but also of boundaries demarcating land territory.[51] The natural phenomena can undergo unforeseeable changes due to floods, earthquakes, and other environmental occurrences, which can affect the interpretation and application of dependent boundary treaties.[52]

The omission of geographic co-ordinates leaves room for interpretation and debate concerning whether the parties intended to establish a fixed or fluctuating boundary. For example, the 1825 Treaty concerning the border of Alaska and, arguably, the maritime boundary in the Beaufort Sea,[53] refers to the 'frozen ocean',[54] a natural limit that is undoubtedly receding with global warming. Neither the United States nor Canada currently argues that the boundary should be measured from the ice-edge and it might not be practically feasible for either state to do so but it is a possible interpretation, which would result in a fluctuating boundary. Moreover, the maritime boundary agreement between France and Tonga establishes an exclusive economic zone boundary by reference to the equidistance line, without fixing any co-ordinates.[55] Wallis and Futuna consists of volcanic islands and fringing reefs[56] and Tonga is made up of islands of coral or limestone on a volcanic base.[57] The islands are very small, there is geological activity in the area and earthquakes are frequently felt, particularly in Futuna.[58] If these coastlines change, e.g., due to sea level rise or volcanic activity, France and Tonga could argue that the equidistance boundary should fluctuate. However, it may be doubtful that either state finds it practically feasible.

The aforementioned treaties do not explicitly refer to fluctuations or explain how the ambulatory phenomena will affect the location of the boundary. However, the 2003 state Border Régime Treaty between Romania and Ukraine provides that 'objective modifications due to natural phenomena' may lead to the revision of co-ordinates.[59] Thus, it envisions potential changes to the boundary but instead of establishing an automatically fluctuating boundary, the treaty calls for re-negotiation. This demonstrates how states are increasingly anticipating natural changes and represents one viable option for meeting the challenges ahead. Yet, it has the disadvantage of requiring mutual consent for any adjustments.

4. Fluctuating boundaries and relevant jurisprudence

The customary law informing the content of UNCLOS Articles 74 and 83 is 'reflected in the case law of [the ICJ], the International Tribunal for the Law of the Sea (ITLOS) and international arbitral courts and tribunals'.[60] It constitutes 'an *acquis judiciare* ... and should be read into

[50]Convention between the Government of the French Republic (Wallis and Futuna) and the Government of the Kingdom of Tonga on the delimitation of economic zones (adopted 11 January 1980, entered into force 11 January 1980) 1183 UNTS 343.

[51]For example, the 1799 border between Suriname and Berbice (a former colony where Guyana is now) ran along the west bank of the Corentyne River. See *Guyana v. Suriname*, *supra* note 36, para. 137.

[52]See Extract from the Yearbook of the International Law Commission (ILC) 1966, Vol. II 'Fifth Report on the Law of Treaties by Sir Humphrey Waldock, Special Rapporteur' (15 November 1965–18 January 1966), UN Doc. A/CN.4/183 and Add.1-4, 44.

[53]Canada and the US have different positions on this matter. See M. Byers, *International Law and the Arctic* (2013), at 59.

[54]Great Britain/Russia: Limits of their Respective Possessions on the North-West Coast of America and the Navigation of the Pacific Ocean (adopted 16 February 1825) 75 Consolidated Treaty Series 95.

[55]Convention between the Government of the French Republic and the Government of the Kingdom of Tonga, *supra* note 50.

[56]R. W. McColl (ed.), *Encyclopedia of World Geography*, vol. I (2005), at 978.

[57]Ibid., at 907.

[58]Ibid., at 907, 978.

[59]Treaty between Romania and Ukraine on the Romanian-Ukrainian State border regime, collaboration and mutual assistance on border matters (entered into force 27 May 2004) 2277 UNTS 3, Art. 1.

[60]*Territorial and Maritime Dispute (Nicaragua v. Colombia)* (Judgment), [2012] ICJ Rep. 624, para. 114.

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Articles 74 and 83 of the Convention'.[61] States are certainly free to depart from the generally applicable law in bilateral agreements but this section explores relevant jurisprudence to determine whether fluctuating maritime boundaries can result from the application of UNCLOS and customary international law.

The law applicable to maritime boundary delimitation has crystallized through recent jurisprudence, most notably the *Black Sea* case of 2009.[62] It is now well established that boundaries must be delimited with due regard for the relevant circumstances of each particular case and that provisional equidistance lines must be adjusted by reference to such circumstances to ensure equitable outcomes.[63] Yet, it remains to be seen whether changes to relevant circumstances can lead to fluctuating boundaries under the applicable international law.

Coastal geography is relevant at all stages of maritime delimitation, from the construction of a provisional boundary line, its subsequent adjustment and the eventual achievement of an equitable solution.[64] International courts and tribunals have repeatedly confirmed the relevance of geographical factors for maritime boundary delimitation[65] and the exceptional weight afforded to those circumstances.[66] Non-geographical circumstances can also have an effect upon the delimitation process. For example, the ICJ stated, in the *Libya/Malta* case, that natural resources in the continental shelf might constitute relevant circumstances,[67] and a Chamber of the ICJ indicated, in the *Gulf of Maine* case, that 'geological, geomorphological, ecological or other factors' might influence maritime delimitation if 'sufficiently important, evident and conclusive'.[68] However, the threshold was not met in the *Gulf of Maine* case and the fact remains that, 'with very few exceptions', geographical circumstances prevail 'over area-specific criteria such as geomorphological aspects or resource specific criteria such as the distribution of fish stocks'.[69]

When courts and tribunals establish maritime boundaries they consistently refer to fixed geographic locations. This is due to a widespread desire for predictability and arguably based on an assumption of environmental stability – an assumption now challenged by climate-related changes and a new geological epoch. As demonstrated in the following sections, instability of the natural environment can leave no alternative than to establish fluctuating boundary-segments and such instability is bound to increase. Courts and tribunals can reach this decision on their own accord and states can encourage the use of fluctuating boundaries in their compromis.

The following sections explore relevant jurisprudence relating to the possibility of establishing fluctuating maritime boundaries through international adjudication by reference to either geographical or ecological circumstances.

[61]*Bangladesh v. India*, *supra* note 10, para. 339.

[62]Extract from the Yearbook of the ILC: 2009, Vol. I 'Summary record of the 3016th meeting' (7 July 2009), UN Doc. A/CN.4/3016, paras. 24–5.

[63]See, e.g., *Maritime Delimitation in the Black Sea*, *supra* note 22, paras. 120, 155.

[64]K. B. Lee, 'The Demise of Equitable Principles and the Rise of Relevant Circumstances in Maritime Boundary Delimitation', submitted for the Degree of PhD School of Law, The University of Edinburgh 2012, at 14.

[65]See, e.g., *North Sea Continental Shelf (Federal Republic of Germany/Netherlands) (Federal Republic of Germany/Denmark)* (Judgment), [1969] ICJ Rep. 3, para. 96; *Cameroon v. Nigeria: Equatorial Guinea intervening*, *supra* note 24, para. 295; *Delimitation of the Exclusive Economic Zone and the Continental Shelf (Barbados v. Trinidad and Tobago)* (Arbitral Award), [2006] RIAA vol. XXVII, 147, para. 288.

[66]See, e.g., *Cameroon v. Nigeria: Equatorial Guinea intervening*, *supra* note 24, para. 295; *Anglo-French Continental Shelf (United Kingdom/France)*, (1977) XVIII RIAA 3, para. 84; *North Sea Continental Shelf*, ibid., para. 96.

[67]*Continental Shelf (Libyan Arab Jamahiriya/Malta)* (Judgment), [1985] ICJ Rep. 13, para. 50 referencing *North Sea Continental Shelf*, ibid., at 54, para. 101(D)(2).

[68]*Delimitation of the Maritime Boundary in the Gulf of Maine Area*, *supra* note 45, para. 56.

[69]*Barbados v. Trinidad and Tobago*, *supra* note 65, para. 228.

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4.1 Changing coastal geography

Maritime boundary delimitation usually results in geographically stable boundaries. However, as rightly noted by Bangladesh in the maritime boundary dispute between Bangladesh and India, 'it would be against equity and common sense to draw a permanent boundary line using basepoints on an unstable coast'.[70] Doing so would distort the correlation between relevant maritime entitlements under UNCLOS and derived maritime boundaries. The solution proposed by Bangladesh was to disregard submerging features and establish a geographically stable boundary by reference to more permanent basepoints.[71] Another solution would be to construct a fluctuating boundary by reference to the fluctuating coastline or make revisions in case of subsequent changes.

Coastal instability has influenced the delimitation process in judicial decisions and led to the adjustment of geographically stable delimitation lines. Courts and tribunals have confirmed, on numerous occasions, that they can give small, submerging or otherwise insignificant features limited or no effect to avoid a disproportionate effect on the resulting boundary.[72] This was the case in *Bangladesh* v. *India* when the arbitral tribunal found that the submerging and barely visible South Talpatty/New Moore Island was 'not a suitable geographical feature for the location of a base point'.[73] Furthermore, the ICJ decided to give the tiny, uninhabited, and unstable feature, Qit'at Jaradah, no effect in the boundary dispute between Qatar and Bahrain, even after classifying it as an island.[74] The Court's decision does not explicitly refer to coastal instability as a determining factor in having the boundary line pass immediately east of Qit'at Jaradah. However, Judge Vereshchetin declared that the feature should not be considered an island due to its constantly changing physical condition.[75] These examples show that fluctuations of relevant coastlines may already influence the thinking of courts and tribunals in some maritime boundary delimitation cases. Yet, the end result is usually a geographically stable boundary – with two notable exceptions: the *Territorial and Maritime Dispute between Nicaragua and Honduras in the Caribbean Sea* and the *Maritime Delimitation in the Caribbean Sea and the Pacific Ocean (Costa Rica* v. *Nicaragua)*.

In the first case, the ICJ constructed an angle-bisector boundary[76] because continued coastal accretion at the river delta made it practically impossible to identify suitable basepoints.[77] Furthermore, the Court established a fluctuating boundary for the first segment of the boundary, from the land boundary terminus and seaward. The first three nm of the boundary were not fixed at geographic co-ordinates. The purpose was to allow for adjustments to the land boundary terminus, the fluctuating Coco River.[78] Nicaragua and Honduras both proposed, in their written submissions, that, due to the changing nature of the coastline, the 'starting-point for the boundary line between them should be located some distance from the mainland coast, but disagreed on exactly where'.[79] During the oral proceedings, Nicaragua advocated for a fluctuating boundary, which would connect the geographically-fixed maritime boundary by a straight line to the land boundary terminus, 'wherever it [might] be located on any given day'.[80] However, Honduras

[70] *Bangladesh v. India*, *supra* note 10, at 112. See Bangladesh's Memorial, para. 6.83.

[71] *Bangladesh v. India*, ibid., paras. 193, 200–3.

[72] See *Maritime Delimitation in the Black Sea*, *supra* note 22, paras. 149, 185; *Libya/Malta*, *supra* note 67, para. 64; *Nicaragua v. Honduras*, *supra* note 23, paras. 202, 302 et seq.; *Nicaragua v. Colombia*, *supra* note 60, para. 202; *Delimitation in the Gulf of Maine Area*, *supra* note 45, paras. 201, 222.

[73] *Bangladesh v. India*, *supra* note 10, para. 263.

[74] *Qatar v. Bahrain*, *supra* note 25, paras. 194–5, 219.

[75] Ibid., declaration of Judge Vereshchetin, at 184.

[76] *Nicaragua v. Honduras*, *supra* note 23, para. 294.

[77] Ibid., paras. 277, 280.

[78] Ibid., paras. 311, 320.

[79] Ibid., para. 307.

[80] Ibid., para. 309.

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urged that a diplomatic solution be found for the first three nm of the boundary.[81] The Court ultimately concluded that the Parties should:

> negotiate in good faith with a view to agreeing on the course of the delimitation line of that portion of the territorial sea located between the endpoint of the land boundary ... and the starting-point of the single maritime boundary determined by the Court.[82]

Thus, the first segment was left to fluctuate unless and until otherwise agreed by the parties.

The solution presented by Nicaragua in the oral proceedings went even further as that would have permanently established a fluctuating boundary. However, the Court favoured the approach originally advanced in written proceedings by both parties, i.e., to fix no boundary for the first segment.[83] In so doing, the Court could rely on judicial precedents confirming that maritime delimitation might 'begin at some distance out at sea', particularly where there was 'an uncertain land boundary terminus'.[84]

The ICJ recently took the next step and explicitly established a fluctuating maritime boundary in a dispute between Costa Rica and Nicaragua. In this case, the Court constructed a 'mobile line' connecting a point on solid land to the median line two nm offshore due to the 'high instability and narrowness of the sandspit near the mouth of the San Juan River which constitutes a barrier between the Caribbean Sea and a sizeable territory appertaining to Nicaragua'.[85] The Court found it more appropriate to create a fluctuating boundary-segment connecting the delimitation line to a fixed point on solid land rather than placing basepoints on the unstable sandspit. To this end, a court-appointed expert identified the point on solid land (on the Costa Rican side) which was closest to the mouth of the San Juan River. The Court explained where this point would be '[f]or the present' while also noting that there might 'be geomorphological changes over time'.[86]

The *Costa Rica* v. *Nicaragua* case demonstrates a clear effort to create a stable legal outcome while also acknowledging the effects of unforeseeable environmental changes. The Court used salient basepoints on land because of 'a relatively higher stability than points placed on sandy features'[87] but it also established a 'mobile line' for the most unstable segment and even indicated that the point anchoring this segment might be changed in the future.

4.2 Changing ecological circumstances

The foregoing suggests that changing coastal geography may sometimes lead to fluctuations in derived maritime boundaries. This section explores the possibility of fluctuations, if maritime boundaries are established by reference to changing ecological circumstances. Two factors make this perspective relevant for the present article. First, the fact that non-geographic circumstances affecting maritime boundaries often relate to ecological circumstances, i.e., the exploitation of living resources.[88] Second, the fact that ecological circumstances usually provide limited geographic stability and have, perhaps for that reason, often been disregarded in the past.

[81] Ibid., para. 309.

[82] Ibid., para. 321(4).

[83] Ibid., para. 311.

[84] Ibid., para. 311 referencing *Delimitation of the maritime boundary between Guinea and Guinea-Bissau (Guinea/Guinea-Bissau)*, (1985) XIX RIAA 149.

[85] *Costa Rica v. Nicaragua*, *supra* note 29, para. 104.

[86] Ibid.

[87] Ibid., para. 100.

[88] *Denmark v. Norway*, *supra* note 21, para. 78, *Delimitation in the Gulf of Maine Area*, *supra* note 45, para. 237. See also V. Prescott and C. Schofield, *The Maritime Political Boundaries of the World* (2005), at 239–41; Kwiatkowska, *supra* note 46, at 75.

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The ICJ confirmed the relevance of ecological changes in the *Jan Mayen* case when it considered the potential effect of seasonal changes on access to fish stocks.[89] The Court had to determine whether the presence of ice qualified as relevant circumstances for the purpose of maritime delimitation, due to its effect on the exploitation of capelin, the only commercially exploitable fish resource in the area. It concluded that ice sheets should not affect the location of the boundary because exploitable capelin could only be expected to appear at times and in areas where the ice had melted.[90] The reasoning of the Court suggests that similar seasonal changes to relevant ecology could affect the delimitation process if access to natural resources was affected. The ICJ's decision in the *Jan Mayen* case sheds no light on what the potential effect would be on a resulting boundary. One solution would be to establish a boundary that fluctuates with ice sheets along relevant coastlines or the migration patterns of relevant fish stocks, although this might not be practically desirable for states or mariners.

A chamber of the ICJ also had to consider the relevance of changing ecological circumstances in the *Gulf of Maine* case in 1984. Moreover, this case dealt specifically with the relevance of a fluctuating limit in the natural environment. The United States and Canada acknowledged the existence of discernible oceano-biological boundaries separating distinct ecological communities, but they disagreed on their location.[91] Canada identified an oceano-biological boundary at the extreme western limit of the delimitation area, east of the Great South Channel.[92] Meanwhile the United States found three 'different oceanographic and ecological' boundaries in the area and submitted that the most important one, separating most of the commercially exploitable fish stocks, ran along the Northeast Channel.[93]

The chamber confirmed that the 'great mass of water is taken into consideration not as some inert mass, but as the habitat of an exceptionally extensive wealth of fauna and flora'.[94] It was 'not however convinced of the possibility of discerning any genuine, sure, and stable "natural boundaries" in so fluctuating an environment as the waters of the ocean, their flora and fauna'[95] or of the relevance of such circumstances for the seabed.[96] Therefore, it seems that these boundaries were rejected for two reasons. First, because they were not sufficiently 'sure and stable'. Second, because the parties had requested a single maritime boundary and the ecological boundary was not relevant for delimiting the continental shelf. These two reasons will be addressed in turn.

First, the Chamber of the ICJ 'reached the conviction that it would be vain to seek, in data derived from the biogeography of the waters covering certain areas of sea-bed, any element sufficient to confer the property of a stable natural boundary'.[97] It is not entirely clear whether this reference to stability relates to geographic stability, certainty of the boundary, or both. The parties had requested a geographically fixed boundary[98] but the natural boundary that the United States relied upon as a basis for delimitation was bound to change.[99] Therefore, the Chamber was arguably faced with an impossible task: to delimit a fixed boundary by reference to a fluctuating limit. It proceeded to establish a geographically stable boundary without specifically addressing

[89] *Denmark v. Norway*, *supra* note 21, para. 78.
[90] Ibid.
[91] *Delimitation in the Gulf of Maine Area*, *supra* note 45, paras. 50–1.
[92] Ibid., para. 50.
[93] Ibid., para. 51.
[94] Ibid., para. 48.
[95] Ibid., para. 54.
[96] Ibid.
[97] Ibid.
[98] Ibid., para. 5.
[99] *Delimitation in the Gulf of Maine Area*, *supra* note 45. Oral Arguments - Minutes of the Public Sittings held at the Peace Palace, The Hague, on 29 January 1982 and from 2 to 19 April 1984, Evidence of Dr Edwards, witness for the United States, at 399, 434–5.

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the possibility of making it ambulatory or the apparent contradiction in aforementioned claims. In fact, the Chamber declared that in this case, there were 'no geological, geomorphological, ecological or other factors sufficiently important, evident and conclusive to represent a single, incontrovertible natural boundary'.[100]

Second, the Chamber rightly concluded that an ecological boundary could not be relevant for establishing a maritime boundary 'serving a double purpose',[101] also known as a single purpose boundary. The construction of single purpose boundaries has been generally accepted since first employed in the *Gulf of Maine* case.[102] Yet, this approach is not always suitable because the application of international law can have different results for different maritime zones, resulting in different boundaries.[103] Indeed, circumstances that are relevant for the exclusive economic zone or exclusive fisheries zone may be irrelevant for delimitation of the continental shelf, and vice versa. The Chamber found, in the *Gulf of Maine* decision, that in delimiting two maritime zones by a single boundary it had to apply neutral criteria, equally suitable to both zones.[104] This made the oceano-biological boundary inappropriate. One can wonder if the decision might have been different if the parties had requested two distinct boundaries, one for the exclusive fisheries zone (or exclusive economic zone) and another one for the continental shelf,[105] i.e., if the natural boundary had been sufficiently important, evident, and conclusive.

5. Feasibility of establishing fluctuating boundaries

Having concluded that fluctuating boundaries do exist and that they can be established by application of law, mutual agreements and judicial decisions, this section takes a further look at the feasibility of establishing such boundaries. States, courts and tribunals have certainly shown a propensity for geographically stable boundaries but priorities are changing with increasing effects of climate change.

'[W]hen two countries establish a frontier between them one of the primary objects is to achieve stability and finality'.[106] Indeed, stability is extremely important for international peace and security.[107] Furthermore, treaties establishing boundaries belong to a category of treaties that requires stability.[108] Yet, the object and purpose of such treaties is generally 'to create a stable legal position'[109] and that does not necessarily require geographic stability. After all, legal stability must be distinguished from substantive stability or guaranteed *status quo*. Stability and sanctity of treaties is important for international relations in general but a balance must be struck with 'principles of equity and justice calling for the adaptation of treaties to a profoundly changing environment'.[110] Perfect stability may actually be impossible to achieve when delimiting maritime

[100] *Delimitation in the Gulf of Maine Area*, *supra* note 45, para. 56.

[101] Ibid., para. 54.

[102] See ibid., para. 243; *Qatar v. Bahrain*, *supra* note 25, paras. 173–4; and *Nicaragua v. Honduras*, *supra* note 23, at 739–40.

[103] Cottier, *supra* note 31, at 218 and *Denmark v. Norway*, *supra* note 21, at 56–7.

[104] *Delimitation in the Gulf of Maine Area*, *supra* note 45, para. 194.

[105] The Treaty between Australia and Papua New Guinea concerning Sovereignty and Maritime Boundaries in the Torres Strait (adopted 18 December 1978, entered into force 15 February 1985) 1429 UNTS 207 is an example of a treaty establishing non-coincident exclusive economic zone and continental shelf boundaries.

[106] *Temple of Preah Vihear (Cambodia v. Thailand)* (Merits), [1962] ICJ Rep. 6, at 34.

[107] Extract from the Yearbook of the ILC, 1966, Vol. II 'Draft articles on the law of treaties: text as finally adopted by the Commission on 18 July 1966 (reproduced at para. 38 of document A/6309/Rev.1)' (18 July 1966), UN Doc. A/CN.4/190 260, para. 13.

[108] Extract from the Yearbook of the ILC, 1966, Vol. I(1) 'Summary record of the 835th meeting' (20 January 1966), UN Doc. A/CN.4/SR.835, at 86.

[109] T. Giegerich, 'Article 62. Fundamental Change of Circumstances', in O. Dörr and K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (2012), at 1067, 1090.

[110] See Giegerich, ibid., at 1068–9.

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boundaries, because the baseline is 'an impermanent feature'.[111] As noted by Manley Hudson in relation to the Hague Conference for the Codification of International Law: 'Few if any countries have ever viewed their maritime frontiers as susceptible of delimitation with the precision that is customary in the demarcation of land frontiers.'[112]

Agreements and judicial decisions establishing fluctuating boundaries can remain legally binding and enforceable against relevant parties, even if their practical implementation leads to revision of geographic co-ordinates. However, failure to take changing circumstances into account in the delimitation process may pose a threat to the validity of maritime boundaries. VCLT Article 62 provides that an unforeseen fundamental change of circumstance, relating to the essential basis of a treaty, can justify suspension, termination or withdrawal from said treaty if it radically transforms obligations still to be performed. Treaties establishing boundaries are explicitly excluded under VCLT Article 62(2)(a). Yet, while the ILC has indicated that territorial sea boundaries are 'true limit[s] of the territory of the State' it further explains that, even if other maritime boundaries are categorized as 'true boundaries', they do not necessarily fall within the boundary exclusion of VCLT Article 62(2)(a).[113] The ICJ has indicated that treaties delimiting the continental shelf should also fall within the boundary exclusion[114] but single purpose boundaries and boundaries delimiting the exclusive economic zone or exclusive fisheries zone may be susceptible to termination. Therefore, a geographically stable boundary may be subject to termination due to unforeseen environmental changes, while a fluctuating boundary that anticipates such changes remains legally enforceable.

When codifying VCLT Article 62, special rapporteur Waldock actually noted that changes to the location of natural phenomena establishing international boundaries might affect the interpretation and application of such treaties.[115] According to this, a fluctuating river thalweg or equidistance line could modify a boundary through revised interpretation instead of justifying its termination. Furthermore, the threat of termination might incite mutual revision through negotiations.[116]

Defined territory is one of the requirements for statehood.[117] Yet, geographic stability does not seem to be a prerequisite for international boundaries, even those that delimit territorial sovereignty. The boundary between the United States and Mexico is an example of a boundary that demarcates land territory by reference to a fluctuating phenomenon and has fluctuated for that reason. The United States and Mexico first agreed to delimit their land territory by reference to the thalweg of the Rio Grande in 1850. The course of the river changed drastically soon after the ratification of the treaty, resulting in land territory that previously belonged to the United States being on Mexico's side of the river and vice versa.[118] This resulted in a century long dispute and on 12 December 1927, the United States Supreme Court found that the boundary between the United States and Mexico was a fixed line following the channel of the Rio Grande.[119] This domestic

[111]L. Sohn and J. Noyes, *Cases and Materials on the Law of the Sea* (2004), at 235, referencing R. Hodgson and R. Smith, 'The Informal Single Negotiating Text (Committee II): A Geographical Perspective', (1976) 3 *Ocean Development and International Law* 225, at 234.

[112]M. Hudson, 'The First Conference for the Codification of International Law', 24 AJIL 447, at 457.

[113]ILC 'Report of the ILC on the work of its 34th session' (3 May–23 July 1982), UN Doc. A/CN.4/SER.A/1982/Add.l (Part 2), at 61.

[114]*Aegean Sea Continental Shelf (Greece v. Turkey)* (Jurisdiction), [1978] ICJ Rep. 3, para. 85.

[115]'Fifth Report on the Law of Treaties by Sir Humphrey Waldock, Special Rapporteur', *supra* note 52, at 44.

[116]Extract from the Yearbook of the ILC, 1963, Vol. I 'Summary Record of the 697th Meeting' (11 June 1963), UN Doc. A/CN.4/SR.697, at 157.

[117]Montevideo Convention on the Rights and Duties of States (adopted 26 December 1933, entered into force 26 December 1934) 165 League of Nations Treaty Series 19, Art. 1.

[118]J. Bowden, 'The Texas-New Mexico Boundary Dispute along the Rio Grande', (1959) 63 *The Southwestern Historical Quarterly* 225.

[119]*The State of New Mexico v. The State of Texas* (United States Supreme Court 1927) United States Reports, CCLXXV, at 279.

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decision was contradictory because the boundary could not be both a fixed line *and* the channel of the fluctuating river.[120] Hence, it did not end the dispute between the United States and Mexico. However, in 1963 the two states concluded another treaty establishing the boundary along the thalweg of the Rio Grande and this time a concrete river channel was built, preventing floods that could affect the course of the river.[121] Thus, the fluctuating boundary was finally made geographically stable. This demonstrates that international boundaries can fluctuate in an unstable environment, even if geographic stability is generally preferred.

The United States and Mexico did not seem to wish for a fluctuating boundary, although they wanted their territories demarcated by the Rio Grande. This did not seem feasible to them or to the United States Supreme Court. However, India and East Pakistan (what is now Bangladesh) showed a willingness to create a fluid land boundary along the Ganges river in 1951 and again in 2014. The Radcliffe Award from 1947 established an international land boundary between India and East Pakistan by reference to the Ganges River and this was relevant for determining the land boundary terminus in the maritime boundary dispute between India and Bangladesh in 2014. When originally interpreting the Radcliffe Award, East Pakistan submitted that the river should be seen as 'flexible and not rigid'.[122] Furthermore, India argued, in *Bangladesh* v. *India* that the location of the land boundary had not been definitively fixed by the Radcliffe Award because India and East Pakistan had agreed, through a subsequent exchange of letters, that the boundary was fluid.[123] The tribunal was not convinced that the exchange of letters constituted a subsequent agreement because India's reply was not signed and could, therefore, not satisfy the necessary requirements.[124] Nonetheless, the letters clearly demonstrate that the states had 'very carefully considered the question of river boundary' and that they were 'of the opinion that the boundary in this section should be fluctuating'.[125]

Geographic stability is arguably less relevant for the equitable division of living resources than it is for the delimitation of territorial sea, continental shelf or single purpose boundaries. The zonal approach to management of living resources 'involves the divergence of the law and nature'[126] and delimitation based solely on the distance criterion ignores relevant ecosystems and their interactions.[127] However, co-operation in the management of transboundary fish stocks and environmental protection is increasing and this reduces the importance otherwise placed on the stability of boundaries.[128] Scientists are encouraging the use of fluctuating boundaries for marine protected areas because they are designed to encompass organisms that do no respect man-made boundaries.[129] The same arguments support the notion of fluctuating boundaries for exclusive economic zone or exclusive fisheries zone boundaries.

Fluctuating boundaries do present practical problems because the location of the boundary can be uncertain at times. This is why states generally prefer geographically stable boundaries.

[120]Bowden, *supra* note 118, at 236–7.

[121]Convention between the United States of America and Mexico concerning the Chamizal Dispute (adopted in Mexico City 29 August 1963, entered into force 14 January 1964), Arts. 1–3.

[122]*Bangladesh v. India*, *supra* note 10, para. 160.

[123]Ibid., paras. 104–5, see also para. 149.

[124]Ibid., para. 165.

[125]Ibid., para. 104 referencing Letter from the Secretary to the Government of Pakistan to the Secretary to the Government of India, Ministry of External Affairs, No. 1(1).3/10/50, 7 February 1951, India's Rejoinder, Annex RJ-1. India's reply confirmed that the boundary 'should be a fluid one'. See Copy of Express Letter from Foreign, New Delhi to Foreign, Karachi, No. F. 20/50- Pak.III, 13 March 1951, India's Rejoinder, Annex RJ-2.

[126]Y. Tanaka, *The International Law of the Sea* (2015), at 238, referencing L. Juda, 'Considerations in Developing a Functional Approach to the Governance of Large Marine Ecosystems', (1999) 30 ODIL 93.

[127]Ibid.

[128]A. Østhagen, 'Maritime boundary disputes: What are they and why do they matter?', (2020) 120 *Marine Policy* 104, at 110.

[129]Maxwell et al., 'Mobile protected areas for biodiversity on the high seas', (2020) 367(6475) *Science (American Association for the Advancement of Science)* 252, at 252.

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However, the ICJ has stated that determination of a boundary along a fluctuating river thalweg and mouth of said river 'should give rise to no difficulty'.[130] States are usually in good positions to monitor fluctuations of their coastlines and they can adjust boundaries accordingly.[131] Indeed, states already have to respect fluctuations of unilateral maritime limits and they can simultaneously keep track of fluctuating boundaries. Unilateral limits are updated with the adjustment of relevant data; charts that are officially recognized by the coastal state[132] or charts/co-ordinates deposited with the UN Secretary-General.[133] The establishment and subsequent adjustment of normal baselines can take effect by the recognition of charts displaying baselines,[134] for example the 'Admiralty Notices to Mariners', which are updated by the United Kingdom Hydrographic Office on a weekly basis.[135] Some boundary agreements refer to these charts[136] and bilateral boundaries could fluctuate in accordance with ambulatory baselines depicted there, as the information is readily available to all mariners.

The notion of fluctuating boundaries may go against a strong desire for geographic stability and predictability but the need for unconventional approaches is likely to increase in the coming era of 'change, uncertainty and instability'.[137] 'The *pacta sunt servanda* rule was intended to ensure the stability of law; not stability at any price, but stability based on justice'.[138] Fluctuating boundaries are one option that may ensure a just outcome by prioritizing legal stability over geographic stability where unforeseeable environmental changes are anticipated. This is largely dependent on political will because states can decide to establish fluctuating boundaries when negotiating boundary agreements, when preparing compromises or arguments before courts and tribunals. However, as the examples demonstrate, courts and tribunals may also resort to this when geographic stability is unattainable.

6. Conclusion

Maritime boundaries can fluctuate under international law. Such arrangements may never be ideal but they represent a viable alternative to meet the challenges of environmental instability. Provisional lines delimiting the territorial sea fluctuate with changing coastlines unless and until otherwise agreed, states can establish fluctuating boundaries on the basis of bilateral agreements and they can result from judicial decisions. Courts and tribunals have repeatedly emphasized the importance of stability and certainty in international boundaries when confronted with naturally fluctuating phenomena. Even so, unstable coastlines have led to the creation of fluctuating boundary-segments in exceptional cases, despite the impracticability of such arrangements. In *Nicaragua* v. *Honduras*, the ICJ chose to establish no boundary, instead of binding the parties to a fluctuating boundary, leaving room for negotiations concerning geographic co-ordinates and revisions.[139] Furthermore, the Court established a 'mobile line' connecting the median line of the

[130]See *Arbitral Award Made by the King of Spain on 23 December 1906 (Honduras v. Nicaragua)*, [1960] ICJ Rep. 192, at 216.

[131]See *Nicaragua v. Honduras*, *supra* note 23, para. 310.

[132]See UNCLOS, Art. 5.

[133]See UNCLOS, Art. 16(1).

[134]C. Schofield, 'Holding back the waves? sea level rise and maritime claims', in O.Ruppel, C. Roschmann and K. R. Schlichting (eds.), *Climate Change: International Law and Global Governance: Legal Responses and Global Responsibility* (2013), vol. I, at 593, 605.

[135]'Admiralty Notices to Mariners', *UK Hydrographic Office*, available at www.admiralty.co.uk/maritime-safety-information/admiralty-notices-to-mariners.

[136]See, e.g., The Agreement between the Republic of Cyprus and the Arab Republic of Egypt on the delimitation of the exclusive economic zone (adopted 17 February 2003, entered into force 7 March 2004) 2488 UNTS 3.

[137]See 'Sydney Conference', *supra* note 5, at 7.

[138]United Nations Conference on the Law of Treaties: 'First session: Summary records of the plenary meetings and of the meetings of the Committee of the Whole' (26 March–24 May 1968), UN Doc. A/CONF.39/11, 150, para. 56.

[139]*Nicaragua v. Honduras*, *supra* note 23, para. 311.

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territorial sea to a fixed point on solid land in the boundary dispute between Nicaragua and Costa Rica, due to the instability of a sandspit near the mouth of the San Juan River.[140]

Fluctuating boundaries can be appropriate where the entire boundary is dependent upon ambulatory phenomena, such as an equidistance line, river or marine ecosystem. However, as indicated by the *Gulf of Maine* decision, the phenomena have to be sufficiently evident and relevant for the requested boundary and they have to produce a stable legal position. Marine ecosystems are not as immediately relevant to maritime boundary delimitation as coastal geography and they may present unique evidentiary difficulties. Yet, courts and tribunals have overcome such difficulties by relying on estimations concerning the 'potential changes' in ecosystems[141] and predictions concerning environmental changes resulting 'from altered flow conditions'.[142] This demonstrates that courts and tribunals can consider fluctuations of coastlines, ecosystems and rivers when deciding contentious cases.

Geographic stability is considered a hallmark of international boundaries and generally preferable when practically achievable. However, it is not a legal requirement, even for land boundaries delimiting sovereignty. This is ultimately a question of priorities and political will. Fluctuating boundaries are final, binding and stable in the sense that they create binding arrangements with other states, which remain enforceable notwithstanding significant changes to the marine environment. Fluctuating boundaries can cause legal uncertainty in the sense that their exact locations may often be disputed and states may disagree in the process of revision. Nonetheless, fluctuating boundaries may be the only delimitation method capable of incorporating consideration for unforeseeable changes to relevant coastal geography and bridging the gap between a stable maritime boundary and a fluctuating land boundary terminus.

Courts and tribunals have taken environmental changes into account when delimiting maritime boundaries and established geographically stable boundaries on that basis. That particular approach calls for a complicated evaluation of future changes (something the courts often shy away from) and does not ensure continued correlation between boundaries and relevant circumstances. Furthermore, significant changes are not always predictable at the time of delimitation and equitable delimitations may be continuously dependent on the location of natural boundaries, such as marine resources and shared rivers. Thus, fluctuating boundaries can be an appropriate alternative, not only when geographic stability is unattainable, but also where fluctuations are particularly relevant for the achievement of an equitable solution.

When delimiting maritime boundaries, courts and tribunals must find solutions that are 'both equitable and as practically satisfactory as possible, while at the same time in keeping with the requirement of achieving a stable legal outcome'.[143] Fluctuating boundaries can certainly provide equitable solutions and stable legal outcomes. Geographic stability was attainable in *Gulf of Maine* as the Chamber of the ICJ could resort to other criteria than the fluctuating oceano-biological limit for delimitation of the single maritime boundary.[144] However, the identification of a stable geographical boundary was problematic in the first segments of the *Nicaragua/Honduras* and *Costa Rica* v. *Nicaragua* cases, which led to the creation of fluctuation boundary-segments.[145]

As of 2016, a little over half of the world's overlapping maritime entitlements had been delimited[146] and existing maritime boundary agreements are often partial or incomplete in

[140] *Costa Rica v. Nicaragua*, *supra* note 29, para. 104.
[141] *The Indus Waters Kishenganga Arbitration (India/Pakistan)*, (2013) 150 ILR 311, para. 100.
[142] Ibid., para. 98.
[143] *Barbados v. Trinidad and Tobago*, *supra* note 65, para. 244.
[144] See *Delimitation in the Gulf of Maine Area*, *supra* note 45, para. 194.
[145] *Nicaragua v. Honduras*, *supra* note 23, para. 311; *Costa Rica v. Nicaragua*, *supra* note 29, para. 104.
[146] C. Schofield, 'Ever More Lines in the Sea: Advances in the Spatial Governance of Maine Space', in J. Kraska and C. Esposito (eds.), *Ocean Law and Policy: Twenty Years of Development under UNCLOS* (2016), at 387, 399.

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character, only dealing with part of the disputed area or not all maritime zones.[147] The entitlement to those un-delimited areas currently fluctuates in accordance with baselines and provisional equidistance lines and that may actually be a conscious decision by relevant states. In other words, a big portion of the world's overlapping entitlements may already be subject to provisional arrangements. The ability to achieve geographic stability may decrease in coming years due to unprecedented changes to the natural environment. Geographic stability has long lain the foundation of international law and shaped the decisions of courts and tribunals, but it may be time to adjust to a new reality. The climate crisis will necessitate significant changes in domestic and international legal systems and fluctuating maritime boundaries present a response to one aspect of this immense challenge.

[147]C. Schofield, 'Parting the Waves: Claims to Maritime Jurisdiction and the Division of Ocean Space', (2012) 1 *Penn State Journal of Law and International Affairs* 40, at 48.

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