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DISTRIBUTED MARITIME DENIAL: DRONE WARFARE IN THE BLACK SEA AND NATO ADAPTATION IN SEMI-ENCLOSED SEAS[1]

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Abstract: *This article examines how drone warfare in the Black Sea has reshaped the logic of maritime denial in semi-enclosed and constrained seas, and what lessons NATO should draw from Ukraine's experience. It argues that Ukraine's use of unmanned surface vessels, aerial drones, missiles, ISR, and adaptive targeting networks has not produced classical sea control, but has generated a form of distributed maritime denial that constrains Russia's freedom of manoeuvre and raises the cost of naval power projection. Using a strategic studies framework, the article links drone warfare to deterrence by denial, cost imposition, and military innovation, while treating hybrid warfare as a secondary contextual lens. The Black Sea is presented as a theory-building case whose lessons are most directly relevant to NATO's eastern and southeastern flanks, especially the Baltic and Black Sea regions, but only selectively transferable to wider constrained theatres such as the South China Sea.*

Keywords: *Drone warfare; Black Sea; maritime denial; NATO; semi-enclosed seas; unmanned systems; military innovation*

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Introduction: The Black Sea Beyond the Black Sea

Russia's full-scale invasion of Ukraine has transformed the Black Sea from a regional security concern into a consequential maritime theatre of contemporary war. At the beginning of the conflict, Russia possessed overwhelming conventional naval superiority: the Black Sea Fleet, military infrastructure in occupied Crimea, missile capabilities, and the ability to threaten Ukrainian ports appeared to give Moscow significant coercive leverage. Yet Ukraine, despite lacking a conventional fleet, has used unmanned surface vessels, aerial drones, shore-based missiles, ISR networks, special operations, and rapid adaptation to impose costs on Russian naval assets and constrain their freedom of manoeuvre. The result has not been classical sea control, but a more diffuse and disruptive form of maritime denial.

This article argues that the Black Sea should be understood not only as a regional battlefield, but as a theory-building case for drone-enabled maritime denial in semi-enclosed seas. Its strategic significance lies in the interaction between technology and geography. The Black Sea is geographically bounded but strategically open: it connects energy routes, grain exports, Danube riverine access, offshore infrastructure, coastal military facilities, and the maritime approaches of NATO members and partners. It is also a theatre in which Russian military power faces a dense cluster of vulnerabilities, including ports, shipping routes, energy nodes, logistics corridors, coastal infrastructure, and politically sensitive borders. The March 2026 report on unmanned systems captures this interaction, noting that the region has become a proving ground for unmanned aerial systems, first-person-view drones, one-way attack systems, loitering munitions, and increasingly capable unmanned surface vessels.[4]

The Black Sea's wider strategic importance is not new, but the war has made it far more visible. Kakachia, Malerius, and Meister describe the region as a historic meeting point, trade corridor, and battleground between great powers, while also noting that Russia has long treated it as belonging to its sphere of influence. They argue that the Black Sea has often been undervalued by European actors despite its centrality to connectivity, energy

[4] ***, "Unmanned Aerial Systems in Modern Warfare: Strategic Implications for Deterrence and Security in the Black Sea Region. Comprehensive Literature Review and Strategic Assessment, updated through 18 March 2026", pp. 2–4; henceforth, "Report on UAS."

networks, trade, industrial capacity, high-tech weapons, and security.[5] This neglect has become increasingly difficult to sustain. Russia wages its war against Ukraine in important part from the Black Sea and uses the waters for military supply, coercive leverage, and regional power projection. Turkey's control of the Straits, Romania's exposure to drone spillovers near the Danube, Bulgaria's position on NATO's southeastern flank, and Ukraine's struggle to preserve maritime access all make the Black Sea a critical space for European security.

The **puzzle** addressed by this article is therefore straightforward but analytically significant: **how did a state without a comparable conventional navy manage to contest the operational utility of Russia's superior maritime power?** The answer cannot be reduced to drones alone. Ukraine's campaign has been effective because unmanned systems have been embedded in a wider architecture of surveillance, targeting, missiles, coastal defence, communications, software, intelligence sharing, and organizational learning. Maritime and aerial drones have mattered not as isolated platforms, but as components of a broader system of distributed denial. The March 2026 report identifies this shift explicitly, arguing that unmanned systems have moved from auxiliary assets to core enablers of surveillance, precision strike, and attrition management, and that Black Sea maritime denial has been reshaped by integrated USV, coastal-strike, and surveillance architectures.[6]

This article defines distributed maritime denial as the ability to prevent, constrain, or raise the cost of an adversary's use of a maritime space through dispersed, networked, relatively attritable, and rapidly adaptable systems rather than through a conventional fleet-on-fleet contest. Distributed denial does not necessarily produce control of the sea. It creates persistent uncertainty, operational risk, defensive burdens, and political constraints for the stronger naval actor. In the Black Sea, this has meant that Ukraine has challenged Russia's naval freedom of action, complicated the use of Crimea

[5] Kornely Kakachia, Stephan Malerius, and Stefan Meister, "Introduction," in Kornely Kakachia, Stephan Malerius, and Stefan Meister (eds.), *Security Dynamics in the Black Sea Region: Geopolitical Shifts and Regional Orders*, Cham: Springer, 2024, pp. 1–5.

[6] "Report on UAS," pp. 3–4, 13–14.

as a maritime power-projection hub, and helped preserve maritime economic lifelines despite conventional inferiority.[7]

The argument is situated within strategic studies rather than hybrid warfare as the primary theoretical framework. Hybrid warfare remains relevant to the wider regional context, especially given Russia's use of disinformation, cyber operations, energy pressure, and legal-political ambiguity in the Black Sea region. Yet the central issue examined here is not primarily ambiguity or subversion, but the changing relationship between technology, geography, naval vulnerability, deterrence, and military adaptation. Chiriac's analysis of Russian foreign policy in the Black Sea is useful because it shows that Moscow has long approached the region through a strategic and realist lens, linking naval power, power projection, and regional influence.[8] This article builds on that insight but shifts the focus to how Ukrainian drone-enabled denial has challenged the operational assumptions behind Russian maritime power.

The article asks how drone warfare in the Black Sea has reshaped maritime denial in semi-enclosed seas, and what lessons NATO should draw. It argues that Ukraine's campaign demonstrates a shift from platform-centred sea control toward distributed maritime denial. This does not mean that large naval platforms are obsolete, nor that drones alone can deliver strategic victory. Rather, in constrained maritime environments, low-cost unmanned systems can impose disproportionate costs on expensive naval assets, ports, logistics hubs, and coastal infrastructure when combined with intelligence, targeting, missiles, electronic warfare, and rapid innovation cycles.

The NATO dimension is central. The Black Sea is not only a Ukrainian or Russian theatre; it is also a test case for NATO's eastern and southeastern maritime posture. The war has exposed the Alliance's lack of consensus on the best posture for the region, even as Romania and Bulgaria face the direct consequences of instability on NATO's southeastern flank.[9] For NATO, the lesson is not simply to acquire more drones or replicate Ukraine's wartime model. Ukraine's model emerged from specific conditions: existential war,

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[7] *Ibidem, loc. cit.*

[8] Olga R. Chiriac, *The Foreign Policy of the Russian Federation: Implications for Black Sea Security*, Cham: Palgrave Macmillan, 2023, pp. 75–98, 137–152.

[9] Kakachia, Malerius, Meister, *art. cit.*, in Kakachia, Malerius, Meister (eds.), *op. cit.*, pp. 1-4.

conventional naval inferiority, proximity to Russian assets, improvisational innovation, domestic and external technology networks, and Western support. NATO must therefore learn the logic of the campaign rather than copy its exact form. That logic points toward distributed denial, resilient coastal defence, counter-UAS and counter-USV systems, hardened infrastructure, theatre-specific doctrine, and faster innovation under pressure.

The article also asks where these lessons travel. The Baltic Sea is the closest NATO-relevant analogue because it is semi-enclosed, infrastructure-dense, geographically compressed, and exposed to Russia. Other constrained maritime spaces, including the Eastern Mediterranean, Red Sea, Persian Gulf, and parts of the South China Sea, share relevant features but differ in scale, legal order, alliance structure, and escalation context. The South China Sea is especially important as a boundary case: it is larger, more archipelagic, more grey-zone oriented, and embedded in a wider China-U.S. strategic competition. Nevertheless, the Black Sea illustrates how unmanned systems can amplify denial, surveillance, attribution, infrastructure vulnerability, and operational risk in constrained maritime environments.

The article proceeds in seven steps. It first develops the strategic studies framework, then explains why semi-enclosed seas amplify drone warfare. It next examines Ukraine's distributed maritime denial campaign, analyses how tactical drone innovation produces strategic effects, identifies NATO lessons, and considers scope conditions from the Baltic to the South China Sea. The conclusion argues that the Black Sea does not prove the end of naval power, but it does show that maritime power in constrained seas is becoming more vulnerable, more distributed, and more dependent on resilience against drone-enabled denial.

Theoretical Framework: Strategic Studies and Drone-Enabled Maritime Denial

The article's theoretical framework is grounded in strategic studies because the central problem is how technology alters the relationship between force, geography, risk, and political effect. Drone warfare in the Black Sea matters because it has changed the conditions under which maritime power can be exercised in a constrained theatre. Ukraine's unmanned systems have not produced conventional sea control, nor have they removed the need for

missiles, intelligence, electronic warfare, industrial production, or external support. Their significance lies instead in making Russian naval operations more costly, less predictable, more defensive, and less politically useful.

The distinction between sea control and sea denial is central. Sea control means using a maritime space while preventing adversary use; sea denial seeks to prevent, disrupt, or raise the cost of adversary use without establishing uncontested command of the sea. The Black Sea case fits this second logic. Ukraine has not replaced Russia as the dominant naval power, nor created a fleet capable of symmetrical operations against the Black Sea Fleet. It has instead generated a distributed denial system in which unmanned surface vessels, aerial drones, coastal strike capabilities, intelligence, targeting, and rapid adaptation make Russian maritime activity more vulnerable.

This is why the concept of **distributed maritime denial** is analytically useful. It captures a form of denial that is not concentrated in a single platform, fleet, or weapons system, but dispersed across sensors, drones, missiles, operators, ports, coastal launch points, communications systems, and innovation networks. The March 2026 report on unmanned systems in the Black Sea describes unmanned systems as having shifted from auxiliary assets to core enablers of surveillance, precision strike, and attrition management, while emphasizing that their strategic effect lies not only in individual platform performance but also in persistence, replaceability, and production depth.[10] Drone-enabled denial is therefore not only about spectacular attacks on ships or infrastructure. It is about creating a persistent environment of risk in which the stronger naval actor must defend more targets, disperse more assets, invest in more countermeasures, and accept greater uncertainty in routine operations.

Schelling's work remains useful for explaining this logic because it shifts attention from military force as conquest to military force as influence. In *Arms and Influence*, Schelling distinguishes brute force from coercive violence: brute force seeks to seize, hold, repel, or destroy, while coercive power derives from the ability to hurt and to make that hurt contingent on the adversary's behaviour.[11] The relevance to the Black Sea is not that Ukraine is practising

[10] "Report on UAS,", pp. 3-4.

[11] Thomas C. Schelling, *Arms and Influence*, with a new preface and afterword, New Haven: Yale University Press, 2008, pp. 1–34.

coercive diplomacy in a narrow sense, but that its drone campaign alters Russian decision-making by changing the anticipated costs of action. Russian ships, ports, logistics hubs, and naval infrastructure become not merely military targets, but bargaining vulnerabilities. The strategic question is not only what Ukraine can destroy, but what Russia is forced to do differently because destruction remains possible.

Schelling's distinction between brute force and the power to hurt also explains why material asymmetry does not automatically translate into operational freedom. Russia may possess superior conventional naval platforms, but those platforms operate in an environment in which exposure can be exploited. Schelling's insight that military power can influence behaviour even when held in reserve is especially relevant here: the threat of future damage can shape choices as much as damage already inflicted.[12] In the Black Sea, the cumulative effect of Ukrainian drone-enabled denial lies in the expectation that Russian naval activity may trigger additional losses, reputational costs, logistical disruption, or escalation-management problems. Maritime space becomes a bargaining environment, not simply a battlespace.

The same logic is visible in the distinction between deterrence by punishment and deterrence by denial. Punishment threatens to impose costs after an adversary acts; denial seeks to prevent the adversary from achieving its objectives in the first place. Drone-enabled maritime denial works primarily through the latter mechanism. It does not need to threaten catastrophic punishment against Russia as a whole. It needs to reduce the probability that Russia can use the Black Sea Fleet, Crimea, ports, logistics routes, and maritime pressure as intended. Recent work on drone coercion makes this distinction explicit: denial threats reduce the probability that the target can achieve its political goals by attacking military forces and combat capabilities, whereas punishment threats seek to impose unacceptable pain more directly.[13] In the Black Sea, Ukrainian drones and associated strike systems have operated less as instruments of punishment than as instruments of denial and cost imposition.

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[12] *Ibidem, loc. cit.*

[13] Kelly M. Grieco and James Wesley Hutto, "Can Drones Coerce?," in James Patton Rogers and James Wesley Hutto (eds.), *Rethinking Remote Warfare: AI, Drones, and Future War*, Cham: Palgrave Macmillan, 2026, pp. 83–104.

This theoretical framing also avoids technological determinism. Drones do not transform warfare automatically. Hutto and Rogers make a similar intervention in the drone-revolution debate, arguing that drones should be treated neither as magic bullets nor as irrelevant tactical additions, but as technologies whose effects depend on political, operational, and organizational context.[14] Drones become strategically consequential when embedded in systems of command, intelligence, targeting, production, software adaptation, and operational learning. Rogers's *De Gruyter Handbook of Drone Warfare* similarly presents drones as part of a wider transformation in the character, though not the nature, of war, emphasizing their proliferation, dual-use character, accessibility to state and non-state actors, and relevance across air, land, sea, underwater, and potentially space domains.[15] The significance of drones in Ukraine is therefore not simply that they are remotely operated or relatively cheap, but that they compress the relationship between detection, decision, and strike while allowing weaker actors to create persistent pressure across a wider battlespace.

The Russia-Ukraine war has also shifted the drone debate away from the earlier model of remote warfare. In the post-9/11 period, drones were often associated with Western counterterrorism, targeted killing, distance, and risk transfer. In Ukraine, they have become central to industrial attrition, mass battlefield surveillance, strike coordination, and adaptation under electronic warfare pressure. Grieco and Hutto note that drones possess persistence, lethality, and lower costs and risks, but also warn that these features do not automatically produce successful coercion.[16] This is important for the present article: the Black Sea case does not prove that drones are independently decisive. It shows that drones can become strategically meaningful when connected to denial objectives, operational geography, and adaptive military organizations.

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[14] James Wesley Hutto and James Patton Rogers, "The Drone Revolution: Towards a Synthesis in the Drone Debate," in *European Journal of International Security*, vol. 11, no. 2, 2026, pp. 145–165, https://doi.org/10.1017/eis.2025.10005.

[15] James Patton Rogers, "What Is 'The Second Drone Age'?," in James Patton Rogers (ed.), *De Gruyter Handbook of Drone Warfare*, Berlin/Boston: De Gruyter, 2024, pp. 237–242.

[16] Grieco and Hutto, *art. cit.*, in Rogers and Hutto (eds.), *op. cit.*, pp. 83-104.

Military innovation and adaptation are therefore the third pillar of the framework. The Black Sea campaign cannot be understood only through weapons effects. It must be understood through the speed with which Ukraine and Russia have adapted tactics, sensors, electronic warfare, communications, production methods, and countermeasures. The March 2026 report describes the war as producing dense reconnaissance-strike meshes, accelerating countermeasure cycles, and forcing simultaneous innovation in electronic warfare, interceptor drones, air-defence adaptation, decoys, fibre-optic links, and AI-assisted target recognition.[17] Sauser similarly argues that the widespread employment of UAS in the Russo-Ukrainian war has transformed operational warfare by combining new weapons, new organizations, and new ways of war, especially through persistent surveillance, deep strike, operational shaping, and changes in command and control.[18] These arguments are directly relevant to the Black Sea, where maritime denial is produced not by drones alone, but by their integration with surveillance, strike, and adaptation cycles.

Hybrid warfare remains relevant, but it should not be the article's primary framework. Russia's war against Ukraine includes disinformation, cyber operations, economic pressure, energy coercion, lawfare, influence operations, and attempts to manipulate domestic and international audiences. The literature on Russian influence operations describes hybrid threats as combinations of military and non-military, covert and overt means, including disinformation, cyber-attacks, economic pressure, irregular armed groups, and regular forces, often designed to blur the line between war and peace.[19] This broader context matters for the Black Sea, where naval coercion, energy routes, information narratives, and infrastructure vulnerability intersect. Yet hybrid warfare does not fully explain why unmanned systems have altered

[17] "Report on UAS," pp. 9-10.

[18] Mark K. Sauser, "Unmanned Aircraft and the Revolution in Operational Warfare: Preparing the U.S. Army for the Age of Unmanned Systems," in *Military Review*, vol. 105, no. 4, July–August 2025, pp. 55–62.

[19] Holger Mölder, Vladimir Sazonov, Ramon Loik, "Challenges to Homeland Security in Countering Latent Hybrid Threats during the War in Ukraine: The Case of Estonia," in Vladimir Sazonov, Holger Mölder, Zdzisław Śliwa, Oleksandr Pakhomenko, and Ilimar Ploom (eds.), *Russian Influence Operations and the War in Ukraine*, Cham: Springer, 2024, pp. 235-261.

Russian naval behaviour. The central issue is not ambiguity alone, but operational denial under conditions of maritime constraint.

Hybrid warfare is therefore a secondary contextual lens. It situates the Black Sea within Russia's wider repertoire of coercive instruments, but the main explanatory work is done by strategic studies. Drone warfare in the Black Sea is a problem of how a weaker actor can use dispersed, attritable, networked systems to raise the cost of adversary maritime action; how geography amplifies denial; how persistent surveillance and precision strike alter operational freedom; and how NATO should adapt when naval superiority no longer guarantees maritime access, infrastructure security, or freedom of manoeuvre in semi-enclosed seas.

The framework rests on four propositions: the Black Sea case is one of distributed maritime denial rather than sea control; drones matter through cost imposition, risk generation, and behavioural change, not only physical destruction; drones become strategically consequential through integration with ISR, missiles, electronic warfare, industrial production, and adaptive organizations; and hybrid warfare remains relevant to the wider conflict environment, but strategic studies provides the sharper framework for explaining drone-enabled maritime denial.

Semi-Enclosed Seas and the Logic of Constrained Maritime Warfare

The strategic effects of drone warfare cannot be understood without geography. Drones operate in theatres shaped by distance, coastlines, ports, chokepoints, surveillance density, infrastructure exposure, and political constraints. This is why the Black Sea matters as more than a regional case. In open-ocean theatres, naval power can exploit depth, mobility, dispersal, and multiple axes of manoeuvre. In constrained maritime spaces, routes are more predictable, bases more exposed, coastlines closer, and surveillance denser. These conditions make it easier for small, dispersed, low-cost systems to generate disproportionate strategic effects.

Semi-enclosed seas are not simply smaller versions of open seas. Their strategic logic is different because they compress operational space and narrow the distinction between maritime, air, land, and infrastructure warfare. Naval bases, shipping corridors, offshore infrastructure, coastal radars, air-defence systems, ports, bridges, and river mouths are often within reach of missiles, aircraft, drones, or special operations. In the Black Sea, attacks on

ports, grain infrastructure, naval vessels, air-defence systems, logistics nodes, and coastal facilities all belong to the same operational ecosystem. The March 2026 report on unmanned systems captures this feature by describing the Black Sea as both geographically bounded and strategically open: it connects energy routes, grain exports, Danube access, offshore infrastructure, coastal military facilities, and the maritime approaches of NATO members and partners.[20]

Bounded geography and strategic openness are central to drone-enabled denial. In a constrained sea, maritime drones do not need blue-water endurance; they can be launched from dispersed coastal positions, hidden infrastructure, modified vessels, or improvised facilities. Aerial drones can support reconnaissance, targeting, communications relay, and strike, while coastal missiles and long-range precision systems can be integrated into the same denial architecture. The resulting system does not need to defeat an enemy fleet in a decisive battle. It needs to impose persistent uncertainty: ships must consider USV attack, ports must defend against aerial and maritime drones, logistics nodes become vulnerable, and naval commanders must devote more resources to force protection.

The Black Sea is especially conducive to this logic because it combines physical constraint with legal and political constraint. Turkey's control of the Straits under the Montreux Convention gives the Black Sea a distinctive access regime. Aydın emphasizes that the Montreux regime limits warships of non-littoral countries in the Black Sea and has long been central to Turkey's effort to preserve regional balance.[21] Since the full-scale invasion, this access regime has also shaped the ability of both Russia and NATO to reinforce naval presence in the region. Harrel notes that Turkey's closure of the Bosphorus and Dardanelles to non-Black Sea riparian state warships barred Russia from reinforcing the Black Sea Fleet from the Mediterranean, while also preventing NATO ships from entering the nearly landlocked sea.[22]

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[20] "Report on UAS," pp. 3-4.

[21] Mustafa Aydın, "Turkey's Black Sea Policies (1991–2023) and Changing Regional Security Since the Russian Invasion of Ukraine," in Kakachia, Malerius, and Meister (eds.), *op. cit*., pp. 100–102.

[22] John S. Harrel, *The Russian-Ukrainian War, 2023: A Second Year of Hell and the Dawn of Drone Warfare*, Barnsley: Pen & Sword Military, 2024, chapter 25.

Constrained access changes the meaning of naval superiority. When extra-regional reinforcement is legally and politically limited, the operational balance depends more heavily on local assets, coastal capabilities, surveillance networks, airpower, missiles, drones, and littoral resilience. The Black Sea therefore creates a paradox: Russia's conventional naval advantage has been significant, but the environment in which that advantage must be used is unusually vulnerable to denial. The fleet depends on ports, repair facilities, coastal air defence, logistics routes, and predictable movement patterns. These are precisely the vulnerabilities that unmanned systems exploit.

The region's political geography compounds this vulnerability. The Black Sea is bordered by NATO members, EU members, Russian-occupied territories, candidate and partner states, and contested spaces in the wider Black Sea and South Caucasus security complex. Kakachia, Malerius, and Meister emphasize that Russia wages its war against Ukraine to an important degree from the Black Sea Fleet and uses the waters for military supply, while Turkey can contain Russia by limiting military vessels through the Straits and has helped Ukraine open a Black Sea export corridor with the assistance of Romania and Bulgaria.[23] They also note that the war has altered security and trade dynamics across the region, directly affecting Romania through attacks on Danube port infrastructure and repeated violations of Romanian airspace by Russian drones.[24] In this environment, drone warfare cannot be separated from trade, energy, logistics, airspace, and alliance politics.

The Danube illustrates the point. Riverine access, ports, grain infrastructure, and cross-border proximity make the western Black Sea not only a naval theatre but also an economic and infrastructural battlespace. Russian attacks on Ukrainian port infrastructure near Romania show how the maritime conflict spills into NATO's southeastern flank even without deliberate attacks on NATO territory. For NATO members on the Black Sea, the drone threat is therefore simultaneously maritime, aerial, economic, and political. The March 2026 report makes this point directly, arguing that for Romania and NATO's southeastern flank, the drone problem is at once an air-defence, maritime-security, infrastructure-protection, and industrial-policy problem.[25]

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[23] Kakachia, Malerius, Meister, *art. cit*., in Kakachia, Malerius, Meister (eds.), *op. cit*., pp. 2-3.
[24] *Ibidem, loc. cit*.
[25] "Report on UAS," pp. 2-3.

The Black Sea also demonstrates how constrained maritime theatres blur the line between tactical and strategic targets. A naval vessel, a port facility, an air-defence radar, a bridge, a fuel depot, and an export corridor can all have strategic relevance because they sustain maritime access and regional coercive power. In such conditions, drones are not only weapons of attrition; they are tools of operational disruption. The UAS report's typology is useful here: maritime drones and USVs perform naval denial, strike, harassment, and decoying functions, while relay drones, battle-management tools, and AI-enabled recognition systems extend range, accelerate kill chains, and turn individual drones into a coherent system.[26] This is why the Black Sea has become a laboratory for distributed denial: the strategic effect emerges from the combination of many small systems, not the isolated performance of any single platform.

This logic travels beyond the Black Sea, but unevenly. Semi-enclosed and constrained seas share limited manoeuvre space, exposed infrastructure, proximity between adversaries, chokepoints, and high political sensitivity. Yet they differ in scale, access regimes, alliance structures, and escalation dynamics. The Baltic is the closest comparison because of its compressed geography, dense infrastructure, and proximity to Russia. The Eastern Mediterranean, Red Sea, and Persian Gulf raise related questions about drones, missiles, ports, energy infrastructure, and commercial shipping. The South China Sea is relevant as a boundary case rather than a direct analogue.

Geography therefore shapes the strategic utility of unmanned systems. Their disruptive potential is greatest where they exploit proximity, infrastructure exposure, predictable routes, limited manoeuvre space, and dense surveillance networks. The Black Sea combines these features: it is semi-enclosed, legally constrained, politically contested, infrastructure-heavy, and connected to NATO's southeastern flank. This is why Ukraine's use of drones has produced effects beyond the tactical level. The theatre has converted relatively small systems into instruments of maritime denial, operational displacement, and strategic signalling.

[26] *Ibidem*, pp. 3-4.

The Black Sea Case: Ukraine's Distributed Maritime Denial

The Black Sea case illustrates how a conventionally weaker maritime actor can contest the operational utility of a superior fleet without acquiring symmetrical naval power. Russia entered the full-scale war with major advantages at sea. Its Black Sea Fleet, the naval infrastructure of Sevastopol, the militarization of occupied Crimea, coastal missile systems, aviation, submarines, and long-range strike capabilities all appeared to provide Moscow with tools for blockade, coercion, amphibious pressure, and power projection. The Black Sea Fleet was not only a military instrument but also a symbol of Russian status, historical entitlement, and regional influence. The importance of Crimea and Sevastopol to Russian strategic thinking long predates the 2022 invasion, but the full-scale war made the peninsula's role as a military hub even more central to Moscow's regional posture.[27]

At the beginning of the war, this naval superiority mattered. Russia used the Black Sea to threaten Ukrainian ports, support missile strikes, pressure Ukraine's maritime economy, and sustain a wider strategy of coercion. The Russian withdrawal from the Black Sea Grain Initiative in July 2023 demonstrated how maritime pressure could be used against Ukraine's economy and global food markets. Harrel notes that Russia slowed inspections before leaving the deal, then immediately attacked Ukrainian port facilities and grain storage, forcing Ukraine to rely more heavily on alternative export routes through Romania and other partners.[28] This showed that the Black Sea was not simply a naval battlespace; it was also an economic and infrastructural theatre in which ports, grain terminals, shipping insurance, Danube routes, and international political support became part of the war.

Yet Russia's conventional naval advantage was constrained by geography, law, and Ukrainian adaptation. Turkey's implementation of the Montreux Convention limited naval reinforcement through the Straits. The relatively small and crowded nature of the Black Sea reduced Russian freedom of manoeuvre. The proximity of Crimea, Sevastopol, Snake Island, Odesa, the Danube ports, and Russian-controlled maritime approaches

[27] Jonathan Haslam, *Hubris: The American Origins of Russia's War against Ukraine*, Cambridge, MA: Harvard University Press, 2025, pp. 75–76.
[28] Harrel, *op. cit*., ch. 24.

created opportunities for strike, surveillance, and denial. Most importantly, Ukraine did not attempt to build a conventional fleet to match Russia's. Instead, it developed a denial architecture that used the vulnerability of Russian ships, bases, logistics, and coastal infrastructure against them. This architecture included unmanned surface vessels, aerial drones, coastal missiles, long-range strikes, ISR, special operations, digital targeting tools, and improvised innovation networks. This interpretation is supported by Raveendran's analysis of Ukraine's maritime campaign as a contemporary case of sea denial against a conventionally superior navy, in which unmanned systems, coastal missiles, and asymmetric tactics allowed Kyiv to contest Russian naval dominance without seeking symmetrical fleet competition.[29]

Harrel's description of the Black Sea battlespace is particularly revealing. He notes that a littoral defender can deny an enemy's use of an area through land-based aircraft, missiles, drones, submarines, small fast coastal craft, mobile missile batteries, and sea mines. In the Black Sea, however, Russia's fleet could not retreat into vast oceanic depth to dilute these threats. Russian ships operated in a relatively small and largely landlocked sea, crowded with neutral commercial vessels, fishing boats, pleasure craft, yachts, and container ships. This clutter made the identification of high-speed Ukrainian sea drones difficult and shortened reaction times to air and maritime drone attacks.[30] In other words, Ukraine's denial campaign worked not because the Black Sea was empty, but because it was congested, proximate, and politically sensitive.

Ukraine's early maritime campaign combined symbolic, operational, and strategic targets. Snake Island showed how a small geographic point could acquire outsized significance. Russia's initial control threatened Ukrainian maritime access and surveillance in the northwestern Black Sea; its later withdrawal after Ukrainian pressure showed the difficulty of sustaining exposed positions under strike threat. Ukrainian attacks on Russian supply ships, air-defence systems, and naval infrastructure gradually made the northwestern Black Sea more dangerous for Russian operations. The campaign

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[29] Jithin Raveendran, "Sea Denial: The Ukrainian Case Study and the Future of Naval Warfare" in *Journal of Strategic Security*, vol. 18, no. 4, 2025, pp. 96–111, https://doi.org/10.5038/1944-0472.18.4.2564.

[30] Harrel, *op. cit.*, ch. 25.

was cumulative: individual strikes did not transform the naval balance alone, but together they degraded Russian confidence in exposed assets and forward positions.

The same cumulative logic applied to Sevastopol. Ukrainian attacks on Sevastopol and vessels of the Black Sea Fleet signalled that Crimea was no longer a secure sanctuary. Harrel records that Ukraine deployed aerial and naval drones toward Sevastopol, launched missiles against Russian naval targets, and used naval drones in an October 2022 attack that damaged several Russian ships. He concludes that the drone attacks ultimately demonstrated that Sevastopol was no longer a safe harbour, contributing to the withdrawal of major elements of the Black Sea Fleet to Novorossiysk, hundreds of kilometres from Odesa.[31] This is a classic example of distributed maritime denial: the effect was not only physical damage, but the displacement of naval assets, the erosion of safe basing, and the reduction of Russian operational confidence.

The Kerch Strait Bridge further illustrates the strategic logic of Ukrainian maritime drone warfare. The bridge is both a logistical asset and a symbol of Russia's annexation of Crimea. Harrel notes that the July 2023 sea-drone attack caused spectacular damage and attracted global attention, even if the bridge proved difficult to destroy because of its engineering, scale, and structural resilience. He also emphasizes its importance as a supply line to Crimea, Zaporizhzhia, and the Black Sea Fleet, as well as its symbolic value as a prestige project for Putin.[32] The attack therefore had multiple effects: it exposed Russian vulnerabilities, signalled Ukrainian reach, threatened logistics, and challenged the narrative of Crimea as permanently secured Russian territory.

The maritime campaign also intersected with Ukraine's effort to preserve export routes. After Russia withdrew from the grain deal, Moscow declared that ships heading to Ukrainian ports would be viewed as potentially carrying military cargo. Ukraine responded by treating vessels heading to Russian ports as potential carriers of military cargo and by creating mechanisms to support shipping despite war risks. Harrel argues that the insurance problem became central, and that Ukraine established a large fund

[31] *Ibidem, loc. cit.*

[32] *Ibidem, loc. cit.*

to compensate civilian ships for damage at Ukrainian ports, while insurers partnered with the Ukrainian government to offer war-risk coverage.[33] Russia's ability to enforce a blockade was constrained by the risk that surface warships would need to move within range of Ukrainian missiles and drones, and by the danger that attacking neutral shipping could expand the war. Harrel concludes that Russia's gambit failed and that Russia lost control of the western Black Sea as NATO assisted in establishing a protected shipping lane.[34]

This episode shows that maritime denial is not limited to naval attrition. By making Russian enforcement costly and risky, Ukraine helped reopen space for export corridors, insurance mechanisms, and NATO-supported surveillance. Distributed maritime denial thus contributed to economic resilience. It did not require Ukraine to command the Black Sea; it required Ukraine to make Russian attempts at command or blockade too dangerous, escalatory, or costly to sustain fully.

The March 2026 report on unmanned systems provides a useful conceptual vocabulary for this process. It identifies maritime drones and unmanned surface vessels, including Ukrainian Magura and Sea Baby variants, as systems designed for direct strikes on ships, surveillance, harassment, decoying, attacks on port facilities, and potentially anti-air functions in some configurations. Their strengths lie in asymmetry, surprise, and the ability to exploit geography and limited defender readiness windows. Their vulnerabilities include weather, detection, close-in defensive fire, and dependence on navigation and communications. Yet their strategic value in the Black Sea derives from their ability to threaten assets whose replacement costs are vastly higher.[35] This cost-exchange logic is at the heart of distributed denial.

The report's broader typology also shows why the Ukrainian campaign cannot be reduced to sea drones alone. It identifies enabling systems such as relay drones, mothership carriers, AI-supported recognition tools, battle-management software, and data infrastructures as potentially more important than individual platforms because they extend range, accelerate targeting, reduce operator workload, and turn many individual

[33] *Ibidem*, ch. 24, *passim*.

[34] *Ibidem, loc. cit*.

[35] "Report on UAS," pp. 13-14.

drones into a coherent operational system.[36] This is crucial for understanding the Black Sea. The maritime drone is the visible part of the campaign, but the strategic effect depends on targeting data, communications, launch methods, route planning, adaptation to Russian countermeasures, and the ability to exploit geographic constraints. Drone warfare in the Black Sea is therefore system-of-systems warfare.

Ukraine's denial campaign has forced Russia into defensive adaptation. Russian ships, ports, and coastal facilities must now defend against threats from the air, the surface, and shore-based strike systems. Close-in defences, barriers, patrols, electronic warfare, surveillance, and dispersal all impose costs. Even failed attacks require alertness, repair capacity, ammunition expenditure, and command attention. The strategic effect of drones is therefore not measured only by confirmed destruction, but also by behavioural change: dispersal, hardening, protected movement, and reluctance to operate surface ships in certain areas.

The Ukrainian campaign has also changed the strategic meaning of Crimea. Since 2014, Crimea has served as the principal platform for Russian power projection into the Black Sea and beyond. It allowed Moscow to extend its military reach, threaten Ukraine's coastline, and sustain a more assertive posture toward the eastern Mediterranean and the wider region. Chiriac's analysis of Russian foreign policy highlights the naval dimension of Russia's hegemonic process in the Black Sea and Moscow's tendency to read NATO's regional presence through a realist and NATO-centric security lens.[37] Ukrainian drone-enabled denial has not reversed Russia's occupation of Crimea, but it has weakened the assumption that Crimea can function as an uncontested military sanctuary. The peninsula remains a power-projection hub, but it is now also a target-rich environment.

Maryna Vorotnyuk's analysis of Ukraine's Black Sea strategy helps place this shift in a broader political context. She notes that for much of the post-Soviet period the Black Sea was only sporadically present in Ukraine's geopolitical thinking, but that the evolving security landscape has required a different approach. Ukraine now seeks to act as a key player in the Black Sea and as a conduit for Euro-Atlantic interests, with EU and NATO membership

[36] *Ibidem*, p. 14.
[37] Chiriac, *op. cit*., pp. 75-98.

ambitions increasingly reflected in its regional strategy.[38] This strategic reorientation matters because the drone campaign is not merely a tactical improvisation. It is part of a wider shift in Ukraine's understanding of the Black Sea as essential to national survival, regional leadership, and Euro-Atlantic integration. Vorotnyuk also notes that Russia's maritime blockade severed Ukraine from traditional maritime supply chains, while the EU-Ukraine "solidarity lanes," Danube routes, and later the temporary humanitarian corridor through the territorial waters of Bulgaria, Romania, and Turkey became lifelines for Ukrainian exports.[39]

The interaction between drones and Western support should also be noted. Ukraine's maritime denial campaign has relied on domestic innovation and improvisation, but it has also depended on intelligence, training, technology, and political support from partners. Harrel records, for example, the role of NATO surveillance aircraft in monitoring early blockade-running attempts and the training of Ukrainian marines by British, Dutch, and other partners for maritime operations.[40] At the same time, Ukraine's most distinctive contribution has been its ability to integrate external support with indigenous adaptation, crowdfunding, commercial technologies, and rapid operational learning. This combination is one reason NATO should study the campaign carefully, but also one reason it should avoid assuming the model can be copied mechanically.

Ukraine's Black Sea campaign has not produced sea control. Russia retains submarines, missiles, aviation, coastal systems, and the ability to strike Ukrainian infrastructure. But classical sea control is not the relevant benchmark. Ukraine's achievement lies in preventing Russia from using its naval superiority as freely and coercively as expected. It has contested the western Black Sea, imposed costs on the Black Sea Fleet, challenged Sevastopol's security, threatened Russian logistics, complicated blockade enforcement, and helped sustain maritime export routes.

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[38] Maryna Vorotnyuk, "Black Sea as a Battlefield: Ukraine's Perspectives and Strategies in the Region," in Kakachia, Malerius, and Meister (eds.), *op. cit*., pp. 113–116.

[39] *Ibidem*, pp. 117-119.

[40] Harrel, *op. cit*., ch. 24, 25, *passim*.

Distributed maritime denial captures the Black Sea case better than the language of naval victory or defeat. Ukraine has used dispersed, networked, attritable capabilities to impose risk on high-value Russian assets and infrastructure. The campaign has blurred naval warfare, coastal defence, economic resilience, infrastructure protection, and strategic signalling. In a semi-enclosed sea, a weaker actor does not need to dominate the theatre to change its strategic logic; it can make the adversary's dominance more fragile, expensive, and politically constrained.

From Tactical Innovation to Strategic Effect

The Black Sea campaign shows that the strategic effect of drones cannot be inferred from individual strikes alone. Tactical innovation becomes strategic when it changes adversary assumptions about risk, movement, protection, logistics, and escalation. In Ukraine, drones have produced such effects because they are elements of a fast-moving adaptation cycle linking surveillance, command software, communications, electronic warfare, production, training, and strike. In the Black Sea, where the operational environment rewards persistence, deception, proximity, and low-cost experimentation, drones reshape not only what is destroyed, but the conditions under which maritime and coastal power can be exercised.

The first mechanism is the compression of the reconnaissance-strike cycle. Earlier models of precision warfare often depended on expensive sensors, aircraft, missiles, and command systems; Ukraine's drone ecosystem has helped democratize parts of that process by shortening the time between detection and attack. Ruiz's discussion of "kill-chain supremacy" in Ukraine supports this point, emphasizing that future advantage depends increasingly on the speed and integration of sensing, decision-making, and strike rather than on platform superiority alone.[41] The March 2026 report describes this as the emergence of a "reconnaissance-strike mesh," in which surveillance, machine-vision support, digital command tools, and immediate attack narrow the temporal distance between seeing and striking.[42] The implication is that unmanned systems do not merely add firepower; they change the

[41] Ashley Ruiz, "The Future of War: Kill-Chain Supremacy and Ukraine's Lessons," in *Journal of Strategic Security*, vol. 18, no. 4, 2025, pp. 53–63, https://doi.org/10.5038/1944-0472.18.4.2592.
[42] "Report on UAS," pp. 9-10.

geometry of exposure. Personnel, vehicles, logistics nodes, ports, ships, radars, bridges, and coastal defences that might previously have survived through concealment, intermittent movement, or distance now face persistent observation and relatively inexpensive attack. In the Black Sea, this creates a continuous targeting problem for Russia: the fleet does not have to be destroyed wholesale for its operational value to decline; it is enough that each movement, port call, repair cycle, or logistics operation becomes more vulnerable.

The second mechanism is adaptation under electronic warfare pressure. The Russia-Ukraine war has become a contest not only between drones and targets, but between drones and counter-drone systems. Radio links, GPS guidance, and remote piloting are vulnerable to jamming, spoofing, and detection. Colom Piella and Marzal Ruano's analysis of Russian electronic warfare is useful here because it shows that the electromagnetic contest has been uneven and adaptive, rather than a one-sided Russian advantage.[43] As electronic warfare has proliferated, both sides have had to develop alternative communications, navigation, and guidance methods. Russia's own drone adaptation followed a similar logic of rapid battlefield learning: Bendett shows that Moscow has relied on a mix of domestic and imported systems, including Orlan-10 reconnaissance UAVs, Lancet and KUB loitering munitions, and Iranian Shahed/Geran systems, while adapting despite sanctions, component constraints, and dependence on foreign technologies.[44] The March 2026 report identifies countermeasure escalation as one of the defining shifts of the war, including frequency agility, terrain masking, machine-vision assistance, improved terminals, and fibre-optic-linked FPV systems.[45]

Fibre-optic FPV drones illustrate this adaptation cycle. GIS reporting from Ukrainian drone workshops describes them as an increasingly important subset of munitions-delivery platforms in electronic warfare-jammed or GPS-denied airspace; by reducing dependence on radio-frequency links,

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[43] Guillem Colom Piella and Cristina Marzal Ruano, "Has Russian Electronic Warfare Underperformed in the Ukrainian Conflict?," in *Journal of Strategic Security*, vol. 18, no. 4, 2025, pp. 78–95, https://doi.org/10.5038/1944-0472.18.4.2369.

[44] Samuel Bendett, "Russian Military Drones: Established and Emerging Technologies in Ukraine," in Rogers (ed.), *op. cit.*, pp. 285–298.

[45] "Report on UAS," p. 10.

they complicate traditional jamming.[46] The same reporting contrasts Ukrainian and Russian approaches: Ukrainian engineers seek fine-tuned efficiencies under conditions of scarcity, while Russia is described as relying more heavily on volume and saturation once a validated concept can be scaled.[47] The strategic point is not that one model is inherently superior, but that drone warfare has become an innovation race between precision, adaptation, and mass. Distributed maritime denial depends on precisely this kind of rapid learning: low-cost systems must survive long enough, penetrate defences often enough, and adapt quickly enough to preserve their cost advantage.

The third mechanism is cost exchange. Drones matter strategically when they force the adversary to spend more to defend than the attacker spends to threaten. One-way attack drones can saturate air defences, force repeated intercept decisions, and compel defenders to protect broad target sets over time. The March 2026 report notes that even when large percentages of drones are intercepted or fail to achieve intended effects, volume can impose strategic burdens by depleting air-defence stocks, pressuring repair networks, exhausting civilian populations, and requiring continuous alerting.[48] In the maritime domain, the cost-exchange problem is even sharper: relatively inexpensive USVs can threaten high-value naval platforms, port facilities, and logistics assets whose replacement and protection costs are much higher.[49] Davis's analysis of cheap drones as creating a "mass effect" reinforces this logic, especially where inexpensive precision systems challenge traditional assumptions about concentration, survivability, and procurement.[50] Advanced navies and air forces are built around expensive platforms, trained crews, sophisticated logistics, and complex maintenance systems. Drone-enabled denial threatens these systems not by matching them symmetrically, but by forcing them to defend continuously against cheap, dispersed, attritable threats.

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[46] Paul Schwennesen, "Eyewitness to War: Ukraine's DIY Drones Defy Russian Jamming," *GIS Reports*, 2026, https://www.gisreportsonline.com/r/ukraine-diy-drones/.

[47] *Ibidem, loc. cit*.

[48] "Report on UAS," pp. 9-10.

[49] *Ibidem*, pp. 13-14.

[50] Erik A. Davis, "Drones and the Changing Character of War," in *Parameters*, vol. 55, no. 4, 2025, pp. 75–97, https://doi.org/10.55540/0031-1723.3369.

The fourth mechanism is operational displacement. In the Black Sea, Ukraine's campaign has mattered not only through destruction, but through the displacement of Russian naval activity, the hardening of ports, the reduction of Russian freedom of manoeuvre in the western basin, and the growing burden of defending Crimea and Novorossiysk. This links drone warfare to deterrence by denial rather than simple attrition. If Russian ships avoid certain areas, remain in port, move farther east, operate under heavier protection, or become less useful for coercive signalling, then Ukraine's denial campaign has achieved strategic effects without achieving sea control.

The fifth mechanism is institutionalized innovation. Early accounts of Ukrainian drone warfare emphasized improvisation, crowdfunding, volunteer networks, commercial technologies, and battlefield ingenuity. These remain important, but the war has moved beyond improvisation alone. The March 2026 report argues that Ukraine's unmanned systems are no longer simply bottom-up improvisations: the state has invested in doctrine, procurement, digital command tools, public-private scaling, allied integration, battlefield data, and AI model training.[51] Schwennesen similarly highlights Ukraine's Delta battlefield software platform, which fuses data from drones, satellites, sensors, and human intelligence into a dynamic operational picture.[52] In the Black Sea context, such digital integration is essential because maritime denial depends on finding, tracking, classifying, and striking mobile or defended targets across multiple domains. The strategic value of Ukraine's model lies not in any single weapon, but in the way military units, engineers, software developers, private firms, volunteers, and external partners have compressed the cycle between battlefield need and technical response.

The sixth mechanism is the shift from tactical visibility to operational paralysis. Sauser argues that UAS employment in the Russo-Ukrainian war has created conditions of near-persistent surveillance that challenge traditional concepts of operational surprise; at Avdiivka, Ukrainian corps-level commanders reportedly used UAS not merely as tactical assets but as integrated elements of operational design.[53] The same logic applies at sea. If movement is

[51] "Report on UAS," p. 10.

[52] Schwennesen, *art. cit*.

[53] Sauser, *art. cit*., pp. 55-56.

increasingly visible and exposed to rapid strike, then concealment, dispersion, deception, and electromagnetic discipline become as important for navies as for ground forces. Jójárt's analysis of Russian military thought links the war in Ukraine to the concept of the transparent battlefield and to debates over how pervasive sensing and precision strike constrain manoeuvre.[54] Williams also connects this evolution to wider NATO and U.S. military adaptation, arguing that the Ukraine war points toward more decentralized forms of warfare while warning that drones will not remove the need for soldiers and may reinforce Western illusions of technologically enabled "easy war."[55]

This does not mean that drones have resolved the war or produced decisive strategic victory. Williams reaches a similar conclusion, arguing that the Ukraine war represents an evolution rather than a full revolution in warfare: drones have become integral across domains, but they complement rather than replace soldiers, tanks, artillery, and other traditional capabilities.[56] De Wijk likewise cautions that drones have transformed warfare but have not yet forced operational or strategic breakthroughs; they have economized offense, compensated for shortages, accelerated tactical adaptation, and created wide kill zones, but have not by themselves translated tactical success into strategic victory.[57] This caution is consistent with Rossiter and Cannon's comparative assessment from Libya to Ukraine, which shows that drones can produce tactical and operational advantages without necessarily deciding wars by themselves.[58] The Black Sea case should therefore be read not as proof of a universal drone revolution, but as evidence that drones alter the cost, risk, and vulnerability structure of specific theatres, especially constrained maritime environments.

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[54] Krisztián Jójárt, "The War Against Ukraine Through the Prism of Russian Military Thought," in *Journal of Strategic Studies*, vol. 47, no. 6–7, 2024, pp. 801–831, https://doi.org/10.1080/01402390.2024.2414079.

[55] Michael John Williams, "Drones All the Way Down: The Evolution of (Remote) War on the Battlefields of Ukraine, 2022–2025," in Rogers and Hutto (eds.), *op. cit*., pp. 205–229.

[56] *Ibidem, loc. cit*.

[57] Rob de Wijk, "Drones Transform Warfare but Not Strategic Outcomes," *GIS Reports*, 2026, https://www.gisreportsonline.com/r/drones-warfare-strategic-outcomes/.

[58] Ash Rossiter and Brendon J. Cannon, "Game-Changing Drones? The Record from Libya to Ukraine," in Rogers (ed.), *op. cit*., pp. 325–341.

The limits of drone warfare are also visible in the counter-drone race. As drones proliferate, countermeasures proliferate as well. Mittal and Goetz's quantitative study reinforces this point, showing that the Russia-Ukraine battlefield is shaped by the interaction between drone and counter-drone systems rather than by drones acting as unopposed tactical instruments.[59] GIS reporting identifies a wide range of counter-drone technologies and practices, including nets, metal cages, electronic warfare, radars, radio-frequency analysers, optical and acoustic sensors, GPS spoofers, lasers, directed-energy systems, and interceptor drones.[60] The March 2026 report similarly emphasizes that interceptor and counter-UAS drones may restore an affordable middle layer in air defence.[61] In the maritime domain, analogous defences include barriers, patrol boats, close-in weapons, electronic surveillance, sonar, rapid-reaction teams, aerial overwatch, and port-defence systems. The result is not a final victory of drones over ships, but an ongoing cycle of adaptation.

The strategic effect of tactical innovation therefore depends on endurance. Ukraine's drone campaign has been effective because it has repeatedly shortened the innovation loop: battlefield experience identifies a problem, engineers and operators generate technical solutions, units test them, and the results feed back into production and doctrine. GIS reporting concludes that the conflict is likely to resemble a technical arms race rather than produce decisive breakthroughs, with temporary advantage going to the side that shortens its innovation loop.[62] For the Black Sea, these mechanisms combine into a single strategic pattern: drones compress reconnaissance and strike; electronic warfare forces adaptation; cost exchange favours attritable threats against expensive assets; operational displacement reduces the utility of Russian naval superiority; institutionalized innovation sustains pressure; and counter-drone systems create a continuous arms race. This is why tactical drone innovation has produced strategic effects in the Black Sea without producing conventional sea control. Ukraine's campaign has not

[59] Vikram Mittal and John Goetz, "A Quantitative Analysis of the Effects of Drone and Counter-Drone Systems on the Russia-Ukraine Battlefield," in *Defense & Security Analysis*, vol. 41, no. 3, 2025, pp. 490–503, https://doi.org/10.1080/14751798.2025.2479973.

[60] De Wijk, *art. cit*.

[61] "Report on UAS," p. 13.

[62] Schwennesen, *art. cit*.

removed Russia from the maritime theatre, but it has changed the operational calculus of Russian naval power.

NATO Lessons: Adaptation, Not Imitation

The Black Sea campaign offers NATO urgent but specific lessons. Ukraine's approach emerged from existential war, conventional naval inferiority, proximity to Russian assets, improvisation, external support, commercial technologies, and rapid battlefield learning. NATO is a large alliance with different political constraints, procurement systems, force structures, legal obligations, and escalation responsibilities. Its task is therefore adaptation rather than imitation: it must absorb the logic of distributed denial while adjusting it to alliance doctrine, high-end deterrence, infrastructure defence, and regional maritime security.

The first lesson is that NATO should treat distributed denial as a central element of maritime deterrence in constrained theatres. Ukraine has shown that a weaker maritime actor can reduce the operational utility of a superior fleet by making ships, ports, bridges, logistics nodes, and coastal infrastructure persistently vulnerable. For NATO, maritime defence in semi-enclosed seas cannot rely only on large platforms, periodic deployments, and traditional air and missile defence. It requires layered systems combining coastal sensors, drones, missiles, mines, electronic warfare, air defence, maritime surveillance, cyber resilience, and mobile launch capabilities. The objective is not to control every maritime space at all times, but to prevent an adversary from using that space for coercion, blockade, power projection, or infrastructure attack without facing unacceptable operational risk. This logic is particularly relevant in the Black Sea because, as Chiriac argues, Russia has long used unconventional and coercive instruments in the region while pursuing a realist foreign policy rooted in national interest, regional influence, and resistance to NATO's eastward presence.[63] NATO's own Black Sea posture has evolved unevenly: MacFarlane notes that Russia's 2022 attack pushed the Alliance back toward deterrence and defence and activated NATO thinking about the Black Sea, but also stresses that institutional

[63] Chiriac, *op. cit.*, pp. 75–98, 137–152.

weaknesses still complicate NATO's enlarged regional role.[64] The Black Sea has moved from relative peripherality to strategic concern, but NATO still lacks the region-specific architecture that drone-enabled threats require.

The second lesson is that drones must be understood as ecosystems rather than platforms. The Ukrainian campaign has worked because drones are integrated with ISR, communications, software, electronic warfare, targeting networks, human intelligence, commercial supply chains, and rapid battlefield feedback. This is directly relevant for NATO, whose technological advantage often lies in high-end systems, but whose procurement cycles are slow and whose command structures are complex. The March 2026 report compares Ukrainian, Russian, and NATO/European adaptation models and argues that NATO's strategic lesson is to combine scale, affordability, and interoperability: Ukraine's strength lies in decentralized, operator-driven innovation, Russia's in scaling selected systems to volume, and NATO/Europe's in high-end systems and alliance integration, but slow acquisition cycles and defensive cost-exchange problems remain weaknesses.[65] NATO cannot adapt to drone-enabled denial if it buys expensive systems in small numbers while adversaries produce cheap drones, decoys, and munitions at scale. It needs a balanced defence stack in which high-end systems remain available for ballistic missiles, cruise missiles, aircraft, and sophisticated threats, while cheaper effectors, interceptor drones, non-kinetic systems, mobile sensors, passive defences, and point-protection systems handle lower-cost drone threats. The report makes this point explicitly: relying on expensive missile interceptors against every small unmanned threat is economically unsustainable, and effective defence must include cheaper effectors, non-kinetic tools, point defences, mobile sensors, passive protection, and increasingly interceptor drones.[66]

The third lesson concerns counter-UAS, counter-USV, and infrastructure defence. Counter-drone capabilities can no longer be treated as niche force protection; they are central to operational endurance, especially where drone incursions, ambiguous tracks, and multi-vector attacks may become normalized. Haider emphasizes that there is no one-size-fits-all counter-UAS solution,

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[64] S. Neil MacFarlane, "NATO and Black Sea Security," in Kakachia, Malerius, and Meister (eds.), *op. cit*., pp. 41–43.

[65] "Report on UAS," pp. 17-18.

[66] *Ibidem*, pp. 18-19.

since unmanned threats vary by size, operating environment, command links, autonomy, and legal context. He also stresses that counter-UAS is not simply an anti-air activity, but must address the entire unmanned system, including ground installations, data links, computer networks, logistics, support equipment, and personnel.[67] For NATO, this means that drone defence must span military, civilian, technological, legal, and infrastructure domains.

The Black Sea makes this particularly clear. The regional air and maritime picture must integrate national air-defence networks, NATO air policing, coastal radars, maritime surveillance, civilian aviation data, and cross-border information-sharing mechanisms. The operational challenge is not only to shoot efficiently, but to classify, track, decide, and act quickly enough to be lawful and effective. The March 2026 report highlights this command-and-control problem directly: small drones challenge classification, tracking, and engagement authority, and the Black Sea is especially exposed because civil and military sensors cannot remain poorly integrated in a theatre marked by repeated incursions, ambiguous tracks, and multi-vector attacks.[68] This is therefore an alliance governance issue as much as a technical one.

Infrastructure protection follows from the same logic. Ports, repair facilities, fuel depots, grain terminals, bridges, energy infrastructure, offshore platforms, undersea cables, river mouths, and border regions are not rear-area concerns; they are part of the battlespace. NATO's southeastern flank is particularly vulnerable because the Black Sea adds maritime chokepoints, Danube approaches, offshore energy assets, and cross-border drone incidents to the more familiar air and missile defence problem. The March 2026 report argues that Romania, Bulgaria, and Turkey face requirements distinct from inland allies, including coastal and riverine UAS detection, protection of ports and energy nodes, resilient communications, and protocols for objects moving between Ukrainian airspace, international waters, and NATO territory.[69] Ukraine's wartime reliance on Romania further shows that maritime resilience

[67] André Haider, "Countering Unmanned Aircraft Systems," in Rogers (ed.), *op. cit.*, pp. 399–416.

[68] "Report on UAS," pp. 18-19.

[69] *Ibidem, loc. cit.*

depends on regional connectivity as much as military capability: Vorotnyuk notes that Romania became a crucial partner for Ukraine through bilateral and minilateral formats, while Romanian ports acquired particular importance as alternative export routes under Russia's maritime blockade.[70]

This is also why NATO's adaptation must be theatre-specific. The Baltic and Black Sea both face Russian coercion, but they are not identical. The Black Sea has the Montreux regime, Turkey's gatekeeper role, Ukraine's war economy, Romania and Bulgaria's exposed maritime infrastructure, Danube routes, offshore energy, and Russian military assets in Crimea and beyond. MacFarlane notes that Russia's invasion of Ukraine has put NATO's collective defence mission at risk and that a Russian victory would affect eastern NATO members, including Romania and Bulgaria; he also points to Russian missile attacks on Ukrainian ports near Romania and the risk of accidental attack on Alliance territory.[71] This makes southeastern flank defence more than an Article 5 abstraction: it is already exposed to the spillover effects of drone and missile warfare.

The fourth lesson is that maritime resilience is economic as well as military. Russia's pressure on Ukrainian ports and grain exports demonstrated that maritime coercion can affect food prices, insurance markets, shipping behaviour, and political stability far beyond the immediate theatre. MacFarlane links the Black Sea blockade and attacks on Ukrainian ports to global grain markets and food supply challenges in the Mediterranean and Africa, while noting that Ukraine later established an alternative maritime route along the Romanian and Bulgarian coasts.[72] For NATO, maritime security cannot be separated from commercial shipping, port resilience, insurance, energy security, and infrastructure protection. A drone attack that does not sink a major warship may still have strategic effects if it disrupts trade, raises insurance costs, or exposes gaps in Alliance protection.

The fifth lesson concerns alliance endurance and industrial resilience. Ukraine's model has relied on domestic adaptation, but also on Western military, financial, intelligence, and technological support. Fix and Kimmage argue that Ukraine's army has become heavily reliant on Western equipment

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[70] Vorotnyuk, *art. cit*., in Kakachia, Malerius, and Meister (eds.), *op. cit*., pp. 111–128.

[71] MacFarlane, *art. cit*., in *ibidem*, pp. 48-49.

[72] *Ibidem*, pp. 49-50.

and strategic planning, and that Ukrainian strategists have benefited from targeting assistance and intelligence-sharing from the United States and other partners.[73] They also warn that continued Western commitment cannot be guaranteed and that the slow unravelling of assistance would seriously endanger Ukraine.[74] NATO's drone lessons are therefore political as well as operational: long wars test public support, production capacity, budgetary planning, and alliance cohesion. If NATO wants Ukraine's innovation to remain strategically meaningful, support must be institutionalized rather than dependent on episodic urgency.

Industrial scale is equally important. Drone warfare rewards production depth, repair capacity, component access, software iteration, and affordable mass. GIS Reports notes that Ukraine's drone sector expanded from 41 companies in 2022 to 132 in 2023 and 183 in 2024, with estimated production of 4.5 million drones in 2025, while European-Ukrainian joint ventures and initiatives such as LEAP point to emerging NATO/EU adaptation.[75] NATO and European states have often excelled at high-end platforms but struggled with speed, volume, and affordability. The March 2026 report notes that Europe is increasingly discussing not only how to defend against drones, but how to mass-produce effectors cheaply enough to avoid exhaustion, including through initiatives such as the European Five's LEAP initiative and the U.S. Replicator 2 program.[76] A state or alliance that cannot replace interceptors, sensors, drones, and components quickly enough may lose the cost-exchange competition even if it retains superior technology.

This industrial lesson cannot be separated from interoperability. NATO's strength lies in alliance integration, but drone warfare exposes friction points in multinational defence: incompatible systems, national procurement rules, data-sharing restrictions, classification barriers, uneven readiness, and supply-chain dependencies. Williams warns that China's near-total dominance of small commercial drone production should concern the United States and

[73] Liana Fix and Michael Kimmage, "Will the West Abandon Ukraine? Kyiv Must Prepare for a Possible Change of Heart in America and Europe," in *Foreign Affairs*, September 12, 2023, https://www.foreignaffairs.com/united-states/will-west-abandon-ukraine.
[74] *Ibidem, loc. cit*.
[75] De Wijk, *art. cit*.
[76] "Report on UAS," pp. 18-19.

its allies as drones become more deeply embedded across military formations.[77] The Black Sea requires integrated air and maritime awareness across Romania, Bulgaria, Turkey, Ukraine, and wider NATO structures, yet each actor has different legal authorities, threat perceptions, and operational roles. A counter-UAS architecture trapped in national silos will be insufficient against drones that cross airspace boundaries, operate near civilian infrastructure, or exploit gaps between military and law-enforcement responsibilities. Haider's emphasis on civil-military coordination is especially relevant because peacetime and below-threshold counter-UAS operations often involve legal constraints and divided authorities.[78]

Finally, NATO should avoid a simplistic "drone revolution" narrative. The Black Sea does not prove that large navies are obsolete or that low-cost systems always defeat expensive ones. It shows that expensive systems are increasingly vulnerable when they operate in constrained environments without layered defences, dispersal, deception, and rapid adaptation. High-end naval and air assets remain indispensable for deterrence, command, logistics, air defence, strike, and alliance signalling, but their survivability now depends more heavily on integration with lower-cost systems, unmanned platforms, passive defences, and distributed sensors. Sauser similarly characterizes drone use in the Russo-Ukrainian war as constrained innovation within existing military paradigms, reinforcing the article's claim that drones reshape operational practice without abolishing older requirements of war.[79]

NATO must translate battlefield improvisation into sustainable deterrence. Ukraine's drone ecosystem benefited from experimentation and risk tolerance that peacetime alliances often struggle to reproduce. NATO's challenge is to institutionalize adaptation without losing speed. This requires flexible procurement, rapid testing, modular systems, operational feedback loops, and closer cooperation with private industry. It also requires accepting that some capabilities must be cheap, replaceable, and produced at scale rather than exquisite, scarce, and slow to field.

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[77] Williams, *art. cit.*, in Rogers and Hutto (eds.), *op. cit.*, pp. 205–229.

[78] Haider, *art. cit.*, in Rogers (ed.), *op. cit.*, pp. 400-416.

[79] Mark Sauser, "Constrained Innovation: Drones and the Russo-Ukrainian War," in *Survival*, vol. 68, no. 1, 2026, pp. 127–148, https://doi.org/10.1080/00396338.2026.2620295.

The Limits of Transferability: Drone-Enabled Denial in Other Maritime Theatres

The Black Sea case has wider significance, but its lessons should not be universalized. Drone-enabled maritime denial depends on geography, infrastructure, surveillance density, legal regimes, political constraints, alliance structures, and the nature of the conflict. The Black Sea demonstrates how unmanned systems can amplify denial in a semi-enclosed theatre, but portability varies. The Baltic Sea offers the closest NATO-relevant analogue; the Eastern Mediterranean, Red Sea, and Persian Gulf share some features of constrained maritime vulnerability; and the South China Sea is a boundary case where drones may matter more for surveillance, attribution, and grey-zone competition than open wartime denial.

The Baltic Sea is the most direct comparison because it shares several structural features with the Black Sea: constrained geography, exposure to Russian coercion, critical ports, energy infrastructure, undersea cables, coastal facilities, dense civilian traffic, and short-range military vulnerabilities. Chiriac notes that in both the Baltic and Black Seas, Russia remains the regional military power, even though NATO faces the same strategic competitor in both bodies of water. The difference has long been political: Baltic states and their partners developed a stronger shared threat perception, while Black Sea states were more divided.[80] Joja makes a similar point, contrasting Baltic regional cohesion and successful advocacy for NATO/EU attention with the more fragmented Black Sea environment, where Romania, Bulgaria, Turkey, Georgia, and Ukraine historically differed in their readings of Russia and preferred regional posture.[81] This comparison suggests that drone-enabled denial is not merely a technical problem, but also a political-coalitional one: technology alone does not produce security adaptation.

The Baltic is operationally relevant because the conditions favouring distributed denial are concentrated there: compressed geography, NATO littorals after Finland and Sweden's accession, proximity to Russian assets in Kaliningrad and the Gulf of Finland, and exposed ports, cables, pipelines, air-defence systems, and maritime routes. A Black Sea-style logic could

[80] Chiriac, *op. cit.*, pp. 129-130.

[81] Iulia-Sabina Joja, "Russia's War Against Ukraine: Its Impact on Romania's Black Sea Policy," in Kakachia, Malerius, and Meister (eds.), *op. cit.*, pp. 129–144.

apply in two directions. NATO could use unmanned systems, coastal missiles, sensors, and mines to complicate Russian freedom of manoeuvre; Russia could use drones, cyber tools, sabotage, and long-range strike to threaten NATO ports, logistics, and infrastructure. The Baltic will not replicate the Black Sea war, but semi-enclosed geography magnifies the interaction between drones, infrastructure, and deterrence.

The Eastern Mediterranean, Red Sea, and Persian Gulf represent partial applicability. Each contains chokepoints, commercial shipping vulnerabilities, energy infrastructure, and dense political competition. In these theatres, drones and missiles can impose costs on shipping, ports, energy assets, and naval forces even when the user lacks conventional naval superiority. The Red Sea shows how low-cost systems can disrupt international shipping and impose disproportionate defensive costs; the Persian Gulf similarly illustrates how geography, energy infrastructure, and proximity amplify missiles, drones, mines, and small craft. Their relevance lies in constrained maritime vulnerability, not direct replication of Ukraine's campaign.

The South China Sea is the most important boundary case. It is relevant because unmanned systems, surveillance, infrastructure, legal disputes, and great-power competition intersect there, but it should not be treated as equivalent to the Black Sea. The South China Sea is larger, more archipelagic, more open to oceanic manoeuvre, and embedded in a wider Indo-Pacific competition involving China, the United States, ASEAN claimants, Taiwan, Japan, Australia, and others. The political context also differs because many non-Western powers have not interpreted the Ukraine war through the same democracy-versus-autocracy lens as Western governments, which makes the transfer of Black Sea lessons into Indo-Pacific strategic politics more complex.[82] Unlike the Black Sea, the South China Sea is not presently defined by open interstate war between two littoral actors in which one side uses drones to offset a superior fleet. It is instead a theatre of grey-zone coercion, coast guard pressure, maritime militia operations, artificial island militarization, lawfare, surveillance competition, and freedom-of-navigation disputes.

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[82] Shivshankar Menon, "Out of Alignment: What the War in Ukraine Has Revealed About Non-Western Powers," in *Foreign Affairs*, February 9, 2023, https://www.foreignaffairs.com/world/out-alignment-war-in-ukraine-non-western-powers-shivshankar-menon.

Precisely for that reason, the South China Sea clarifies the limits of the Black Sea model. In the Black Sea, drones have been used primarily for wartime denial, strike, and operational displacement. In the South China Sea, unmanned systems may initially matter more for intelligence collection, persistent monitoring, attribution, evidence-gathering, maritime domain awareness, crisis signalling, and legal contestation. The 2016 U.S.-China underwater drone incident illustrates this different logic: unmanned systems in the South China Sea may operate first as tools of surveillance, intelligence-gathering, legal signalling, and grey-zone contestation rather than as instruments of kinetic denial.[83] Reporting collected in *Drone Warfare* describes the South China Sea as one of the world's busiest commercial and military waterways and notes that the seized drone was viewed by American experts as potentially linked to monitoring China's submarine buildup and naval activity.[84] The same reporting presents the incident as a deliberate challenge and low-level provocation that involved contested maritime conduct, intelligence collection, and legal signalling without direct loss of life.[85] In a crisis or conflict, however, unmanned systems could shift toward denial roles, including island defence, dispersed sensing, anti-ship targeting, mine countermeasures, decoy operations, and attacks on exposed infrastructure. The Black Sea therefore warns what unmanned systems can become in wartime, while the South China Sea shows how similar technologies may operate below the threshold of war.

The Black Sea also provides lessons for smaller and middle powers beyond NATO. The appeal of drone-enabled denial lies in asymmetric resilience: states that cannot match larger adversaries in conventional naval tonnage may seek to impose costs through sensors, drones, missiles, cyber capabilities, mines, and resilient coastal defence. Rogers's account of the "Second Drone Age" is useful here because it frames contemporary drone warfare as a period of widening diffusion in which drones are no longer dominated by Western counterterrorism use, but are increasingly accessible to states and non-state actors across multiple theatres.[86] Yet diffusion is

[83] The New York Times Editorial Staff (eds.) *Drone Warfare*, New York: New York Times Educational Publishing/Rosen Publishing, 2020, pp. 85–89.

[84] *Ibidem, loc. cit*.

[85] *Ibidem, loc. cit*.

[86] Rogers, *art. cit*., in Rogers (ed.), *op. cit*., pp. 237-242.

uneven. It depends on industrial capacity, access to components, software expertise, battlefield data, training, doctrine, and the ability to integrate drones into wider command systems.

Black Sea lessons travel most directly to theatres combining six features: compressed waters; proximity between adversary coastlines and military infrastructure; exposed ports, bridges, energy nodes, and logistics systems; dense ISR and electromagnetic contestation; limits on reinforcement or freedom of manoeuvre; and strong political incentives to avoid escalation while contesting maritime access. They travel partially where these features appear in weaker combinations, and least directly where the theatre is larger, more open, more archipelagic, more grey-zone oriented, or embedded in broader great-power naval competition.

This reinforces the article's claim that NATO should adapt rather than imitate. The Baltic requires distributed denial and infrastructure defence; the Black Sea requires southeastern flank resilience, Danube and port protection, counter-UAS integration, and careful management of the Montreux regime; the Eastern Mediterranean requires attention to energy infrastructure, contested maritime zones, and Turkey's regional role; the Red Sea and Persian Gulf require shipping protection; and the South China Sea requires maritime domain awareness, attribution, partner capacity, and grey-zone resilience. The common thread is not one drone doctrine, but sensitivity to the geography and politics of each theatre.

The Black Sea is both a model and a warning. It shows how drones can help a weaker actor impose costs on a superior naval force, but also that such effects depend on local conditions. Geography, infrastructure, law, alliance politics, and adaptation cycles determine whether drones become tactical nuisances, tools of grey-zone signalling, or instruments of strategic denial. Maritime strategy is therefore becoming less platform-centric and more environment-centric. The question is not simply what drones can do, but where, under what conditions, and as part of which wider system of deterrence, resilience, and escalation control.

Conclusion: Maritime Power Under Drone-Enabled Denial

The Black Sea campaign should be read less as a story about the triumph of drones than as evidence of a changing relationship between maritime power, geography, and vulnerability. Its central lesson is not that conventional navies are obsolete, nor that unmanned systems can substitute for strategy. Rather, the case shows that in semi-enclosed seas, where distance is compressed and infrastructure is exposed, relatively cheap and adaptable systems can alter the cost structure of naval power. The most important transformation is therefore relational: drones change what ships, ports, bases, bridges, logistics corridors, and coastal infrastructure mean inside a constrained battlespace.[87]

This article has used the concept of distributed maritime denial to capture that change. Distributed denial does not require the weaker actor to command the sea. It requires the ability to make an adversary's maritime activity more uncertain, more defensive, more expensive, and less politically useful. In the Black Sea, Ukraine has not replaced Russia as the dominant naval actor, but it has weakened the operational value of Russian dominance. By combining USVs, UAVs, coastal missiles, ISR, digital targeting, special operations, and rapid adaptation, Ukraine has made Russian naval power more vulnerable to displacement, defensive absorption, and reputational cost.[88]

This has implications for how strategic studies should approach contemporary drone warfare. Much of the earlier drone debate was shaped by remote counterterrorism, targeted killing, and the asymmetry between Western states and non-state actors. The Black Sea points to a different problem: the integration of unmanned systems into high-intensity interstate war, maritime denial, and alliance adaptation. Drones are no longer merely instruments of remote strike; they are part of reconnaissance-strike meshes, cost-exchange competitions, electronic warfare contests, and industrial mobilization. Their significance lies in how they reorganize the relationship between sensing, striking, protecting, and adapting.[89]

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[87] "Report on UAS," pp. 2-4.

[88] Harrel, *op. cit.*, ch. 25; see also "Report on UAS," pp. 13–14.

[89] James Patton Rogers, "Introduction," in Rogers (ed.), *op. cit.*, 1–4; also, Williams, *art. cit.*, in Rogers and Hutto (eds.), *op. cit.*, pp. 205–229.

The case also reaffirms the continued importance of geography. Semi-enclosed seas generate distinctive strategic conditions: predictable routes, exposed ports, short distances, chokepoints, civilian traffic, legal constraints, and dense surveillance. These features make denial more accessible and sea control more fragile. In such theatres, naval power must be judged not only by the number or sophistication of platforms, but by the ability to operate under persistent observation and low-cost attack. The Black Sea therefore suggests a shift from platform-centred assessments of maritime power toward environment-centred assessments of maritime vulnerability and resilience.[90]

For NATO, the practical lesson is adaptation rather than imitation. Ukraine's drone campaign emerged from conditions that NATO cannot and should not simply reproduce: existential war, improvisational procurement, acute scarcity, and high operational risk tolerance. Yet the logic of the campaign is highly relevant. NATO must prepare for maritime theatres in which ports, logistics hubs, repair facilities, energy nodes, undersea cables, and naval platforms are all part of the target environment. This requires layered counter-UAS and counter-USV defence, integrated civil-military surveillance, hardened infrastructure, cheaper defensive effectors, electronic warfare resilience, and procurement systems capable of moving at the speed of battlefield adaptation.[91]

The Black Sea also clarifies where these lessons travel: most directly, to the Baltic, where semi-enclosed geography, proximity to Russia, dense infrastructure, and NATO's collective defence mission create similar vulnerabilities. They travel partially to the Eastern Mediterranean, Red Sea, and Persian Gulf, where drones and missiles can disrupt maritime traffic, energy systems, and naval operations in constrained waters. They travel more selectively to the South China Sea, where unmanned systems are likely to matter first as tools of surveillance, attribution, legal signalling, and grey-zone resilience, even though they could support denial in wartime. The point is not to universalize the Black Sea, but to identify the conditions under which drone-enabled denial becomes strategically consequential.[92]

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[90] Chiriac, *op. cit.*, pp. 75–98; see also Kakachia, Malerius, and Meister, *art. cit.*, in Kakachia, Malerius, and Meister (eds.), *op. cit.*, pp. 1–4.

[91] "Report on UAS," pp. 18–19; Haider, *art. cit.*, in Rogers (ed.), *op. cit.*, pp. 399–416.

[92] Joja, *art. cit.*, in Kakachia, Malerius, and Meister (eds.), *op. cit.*, pp. 129–144; The New York Times Editorial Staff (eds.), *op. cit.*, pp. 85–89.

The Black Sea is a warning against both complacency and exaggeration. Conventional superiority no longer guarantees operational freedom in constrained maritime spaces. Yet drones do not abolish older requirements of war: logistics, manpower, missiles, air defence, intelligence, industrial capacity, and political will remain decisive. What drones change is the distribution of risk and the speed of adaptation. For NATO and other maritime actors, the central challenge is not to decide whether drones matter, but whether alliances, doctrines, industries, and infrastructures can adapt quickly enough to a maritime environment in which denial is increasingly distributed, persistent, and affordable.

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