EXECUTIVE SUMMARY

Marine Protected Areas and Island Futures

Integrated findings and the adaptive pathway for Paros-Antiparos

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PAROS • ANTIPAROS • THE SURROUNDING MARINE SYSTEM

Why this study was undertaken

Paros and Antiparos depend upon the sea in ways that are ecological, economic and cultural. Their surrounding waters support fish populations, Posidonia oceanica meadows, rocky reefs, seabirds and other marine life. They also provide fishing grounds, navigation routes, anchorages, recreational space and a foundation for much of the islands' visitor economy. Protecting these waters is therefore not solely an environmental question. It concerns the continuing capacity of the islands to support livelihoods, local identity and a viable coastal economy.

The marine system is exposed to several interacting pressures: professional and recreational fishing, spearfishing, anchoring and boating, coastal development, wastewater and land-sea pollution, warming, marine heatwaves and invasive species. The available local evidence does not yet allow these pressures to be ranked reliably on common spatial and temporal measures, and this study does not assume that any single pressure has been proved dominant. The practical public question is whether the present combination of rules, monitoring and enforcement is sufficient to protect the ecological foundations on which marine life, fishing livelihoods and coastal tourism depend.

The problem in one sentence
How can Paros and Antiparos protect the long-term ecological and productive capacity of their surrounding waters while retaining fair and workable access for the people who depend upon them?

What is a marine protected area?

A marine protected area, or MPA, is a geographically defined part of the sea managed under rules intended to conserve habitats, species or ecological processes. It is not necessarily an area closed to all human activity. Some MPAs regulate only particular activities, such as anchoring, fishing gear, extraction or seasonal access. Others contain stricter no-take zones within a wider multiple-use area. This functional understanding is consistent with the IUCN marine protected-area guidance and the MPA Guide framework (Day et al., 2019; Grorud-Colvert et al., 2021).

A boundary is only the beginning. The ecological effect depends on what the rules actually restrict, whether those rules address the relevant pressure, whether they are implemented and enforced, whether users comply, and whether ecological change is measured against a defensible comparison. An MPA can therefore be a powerful management instrument, a limited objective-specific designation or a poorly implemented 'paper park'. The label alone cannot reveal which one it is.

Essential distinction

Designation is a legal act. Effective protection is a continuing management outcome. The study treats area coverage, restriction intensity, implementation, compliance and ecological response as separate questions.

What experience elsewhere tells us

International evidence provides a qualified but important answer. Strongly protected, adequately enforced and long-established MPAs commonly show higher biomass, abundance or average size of exploited fishes within their boundaries. In some settings, movement or spillover can also benefit fishing outside protected zones. Yet outcomes vary with habitat, species, scale, age, isolation, rule design, staffing, finance and compliance (Edgar et al., 2014; Gill et al., 2017; Giakoumi et al., 2017; Hopf et al., 2024).

The social and economic record is more conditional. Ecological recovery does not automatically become higher catch, profit, employment or local income. Restrictions can impose immediate and concentrated costs, particularly on small or less-mobile fishers, while benefits may take years to appear or accrue to other users. Tourism can provide work and conservation finance, but it can also intensify anchoring, boating, disturbance and public-service pressure. Successful cases therefore join ecological design to legitimate rules, recurrent finance, credible enforcement, representative participation and explicit attention to who bears costs and who receives benefits.

Why consider marine protection around Paros-Antiparos?

Paros-Antiparos already has legally meaningful protection, notably the marine Special Protection Area GR4220025, but this designation covers only part of the wider marine-use system and is not a general prohibition on fishing, anchoring, navigation or diving. The islands also lack a current system-wide ecological baseline and a common-denominator account of fishing, boating, anchoring, enforcement and land-sea pressures. These conditions do not prove that a large new MPA is required. They do establish a reasonable case for asking whether better-targeted or stronger marine protection could improve upon the present fragmented arrangement.

The reason to consider an MPA is therefore not that a fashionable conservation label should be added to a map. It is that a spatially explicit management system might help protect vulnerable receptors, organise compatible uses, make enforcement more coherent and preserve the ecological foundations of

fishing and tourism. Whether that potential justifies targeted controls, a small no-take pilot, a multiple-use system or a broader network depends on evidence that is partly available and partly still missing.

Core research question

The question tested by this study
Under what ecological, legal, institutional and social conditions could marine protection produce measurable and durable benefits in the Paros-Antiparos marine system, and what form of protection - if any - is justified by the evidence presently available?

What kind of study is this?

This is a structured evidence synthesis and pre-design decision framework, not a new ecological field survey or stock assessment. Current evidence cannot determine whether the Paros-Antiparos marine system is declining, stable or improving. The study establishes what can presently be concluded, what remains unknown and which evidential and institutional conditions should precede permanent spatial zoning.

Integrated determination in plain language

The answer
Paros-Antiparos should choose neither immediate large-scale designation nor inaction. The most defensible present course is an Adaptive Targeted Protection Pathway: strengthen the common monitoring and enforcement foundation; introduce targeted and reversible measures where pressures and affected habitats are demonstrated; prepare a small no-take pilot behind explicit ecological, social, legal and financial safeguards; and retain broader protection as a future option if later evidence shows that narrower measures are insufficient.

This is not a conclusion against MPAs. Nor is it an automatic endorsement of a large reserve. It is a conditional conclusion about sequence. Action should begin where the causal mechanism and delivery chain are strongest, while the islands build the evidence, legitimacy and institutional capacity needed to decide whether stronger spatial protection is warranted.

Paros-Antiparos: the spatial baseline

The two maps resolve the study's most important spatial distinction. Paros-Antiparos already contains a legally operative marine Natura designation, but it does not cover the whole study system and it is not a general no-take reserve. The published Southern Cyclades consultation footprint is a separate prospective instrument and, in the July 2025 map, does not include Paros or Antiparos.

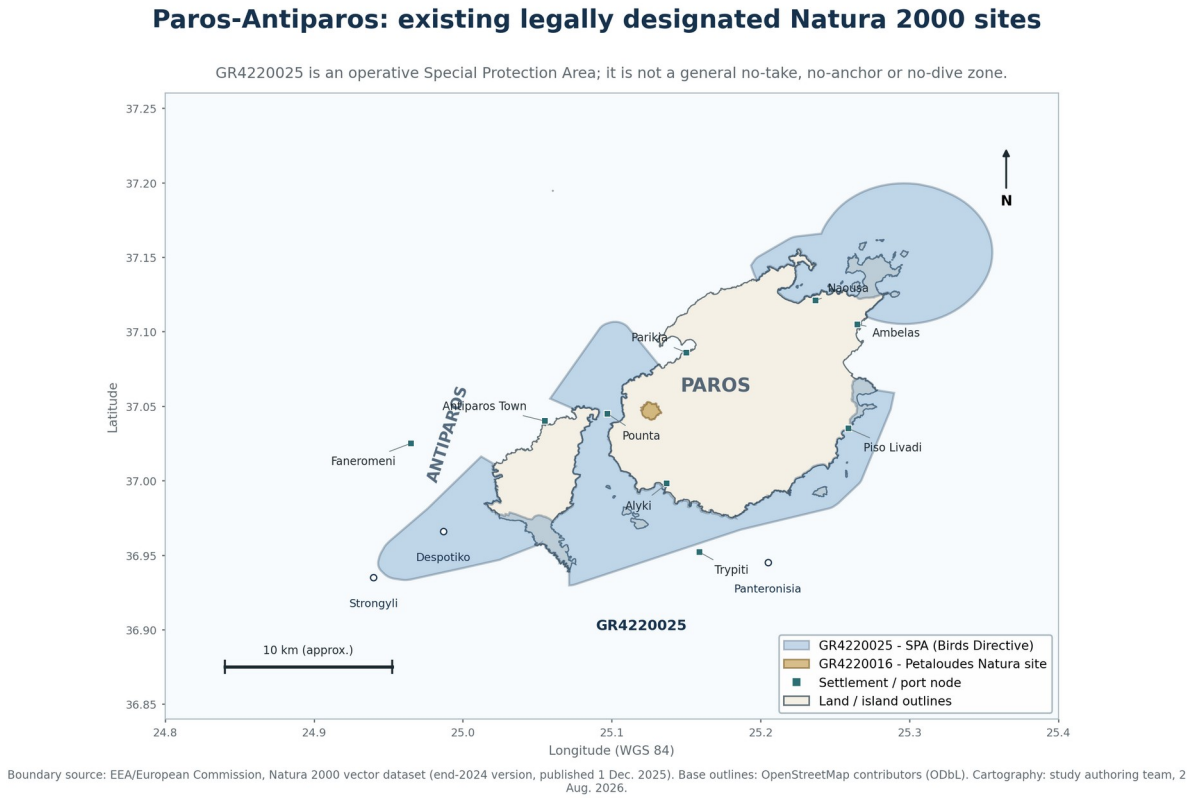

Figure 1. Existing Natura 2000 designations around Paros-Antiparos. GR4220025 is operative and legally meaningful, but its designation does not by itself prohibit all fishing, anchoring, navigation or diving.

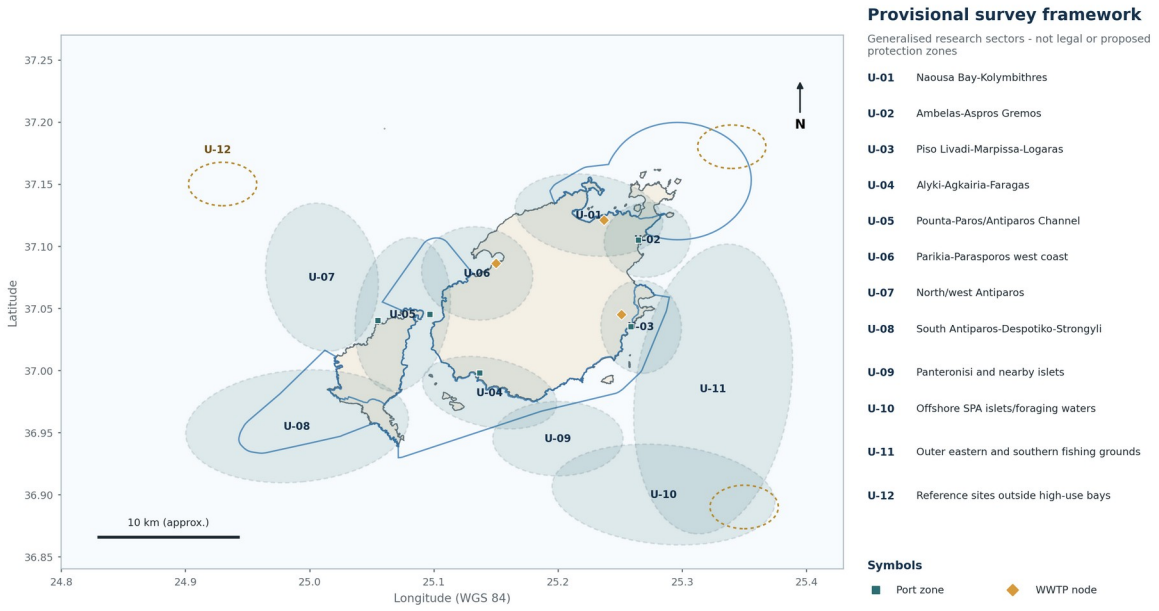

Figure 1B. Local geography and the twelve Phase 7 survey strata. The ellipses are generalised sampling sectors, not legal boundaries or proposed protection zones. U-12 shows the concept of matched lower-use reference sites; final controls require reconnaissance and habitat matching.

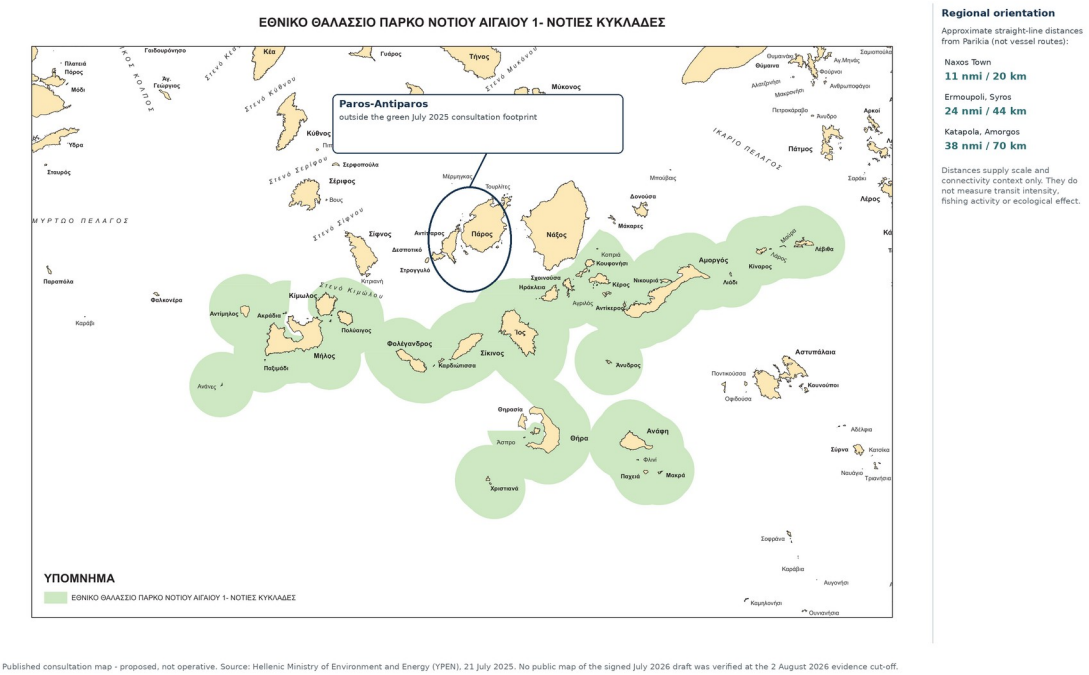

Figure 2. YPEN's July 2025 Southern Cyclades consultation footprint. Paros-Antiparos lies outside the green area. The accompanying straight-line distance cues provide regional scale only; they are not vessel routes or pressure measures. No public map of the signed July 2026 draft was verified at the evidence cut-off.

What the evidence establishes

- Strong, implemented and enforced protection commonly improves exploited-fish biomass, density or size inside boundaries; designation alone does not.
- Coverage statistics must be separated from restriction intensity, implementation, compliance and ecological outcomes.
- Spillover can occur, but catch, profit, employment and welfare depend on displacement, access, costs, prices, ownership and time.
- It can support livelihoods and finance while also increasing anchoring, boating, disturbance, crowding and infrastructure pressure.
- The legal instruments exist, but protection requires interoperable environmental, fisheries, navigation, licensing and enforcement chains.
- GR4220025 is operative but covers only part of the system and is not an automatic no-take, no-anchor or no-dive rule.
- Current evidence cannot rank professional fishing, recreational fishing, spearfishing, anchoring, tourism, land-sea loads, warming and invasives on common denominators.
- Transboundary governance matters, but current evidence does not establish Turkish fishing as a measurable cause of decline around Paros-Antiparos.

What this means for Paros-Antiparos

The islands already possess legally significant protection, including the marine Special Protection Area GR4220025. That status does not automatically prohibit fishing, anchoring, navigation or diving, and it covers only part of the wider ecological and use system. The published July 2025 Southern Cyclades consultation footprint does not include Paros or Antiparos. Existing and prospective law must therefore be translated into activity-specific local rules with clear coordinates, authority, detection, sanctions, monitoring and finance.

Local evidence is not yet adequate to rank professional fishing, recreational fishing, spearfishing, anchoring, boating, tourism, wastewater, coastal development, warming and invasive species on common denominators. No contemporary, peer-reviewed, depth-stratified ecological baseline was identified. The 2011 survey is a historic shallow-water alien-species snapshot, not a baseline of current ecosystem condition, fish biomass, demersal stocks or benthic integrity. Dated personal observations at Ambelas and Panteronisi remain valuable repeat-survey leads, not causal proof.

The recommended sequence

1. Build one versioned legal and habitat map, a multi-year baseline, an enforcement ledger and a five-year recurrent cost model.
2. Introduce targeted controls only where a receptor, pressure, exposure, legal route, enforcement method and monitoring indicator are all specified.
3. Prepare a small, time-bounded no-take pilot with matched reference sites, privacy-protected fishing-ground dependence analysis, transition safeguards and exit rules.
4. Advance to a zoned multiple-use system or broader network only if narrower measures cannot meet a specific ecological objective and delivery capacity is demonstrably adequate.
5. Publish annual ecological, economic, distributional, enforcement and finance results, including dissent and policy changes.

The five scenarios

Scenario	Current role	Why
S0: strengthened existing instruments	Immediate foundation	Fastest and most legally feasible; creates the counterfactual and delivery system.
S1: targeted measures	Preferred provisional pathway	Matches rules to demonstrated pressures and remains reversible.
S2: small no-take core	Conditional pilot	Strong scientific test, but habitat, displacement, finance and legitimacy gates remain open.
S3: multiple-use system	Design option	High integrative potential; present delivery and finance evidence are inadequate.
S4: broader network	Long-term hypothesis	Could serve connectivity and representation; cannot remove warming, invasives or outside mortality.

Fisheries, tourism and fairness

Biomass recovery and spillover are biological mechanisms, not income statements. Whether fishers benefit depends on species, distance, vessel mobility, fuel and time, prices, access rights and who can capture the benefit. Costs can occur immediately while recovery takes years. Recreational fishing and

spearfishing require separate catch and effort measurement rather than being inferred from professional data.

Tourism is likewise both opportunity and pressure. Diving, excursions and sailing may support local work and conservation finance, but they can also increase anchoring damage, disturbance, crowding and public-service costs. Visitor fees may supplement management but cannot be assumed to fund it fully, and revenue must never justify ecological overuse. Employment must be evaluated by full-time-equivalent work, wages, contract duration, residence and ownership.

Regional fisheries governance context

Greek and Turkish fleets use a shared regional ecosystem and some connected resources, so cooperation, monitoring and comparative control matter. Current evidence, however, does not establish Turkish fishing as a measurable cause of ecological decline around Paros-Antiparos. Vessel presence is not the same as fishing, fishing is not automatically illegal, and illegality is not proof of ecological effect. A local MPA cannot remove mortality outside its lawful perimeter.

What would change the recommendation

- System-wide habitat and fish surveys show that ecologically important receptors require connected protection rather than local controls.
- Full-year effort and catch data establish substantial local fishing mortality and identify a fair, enforceable geometry.
- Anchoring exposure maps identify concentrated Posidonia damage that may justify no-anchor zones; any mooring field must first pass site-specific engineering, seabed, meltemi-load, maintenance, carrying-capacity and vessel-pollution tests.
- A credible staffing, patrol, sanction and five-year finance plan makes a larger system deliverable.
- Representative participation and distribution analysis identify acceptable transition measures and hardship thresholds.
- A final Southern Cyclades decree becomes operative and its verified map or measures materially affect Paros-Antiparos.

Final judgement

The study therefore supports neither maximalism nor passivity. Its conclusion is precaution with accountability: act where causal mechanisms and delivery chains are strongest; measure what is unknown; retain the option to escalate; and make every measure answerable to ecological, social and fiscal evidence. Access, cost and risk remain public choices.

Spatial conditions of transferability

Comparative transfer depends on more than whether a protected area has produced a favourable outcome. Scale, depth, shoreline geometry, ecological receptors, access, port proximity and the distribution of human uses determine whether the same rule can be implemented and whether its mechanism is relevant to Paros-Antiparos. The matrix therefore distinguishes a transferable governance lesson from a transferable spatial design.

Interpretive rule
Area values describe the footprint reproduced in the atlas source, not a standardised measure of effective or no-take protection. A nested reserve, fisheries closure, Natura designation and multi-use park remain legally different treatments even when their mapped areas can be measured.

Case	Spatial form and depth	Human access	Paros relevance	Principal transfer limit
Cabo Pulmo National Park	Coastal fringe; Shallow reef and coastal shelf	Adjacent village; road and small-vessel access; intensive diving tourism	Coastal tourism, local legitimacy and enforcement	Tropical reef ecology and a much smaller settlement/use system
Apo Island marine reserve	Small island coastal reserve beside fished waters; Shallow fringing reef	Resident island community; small boats and visitor access	Small-island co-management and spatially bounded spillover	Far smaller geography, tropical reef system and different national institutions
Papahanaumokuakea	Remote oceanic archipelago; Oceanic, pelagic and seamount system	Extremely remote; no comparable resident port or mass-tourism system	Legal durability and political reversibility	Scale, remoteness and oceanic ecology are not local design analogues
Medes Islands Marine Reserve	Nearshore islets with nested protection; Shallow rocky reef and shelf	Immediately accessible from a major dive-tourism coast	Tourism capacity, recovery lags and nested zoning	Much more spatially concentrated than the Paros-Antiparos system
Torre Guaceto MPA	Mainland coastal fringe with internal zones; Shallow coastal shelf	Adjacent ports, towns, tourism and authorised artisanal fleet	Core-plus-local-access design and multi-use compliance	Mainland coastline and more concentrated governance geography
Columbretes Islands Marine Reserve	Isolated offshore volcanic islets; Rocky shelf and slope	Offshore vessel access; fishing and regulated tourism	Bounded spillover and surveillance dependence	Uninhabited offshore geometry with fewer resident-use conflicts

Case	Spatial form and depth	Human access	Paros relevance	Principal transfer limit
Gokova Bay SEPA	Large semi-enclosed bay with nested fisheries closures; Shallow shelf grading to deeper bay waters	Fishing cooperatives, settlements, marinas and tourism	Eastern Mediterranean ecology, small-scale fisheries and co-management	Bay geometry and Turkish institutional framework differ
Sinis-Mal di Ventre MPA	Coastal shelf and offshore-island system; Shelf, rocky reef, seagrass and sandy habitats	Adjacent coastal settlements, tourism and fisheries	Multiple-use zoning and risk of nominal protection	Different fleet, coastline and compliance history
Alonissos-Northern Sporades National Marine Park	Large inhabited and uninhabited archipelago; Shelf, slope and pelagic waters	Island settlements, fisheries, ferries and wildlife tourism	Greek authority chain and archipelagic multiple use	Larger, less urbanised system with different focal objectives
National Marine Park of Zakynthos	Tourism-intensive bay and nesting coast; Shallow bay and coastal shelf	Urban/tourism nodes, ports, excursion and recreational vessels	Activity-specific tourism controls and compliance burden	Target-species and nesting-beach objectives dominate
Gyaros protected area	Uninhabited offshore islet and surrounding waters; Island shelf and slope	No resident settlement; fishing and authorised vessel access dominate	Greek legal executability and allocation design	No resident population, mass tourism or comparable port network
Inner Ionian Sea Archipelago Natura 2000 site	Inhabited inter-island channels and islets; Shelf and channel system	Ferries, tourism, aquaculture and local fisheries	Cumulative pressure and paper-park risk in an inhabited archipelago	Different hydrodynamics, fleet pattern and protected features

The matrix makes three distinctions especially important for Paros-Antiparos. Gyaros and Columbretes are useful evidence about isolated-site protection and surveillance but weak direct analogues for a resident, tourism-intensive inter-island system. Medes, Torre Guaceto, Zakynthos and Gokova offer stronger lessons about intensive access, local fleets, visitor pressure and compliance, although their ecological and institutional settings still differ. Alonissos and the Inner Ionian illustrate the Greek problem of joining broad spatial designation to activity-specific rules, monitoring and enforcement.

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