

Article: Auditing marine survey evidence for submerged prehistoric landscapes on the Spanish Gulf of Cádiz shelf
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Online Resource 3. Discovery, accounting and validation protocol

1. Scope and retrospective boundary

Initial discovery was iterative and was not prospectively registered. The original document-level hit count and every verbatim query therefore cannot be reconstructed. This resource does not manufacture those values or present a retrospective systematic-review flow. Reproducible accounting begins at the 21 candidate source families formed and frozen on 21 August 2026. All 21 were retained for classification so that restriction, missing geometry, incomplete configuration and poor target fit remained visible evidence states.

Accounting stage	Count	Interpretation
Document-level hits	Not reconstructable	Retrospective boundary; no fabricated denominator
Candidate source families	21	Frozen 21 August 2026; none excluded after family formation
Custodian/access routes	15	Institutional contacts or request pathways recorded
Priority families decomposed	5	Selected for controlled observation outcomes
Controlled observations	20	Project-, product- or inspection-level result units
Envelope-contributing families	6	Partly overlapping with observation families
Method-target envelopes	13	Capability statements bounded by target and conditions

2. Prospective discovery and update protocol

The following protocol is prescribed for future inventory updates. It describes how a new search should be made reproducible; it is not represented as a verbatim reconstruction of every original search.

- Geographic block: Gulf/Golfo de Cádiz; Cádiz Bay; Bahía de Algeciras; adjacent Spanish shelf; named ports, channels and survey areas
- Method block: multibeam, single-beam, side-scan sonar, sub-bottom/parametric profiler, seismic, magnetometry, core, borehole, grab, dredging, diving, remotely operated vehicle and video
- Campaign/archive block: campaign or cruise, vessel, project title, catalogue identifier, custodian, principal investigator and cited report
- Search each relevant repository or archive with dated query strings; export or screenshot the results; record platform, date, filters, result count and stable locator
- Snowball through cited campaigns, vessel identifiers, project references and custodian advice; label every added candidate with its discovery route
- Freeze each update, preserve prior identifiers, document additions and state changes, and rerun the integrity and cumulative-readiness checks

3. Eligibility, family formation and deduplication

Include a candidate when it documents a marine campaign, dataset, intervention or archive holding that intersects the geographic discovery envelope or can calibrate a relevant method-target relationship. Retain restricted and incompletely documented candidates. Consolidate catalogue entries, reports and landing pages only when they describe the same coherent acquisition or project family. Split materially different dates, sensors, configurations, targets or outcomes at the observation-unit stage. Do not infer settings from nominal instrument specifications, and never encode non-retrieval, an unsuitable method, a missing result or 'no reported archaeology' as absence.

Discovery-route totals for this freeze were 11 scientific, hydrographic or geological catalogue/repository families; nine heritage, port or project-archive families; and one inherited legacy compilation. These categories describe how a family entered the inventory, not data quality or independence.

4. Data-integrity and robustness checks

Check	Status	Result
Inventory identifiers	Pass	21 unique IDs
Readiness links	Pass	21/21 inventory families represented exactly once
Observation identifiers	Pass	20 unique records; every project ID has an inventory parent
Envelope identifiers	Pass	13 unique records; every inventory ID has a parent
Controlled vocabularies	Pass	All gate states and observation outcomes valid
Strict cumulative series	Pass	17, 8, 2, 0, 0, 0, 0
Pass-or-partial series	Pass	21, 16, 15, 9, 6, 6, 0

Check	Status	Result
Gate-order robustness	Pass	Terminal strict and inclusive counts were 0 for all 5,040 gate orders
Opportunity categories	Pass	858,501 cells exhaust the 8,582.846319 km ² mask
Scenario and constraint geometry	Pass	All recorded Boolean checks true

The terminal result is invariant because every source family fails the adequate-negative gate. This does not make intermediate attrition invariant: intermediate counts depend on field definitions, source-family formation and whether partial states are admitted. The executable validation report and source-accounting CSV accompany the review package.

5. Independent recoding and adjudication protocol

Independent blinded coding was not completed for the present submission, and no inter-rater agreement statistic is claimed. The following protocol is provided for coauthor, reviewer or future replication.

- Freeze the source packet and gate definitions; remove the original state labels while preserving stable IDs and evidence locators
- Have at least one coder who did not make the original assignment score every gate as pass, partial or fail and record a short rationale, decisive gap and evidence locator
- Compare exact agreement and an ordinal weighted agreement statistic gate by gate; report missing or unscorable rows separately
- Adjudicate disagreements by returning to the source evidence, never by averaging ordinal labels; preserve both original assignments and the adjudication reason
- Rerun strict, pass-or-partial and gate-order analyses on the adjudicated matrix and version any changed source state

6. Frozen source-family discovery log

The log below is the reproducible 21-family denominator. 'Inclusion/current role' records why a family remained in scope; it is not a claim of target-capable coverage.

ID	Source family	Route	Inclusion/current role	Primary locator
GOC-001	IGME FOMAR Sheet 86 geophysics: GC-86-1; GC-88-3; G-86-1; HE-91-3; CD; CAMPSA-CGG. Samples: AMBIO-94; GC-86-2; GC-88-3; M-86-2; M-86-3; M-86-4	A	Potentially high; memoir figures show dense shelf and slope coverage but only as scanned cartography Basis: Published source family is identifiable, but observation geometry and settings are incomplete. Gap: No controlled target-level result.	https://info.igme.es/cartografiadigital/datos/Fomar200/memorias/Memoria86_FM200.pdf
GOC-002	ICM-CSIC Marine Geological Reference Collections and Marine Geosciences catalogue	A	Unknown until intersecting records are identified and their geometry, depth and acquisition configuration are screened Basis: Potentially relevant legacy evidence is described only at coarse catalogue level. Gap: No testable geometry or configuration.	https://www.icm.csic.es/es/servicio/colecciones-geologicas-marinas-de-referencia-cgmr-icm
GOC-003	EMODnet HR-DTM Atlantic Gulf of Cadiz 60 m; FRAME-MCS; FRAME-OBS; INSIGHT_LEG2	A	Three component cruises intersect the exact mask only marginally: processed cell-centre support about 18.10 km ² and 0.243% of valid mask pixels; depths 36.6-143.6 m Basis: Native geometry exists; configuration and results require target-level interpretation. Gap: No adequate archaeological negative result.	https://data.utm.csic.es/geonetwerk/srv/eng/catalog.search#/metadata/urn:SDN:CSR:LOCAL:29SG20190930
GOC-004	RV METEOR cruise M167 multibeam and companion Parasound	A	Context only: 38 multibeam file starts inside the permissive envelope are approximately 183-1842 m deep Basis: Technically documented dataset is usable for its original purpose. Gap: Not designed for the primary prehistoric-context target.	https://doi.org/10.1594/PANGAEA.938121 ; https://doi.org/10.1594/PANGAEA.938124
GOC-005	RV Maria S. Merian cruise MSM36 gridded multibeam	A	Low for Spanish shelf; contextual for southern Gulf Basis: Source and some spatial information are available. Gap: Target mismatch and incomplete native geometry.	https://doi.org/10.1594/PANGAEA.893200
GOC-006	RC2912 SeaBeam multibeam and processed trackline geophysics	A	One approximately 15.86 km in-mask transit centreline; approximately 9.49 km has bathymetry at 80-123 m Basis: Geometry is testable; configuration and controlled results remain partial. Gap: No adequate target-specific outcome register.	https://www.ngdc.noaa.gov/ships/robert_d_conrad/RC2912_mb.html ; https://doi.org/10.1594/IEDA/315260
GOC-007	Duarte et al. Gulf of Cádiz seismic-oceanography dataset	A	No analytical-domain intersection: seven lines are west of the search envelope and PD00715 has zero traces inside the exact mask Basis: Well-documented technical source. Gap: Not designed for the primary target.	https://doi.org/10.5281/zenodo.14887001
GOC-008	IODP Expedition 339 Mediterranean Outflow	A	Low for exposed prehistoric shelf; high for regional stratigraphy Basis: Native geometry is available and technically useful. Gap: Partial settings and target-outcome mapping.	https://publications.iodp.org/preliminary_report/339/339pr_6.htm
GOC-009	MOUNDFORCE-2007; MVSEIS-2008 (29HE20080516/HE-129); SUBVENT-2	A	Official reports/maps recovered; mostly slope/deep Gulf. Exact Article 3 mask intersection remains to compute from digital tracks Basis: Relevant source metadata exist. Gap: No controlled target-level results and only partial geometry.	https://www.frontiersin.org/journals/earth-science/articles/10.3389/feart.2021.653639/full
GOC-010	Cádiz Bay navigation-channel deepening archaeological geophysics	B	High; shallow, development-led, archaeological interpretation Basis: 2019 geophysical targets and 2024 diver outcomes can be linked for ten points. Gap: Primary T1/T2 target mismatch; 2019 effort metrics incomplete.	https://www.puertocadiz.com/download/memoria-preliminary-final-de-la-actividad-arqueologica-preventiva-de-prospeccion-arqueologica-sub-acuatica-dragado-de-canal-de-acceso/?refresh=6a036cc46fef61778609348&wpdm=11897
GOC-011	Campamento dry-dock dredging preventive survey, San Roque	B	High locally for labelled project-scale calibration; different environment/target from Paper 1 Basis: Potentially relevant observations are described. Gap: Geometry, settings and controlled results are only partial.	https://www.juntadeandalucia.es/cultura/tabula/bitstream/20.500.11947/20065/1/AAA_2014_077_rojasroca_diquesecocampamento_cadiz_borrador.pdf
GOC-012	Camposoto underwater archaeological surveys; 2009 preventive survey and 2010-2011 IAPH-CAS follow-up	B	Very high local nearshore relevance; one explicit side-scan anomaly at 36.438633 N, -6.241147 W is inside exact mask Basis: Positive T3 archaeological observations are documented. Gap: Does not test the primary buried prehistoric target; acquisition geometry is incomplete.	https://www.juntadeandalucia.es/cultura/tabula/handle/20.500.11947/21881
GOC-013	HERAKLES Bay of Algeciras/Strait campaigns; El Saladillo SES-2000 survey	B	High locally for palaeolandscape and stratigraphic calibration; geographically limited and not a regional shelf sample Basis: Published shallow profiles detect a palaeochannel. Gap: Digital navigation, exact settings and raw profiles are unavailable.	https://www.mdpi.com/2077-1312/14/10/943
GOC-014	VESTIGIUM intertidal archaeological project	B	High for land-sea interface; patchy regional coverage Basis: Catalogue-level evidence suggests relevance. Gap: No testable spatial footprint or configuration.	https://www.juntadeandalucia.es/organismos/iaph/servicios/actualidad/noticias/detalle/487216.html
GOC-015	CAS/IAPH DOCUSUB and underwater intervention archive	B	High for known archaeology and survey-history bias Basis: Catalogue-level and restricted information indicate possible relevance. Gap: No testable geometry/configuration and access is constrained.	https://www.juntadeandalucia.es/organismos/culturaydeporte/servicios/directorio-instituciones/detalle/2820.html
GOC-016	Port of Huelva periodic bathymetry, dredging and geotechnical archive; expedientes 535, 533 and ORD/IN/0731.1 plus Recinto 4 and maintenance/deepening projects	B	Potentially very high for shallow estuary/channel context; exact study-mask intersections unresolved Basis: Source family is known at catalogue level. Gap: No testable geometry, settings or outcomes.	https://www.boe.es/diario_boe/txt.php?id=BOE-B-2024-6634
GOC-017	Port of Algeciras 2018-2019 PDI environmental-geophysical package and related project archive	B	High locally as a multi-method observation archive and eastern-sector comparator Basis: Campaign identity and some technical metadata are known. Gap: No recoverable in-mask observation geometry or controlled result.	https://puertodealgeciras.sede.gob.es/
GOC-018	Spanish Navy Hydrographic Institute survey archive; MBAR24	A	High for regional seabed morphology; valid-cell coverage quantified, but source-survey coverage and archaeological detectability remain unresolved Basis: Derived bathymetric coverage is quantified across the study mask. Gap: Fused product lacks source-survey effort and cannot support archaeological absence.	https://cdihm.cnig.es/CentroDescargasIHM/home
GOC-019	Cádiz Bay channel anomaly verification preventive archaeological survey	B	High for ground-truth calibration of 2019 discrete anomalies; not area-wide coverage Basis: Ten anomaly points have controlled 2024 diver outcomes. Gap: T3 target mismatch and incomplete effort metrics.	https://www.puertocadiz.com/download/memoria-preliminary-final-de-la-actividad-arqueologica-preventiva-de-prospeccion-arqueologica-sub-acuatica-dragado-de-canal-de-acceso/?refresh=6a036cc46fef61778609348&wpdm=11897

ID	Source family	Route	Inclusion/current role	Primary locator
GOC-020	MOWER research cruise 29SG20140901	A	High as an observation-opportunity candidate; exact sensor-on shelf coverage remains unresolved Basis: Cruise metadata and ship navigation are recovered. Gap: Sensor-on geometry, event table and primary files remain inaccessible.	https://doi.org/10.20351/29SG20140901
GOC-021	MARINE_POLICY legacy GIS package: hydrocarbon-borehole points, terrain/context layers and prior model products	C	Medium as a discovery and provenance source; not a survey-coverage dataset Basis: Legacy GIS layers and 34 borehole points are spatially recoverable. Gap: No survey configuration, drill logs or target-level outcomes; credentials and rights require control.	Local package supplied privately; historical source recorded in metadata: http://www.mityc.es/energia/petroleo/Exploracion/Mapa/Paginas/mapSondeos.aspx

Route A = scientific, hydrographic or geological catalogue/repository; B = heritage, port or project archive; C = inherited legacy compilation.