

Survey Methods for Ocean Economic Activity

Provides guidance on survey methods for collecting data on ocean economic activity.

Version	0.7.0	Status	Draft	Stability	Applied
Last updated	September 2026	Responsible officer	Dr Jordan Gacutan		

Drafting AI-assisted drafting from GOAP Secretariat source materials; source list to be published at the close of consultation.

OUTCOME

This Circular provides guidance on survey methods for collecting data on ocean economic activity. Readers will understand how to design and implement business surveys targeting ocean-related establishments, conduct household surveys capturing ocean-related employment and consumption, apply appropriate sampling designs for the ocean economy, and ensure quality in survey-based ocean data. By applying this guidance, statistical offices can generate reliable estimates of the ocean economy's contribution to employment, production, and income that are suitable for integration with broader national accounts frameworks and ocean accounting systems. These survey methods support three principal decision use cases: ocean economy measurement for compiling the accounts described in [TG-3.3 Economic Activity Relevant to the Ocean](#) and [TG-2.5 Structure and Function of the Ocean Economy](#), employment surveys for deriving labour market indicators under [TG-3.3 Economic Activity Relevant to the Ocean](#) and [TG-2.5 Structure and Function of the Ocean Economy](#), and tourism expenditure surveys for measuring coastal and marine tourism's economic contribution. The sampling designs in Section 3.3 and quality assurance procedures in Section 3.4 align with the overarching quality framework established in [TG-0.7 Quality Assurance](#). Where survey-based approaches intersect with administrative data, readers should also consult [TG-4.3 Administrative Data Sources](#) for guidance on integration strategies. Key terms introduced here are defined in [TG-0.6 Glossary](#).

CONTENTS

1. Outcome	3
2. Requirements	3
3. Guidance Material	3
3.1 Business Surveys	4
3.2 Household Surveys	7
3.3 Sampling Design	9
3.4 Quality Assurance for Survey Data	12
4. Worked Examples	14
4.1 Ocean economy survey module design – synthetic worked example	14
4.2 Stratified sampling for marine fishing establishments	15
4.3 Household survey module for coastal tourism	15
5. Acknowledgements	16
6. References	16

ABOUT THIS CIRCULAR

RECOMMENDED CITATION

Survey Methods for Ocean Economic Activity (2026) (GOAP Technical Guidance on Ocean Accounting, TG-4.2, v0.7.0). GOAP Secretariat.
<https://guidance.oceanaccounts.org/circulars/section-4/4-2-survey-methods/>

© 2026 Global Ocean Accounts Partnership. Licensed under CC BY-NC 4.0.

DRAFT

¶1 ⓘ Framework Position

¶2 TG-4.2 sits within Section 4 (Data Methods). It owns the survey instrument for ocean economic activity: the business and household frames, stratification and sample allocation, questionnaire content, non-response and validation, and the estimates and sampling errors those designs deliver – output, employment, value added and ocean share by industry. It does not own the tables those estimates enter. The supply and use table structure and the industry classification are **TG-3.3 Economic Activity Relevant to the Ocean**; the ocean economy indicators derived from them are **TG-2.5 Structure and Function of the Ocean Economy**.

1. Outcome

¶1 This Circular provides guidance on survey methods for collecting data on ocean economic activity. Readers will understand how to design and implement business surveys targeting ocean-related establishments, conduct household surveys capturing ocean-related employment and consumption, apply appropriate sampling designs for the ocean economy, and ensure quality in survey-based ocean data. By applying this guidance, statistical offices can generate reliable estimates of the ocean economy's contribution to employment, production, and income that are suitable for integration with broader national accounts frameworks and ocean accounting systems.

¶2 These survey methods support three principal decision use cases: ocean economy measurement for compiling the accounts described in **TG-3.3 Economic Activity Relevant to the Ocean** and **TG-2.5 Structure and Function of the Ocean Economy**, employment surveys for deriving labour market indicators under **TG-3.3 Economic Activity Relevant to the Ocean** and **TG-2.5 Structure and Function of the Ocean Economy**, and tourism expenditure surveys for measuring coastal and marine tourism's economic contribution. The sampling designs in Section 3.3 and quality assurance procedures in Section 3.4 align with the overarching quality framework established in **TG-0.7 Quality Assurance**. Where survey-based approaches intersect with administrative data, readers should also consult **TG-4.3 Administrative Data Sources** for guidance on integration strategies. Key terms introduced here are defined in **TG-0.6 Glossary**.

2. Requirements

¶1 This Circular requires familiarity with:

- ¶2 **TG-0.1 General Introduction to Ocean Accounts** – provides the conceptual framework and key components of Ocean Accounts, including the relationship between environmental and economic accounting frameworks that survey data are designed to populate.
- ¶3 **TG-0.2 Overview of Relevant Statistical Standards** – establishes the statistical classification standards, including ISIC, that underpin the industry identification and coding procedures described in this Circular.
- ¶4 **TG-0.7 Quality Assurance** – establishes the quality framework governing all ocean accounting data, including the principles of accuracy, coherence, and fitness-for-use that guide the survey design and quality assurance procedures described in this Circular.
- ¶5 **TG-3.3 Economic Activity Relevant to the Ocean** – defines the industry scope of ocean accounts and the classification framework that determines which industries require ocean share estimation and how survey results are integrated into account tables.

3. Guidance Material

¶1 Survey methods are central to measuring the ocean economy. Whilst administrative data sources are valuable, surveys provide the detailed information required to measure economic activity across ocean-related industries, capture employment characteristics, and understand household consumption patterns linked to the ocean. This Circular addresses business surveys (Section 3.1), household surveys (Section 3.2), sampling design considerations (Section 3.3), and quality assurance procedures specific to survey data (Section 3.4). For guidance on data quality considerations applicable across all ocean accounting work, see **TG-0.7 Quality Assurance**.

¶2 Data needs for ocean accounting span multiple domains. Each requires different survey instruments and sampling approaches. Table 3.0 summarises the primary survey types used to collect data on key ocean variables, the sampling frames from which respondents are drawn, and the principal variables of interest.

¶3 *Table 3.0: Ocean data survey type matrix*

Data Need	Primary Survey Type	Sample Frame	Key Variables	Used In
Ocean GVA	Business surveys	Enterprise register	Output, costs, employment	TG-2.5, TG-3.3
Fish catch	Catch surveys	Vessel register	Species, weight, location	TG-3.3
Marine recreation	Visitor surveys	Tourism statistics	Visits, expenditure, activities	TG-2.5
Household dependence	Household surveys	Census	Income, consumption, assets	TG-2.3
Employment	Labour force surveys	Household sample	Jobs, hours, wages	TG-3.3, TG-2.5

3.1 Business Surveys

¶1 Business surveys are essential for measuring the production, employment, and value added of establishments engaged in ocean-related economic activities. The design of business surveys for ocean accounting builds upon established practices in economic statistics whilst addressing the specific characteristics of ocean industries.

The role of business registers

¶1 The statistical business register is the foundation for business surveys targeting ocean industries. A business register is a central listing, usually maintained by the national statistical office or taxation authority, that contains information on all establishments and enterprises within an economy¹. For each unit, the register typically records industry classification, geographic location, employment size, turnover, and ownership characteristics².

¶2 The *UN Guidelines on Statistical Business Registers* provides best practices for the development and maintenance of business registers³. For ocean accounting purposes, the business register serves three functions, summarised in Table 3.1.1 below.

Function	Description
Frame population	Identifying the universe of ocean-related establishments from which samples can be drawn.
Stratification variables	Providing size and location information for designing efficient samples.
Auxiliary information	Supplying data for non-response adjustment and estimation.

¶3 Within the structure of a business register, establishments classified to ocean-relevant industries can be identified using the International Standard Industrial Classification (ISIC)⁴. For the authoritative enumeration of ocean-relevant ISIC classes and the survey-approach treatment for each (full

coverage vs. ocean-share supplementary questions), compilers should consult **TG-3.3 Economic Activity Relevant to the Ocean**. For guidance on how these classifications are applied within ocean accounting more broadly, see **TG-0.2 Overview of Relevant Statistical Standards** and **TG-4.6 Data harmonisation**⁵.

¶4 The ocean-relevant classes cited here reflect ISIC Revision 4, which remains the current operational classification for most national statistical systems. ISIC Revision 5 was endorsed by the UN Statistical Commission in March 2024 with national implementation expected from 2027. Rev.5 introduces structural changes to the classification of fishing and aquaculture activities and adds new categories for renewable energy generation that are directly relevant to offshore wind and wave power. Compilers currently using ISIC Rev.4 should begin mapping their ocean-relevant industry codes to Rev.5 equivalents using the UN correspondence tables published alongside the Rev.5 classification. In the transition year, run parallel coding for ocean-relevant ISIC classes using dual-coded questionnaires or post-coding via the correspondence table, and publish a methodological note documenting the break point and its effect on ocean economy aggregates. Survey-approach treatment applies equivalently to Rev.4 and Rev.5 equivalent codes. See **TG-0.2 Overview of Relevant Statistical Standards** for further guidance on managing classification transitions⁶.

Ocean share estimation for partially ocean-related industries

¶1 Beyond the directly identifiable core ocean industries (see TG-3.3), many establishments have partial ocean-related activity that cannot be captured through industry classification alone. For example, a construction company may undertake both land-based and marine construction projects. For such partially ocean-related industries, supplementary survey questions are required to determine the ocean share of economic activity⁷.

¶2 When estimating ocean shares, compilers should apply the following standards:

- ¶3 **Inclusion threshold:** Establishments where the self-reported ocean share is less than 5% of total activity, and whose industry is not a core ocean industry, may be excluded from ocean accounts. This threshold should be documented in metadata.
- ¶4 **Administrative validation:** Self-reported ocean shares should be cross-checked against administrative data where available (landing receipts, maritime licences, port records) to assess plausibility.
- ¶5 **Metadata documentation:** Ocean share ratios must be recorded in metadata and reviewed across survey cycles for stability. Unexplained shifts in ratios between cycles should trigger follow-up with respondents.
- ¶6 **Geographic sub-stratification:** Ocean share ratios should be estimated separately for geographically stratified sub-groups where there is reason to believe that coastal and non-coastal establishments within the same ISIC class have substantially different ocean shares (see Section 3.3 for stratification guidance).

¶7 For the classification framework that determines which industries fall within the scope of ocean accounts and which require ocean share estimation, see **TG-3.3 Economic Activity Relevant to the Ocean**⁸.

Geographic scope of ocean economy surveys

¶1 The geographic scope of ocean economy surveys follows the economic territory of the compiling country as defined in the System of National Accounts (SNA residency principle), not the physical location of operations. Business surveys must therefore capture all marine economic activity by resident establishments regardless of where in the ocean that activity occurs, including operations in the domestic Exclusive Economic Zone (EEZ), foreign EEZs under access agreements, and the high seas.

¶2 Surveys should include a supplementary geographic breakdown variable distinguishing:

- ¶3 Domestic EEZ operations
- ¶4 Foreign EEZ operations (under access agreement)
- ¶5 High-seas operations

¶6 This breakdown supports analytical use of ocean accounts in trade, access agreement, and international governance contexts without altering the residency-based aggregate totals. For the spatial scope framework governing ocean accounts, see **TG-0.1 General Introduction to Ocean Accounts**⁹.

Survey design for tourism industries

¶1 The tourism sector presents particular challenges for ocean accounting because tourism is defined by the characteristics of the visitor, not by a distinct set of industries¹⁰. The *International Recommendations for Tourism Statistics 2008* (IRTS 2008) and the *Statistical Framework for Measuring the Sustainability of Tourism* (SF-MST) provide guidance on survey methods for tourism establishments¹¹.

¶2 Within the structure of a business register, establishments classified as tourism industries can be assessed using variables such as industry class, size in terms of turnover or employment, employment characteristics, ownership (resident or non-resident), and legal entity type¹². For coastal and marine tourism specifically, geographic location becomes a determining variable. Establishments should be flagged as “coastal” using the following operational criterion: establishments located within a nationally defined coastal zone, or where no such zone exists, within 10 km of the mean high-water line consistent with SEEA-Ocean spatial boundary guidance. This criterion should be documented in metadata and applied consistently across survey cycles to preserve time-series comparability. Cross-reference **TG-0.2 Overview of Relevant Statistical Standards** for spatial boundary standards¹³.

¶3 The SF-MST framework provides the basis for compiling thematic and extended accounts for tourism that integrate environmental dimensions. Coastal and marine tourism measurement within ocean accounts should draw on the SF-MST methodology for defining tourism industries and measuring their economic contribution. Where countries develop dedicated ocean tourism accounts, the survey instruments described in this section supply the primary data inputs. For the broader framework within which tourism data are organised, see **TG-3.3 Economic Activity Relevant to the Ocean**.

¶4 Generalised annual economic surveys typically provide information on the number of establishments classified by industry, output by source of revenue, intermediate consumption, employment and compensation of employees, and investment¹⁴. Tourism-specific surveys may nonetheless be required to capture the share of output attributable to visitors and to distinguish between domestic, inbound, and outbound tourism expenditure.

Survey content for ocean industries

¶1 Business surveys targeting ocean industries should collect the following categories of information:

¶2 Economic variables:

- ¶3 Output/turnover by product type
- ¶4 Intermediate consumption by category
- ¶5 Compensation of employees
- ¶6 Gross fixed capital formation
- ¶7 Inventories

¶8 Employment variables:

- ¶9 Number of jobs (full-time equivalent)

- ¶10 Employment by occupation
- ¶11 Employment by sex
- ¶12 Casual and seasonal employment patterns

¶13 Ocean-specific variables:

- ¶14 Share of activity directly ocean-related
- ¶15 Geographic location of operations (including at-sea activities and geographic breakdown per Section 3.1 above)
- ¶16 Type of marine resources used or accessed
- ¶17 Environmental management practices

¶18 The *Tourism Satellite Account: Recommended Methodological Framework 2008* (TSA:RMF 2008) provides a template for organising data on tourism industries that can be adapted for broader ocean economy thematic and extended accounting¹⁵. Table 5 of the TSA:RMF records production by tourism industries. That table details the tourism characteristic products produced by each industry and summary measures of economic performance. For detailed guidance on compiling ocean economy accounts, see [TG-3.3 Economic Activity Relevant to the Ocean](#).

Informal economy considerations

¶1 In many countries, an important contribution to ocean economic activity comes from the informal economy where there is no registration of economic units¹⁶. Small-scale fisheries, informal coastal tourism services, and subsistence activities may be economically significant but are typically not captured in business registers. Conceptually, informal activity and the economic units involved (commonly households) are within the measurement scope, but in practice their inclusion in statistics may not be possible through conventional business surveys¹⁷.

¶2 Where informal ocean activities are significant, compilers should apply the following minimum standards:

- ¶3 **Estimation requirement:** Where informal ocean activity is estimated to constitute more than 10% of total ocean activity in the compiling country, it must be estimated rather than simply excluded. Omission without estimation in this case would materially understate the ocean economy aggregate.
- ¶4 **Combination methods:** For countries where direct measurement is not feasible, recommended approaches include ratio expansion from area survey data (e.g., landing site surveys grossed to the national fleet) and cross-validation with FAO small-scale fisheries datasets.
- ¶5 **Disclosure requirement:** Where informal sector coverage is below 80% of estimated total ocean activity, a mandatory metadata flag must be included: "Informal sector partially excluded – estimated coverage [X]%." This flag ensures that users of ocean accounts can assess comparability across countries.

¶6 For countries where small-scale fisheries constitute a large share of ocean activity, complementary data collection approaches that may be used alongside or instead of conventional business surveys include:

- ¶7 Household surveys with questions on informal economic activity (see Section 3.2)
- ¶8 Area-based surveys at landing sites, ports, and coastal markets
- ¶9 Key informant interviews with industry associations and cooperatives
- ¶10 Administrative data from fishing licences and vessel registrations¹⁸

3.2 Household Surveys

¶1 Household surveys provide essential data for ocean accounting that cannot be obtained from business surveys or administrative sources. They capture the demand perspective of ocean eco-

economic activity, including household consumption of ocean-related goods and services, employment characteristics of workers in ocean industries, and household dependence on ocean resources.

Labour force surveys

¶1 Household labour force surveys are an important data source that can in principle cover the entire population of a country, all industries, and all categories of workers, including the self-employed and casual workers¹⁹. They can capture economic activity in both formal and informal sectors, as well as informal employment arrangements that are common in many ocean industries, particularly fisheries and coastal tourism²⁰.

¶2 Labour force surveys collect data from individuals and thus provide information on persons who may be employed in more than one job (multiple-job holders) and in different industries²¹. Multiple job-holding is particularly relevant for the ocean economy, where seasonal patterns may lead workers to combine ocean employment with other activities throughout the year.

¶3 For ocean accounting, labour force surveys can provide estimates of:

- ¶4 Total employment in ocean industries (using ISIC-coded occupation and industry data)
- ¶5 Employment characteristics including hours worked, earnings, and job tenure
- ¶6 Self-employment and casual work patterns
- ¶7 Multiple job-holding across ocean and non-ocean sectors
- ¶8 Informal employment in ocean-related activities

¶9 The collection of data on employment in the tourism industries should be integrated in the regular national statistical system²². By its nature, employment in tourism industries can be undertaken either in paid employment or self-employment, and it is unlikely that a complete picture can be obtained from a single statistical source.

¶10 Where labour force surveys do not provide sufficient ISIC detail to isolate ocean employment, compilers should apply a tiered approach:

1. ¶11 **4-digit ISIC available:** Use ISIC codes directly to identify ocean industries (e.g., 0311 Marine fishing vs. 0312 Freshwater fishing; 5011 Sea and coastal passenger transport vs. 5021 Inland passenger water transport).
2. ¶12 **2-digit ISIC only:** Use ISCO-08 occupational codes as a proxy, applying the tiered approach described in the labour force surveys subsection above (ISCO 6221, 8350, 3151). These codes capture the majority of directly ocean-dependent occupations even where industry coding is insufficient.
3. ¶13 **Neither available:** Design a dedicated ocean employment module for periodic attachment to the labour force survey. The module should include industry and occupation questions at sufficient detail to isolate ocean-related work²³.

Household consumption surveys

¶1 Household budget surveys or consumption expenditure surveys provide data on household purchases of ocean-derived products. Standard household budget survey product classification systems (COICOP 01.1.4 Fish and seafood) do not separate marine from freshwater species. To disaggregate ocean-related consumption:

- ¶2 **Direct survey disaggregation:** Include a question in the HBS module asking whether fish purchased was marine (sea-caught or sea-farmed) or freshwater (lake, river, or freshwater-farmed). This question may be asked at the point of purchase recall or as a species-identification supplement.
- ¶3 **Supply-side ratio method:** Where direct survey disaggregation is not feasible, construct post-hoc marine/freshwater disaggregation ratios using supply-side data, specifically national catch composition statistics and trade records showing the marine share of total fish supply. Apply these ratios to COICOP 01.1.4 aggregate consumption figures.

- ¶4 **COICOP mapping:** The marine share of COICOP 011.4 should be documented in metadata. Marine products also appear in COICOP 011.9 (other food products) for processed marine items and COICOP 091.4 (recreational and sporting goods) for marine recreational equipment. The COICOP marine product codes cover supplements, recreational goods, and tourism services as listed in the codes above.²⁴

Domestic tourism surveys

¶1 Household surveys based on a stratified sample using spatial, demographic, and socio-economic criteria can be efficient and suitable instruments for measuring domestic tourism activity and related expenditure²⁵. They can provide information on both same-day and overnight visitors to coastal and marine areas.

¶2 Household surveys make it possible to observe round trips taken by visitors, which gives a fuller view of tourism behaviour than surveys conducted at the destination²⁶. For ocean accounting, household tourism surveys can capture:

- ¶3 Trips to coastal and marine destinations
- ¶4 Expenditure on ocean-related tourism activities (boat trips, diving, beach recreation)
- ¶5 Consumption of ocean-derived products (seafood at restaurants, marine souvenirs)
- ¶6 Time spent in marine and coastal environments

¶7 Sample size and design are strongly related to the significance and accuracy of the variables to be estimated. Two issues need consideration when designing domestic surveys to analyse coastal and marine tourism: the unequal distribution of such tourism over the national territory and the high degree of heterogeneity of the population in terms of tourism behaviour²⁷.

Survey instruments for household surveys

¶1 For household surveys targeting ocean-related topics, questionnaire design should consider:

¶2 **Trip-based modules** (for tourism surveys):

- ¶3 Identification of coastal/marine destinations
- ¶4 Purpose and duration of trips
- ¶5 Transport modes including water transport
- ¶6 Accommodation types in coastal areas
- ¶7 Expenditure categories with ocean-specific detail

¶8 **Employment modules** (for labour force surveys):

- ¶9 Industry of employment with sufficient detail to identify ocean sectors (see tiered approach above)
- ¶10 Occupation with detail on fishing, seafaring, and marine occupations (using the ISCO codes specified in the tiered approach above: 6221, 8350, 3151)
- ¶11 Location of work including at-sea activities
- ¶12 Seasonality and casualness of employment

¶13 **Consumption modules** (for budget surveys):

- ¶14 Detailed product codes for fish and seafood with marine/freshwater split
- ¶15 Services related to ocean recreation
- ¶16 Purchases during coastal tourism trips

3.3 Sampling Design

¶1 Effective sampling design underpins reliable estimates of ocean economic activity. The ocean economy presents distinctive challenges including geographic concentration along coastlines, high variability in establishment size, and seasonal patterns in many ocean industries.

Frame coverage and maintenance

¶1 The quality of the sampling frame is fundamental to survey accuracy. For business surveys, the sampling frame is typically derived from the business register. A systematic approach should be in place for updating survey frames to ensure accurate coverage of the target population²⁸.

Information gathered during surveys should be used to assess and improve the quality of the frame, especially regarding coverage and the quality of contact variables and auxiliary information²⁹.

¶2 For ocean industries specifically, frame coverage issues may include:

- ¶3 **Undercoverage of small units** – small fishing vessels and informal operators may not appear in the business register
- ¶4 **Classification errors** – establishments may be misclassified to non-ocean industries
- ¶5 **Geographic coding errors** – coastal location may be incorrectly recorded
- ¶6 **Outdated information** – high entry and exit rates in some ocean industries

¶7 An appropriate sampling frame, drawn representatively from the business register, is particularly important for ocean surveys. If samples are drawn on the basis of turnover, employment, or value added alone, there is a risk that information relevant to ocean activity is not representative³⁰.

¶8 For the marine fishing sector specifically, the general business register may provide incomplete coverage of small-scale and artisanal operators. Vessel registries maintained by fisheries management authorities and fishing licence databases administered by maritime agencies can serve as supplementary frames. These specialised registers typically contain information on vessel characteristics (length, tonnage, gear type), port of registration, and licence holder that are not available in business registers. Where available, a dual-frame design (combining the business register for larger commercial operations with the vessel or licence register for smaller operators) can substantially improve coverage.

¶9 Compilers should assess the overlap between frames and apply one of the following estimation approaches to avoid double-counting units appearing in both frames:

- ¶10 **Screening (domain identification):** The preferred approach where the overlap between frames can be directly verified by matching units via a common identifier (tax ID, vessel registration number, business licence number). Units identified in both frames are assigned to one frame only before sampling and estimation.
- ¶11 **Weight adjustment (Hartley estimator):** Where direct matching is not feasible, apply weight adjustment using the Hartley estimator or analogous multiple-frame estimator. Under this approach, each sampled unit from the overlap domain receives a fractional weight that accounts for its probability of selection under both frames, preventing double-counting in the aggregate estimate.

¶12 The choice of estimator should be documented in survey methodology metadata. For further guidance on integrating administrative and survey data sources, see **TG-4.3 Administrative Data Sources**³¹.

Stratification strategies

¶1 Stratified sampling improves efficiency by ensuring representation across important subgroups. For ocean economy surveys, stratification variables should include:

¶2 **Size stratification:**

- ¶3 Annual turnover or output (preferred for GVA and output estimation)
- ¶4 Number of employees or full-time equivalents (preferred for employment estimation)
- ¶5 Vessel tonnage (for fishing and shipping industries)

¶6 The choice of stratification variable should match the target statistic: use turnover or vessel capacity (GRT) as the primary stratification variable when the survey aims to estimate GVA or output.

Use employment count when the primary objective is employment estimation. Where a survey estimates both, use turnover as the primary stratification variable with employment as a secondary sort within strata.

¶7 **Geographic stratification:**

- ¶8 Coastal region or port
- ¶9 Distance from coastline, defined as the nationally defined coastal zone where one exists, or a 10 km buffer from the mean high-water line where no national coastal zone definition is available (consistent with SEEA-Ocean spatial boundary guidance and the coastal tourism criterion in Section 3.1). The same spatial criterion must be applied consistently across business and household surveys to support integration of results³².
- ¶10 Marine area of operation (for fishing vessels)

¶11 **Industry stratification:**

- ¶12 ISIC class or national equivalent
- ¶13 Type of ocean activity (fishing, aquaculture, shipping, tourism, offshore extraction)

¶14 Appropriate sampling techniques should be used to minimise sample sizes whilst achieving the target level of accuracy³³. For ocean industries characterised by high variability, oversampling of large units (take-all strata) combined with probability sampling of smaller units is typically efficient.

Sample allocation

¶1 Sample allocation across strata should balance:

- ¶2 **Precision requirements** – larger samples where greater precision is needed
- ¶3 **Variability** – larger samples in more heterogeneous strata
- ¶4 **Cost** – consideration of differential data collection costs across strata
- ¶5 **Domain estimates** – allocation to support estimates for geographic areas and industry groups

¶6 For ocean economy surveys, the geographic dimension often requires explicit consideration. If estimates are required for specific coastal regions or ports, sample allocation must ensure adequate representation in each domain.

Temporal considerations

¶1 Many ocean industries exhibit strong seasonal patterns that affect survey design:

- ¶2 **Fishing** – seasonal variation in catches by species and fishing ground
- ¶3 **Coastal tourism** – concentration in summer months in temperate climates
- ¶4 **Offshore energy** – weather-related operational patterns
- ¶5 **Shipping** – trade cycle variations

¶6 For first-time ocean economy surveys with limited budget, a tiered approach to temporal design is recommended:

1. ¶7 **Minimum viable (resource-constrained setting):** Repeated cross-sections at two strategically chosen reference periods (peak season and off-peak season), with estimates averaged or weighted by season duration to produce annual totals. This approach captures the most important seasonal variation at manageable cost.
2. ¶8 **Recommended where resources allow:** Continuous surveys where daily variability is high (e.g., coastal tourism and artisanal fishing), with data collection distributed throughout the year to support more precise seasonal adjustment.
3. ¶9 **For multi-year accounts:** Panel surveys following the same units over time, which measure change in business performance directly instead of inferring it from cross-sectional comparison.

¶10 The choice of temporal design should be documented in methodology metadata and applied consistently across compilation cycles³⁴.

Household survey sampling

¶1 For household surveys measuring ocean-related topics, sampling design considerations include:

¶2 As noted in Section 3.2, household surveys with stratified spatial and demographic design are efficient instruments for tourism measurement.³⁵ For coastal and marine tourism measurement, geographic stratification is particularly important: households in coastal areas may have different patterns of ocean-related consumption and recreation than inland households.

¶3 Where ocean-related activities are concentrated in specific population subgroups (e.g., fishing communities), screening approaches or oversampling of relevant areas may be required to obtain sufficient sample sizes for detailed analysis.

3.4 Quality Assurance for Survey Data

¶1 Quality assurance for survey data encompasses all procedures designed to ensure that survey results are accurate, reliable, and fit for their intended uses. The *UN National Quality Assurance Framework Manual* (UN NQAF) provides the overarching framework for statistical quality, with specific guidance applicable to surveys³⁶. For the broader quality framework governing ocean accounting, see **TG-0.7 Quality Assurance**.

Sampling and non-sampling errors

¶1 Survey quality is affected by both sampling errors (arising from observing only a sample rather than the entire population) and non-sampling errors (arising from all other sources).

¶2 **Sampling errors** should be measured, evaluated, and documented for all survey estimates³⁷. Standard errors or confidence intervals should be calculated and published alongside point estimates. For complex survey designs (stratified, clustered, or multi-stage samples), appropriate variance estimation methods must be employed.

¶3 **Non-sampling errors** include:

- ¶4 **Coverage errors** – differences between the frame population and target population
- ¶5 **Measurement errors** – differences between collected and true values due to questionnaire design, respondent error, or interviewer effects
- ¶6 **Processing errors** – errors introduced during coding, editing, or data entry
- ¶7 **Non-response errors** – bias arising from non-participation

¶8 Sources of possible sampling error should be identified and described, and non-sampling errors identified, described, and evaluated. Information about both should be made available to users as part of metadata³⁸.

Non-response handling

¶1 Proper follow-up procedures should be planned and implemented in cases of non-response³⁹. Non-response in ocean industry surveys may arise from:

- ¶2 **Unit non-response** – establishments or households that do not participate at all
- ¶3 **Item non-response** – individual questions left unanswered
- ¶4 **Operational non-contact** – inability to reach at-sea operations or mobile fishing vessels during the survey reference period

¶5 Operational non-contact is structurally different from ordinary non-response. Vessels at sea are unreachable during the reference period, and their absence from the returns does not indicate refusal. Because vessels operating at sea during the reference period are likely to have higher catch

volumes than those in port, standard non-response adjustment methods applied without modification would systematically underestimate production.

¶6 Compilers should treat operational non-contact as a distinct category with its own adjustment procedure:

- ¶7 **Where VMS or logbook data are available:** Use vessel monitoring system data or fishing logbooks from fisheries management authorities as auxiliary information to impute activity levels for non-contacted vessels. This is the preferred approach as it uses operational data that directly captures the activity being measured.
- ¶8 **Where VMS is unavailable:** Apply donor-based hot-deck imputation stratified by gear type and season, with donors drawn from vessels with similar operational characteristics to the non-contacted unit.
- ¶9 **Reporting:** Non-contact rates must be reported separately from refusal rates in survey metadata, as they carry different analytical implications and require different adjustment strategies.

¶10 Cross-reference **TG-4.3 Administrative Data Sources** for guidance on VMS and logbook data integration⁴⁰.

¶11 Generic prevention measures (clear communication, respondent-friendly design, multiple contact attempts), adjustment measures (weighting, imputation), and statistical editing follow the UN NQAF framework as applied in **TG-0.7 Quality Assurance Principles**^{41, 42}.

Data validation

¶1 Data validation procedures should identify potential problems, errors, and discrepancies such as outliers, missing data, and miscoding⁴³. For ocean economy surveys, validation checks include:

¶2 **Range checks:**

- ¶3 Are reported values within plausible bounds for the industry?
- ¶4 Are employment figures consistent with establishment size?
- ¶5 Are output values consistent with industry averages?

¶6 **Consistency checks:**

- ¶7 Do components sum to reported totals?
- ¶8 Are ratios (value added to output, wages to employment) plausible?
- ¶9 Are reported activities consistent with ISIC classification?

¶10 For first compilation, compilers should use national accounts SNA supply-use table ratios as initial plausibility bounds for value-added-to-output and wages-to-output ratios. For fishing industries specifically, FAO's Techno-Economic Performance Reports provide value-added-to-output ratios by fleet type that serve as external validation benchmarks. From the second compilation cycle onward, use the prior cycle's stratum means as a rolling baseline, and flag any observation deviating more than two standard deviations from the stratum mean for follow-up with the respondent. No GOAP-specific reference ranges are prescribed given the high variability across national contexts⁴⁴.

¶11 **Longitudinal checks:**

- ¶12 Are changes from previous periods plausible?
- ¶13 Are large changes supported by known economic events?

¶14 **Cross-source validation:**

- ¶15 Are survey results consistent with administrative data (tax records, fishing licences)?
- ¶16 Do aggregated survey results align with independent benchmarks?

Integration of multiple data sources

¶1 The general principles and workflow for integrating data from multiple ocean accounting sources (including classification alignment, linkage quality testing, and metadata requirements) are covered in **TG-4.6 Data Harmonisation and Interoperability**. In the survey context, the key survey-specific point is that administrative data from fisheries management systems (catch reporting, VMS, observer records) often capture landing volumes more completely than business surveys, whilst survey data remain essential for the economic dimensions (value added, employment, costs) that administrative systems do not cover. See **TG-4.3 Administrative Data Sources** for the full multi-source reconciliation workflow.⁴⁵

Quality documentation

¶1 General quality documentation requirements for ocean accounting data (covering methodology description, accuracy measures, comparability notes, and fitness-for-use guidance) are set out in **TG-0.7 Quality Assurance Principles** and the UN NQAF dimensions described in **TG-4.5 Research Data §3.3.1**. Survey-specific quality considerations not covered by those circulars (including sampling and non-sampling error estimation, non-response handling for at-sea operations, and cross-source validation against administrative and fisheries management data) are addressed in Sections 3.3 and 3.4 above.⁴⁶

4. Worked Examples

4.1 Ocean economy survey module design – synthetic worked example

¶1 A national statistical office seeks to compile ocean economy thematic accounts for the first time. The office decides to augment the existing annual economic survey with a supplementary module targeting establishments in partially ocean-related industries to estimate the ocean share of their activity. The compilation procedure follows this sequence:

¶2 **Step 1: Industry scope determination.** Working with **TG-3.3 Economic Activity Relevant to the Ocean**, the compiler identifies ISIC classes that require ocean share estimation. These include:

- ¶3 ISIC 1020 (Processing and preserving of fish) – may process both marine and freshwater fish
- ¶4 ISIC 5510 (Short-term accommodation) – coastal establishments serve both marine tourism and other visitors
- ¶5 ISIC 4721 (Retail sale of food) – coastal fish markets and seafood retailers

¶6 **Step 2: Survey instrument design.** For each target industry, a short supplementary questionnaire is designed asking:

1. ¶7 What percentage of your total output/turnover in the reference year was directly related to ocean or marine activities? (0-100%)
2. ¶8 What percentage of your employment was engaged in ocean or marine activities? (0-100%)
3. ¶9 Please describe the nature of the ocean-related activity (open text)

¶10 **Step 3: Survey administration.** The supplement is included in the annual economic survey mailout for the 850 establishments in the target industries. Response rate is 78% (663 usable responses).

¶11 **Step 4: Compilation and validation.** For each industry class, the weighted mean ocean share is computed across responding establishments. For ISIC 1020, the mean ocean share is 72%. For coastal ISIC 5510, the mean is 45%, and for ISIC 4721, the mean is 28%.

¶12 Before applying class-level means, compilers should check for high within-class variance. Where the coefficient of variation of the ocean share within a stratum exceeds 0.5, estimate ratios separately for geographically stratified sub-groups (coastal vs. non-coastal establishments within the same ISIC class) rather than applying a single class-level mean. For ISIC 5510 in this example,

beachfront accommodation and inland-city hotels are both classified to the same code.

Geographic sub-stratification ensures that the 45% class mean is not applied uniformly to establishments with no proximity to the coast.

¶13 Ocean share ratios are then applied to the full industry output and employment aggregates from the annual economic survey to derive ocean economy estimates. Ratios with a coefficient of variation exceeding 0.5 that could not be sub-stratified should be flagged in metadata.

¶14 **Step 5: Account integration.** The ocean share estimates are combined with the output, intermediate consumption, and employment data for the partially ocean-related industries. These are then aggregated with data for wholly ocean-related industries (fishing, aquaculture, maritime transport) to produce the ocean economy totals that feed into **TG-2.5 Structure and Function of the Ocean Economy** indicators.

¶15 This module-augmentation approach scales to other partially ocean-related industries and adapts to different national contexts.

4.2 Stratified sampling for marine fishing establishments

¶1 A national statistical office seeks to estimate gross output and employment for the marine fishing industry. The business register contains 2,400 fishing enterprises classified to ISIC 0311 (Marine fishing). Register data indicate high skewness in the size distribution: 150 large operations account for 65% of total industry employment.

¶2 Frame preparation:

- ¶3 The register is cleaned to remove ceased operations and update contact information
- ¶4 Enterprises are geocoded to coastal regions

¶5 Stratification:

¶6 This example uses employment as the stratification variable because the primary survey objective is employment estimation. Where the objective is GVA or output estimation, annual turnover or vessel capacity (GRT) should be used as the primary stratification variable instead (see Section 3.3). Where both employment and output estimates are required, stratify on turnover as the primary variable with employment as a secondary sort within strata.

Stratum	Employment range	Population (N)	Sampling fraction	Sample (n)
Take-all	50+ employees	150	100%	150
Large	10-49 employees	450	40%	180
Medium	3-9 employees	800	20%	160
Small	1-2 employees	1,000	10%	100
Total		2,400		590

¶7 **Table 4.1: Sample allocation for marine fishing survey**

¶8 **Estimation:** Estimates are calculated using Horvitz-Thompson estimators with design weights equal to the inverse of the sampling fraction. Variance estimates account for the stratified design.

4.3 Household survey module for coastal tourism

¶1 A household tourism survey includes a module to measure visits to coastal and marine destinations. The module asks:

1. ¶2 In the past 12 months, did you take any trips (overnight or same-day) to coastal or beach destinations?
2. ¶3 [If yes] How many trips to coastal/beach destinations did you take?
3. ¶4 For your most recent coastal trip:

- ¶5 Main destination (locality/region)
- ¶6 Duration (number of nights, or same-day)
- ¶7 Main purpose (holiday, visiting friends/relatives, business, other)
- ¶8 Activities undertaken (beach recreation, swimming, diving/snorkelling, fishing, boat trips, other)
- ¶9 Total expenditure on the trip
- ¶10 Breakdown by category: accommodation, food/drink, transport, activities, shopping

¶11 Survey results are weighted using household sampling weights and grossed to the national population. Expenditure estimates are compared with administrative data from accommodation establishments in coastal areas for validation.

5. Acknowledgements

¶1 **Authors:** [To be confirmed]

¶2 **Reviewers:** [To be confirmed]

6. References

1. ¶1 SF-MST (2024), para 3.20. Data on the characteristics of tourism establishments is most readily organised by utilising and extending the information available in a business register.
2. ¶2 SF-MST (2024), para 3.21. Within the structure of a business register, establishments classified as being involved in tourism industries can be assessed using variables such as industry class, size of establishment, employment, ownership, and legal entity.
3. ¶3 2025 SNA, Chapter 28, para 28.4. Best practices in the development and maintenance of business registers are presented in the UN Guidelines on Statistical Business Registers.
4. ¶4 ISIC Rev.4 (2008), Introduction. The International Standard Industrial Classification of All Economic Activities (ISIC) provides the framework for classifying economic activities.
5. ¶5 ISIC Rev.4 (2008), Detailed Structure, Sections A, B, C, H, and M. Core ocean ISIC classes include 0311 (Marine fishing), 0321 (Marine aquaculture), 3011 (Ship and floating structure building), 5011/5012 (Sea and coastal passenger/freight water transport), 5222 (Services incidental to water transportation), and 5224 (Cargo handling at ports) – all surveyed under full coverage. Partially ocean-related classes requiring ocean-share supplementary questions include 1020 (Fish processing), 3511/3512 (Offshore renewables), 7210 (Marine R&D), and 0910 (Support to offshore petroleum and gas). For the complete authoritative industry scope of ocean accounts and the survey-approach treatment for each class, see [TG-3.3](#); for the canonical treatment of standards relevant to ocean accounting more generally, see [TG-4.6](#).
6. ¶6 ISIC Rev.5 (2024), endorsed by the UN Statistical Commission at its 55th session. Implementation expected from 2027, with transitional correspondence tables to be provided by the UN Statistics Division. See TG-0.2 for guidance on managing classification transitions in ocean accounting.
7. ¶7 SF-MST (2024), para 3.19. The measurement of the economic activity of tourism focuses on tourism establishments. For ocean accounting, the broader challenge of identifying partially ocean-related activity across all industries requires supplementary survey questions to determine the ocean share of economic activity at the establishment level.
8. ¶8 TG-3.3 Economic Activity Relevant to the Ocean, Section 3.1. The industry classification framework and criteria for inclusion of partially ocean-related industries are defined in TG-3.3.
9. ¶9 SNA 2025, Chapter 3 (economic territory and residence); SEEA-Ocean (2021), Chapter 2; UNCLOS (1982), Part VII (high seas). The residency-based scope ensures consistency between ocean economy accounts and the broader national accounts framework.
10. ¶10 IRTS 2008, para 2.9. Tourism is a social, cultural and economic phenomenon related to the movement of people to places outside their usual place of residence.
11. ¶11 SF-MST (2024), para 1.1. The Statistical Framework for Measuring the Sustainability of Tourism provides a framework for integrating tourism statistics with the SEEA.
12. ¶12 SF-MST (2024), para 3.21.
13. ¶13 SF-MST (2024), para 3.25. Where available, business registers are most commonly developed at a national level with the relevant data derived mainly from administrative data sources and business statistics. The 10 km buffer criterion is consistent with SEEA-Ocean (2021) Chapter 2 spatial boundary guidance.
14. ¶14 IRTS 2008, para 6.57. Generalised annual surveys will usually provide economic information on establishments, including the number of units, classified by industry, output by source of revenue or main product and intermediate consumption.

5. ¶15 TSA:RMF 2008, Table 5. Production accounts of tourism industries and other industries.
6. ¶16 SF-MST (2024), para 3.18. In many instances, there may be an important contribution to tourism activity from the informal economy where there is no registration of economic units.
7. ¶17 SF-MST (2024), para 3.18.
8. ¶18 ILO (2018), *Women and Men in the Informal Economy: A Statistical Picture*. 3rd edition. Geneva: ILO; FAO (2015), *Voluntary Guidelines for Small-Scale Fisheries*. Rome: FAO. The 10% and 80% thresholds are operational guidance values; compilers may adopt more conservative thresholds based on national context.
9. ¶19 IRTS 2008, para 7.30.
0. ¶20 IRTS 2008, para 7.30.
1. ¶21 IRTS 2008, para 7.31.
2. ¶22 IRTS 2008, para 7.29. The collection of data on employment in the tourism industries should be integrated in the regular national statistical system.
3. ¶23 ILO (2013), *Resolution Concerning Statistics of Work, Employment and Labour Underutilization*, 19th ICLS. Geneva: ILO; ISCO-08 (ILO, 2012). The ISCO codes cited (6221, 8350, 3151) are indicative of the most common ocean-related occupations; compilers should review the full ISCO-08 structure for their national context.
4. ¶24 COICOP 2018, Class 01.1.4 (Fish and seafood) and subclasses; UN Statistics Division. The supply-side ratio method is appropriate where HBS sample sizes in coastal fish-consuming households are insufficient for direct statistical estimation.
5. ¶25 IRTS 2008, para 2.72. Household surveys based on a stratified sample using spatial, demographic and socio-economic criteria can be efficient and suitable instruments for measuring domestic tourism activity and related expenditure.
6. ¶26 IRTS 2008, para 2.74. From a general household survey perspective, it is possible to observe round trips taken by visitors and not only visits as is the case when observing visitors during their trips.
7. ¶27 IRTS 2008, para 2.73. Sample size and design are strongly related to the significance and accuracy of the variables to be estimated. Two different issues need to be taken into consideration when designing domestic surveys to analyse tourism.
8. ¶28 UN NQAF Manual (2019), Requirement 10.4. A systematic approach is in place for updating the survey frames to ensure accurate coverage of the target population.
9. ¶29 UN NQAF Manual (2019), Requirement 10.4. Information gathered during the conduct of surveys is used to assess and improve the quality of the frame, especially with regard to its coverage.
0. ¶30 SEEA Technical Note on Water Accounts, para on sampling frame. The need for an appropriate sampling frame which draws a representative picture of water supply and use from the business register.
1. ¶31 Hartley, H.O. (1962), "Multiple frame surveys," *Proceedings of the American Statistical Association, Social Statistics Section*, pp. 203-206; Lohr, S.L. & Rao, J.N.K. (2006), "Estimation in multiple-frame surveys," *Journal of the American Statistical Association* 101(475), pp. 1019-1030. The screening approach is generally preferred as it avoids the need for complex weight adjustment formulas.
2. ¶32 SEEA-Ocean (2021), Chapter 2 (spatial extent of ocean accounts); TG-0.2 Overview of Relevant Statistical Standards; UN NQAF Manual (2019), Requirement 10.4.
3. ¶33 UN NQAF Manual (2019), Requirement 11.1. Appropriate sampling techniques are used to minimise sample sizes to achieve the target level of accuracy.
4. ¶34 UN NQAF Manual (2019), Requirement 11; IRTS 2008, para 2.73; FAO (2001), *Guidelines for the Routine Collection of Capture Fishery Data*, Chapter 4. The two-reference-period approach is standard practice in fisheries production surveys where year-round continuous surveys are not feasible.
5. ¶35 IRTS 2008, para 2.72.
6. ¶36 UN NQAF Manual (2019), Overview. The UN National Quality Assurance Framework Manual provides guidance on assuring the quality of official statistics.
7. ¶37 UN NQAF Manual (2019), Requirement 15.2. Sampling errors are measured, evaluated and documented.
8. ¶38 UN NQAF Manual (2019), Requirement 15.2. Non-sampling errors are described and, when possible, estimated. Information about the sampling and non-sampling errors is made available to users as part of the metadata.
9. ¶39 UN NQAF Manual (2019), Requirement 10.1. Proper follow-up procedures are planned and implemented in cases of non-response.
0. ¶40 FAO (2001), *Guidelines for the Routine Collection of Capture Fishery Data*, Chapter 5; TG-4.3 Administrative Data Sources. VMS-based imputation for at-sea non-contact is consistent with established practice in European and Pacific fisheries survey programmes.
1. ¶41 UN NQAF Manual (2019), Requirement 10.1. Statistical editing procedures and imputation methods are based on sound methodology.
2. ¶42 UN NQAF Manual (2019), Requirement 12.2. The effects of data editing and imputation are analysed as part of assessing the quality of the data collection.
3. ¶43 UN NQAF Manual (2019), Requirement 12.2. Data of all data sources are reviewed and validated to identify potential problems, errors and discrepancies such as outliers, missing data and miscoding.
4. ¶44 FAO (various years), *Techno-Economic Performance of the European Fishing Fleets*. Annual report series. Rome: FAO; SNA 2025, Chapter 28 (supply-use tables and industry ratios). The two-standard-deviation flag rule is a standard statistical editing practice; compilers may tighten or loosen the threshold based on prior knowledge of variability in their industry sample.

5. ¶45 FAO. (2001). *Guidelines for the Routine Collection of Capture Fishery Data*. FAO Fisheries Technical Paper No. 382. Rome: FAO. The integration of administrative catch data with survey-based economic data is recommended practice in fisheries statistics, where landings records provide volume benchmarks and surveys supply value-added dimensions.
6. ¶46 UN NQAF Manual (2019), Chapter 3. The concept of data quality for official statistics encompasses factors of relevance, timeliness, accuracy, coherence, interpretability, and accessibility.

DRAFT