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From Past to Present: Construction of a Dataset Documenting Mother-of-Pearl Exports From a Pacific Island Nation, Papua New Guinea

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INTRODUCTION

Inter-generational loss of information relating to marine resource exploitation leads to shifting baselines (Pauly, 1995; Pinnegar and Engelhard, 2007), which have direct consequences for fisheries management and livelihoods opportunities. Historical data provide a means of regaining that information (Jackson et al., 2011; Cardinale et al., 2015; Fortibuoni et al., 2017) and are increasingly incorporated into assessments of change (Lotze and Milewski, 2004; Eddy et al., 2010; Gianelli and Defeo, 2017). Through improved knowledge of past environmental states and resource use dynamics, there is demonstrable evidence that historical data brings value to modern marine policy and management in both national and regional contexts (Jackson et al., 2011; Engelhard et al., 2016; Fortibuoni et al., 2017).

Despite this, historical data are not commonly incorporated into such frameworks for several reasons. Most notably, historical data are difficult to collect. Records may exist in a variety of languages, accessible only as physical documents, widely dispersed among archives and institutions, require special permissions to access, or occur in obfuscating formats (Lotze and Milewski, 2004; Rose et al., 2009; McClenachan et al., 2012). Furthermore, the challenge of standardising unfamiliar data, such as non-metric weights and pre-decimal currencies, to enable interpretation in modern contexts, presents a barrier to their use (Lotze and Milewski, 2004; Bainbridge and Hulme, 2014; Tesfamichael et al., 2014). Funding barriers also exist, which hinder government agencies in addressing these challenges (McClenachan et al., 2012).

The inherent challenges of accessing and analysing historical data are particularly germane for agencies concerned with fisheries management in the Pacific region (Gillett and Tauati, 2018). Historical data of relevance to fisheries were rarely published or disseminated and, where extant, records are less accessible from within the region than from outside (Flores, 1984; Blanchet, 1990). Lack of coherent information policies (SPC, 1988; Blanchet, 1990) coupled with poor conservation of public records (Bell, 2003; Rose et al., 2009) has generated an abundance of isolated reports which are now only available from repositories of formal colonial authorities and international agencies. Compiling existing information into a usable, inter-operable data format, supporting multi-disciplinary use, has long been a regional priority, particularly for fisheries supporting livelihoods (SPC, 1988; Blanchet, 1990; Halford et al., 2021).

For a substantial part of the Pacific region, livelihoods are partly or wholly dependent on fishing for food security and income generation (Dalzell et al., 1996; Gillett and Tauati, 2018; Andrew et al., 2019). While artisanal fishing for subsistence has occurred for millennia (Swadling, 1976, 1977; Szabó and Amesbury, 2011), escalation of exploitation for both subsistence and export markets has occurred in the last several decades or centuries (Dalzell et al., 1996; Gillett and Lightfoot, 2001). Since the introduction of colonial capitalist economies to the region (ca. 1800s) (Cariño and Monteforte, 2009), export-driven mother-of-pearl (MoP) fisheries, which target pearl oysters (*Pinctada* spp.), greensnail (*Turbo marmoratus*), and trochus (*Rochia nilotica*) for their nacreous shells, have made and continue to make important contributions to household earnings (Hawes et al., 2011; Purdy et al., 2017; Vieira et al., 2017; Gillett et al., 2020; Purcell et al., 2021). With past exploitation inevitably influencing the status of present-day populations of these commodities (Berzunza-Sanchez et al., 2013), resulting in local depletion in some cases (Chesher, 1980; Kelso, 1996; Kile, 2000; Pakoa et al., 2014), there is scope for historical data to provide valuable insight into the scale, nature, and timing of human influences on MoP fisheries.

To support the use of historical data by agencies concerned with managing MoP fisheries, we present a quantitative, standardised, and quality-validated dataset covering over 130 years (1888–2019) of MoP exports from a key producer in the Pacific region; Papua New Guinea (PNG). Both the size and economic importance of MoP fisheries in PNG (Purdy et al., 2017; Vieira et al., 2017; Gillett et al., 2020) have motivated the collaborative effort presented here, which aims to raise awareness and expand access to existing historical information of consequence to national and regional marine policy and management (Anon, 2017; SPC, 2019). Specifically, weight, value, and value tonne^{-1} of MoP exports from PNG are presented as time-series from the onset of commercial fishing in 1888 to present (2019).

METHODS

Data Collection

Data were collected from two sources: (1) physical records and (2) the electronic data management system maintained by PNG National Fisheries Authority. A complete list of physical records from which data were collected appears in the Record Availability section.

Data pertaining to MoP exports were commonly reported as part of annual trade summaries representing a 12-month period. In 1903 and 1978, however, trade summaries represented a 21 and 16-month period, respectively, as a result of fiscal to calendar year transitions in reporting. For these years, data were discounted to a 12-month period through multiplication with the appropriate fraction (e.g., $^{12}/_{21}$ or $^{12}/_{16}$). In cases where data were reported monthly (e.g., government gazettes) or quarterly (e.g., statistical bulletins), data were summed to derive an annual datum for the corresponding reporting year. Similarly, where data were reported separately for past administrative divisions of PNG (colonial administrations of British New Guinea/Territory of Papua and German New Guinea/Territory of New Guinea), data were summed to derive an annual datum for the whole nation. Data pertaining to both weight and value of MoP exports were collected, when available. Where records contained both weight and value data, value tonne^{-1} was calculated.

The most definitive datum was chosen where multiple records reported data for a given reporting year with varying levels of precision (e.g., 2,797 cwt in one record was truncated to 140 tonnes in another). If data variability between records exceeded what could reasonably be attributed to truncation (evaluated using floor and ceiling functions), the mean ± 95% confidence interval (CI) of available data was calculated to represent the annual datum for the corresponding reporting year.

Taxonomic resolution of data was maintained where possible. Records commonly reported exports for pearl oysters, greensnail, and trochus separately, although some records reported the export of unspecified MoP in addition to, or in place of, the taxa-specific categories. The sum of all categories against which MoP exports were reported for a given reporting year was taken to represent the total MoP exported for that year.

Disaggregation of MoP exports based on processing (i.e., unprocessed shell or buttons) or origin (i.e., aquaculture or fisheries) was not possible as record specificity precluded such differentiation.

Interpolation

For some reporting years, data were unavailable for part or the entirety of PNG. Data pertaining to the value of MoP exports were available for 129 years (97.7% coverage) of the 132-year period covered by our dataset. Omissions were due to a loss of records associated with military occupations during WWI (1914) and WWII (1942 and 1946). Missing data were derived through linear interpolation, given by the equation

$$E = E_{Ya} + \frac{(E_{Yb} - E_{Ya}) \times (Y - Y_a)}{Y_b - Y_a} \quad (1)$$

where the value of exports (E) for a given year (Y) is linearly proportional to the nearest preceding (Y_a) and proceeding year (Y_b) for which the value of exports was known.

Data pertaining to the weight of MoP exports was available for 115 years (87.1% coverage) of the 132-year period. The difference in coverage between value and weight data was the result of annual trade summaries irregularly reporting the weight of MoP exports between 1900 and 1922. Where omitted, weight was calculated by dividing the value of exports for that year (a known value) by an estimate of their value tonne^{-1}, derived through linear interpolation (Equation 1). This approach, rather than interpolating weight directly, was chosen because the year-on-year variation in the value tonne^{-1} of exports was substantially less than the variation in weight (**Figure 1**), making value tonne^{-1} the more appropriate metric to interpolate.

Standardisation

The system of currency operating within PNG changed frequently (Mira, 1986), with values recorded in pound sterling

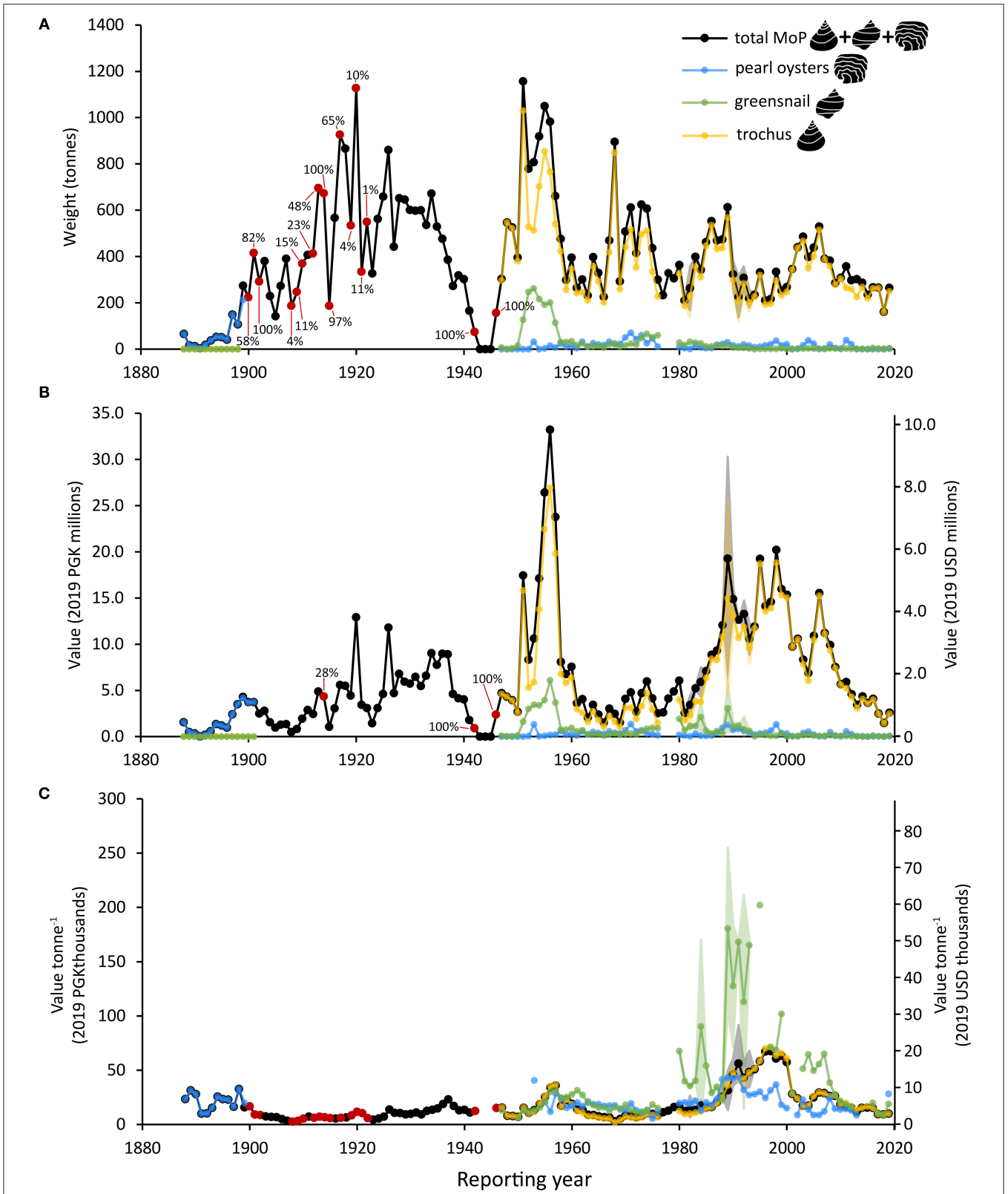

FIGURE 1 | Visualisation of the annual **(A)** weight, **(B)** value, and **(C)** value tonne^{-1} of mother-of-pearl (MoP) exports from Papua New Guinea between 1888 and 2019. Total MoP exports are differentiated as pearl oysters (*Pinctada* spp.), greensnail (*Turbo marmoratus*), and trochus (*Rochia nilotica*) for reporting years with a reasonable degree of accuracy (i.e., unspecified MoP accounted for <10% of exports). Shading identifies the 95% confidence interval. Data partly or entirely derived through interpolation are marked in red and the relative contribution of interpolated data to the weight and value of total MoP exports indicated as a percentage. Data can be accessed as described in the Dataset section.

(1888–1909), goldmark (1898–1913), Australian pound (1910–1966), Australian dollar (1966–1975), and kina (1975–2019). As these currencies were not directly comparable, values were converted and denominated in terms of a base currency. We adopted the current legal tender of PNG, kina (ISO 4217: PGK), as the base currency following precedent of prior studies (Glucksman and Lindholm, 1982; Wright, 1986).

Values recorded in demonetised currencies were expressed as PGK based on appropriate conversion rates. The Australian pound replaced the pound sterling at par, while the Australian pound replaced the goldmark at a conversion of 1 to 20.50 (Mira, 1986). Subsequently, the Australian dollar replaced the Australian pound at a conversion of 2 to 1, and then the PGK replaced the Australian dollar at par (Mira, 1986).

To standardise values across time, nominal values were adjusted for inflation using price indices representative of temporal changes in consumer prices in the local economy. Specifically, we used the Retail Price Index Numbers, Long-Term Linked Series (1888–1962) published by the Australian Bureau of Statistics (Castles, 1994), the Retail Price Index (1962–1971) published by the Australian Department of External Territories (Australia, 1972), and the Consumer Price Index (1971–2019) published by World Bank (2021) to adjust nominal values to 2019 PGK. Real values are reported as 2019 PGK alongside the 2019 United States dollar (ISO 4217: USD) equivalent, based on an exchange rate of 1 USD to 3.3875 PGK.

Weight was standardised as metric tonne, converting weights recorded in the imperial system of units as hundredweight (0.0508 tonne) or long ton (1.01605 tonne).

Dataset

Centralised reporting of MoP exports from PNG began in 1888, coinciding with the arrival of commercial pearling fleets (British New Guinea, 1889; Moore, 2000). Our dataset tabulates the standardised weight (tonnes), value (2019 PGK / USD) and value tonne^{-1} (2019 PGK/USD) of MoP exports annually from this point until 2019, on the basis of the reporting year (**Figure 1**). The relative contribution of interpolated data to a given reporting year is denoted as a percentage to indicate the extent data approximates actual exports. Similarly, the relative contribution of unspecified MoP exports to a given reporting year is denoted as a percentage to indicate the extent data for taxa-specific (i.e., pearl oysters, greensnail, trochus) categories may reflect actual exports.

The dataset is accessible through an unrestricted repository, USC Research Bank [DOI 10.25907/00080], and Research Data Australia [https://researchdata.edu.au/mother-of-pearl-1888-2019/1734519]. The source data underpinning the constructed dataset can also be retrieved, redacted as an XLS file, using the same accession link.

QUALITY-VALIDATION OF THE DATASET

In working with historical data, two aspects of selection bias must be addressed: (1) the degree to which collected data represent the wider record collection from which records were drawn; (2) the degree to which the collected data reflect actual history (Inwood and Maxwell-Stewart, 2020). Independently constructed time-series for MoP fisheries of PNG and neighbouring Pacific nations allows quantitative assessment of such biases, permitting quality-validation of our dataset.

Four-decades ago, Glucksman and Lindholm (1982) constructed time-series for MoP exports from PNG between 1948 and 1976. Their data, from undisclosed sources, were very highly correlated (Pearson's distances: $d_{cor} \leq 0.05$, $r > 0.99$, and $p < 0.001$) with our dataset for the period of overlap, showing near-identical trends and remarkably similar magnitudes (**Supplementary Figure 1**). Agreement between these two successive efforts demonstrates replicability and implies fairly homogenous data among records for this period.

In contrast, heterogeneous data among records for MoP exports from PNG between 1980 and 1993 is a known problem (Kailola, 1995). By presenting the mean ± 95% CI of collected data for this period, our dataset accurately reflects the variability among accessible records, thus, managing potential bias from record selection.

Comparison with the FAO Global Production database shows our dataset largely agrees with FAO's "best scientific estimates" (Garibaldi, 2012) of trochus and pearl oyster production for PNG (**Figure 2**). The reported weight of trochus production by FAO for periods 1953 to 1968 and 1985 to 2018 were highly correlated (Pearson's distance: d_{cor}0.55, $r = 0.85$, and $p < 0.001$) with the weight of trochus exports presented in our dataset. In comparison, the weight of pearl oyster production is reported by FAO for only a single period (1988–2018) and had a moderate correlation (Pearson's distance: d_{cor} 0.85, $r = 0.64$, and $p < 0.001$) with the weight of pearl oyster exports presented in our dataset. While disagreement with FAO estimates for missing data is understandable, the substantially greater weight of pearl oyster exports in 2011 and 2012 (**Figure 2B**) likely results from pearl oyster exports of aquaculture origin which should be excluded from the FAO data (Garibaldi, 2012).

To gauge whether our dataset accurately reflects the trends of MoP fisheries in the Pacific region, comparison was made to the Australian trochus fishery, which operated in the Great Barrier Reef region (Nash, 1985). The weight and value tonne^{-1} of trochus production from the Australian fishery was reported, almost continuously, from 1912 to 1962; these data show similar (Pearson's distances: $d_{cor} \leq 1.05$, $r \geq 0.45$, and $p \leq 0.002$) trends to those observed for MoP exports from PNG (**Supplementary Figure 2**).

The series of comparisons presented here, while not exhaustive, validate that our dataset provides a reliable indication of temporal change in MoP exports from PNG over many decades, consistent with past studies, international agency estimates, and regional trends in production and value tonne^{-1}. Since our dataset provides unprecedented coverage for MoP fisheries in the Pacific region, it is unreasonable to expect validation of each datum. By making the dataset freely available, however, we encourage further validation of our dataset as more information on MoP fisheries in the Pacific region becomes available.

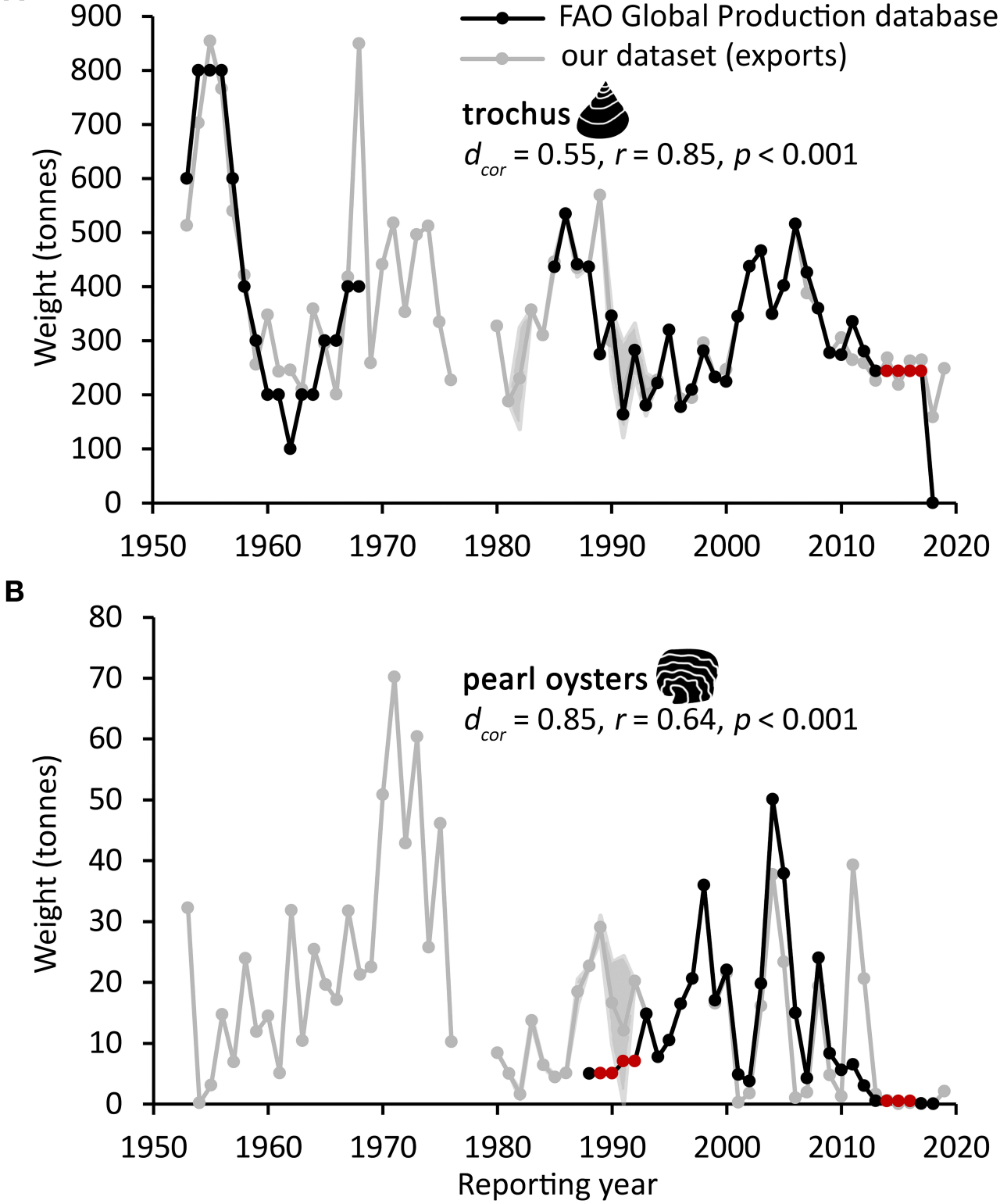

FIGURE 2 | Annual weight of **(A)** trochus (*Rochia nilotica*) and **(B)** pearl oysters (*Pinctada* spp.) production, based on data from FAO Global Production database (black lines), and exports, based on data from our dataset (grey lines), for Papua New Guinea since 1953. FAO estimates for missing data (red points) and the 95% confidence interval of exports (shading) are shown.

CONSIDERATIONS FOR INTERPRETATIONS AND USE OF THE DATASET

Effective management of commercial fisheries is of salience to the future of coastal communities in the Pacific region, where a substantial part of the population is partly or wholly dependent on fishing for income generation (Dalzell et al., 1996; Sulu et al., 2015). With extensive reef systems and abundant MoP resources, PNG is regarded as a main regional exporter of MoP (Gillett et al., 2020), where the harvest and sale of MoP is estimated to support 20–30% of the coastal population (Purdy et al., 2017), accounting for as much as 75% of income in some areas (Vieira et al., 2017). Expanding coastal human population and increasing pressure on marine resources emphasise the need for accessible fisheries information for analysis and to support effective fisheries management in the region (SPC, 2019). Since little attention has been given to MoP fisheries in the last 25 years (Gillett et al., 2020) and historical information is important in guiding appropriate policy (Jackson et al., 2011; Engelhard et al., 2016; Fortibuoni et al., 2017), our dataset provides a basis for raised awareness and improved management of MoP fisheries within both national (Anon, 2017) and regional contexts (SPC, 2019; Gillett et al., 2020). Our dataset presents and facilitates access to MoP trade information, which can be used to estimate and analyse fisheries production, bioeconomic trends, shocks, and their potential drivers (Gephart et al., 2017; Gianelli and Defeo, 2017). The dataset presented here could further be evaluated against other economic and social variables as well as ecological information (Barausse et al., 2011; Papetti et al., 2013; Haimovici and Cardoso, 2016; Gianelli and Defeo, 2017) to inform development of broader marine policy and management strategies. Considerations for the use and interpretation of our dataset in addressing the above opportunities are outlined below.

A concern in the use of historical data for monitoring fisheries is the existence of a latent bias arising from improvements in fisheries reporting systems and regulatory systems. This "presentist bias" (Zeller and Pauly, 2018) has potentially serious consequences when assessing the status of fisheries or in interpreting resource use dynamics. In the case of MoP exports from PNG, procedures for collection of export data have remained largely unchanged since their inception, relying on export declarations validated through visual inspection. Prior to 1899, however, we acknowledge that presentist bias led to underestimation of weight and value of MoP exports from PNG. This is partly because records contain minimal economic data before 1899, for German New Guinea, when a private company functioned as both the administrative authority and an economic competitor. With this conflict of interest, an accurate disclosure of trade information from economic rivals could not be expected and, understandably, such information is scant (Sack and Clark, 1979). Additionally, in British New Guinea, it was not until 1894 that inspectors were instated and ports of export constituted for MoP fisheries (British New Guinea, 1896). Prior to this, "considerable yields of pearl-oyster" appropriated from PNG went unreported, but it is impossible to fix the amount (British New Guinea, 1888, 1892). Caution is therefore advised when drawing conclusions from our dataset for MoP exports during the 19th century, because available data provides a known underestimation.

For most nations in the Pacific region, data on MoP fisheries production is virtually non-existent because artisanal fishing activities of coastal communities are generally not monitored by government agencies (Gillett and Lightfoot, 2001; Govan, 2013; Zeller et al., 2014). In lieu of definitive production data, export data are commonly used by management agencies to estimate production of MoP fisheries (e.g., Lasi, 2010; Gillett et al., 2020). Our analysis (**Quality-validation of the dataset** section) confirmed that MoP exports from PNG were reflective of national (**Figure 2**) and regional (**Supplementary Figure 2**) production trends validating such application, with the following considerations for unreported harvest. First, it must be recognised that pearl oysters, greensnail, and trochus are also harvested for subsistence (as a protein source) (Glucksman and Lindholm, 1982) and, to a small extent, for the domestic shell trade (Simard et al., 2019). Second, the proportion of MoP production ultimately exported is further reduced by shells rejected as part of quality control (i.e., undersized, oversized, or damaged shell) (Kelso, 1996). Third, export tariffs have incentivised commercial operators to under-declare export volumes (SPC, 1997; Gillett et al., 2020). Fourth, exports do not account for illegal, unreported, and unregulated (IUU) harvests by foreign fishing vessels, with poaching of MoP from territorial waters a known issue for much of the period covered by our dataset (Bach, 1955; Christensen, 2016). The extent to which these four factors contributed to a disparity between production and export of MoP in PNG is not precisely known; unreported harvest between 1980 and 1995 was approximated at 25–30% of the exported volume (ICECON, 1997; SPC, 1997) and a correction of 25% is currently adopted at a regional level when adjusting export data to estimate production (Gillett et al., 2020). Adoption of a similar correction when using our dataset to estimate MoP production should be given consideration until more precise estimates of error are established by clear scientific evidence (Garcia, 1994).

In addition to unreported harvest, the potential contribution of aquaculture to exports has implications for estimating fisheries production of pearl oysters. Neither greensnail nor trochus were ever cultured commercially in PNG (Kailola, 1995; Gillett et al., 2020), but pearl oysters were. During the 1960–70s, and more recently since 1997, pearl oysters were cultured commercially to support pearl production in PNG (George, 1978; IPA, 2021). Since records failed to identify the origin of pearl oyster exports, aquaculture could lead to an overestimation of fisheries production. The small volume of pearl oyster exports, however, suggests that aquaculture contributed, at most, only 4.9% of total MoP exports by weight during these periods (**Figure 1**), although actual contribution is likely less since the artisanal fishery was active and contributing to pearl oyster exports concurrently (Glucksman and Lindholm, 1982).

A limited aquaculture contribution would imply that export data provides a good indication of the minimal MoP fisheries production which has occurred in PNG, for reasons discussed

above. Such information provides a much-needed overview in the case of data-poor fisheries (Govan, 2013), and several studies have demonstrated that export data provide an accurate understanding of relative temporal change in commercial fisheries production (e.g., Clarke, 2004; Schwerdtner Máñez and Ferse, 2010; Gianelli and Defeo, 2017; Plagányi et al., 2017). The significant correlation between Australian trochus production and MoP exports from PNG presented above certainly indicates that this holds true for MoP fisheries, as suggested elsewhere (ICECON, 1997; Gillett et al., 2020). It would be remiss, however, to not offer a few words of caution when relating export trends to production.

Trends in MoP exports, such as those shown in **Figure 1A**, can be difficult to interpret as they may reflect both biological and economic factors (Nash, 1985; Foale, 2008). For example, reduced export volume in a given year can reflect poor market price (SPC, 1960), rather than a depletion of stocks. Atypical of most commercial fisheries commodities, MoP is an inert product having a long-lasting (i.e., years) shelf-life (Glucksman and Lindholm, 1982; Foale, 2008). This permits stockpiling of MoP for liquidation when more favourable market prices arise and, thus, exports for any given year may reflect both current and past production. To better enable the users of our dataset to address potential economic factors influencing exports, the value tonne^{-1} of MoP exports was calculated and included in our dataset. Whilst in-country processing of MoP buttons would invariably impact the value tonne^{-1} of MoP exports, this is a relatively recent development, which occurred irregularly between 1992 and 2014 (ICECON, 1997; Gillett et al., 2020).

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: USC Research Bank [DOI 10.25907/00080] and Research Data Australia [https://researchdata.edu.au/mother-of-pearl-1888-2019/1734519].

Records catalogued by the National Library of Australia had the following accession numbers (Bib ID):

1. 395064: *New Guinea gazette*.
2. 1053953: *Annual report on British New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-82611572
3. 1282521: *Report to the Council of the League of Nations on the administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-324059207
4. 1293821: *Papua: annual report for the year ending 30th June*. Digitised and available from: https://nla.gov.au/nla.obj-268724687
5. 1293848: *Territory of Papua: Annual report for the period*. Digitised and available from: https://nla.gov.au/nla.obj-2060262652
6. 1293865: *Annual report of the Territory of Papua for the period.…* Digitised and available from: https://nla.gov.au/nla.obj-2164593963
7. 1300182: *Territory of Papua: Annual report for the year*. Digitised and available from: https://nla.gov.au/nla.obj-1905139508
8. 1329016: *Report to the General Assembly of the United Nations on the administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-2059853295
9. 1758906: *Government gazette: British administration of German New Guinea*.
10. 2790423: *International trade*.
11. 2804807: *Report to the League of Nations on the administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-2590388577
12. 2804816: *Report to the Council of the League of Nations on the administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-228879604
13. 2816137: *Territory of Papua: Annual report for the period*. Digitised and available from: https://nla.gov.au/nla.obj-1905803422
14. 2851375: *Administration of Papua New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-1297995152
15. 2851382: *Administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-2765327678
16. 2851390: *Report to the General Assembly of the United Nations on the administration of the Territory of New Guinea*. Digitised and available from: https://nla.gov.au/nla.obj-1904874562
17. 2925185: *Amtsblatt für das Schutzgebiet Deutsch-Neuguinea*. Digitised and available from: https://nla.gov.au/nla.obj-48330386

Records catalogued by the Pacific Community (SPC) Library had the following accession numbers (Bib ID):

1. 18399: SPC (1997). *Workshop on trochus resource assessment, management and development report and selected papers*. Integrated Coastal Fisheries Management Project Technical Document No. 13. Noumea, New Caledonia: South Pacific Commission (SPC). Digitised and available from: http://opac.spc.int/cgi-bin/koha/opac-detail.pl?biblionumber=18399
2. 46314: Kailola, P. J. (1995). *Fisheries Resources Profiles: Papua New Guinea*. FFA Report No. 95/45. Honiara, Solomon Islands: Forum Fisheries Agency.
3. 53907: Wright, A. (1986). *An analysis of exports of marine produce from Papua New Guinea for the period 1980 to May 1986, with emphasis on produce collected by small-scale fishermen*. Fisheries Research Laboratory, Department of Primary Industry. Kavieng, Papua New Guinea: Department of Primary Industry (DPI).

Records catalogued by the Staats- und Universitätsbibliothek Bremen had the following accession numbers (Uniform Resource Locator):

1. urn:nbn:de:gbv:46:1-14372: *Jahresbericht über die Entwickelung der Schutzgebiete in Afrika und der Südsee:*

im Jahre (1899–1907). Digitised and available from: https://nbn-resolving.de/urn:nbn:de:gbv:46:1-14372.

AUTHOR CONTRIBUTIONS

NS, TM, and JK collected relevant records. NS extracted data from records and constructed the dataset. TM and JK verified the dataset. NS and TM performed the statistical analysis for validation. NS wrote the manuscript with support from TM, JK, and PS. All authors contributed to conception and design of the project, manuscript revision, read, and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmars.2021.762610/full#supplementary-material

Supplementary Figure 1 | Annual weight and value of **(A,B)** total mother-of-pearl (MoP) exports for Papua New Guinea differentiated as **(C,D)** trochus (*Rochia nilotica*), **(E,F)** pearl oysters (*Pinctada* spp.), and **(G,H)** greensnail (*Turbo marmoratus*), comparing data from Glucksman and Lindholm (1982) (black lines) with data from our dataset (grey lines).

Supplementary Figure 2 | Annual **(A)** weight and **(B)** value tonne^{-1} of trochus (*Rochia nilotica*) production from the Australian mother-of-pearl (MoP) fishery operating in the Great Barrier Reef region between 1912 and 1962 (Nash, 1985) compared with total MoP exports for Papua New Guinea.

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