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SUSTAINABLE FISHING TECHNOLOGY FOR SHRIMP IN CAPE VERDE'S SEMI-DEEP WATERS – A 20-YEAR COOPERATIVE JOURNEY: FROM SURVEYING TO SUSTAINABLE EXPLOITATION OF A VIRGIN RESOURCE

BY

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ABSTRACT

Sustainable fishing technology for shrimp in Cape Verde's semi-deep waters. A 20-year cooperative journey: from surveying to sustainable exploitation of a virgin resource.

RESUMO

Tecnologia sustentável de pesca para camarões nas águas semi-profundas de Cabo Verde. Uma viagem de 20 anos em cooperação: desde a prospecção até a exploração sustentável de um recurso virgem.

RESUMEN

Tecnología de pesca sostenible para camarones en las aguas semi-profundas de Cabo Verde. Un viaje de 20 años en cooperación: desde la prospección hasta la explotación sostenible de un recurso virgen.

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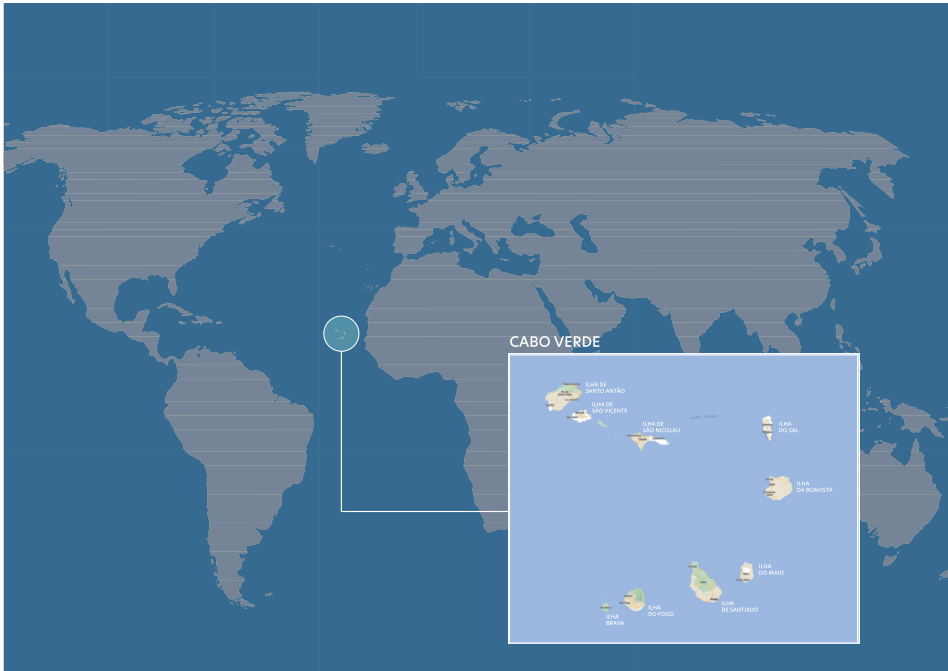


Fig. 1. Geographical location of the Cape Verde Islands in the eastern North Atlantic Ocean.

INTRODUCTION

This research, encompassing fisheries, biology and socioeconomics, along with the transfer of technology, scientific knowledge and know-how, represents a lengthy, groundbreaking and collaborative process that is arguably unparalleled globally. It deserves publication to reach a broader audience and to honour the contributions of funders, collaborating partners, researchers, and the people of the Cape Verde archipelago (fig. 1).

Within the framework of the Hydrocarpo project (2003-2005, European ERDF Interreg Programme) extensive surveys were conducted on the islands of Boa Vista and Santiago, utilizing bottom traps at depths ranging from 100 to 1000 m. These surveys took place during two campaigns, aboard the research vessels “Taliarte” and “Pixape II”. Notably, these efforts led to the initial discovery of the striped soldier shrimp, *Plesionika edwardsii* (Brandt, 1851) (Decapoda, Pandalidae) in Cape Verde waters, marking its debut as a potential fisheries resource for the region (fig. 2). During the second campaign, eight fishing operations were executed using semi-floating multiple shrimp traps (MSFSTs), highlighting their effectiveness for capturing this pandalid shrimp species (González et al., 2004; González & Tariche, 2009).



Fig. 2. A fresh sample of just caught striped soldier shrimp, *Plesionika edwardsii* (Brandt, 1851).

As part of the “Proactiva” pilot (2009-2010, Canary Islands Government) and the “Marprof-CV” project (2010-2015, ERDF Interreg Programme), the island stocks of *P. edwardsii* in the Cape Verde Islands were thoroughly surveyed using MSFSTs (fig. 3). These surveys were conducted aboard the R/V “Prof. I. Lozano”. Subsequently, extensive research was carried out to gain insights into the biology of this target species. Furthermore, its maximum sustainable yield (MSY) was estimated using a depletion method, revealing a potential annual yield of 192.5 tonnes per year. This estimate was based on the interval of maximum abundance found at depths ranging from 90 to 220 m. Additionally, an in-depth study of the bycatch composition associated with this emerging fishery resource was undertaken (González et al., 2012; Pajuelo et al., 2018).

These research initiatives were spearheaded by the former Canarian Institute for Marine Sciences, now integrated into the Las Palmas de Gran Canaria University (ULPGC). Collaboratively, ULPGC worked alongside the former Institute for Fisheries Development of Cape Verde (INDP), now known as IMar, and the University of Cape Verde (UniCV). This extensive period of research and cooperation, spanning from 2003 to 2021, has resulted in the publication of several scientific articles (González et al., 2016, 2017; Triay-Portella et al., 2017; González, 2018).

In 2021-2022, with the support of the Cape Verde Fishing Shipowners Association (APESC) and funding from the Global Environment Facility (GEF) (Contract

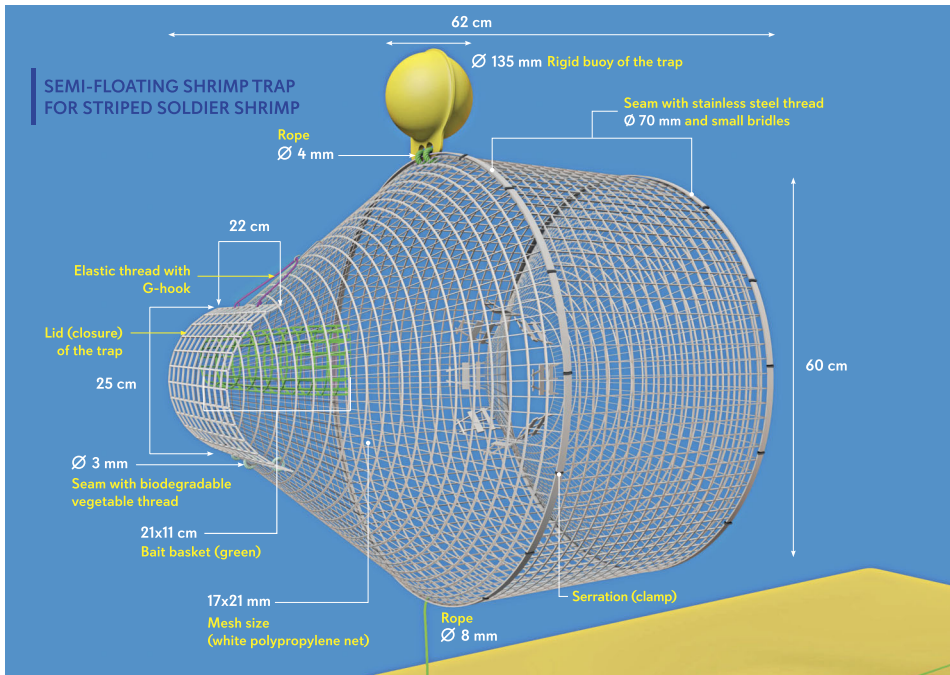


Fig. 3. Schematic drawing of the artisanal multiple semi-floating shrimp trap (MSFST).

7202864), a knowledge transfer initiative was conducted in collaboration between ULPGC, IMar, and various Cape Verdean public institutions. The overarching goal of this initiative was to diversify fisheries by establishing a regular, sustainable, and permanent operational semi-industrial fishing fleet, capable of harnessing Cape Verde's annual potential of the target resource (fig. 5). An important aspect to highlight is the valuable involvement of three fishermen from the Canary Islands who employ this fishing technology on their artisanal 8-meter, 30-horsepower boat, along with a locally based logistics expert. With the successful achievement of both general and specific objectives, these experiences were extended to the fleet based on the island of Sal in 2022-2023 under Contract 1282052.

RESULTS AND DISCUSSION

Upon completion of this last project, the first professional fishing operation was carried out by the F/V "Gaiado II" (fig. 6) with the following technical details: Departure, 23 June 2023; fishing days, 3; number of traps per day, 70 + 70; using locally sourced bait caught by the vessel itself; striped soldier shrimp catch, 100 kg; average catch per trap, 240 g/trap; commercial bycatch, 13 kg of fish;

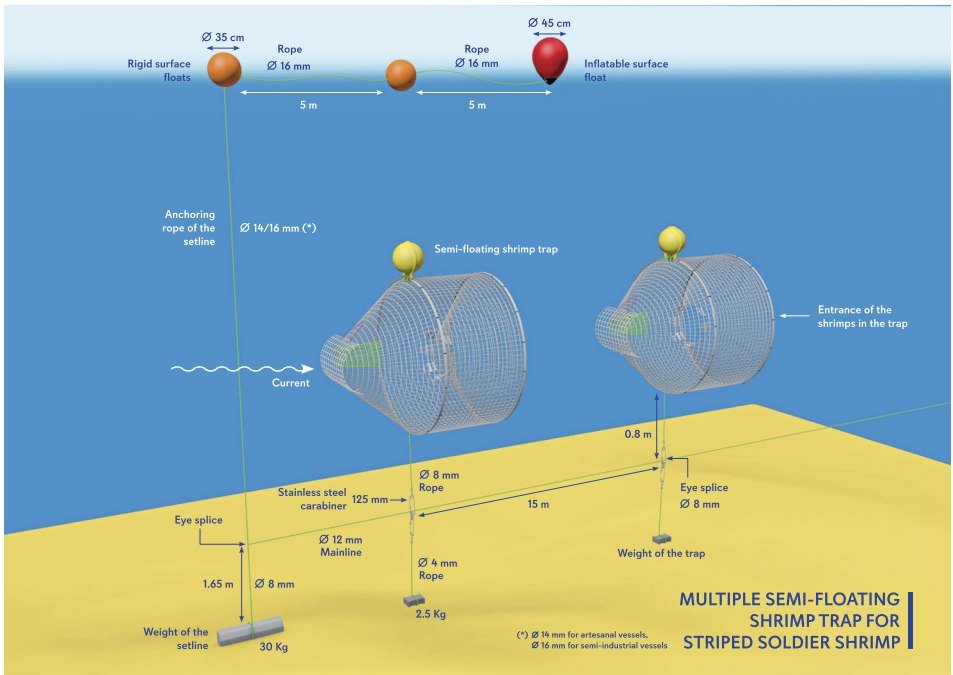


Fig. 4. Schematic drawing of the way artisanal multiple semi-floating shrimp traps (MSFSTs) are deployed as used on board the Cape Verdean semi-industrial fishing vessels in 2022-2023.



Fig. 5. A Cape Verdean fisherman showing a shrimp trap during the hauling of the fishing gear, with the support of an experienced fishing captain.



Fig. 6. The first departure of F/V “Gaiado II” from Palmeira, Sal, to start regular fishing operations in the Boa Vista fishing grounds.

fishing location, Boa Vista Island; unloading point, Palmeira, Sal Island; first-sale price obtained, 10.5 USD/kg. The crew did not classify the shrimp catch into two commercial size categories, nor did they engage in handline fishing while the shrimp traps were actively fishing. Both actions were agreed upon with the research team.

In summary, the state of the art in terms of main results and milestones achieved (2003-2022) is as follows:

- (1) The resource: This was prospected, assessed, and its biology studied. The striped soldier shrimp is abundant and accessible, particularly in semi-deep waters, with favourable biological and ecological characteristics that make it suitable for responsible exploitation.
- (2) The fleet: We have worked with three semi-industrial fishing vessels based in São Vicente and two more based in Sal (fig. 6). These vessels are conditioned, licensed, and equipped with relatively cost-effective technology that has been successfully tested by the crews themselves.
- (3) The fishermen: A total of five crews, comprising 86 individuals, have been trained in the use of the fishing gear, its manoeuvres and the handling of

TABLE I

Current data on the economic feasibility of the Cape Verde shrimp fishing activities as described in the text

Island	Fishing vessel	Size (m/hp)	Current activity	Net value present (USD)	Internal rate of return (%)	Payback period (years)
San Vicente	“Gamboa”	11.9/170	Purse seine net	108 040	30	4
Sal	“Gaiado II”	15.0/340	Purse seine net	166 960	19	5
Sal	“Luta de Pescador”	26.7/500	Pink lobster trap and purse seine net	201 760	17	5

catches. This pilot action has fostered an excellent relationship of trust between fishermen and researchers, primarily due to the practicality and effectiveness of the technology (fig. 5).

- (4) The fishing gear (MSFSTs) (figs. 3-4): Highly selective and environmentally friendly fishing gear has been made available to the fishermen. The initial industrial model, originally used by the Mediterranean fleet, was scaled to meet the specific conditions of an artisanal-semi-industrial fleet operating in volcanic seabeds. This fishing gear has been equipped with biodegradable and anti-loss elements.
- (5) Promotion: A series of seven events was organized to promote the new product, with accompanying statistical analysis of acceptance questionnaires aimed at potential buyers and consumers.
- (6) Economic feasibility: An in-depth analysis of investments was conducted, considering the versatility of the vessels involved, including the alternation of target resources such as handline fishing for demersal species. Assumptions were made regarding fishing effort with MSFSTs, monthly catches, revenue projections, and general vessel expenses. The resulting economic and financial feasibility indicators should speak for themselves, and are presented in table I.

In view of the results reported here, the authors as well as those further involved think it may be concluded that the entire project is to be characterized as successful, both in terms of sustainability and from a socio-economic point of view.

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