

**An Integrated Approach to Development
of the Small-Scale Fisheries of the
Talamanca Coast of Costa Rica**

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ABSTRACT

Ocean Arks International has begun to implement an integrated approach to the economic development of a fishing community, Puerto Viejo, on the Talamanca coast of Costa Rica. At the present time, the region's fisheries are economically depressed, and fuel, ice and engine spare parts are often in short supply or unavailable. The program to assist the community involves seven components, and taken together they provide a framework for a model of ecological development. They are: 1) The design of advanced sail-assisted fishing craft specifically adapted to existing infrastructural constraints and current fishing techniques, and the income-producing capabilities of the fishermen. 2) The transfer of new technologies, training, and the establishment of a local boat-building enterprise. 3) In collaboration with a Talamanca-based agricultural research institute (ANAI), the establishment of boat-wood plantations of fast growing trees suitable for wood-epoxy composite construction and hull panel manufacture. 4) The development and testing of passive and active fishing gear in the existing fisheries with the sail-powered Ocean Pickup, R/V EDITH MUMA. 5) A search with the Ocean Pickup for underutilized resources of the area. 6) A project being started, in collaboration with the agricultural cooperative, Coopetalamanca, to introduce or re-introduce local fish processing, including smoking, and to find new market for shark and its by-products. 7) An economic model which links and directs the various facets of the work.

INTRODUCTION

Ocean Arks International (OAI), a research and communication organization, has as its overall objective the development of technologies and strategies that allow for the sustained use of natural resources. In the broadest sense it has set out to adapt ecological concepts to the solving of economic problems. Its primary, but not exclusive, areas of interest are tropical and subtropical coastal and island nations.

In early 1984, OAI initiated a project to explore an integrated approach to the economic development of a mixed fishing and farming community, Puerto Viejo, on the Talamanca coast of Costa Rica. The whole Talamanca region is hard pressed economically. In 1979, its only important commercial crop of the small farmers, cacao, was decimated by a disease known as Monilia pod rot, resulting in the total destruction of the agricultural economy. Monilia resistant varieties are being developed by CATIE (Centro Agronomico Tropical de Investigacion y Ensenanza), but it will be years before they are tested and widely planted.

The fisheries of the coastal region are in abrupt decline. Between 1975 and 1979, the lobster harvested dropped almost tenfold to 41,229 kilograms. The finfish fishery during the same time period climbed sixfold to 53,757 kilograms in 1979. However, the overall Atlantic catch, for which these are estimates, represents less than one percent of the total Costa Rican harvest (unpublished data, Ministerio de Agricultura y Ganaderia, San Jose). Perhaps the most telling story is the recent decrease in the number of fishermen. The artisanal fisheries are suffering rising costs and chronic shortages of ice, fuel and engine spare parts. The combination of a weak fishery infrastructure and softness of the national currency has eroded the position of most of the fishermen. For most of them, fishing has become uneconomical. The fishermen's cooperative, COPEPEsla R.L., in Puerto Limon to the north of Puerto Viejo, reported a sixty percent drop in its membership over the last year (pers. comm., Cooperative Manager).

Ocean Arks International, with its emphasis on overall coastal community development, was asked by the fishermen of Puerto Viejo to bring its sail-powered experimental fishing vessel, the Ocean Pickup, from Guyana to the Caribbean coast of Costa Rica. In the fisheries of Guyana, under the auspices of the Canadian International Development Agency and the Government of Guyana, it had proven the economic viability of modern sailing craft (Todd, 1984a). For the past eight months, along the Talamanca coast, we have undertaken exploratory fishing trials and begun to embark upon the integrated development plan described below. So far the presence of a single 1.5 ton sail-powered Ocean Pickup in Puerto Viejo has enabled half a dozen fishermen to fish together on the vessel. Further, it has allowed several fishermen to return to fishing as a livelihood. Because of the Ocean Pickup's lack of down-time due to bad weather or fuel and spare part availability, the vessel has helped stabilize the supply of fish, which in turn has increased the marketing potential of local marine products. Most importantly, our field experience has allowed us to begin to understand the specific needs of the fishing community of Puerto Viejo. As a result of this experiment, we are developing an ecological development project that has a strong land-based reforestation and restoration component, as well, and involves the community at large.

PROJECT COMPONENTS

This paper describes the eight major components of the project which are linked into an integrated whole. Some of the components are currently being implemented while others will be initiated in 1985. In our view, a fishery and fishing community needs to be sustained by technologies which have their own intrinsic support systems. So much technology transfer involves the export of the technology, but rarely the technological support infrastructure. The following components provide for much of the infrastructure.

High Performance Fishing Craft.--The Ocean Pickup series of fishing craft, developed in collaboration with naval architect Richard C. Newick, have been designed to meet four basic criteria: 1) The boat would have to be primarily wind powered and be almost as fast as the motor boats currently in use. They would have to employ the most advanced structural hydrodynamic and aerodynamic concepts in their design. 2) The technology would have to be suited to construction in the communities where they would be used. 3) The basic material would have to be wood from fast-growing trees that could be grown locally and used in the fabrication of wood/epoxy composite building materials with a high strength-to-weight ratio. 4) Imported components would have to be less than twenty percent of the overall cost of the vessel.

The first Ocean Pickup (Fig. 1), with a 1.5 ton payload, was launched in 1982 and has fished in New England, Guyana and Central America. Its performance and economic potential has been widely reported (Todd, 1984a,b). The Talamanca coast of Costa Rica has a number of constraints, including fishing techniques, distance to grounds, coastal conditions and wind regime. We have designed a vessel, a $\frac{1}{2}$ ton Ocean Pickup (Fig. 2), that allows for these constraints and at the same time will be affordable by the average fisherman. It is a 24' catamaran, with 210 sq ft of sail and a lateen rig. It will be fast in light airs, rowable, beachable and able to carry about one thousand pounds of iced fish in insulated holds on either hull. There is also provision for two live wells. The overall simplicity of the vessel is the product of many years of technological refinement. Construction of a prototype will begin in Puerto Viejo early in 1985.

Technology Transfer.--Ocean Arks International is establishing a local training and boat building facility. The object is to create local boat building enterprises that include veneer cutting, hull panel manufacture, assembly and at some future date, sail fabrication. The plan includes using regional forest products to fabricate the vessels. Local woods, including laurel (Cordia alliodora), have been found to be suitable for the boats' cold-molded and vacuum-bagged wood/epoxy composite hull panels.

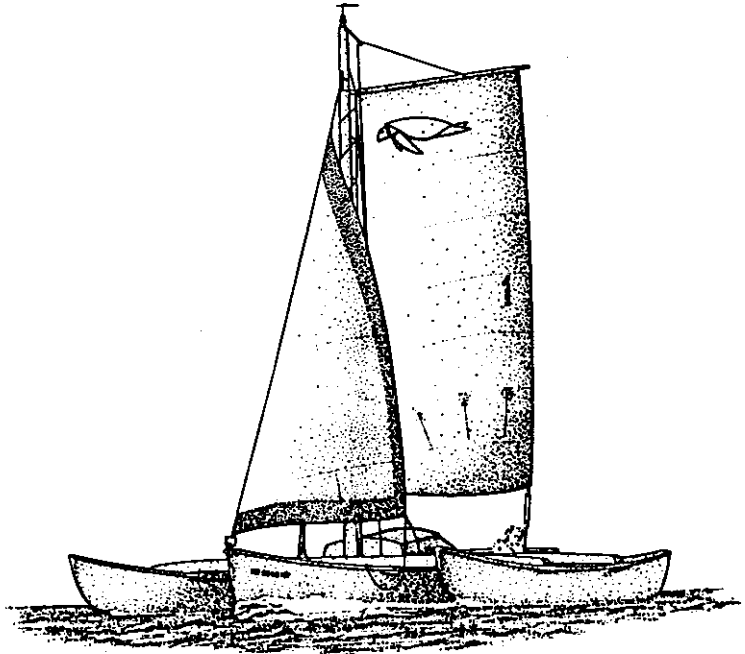
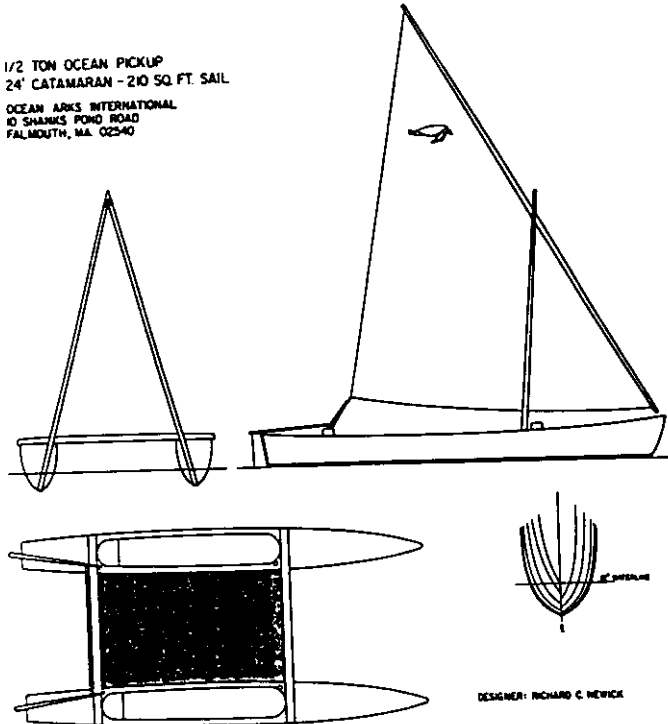


Figure 1. The 1.5 ton Ocean Pickup.

1/2 TON OCEAN PICKUP
 24' CATAMARAN - 210 SQ. FT. SAIL
 OCEAN ARKS INTERNATIONAL
 10 SHAMUS POND ROAD
 FALMOUTH, MA. 02540



DESIGNER: RICHARD C. NEWICK

Figure 2. The 1/2 ton Ocean Pickup.

Reforestation and Boat Wood Plantations.--Hartshorn et al. (1982), report that Costa Rica's forests, apart from the National Parks and Reserves, will be cut by the end of the decade and "reforestation of 450,000 hectares is urgent," whereas the current reforestation effort is limited to 4,000 hectares. Hence, land restoration is integral to our work and to the long-term survival of coastal communities. Already our associates, La Asociacion De Los Nevos Alquimistas (ANAI), have identified and set out plantations of three species in Talamanca that are fast growing and soil building, while being suitable for wood/epoxy composite boat hull manufacture. One of these, Gmelina arborea, has grown to a utilizable size in approximately three years from planting out. Ultimately we plan to reforest eroded hillsides adjacent to the community, and part of the project will include establishing a portable veneer cutting mill which can be moved from farm to farm.

Adapting Ocean Pickups to Existing Fisheries.--This work is well underway. The principal fisheries are for mackerel, red snapper and lobster. We have effectively fished the 1.5 ton vessel with longlines, gill nets, traps and by trolling, utilizing sail power almost exclusively. Due to fuel scarcity and lack of spare parts, the Ocean Pickup's 15 hp auxilliary outboard has been little used. We have concluded that the gear currently used in the local fisheries can in most instances be better utilized on an Ocean Pickup. The easy motion, shade from the sun, and the small cabin together have resulted in the fishermen being more rested and more inclined to fish longer and more efficiently. Because of the total absence of local credit to the fishermen, only a small percentage could afford the 32', 1.5 ton Ocean Pickup. The new $\frac{1}{2}$ ton Ocean Pickup would be affordable and still be able to effectively work the existing gear.

New and Underutilized Ocean Resources.--The prototype Ocean Pickup has been used to search for untapped marine resources. In the last few months it has helped develop a substantial longline shark fishery. Also, we have trawled fwith a 20', four seam, semi-balloon shrimp trawl for shrimp with limited, but encouraging, success. In the future we plan to systematically search for shrimp, tuna and sharks offshore on the continental slope dropoff. Being wide ranging and fuel independent, the Ocean Pickup can fish areas forbidden economically to outboard motor vessels.

Mariculture and Stationary Fishing: The Ocean Farming Module.--Several years ago we developed a relatively low cost system of culturing fish and attracting wild fish in French Polynesia. The concept has been subsequently developed into an Ocean Farming Module, a raft-like complex which functions simultaneously as a fish attraction device (FAD) and as a floating complex for the culture of highly valuable fishes. Wild fish are captured with fishing gear mounted on the facility. Unmarketable species are processed and fed to the cultured

animals. Since Ocean Farming Modules have the potential to expand the economic base of fishing communities dramatically, their development in our view may be an essential component in long-range fisheries planning. The preliminary design work for a Talamanca coast Ocean Farming Module has been completed and we intend to build a prototype in 1985.

Marine Products and the Processing and Marketing of Fish.--We have begun, in collaboration with Coopetalamanca, the local agricultural cooperative, to introduce new and re-introduce traditional fish processing, including the smoking of fish. Experiments with solar drying will be undertaken, particularly for shark which have an export market. We will use a vented and plastic canopied drier of the type OAI developed for fishermen on the Seychelle Islands in the Indian Ocean. The Ocean Pickup is being retrofitted with insulated, modular ice boxes so that it can transport fresh fish to Limon markets to the north. A major target of our marketing assistance will be finding new markets for shark and its by-products.

Econometric and Casual Modeling of Fishing Communities.---In collaboration with the Escuela de Economia Agricola, Universidad de Costa Rica, we are developing an econometric model of the existing fishery and its technologies. A comparison will be made with our Ocean Pickup-based approach to fishing in the region. The model will enable us to optimize vessel design, the fisheries utilized, gear development and marketing strategies.

In collaboration with the Resource Policy Center, Thayer School of Engineering, Dartmouth College, New Hampshire, USA, we are developing a causal model of the fishing/agricultural community. The model will enable planners and government officials, as well as fishermen and farmers, to place themselves in each other's position and perspective, and hopefully allow them to collectively design an optimal development strategy. With causal models the consequences of a variety of strategies can be perceived in advance. Essentially the systems dynamics/causal model will enable us to define just what ecological development means, and how to best go about it. Meadows (1982) has indicated that a systems or ecological view of development teaches one to be: a) respectful of the system; b) responsible for the system's behavior; c) experimental to maximize performance of parts; d) attentive to the system as a whole; e) attentive to the long term, and finally; f) comprehensive, allowing that human, technological and biotic elements are all linked and on many levels. Hopefully, in working with the fishermen and community of Puerto Viejo we can create a mutually enjoined and shared approach to development. The alternative is economic hardship and inequity.

LITERATURE CITED

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