APPENDIX 4

A SYNOPSIS OF THE BAITFISHING PROBLEM IN THE CENTRAL AND WESTERN PACIFIC AREA

1. The use of live bait to catch tunas, variously called baitfishing or pole-and line fishing, still is the single-most productive method for producing tuna today. When based upon pounds/caught per dollar of capital investment, baitfishing is probably more productive than purse seining. However, the reverse is true when the units of productivity are measured in pounds/man-year; this fact underlies the present-day trend to mechanize fishing operations. Live-bait fishing can be considered two fisheries in one, that is, a fishery for bait and a fishery for tuna. The principal problems are: (1) bait supply, (2) tuna supply, and (3) maximizing the efficiency of the operation.

1.1 Bait supply

Live bait for tunas consists of natural supplies of suitable species accessible to the tuna grounds or supplies produced through aquaculture. With regard to the former, supplies exist in many areas of the Pacific and tuna fisheries already use many of these sources (figure 1 and table 1). In many instances these sources are unreliable owing to not-understood fluctuations in their abundance and availability, institutional barriers limiting access to them, marginal suitability of the bait due to poor attractiveness to tunas, poor survival, difficulty in capture, etc.

Solutions to these problems may come through research and negotiations; however, in many areas an alternative solution may lie in aquaculture. Economic studies suggest that good baitfish (defined as a baitfish that produces 20 pounds of tuna per pound of bait) are worth about $2/pound to the fisherman, a value that would seem to place the fish in the high-value product category sought for aquaculture operations. Aquaculture for such fish has to be developed but the methodology is near at hand and this may be an attractive supply for bait in the near future.

Both natural bait and live bait require special handling and transportation to the fishing grounds. An alternative to aquaculture for areas lacking natural supplies may lie in mass transport of bait from areas of supply to staging areas near the fishing grounds. For example, it appears that it may be economically attractive to transport live bait from the U.S. west coast to Hawaii, Samoa and French Polynesia aboard LASH or roll-on, roll-off freighters. The success of such an operation depends upon several factors affecting the survival of the bait, the two most significant being temperature tolerance and packing density. These

determine the feasibility of the concept for any species since they give a measure of expected survival and transport cost/ton of container weight. Such considerations also may have a bearing on raising bait since suitable sites for aquaculture may be far removed from the fishing grounds.

1.2 Tuna supply

The tuna supply problem for baitfishing is similar to the problem in connection with purse seining. Baitfishing is often feasible in areas where purse seining is not. It should be noted that the reverse can be true also but less often if bait supply is not a problem). For example, baitfishing is usually successful on wild or scattered fish and on shallow banks where purse seining has not proved successful.

1.3 Efficiency

Baitfishing is less capital and more labor intensive than purse seining. This may be of benefit in developing areas but where it is not, steps can be taken to reduce the manpower requirements. Included would be an independent study of bait allowing the fishermen on the tuna boats to devote more time to tuna fishing, developing automatic poles, such units are being used in Japan with some success, and finding ways to locate, attract and hold tuna schools to reduce the time spent searching for fishable schools.

Another way of increasing the efficiency of baitfishing lies perhaps in a "hybrid" operation whereby bait is used to aggregate and hold a tuna school while a purse seine is set on the fish. Such an operation can take several forms, a bait boat could be used in conjunction with a seiner, the seiner could carry the bait and a small boat to chum, the seiner could carry the bait and a small boat to chum, the seiner could carry bait and chum off the seiner. A hybrid operation combines the advantages of both baitfishing and purse seining since it offers a chance to hold and seine fish in clear offshore waters and may result in a marked increase in catch/lb of bait used. For exploratory work hybrid operations offer a higher probability of success since they would both provide the assurance of catching fish even if the schools are wild or scattered and, at the same time, better estimates of school size than can a bait boat operation alone. Furthermore, hybrid seiners might allow the construction of small seiners for local operations using small nets and mechanized handling equipment such as drums. Even if the purse seine and bait boat or bait boats do not fish together in the same area, there may be some logistic advantages of a purse seine-bait boat operation which would include cooperative search and fish holding facilities.

On the negative side hybrid operations would be dependent upon a supply of live bait with all the concomitant difficulties.

Table 1.—Availability of bait for live-bait fishing in the Pacific and Indian Oceans.

Area	Kinds of baitfish	Commercial landings	Used for live bait	Potential
1 Indian Ocean	Anchovy, sardine, herring	>100,000 metric tons	?	Very good
Minicoy, Laccadive Is.	Reef fishes—apogons, damsels, etc.	Limited amount	Yes	Limited, small fishery
2 Southeast Asia	Anchovy, sardine, herring	>40,000 metric tons	?	Very good
3 Japan: Northeast	Anchovy, *Engraulis japonicus*	7,299 tons	1,970 tons	Excellent
Central	do	73,541 tons	10,857 tons	Excellent
Southwest	do	144,508 tons	11,200 tons	Excellent
4 Formosa[1]	Anchovy	?	?	?
5 South Korea[2]	Anchovy	?	?	?
6 Philippine Is.	Anchovy	20,000 metric tons	?	Very good
7 Marianas	Rabbitfish, etc.	?	?	Very poor (highly seasonal)
8 Western Carolines	Anchovy, sardine, silverside, round herring, etc.	?	Est. >100,000 buckets	Good
9 Eastern Carolines	do	?	?	Poor, OK for small scale operation
10 New Guinea[3]	Anchovy, sardine	?	?	?
11 Fiji	Anchovy, sardine, silverside, mackeral, etc.	?	Experimental	Good
12 Solomon Is.[4]	Sardine	?	Yes	?
13 Gilbert Is.[5]	Sardine	?	?	?
14 Phoenix Is.	Goatfish, mullet, etc.	?	?	Poor
15 Marshall Is.	Sardine, silverside, round herring, etc.	?	Experimental	Good
16 Samoa	Sardine, anchovy, mackerel, etc.	?	Experimental	Poor
17 Society Is.	Mackerels, round herring, etc.	?	Experimental	Poor
18 Tuamotu Archipelago	Goatfish, mullet, round herring	?	Experimental	Poor
19 Marquesas Is.	Sardine	?	Experimental	Good (seasonal)
20 Line Islands	Goatfish, mullet, etc.	?	Experimental	Poor
21 Hawaii	Anchovy, silverside, round herring, etc.	?	ca. 35,000 buckets (130 metric tons)	Good
Leeward Is.	Silverside, mullet, goatfish, etc.	?	Experimental	Poor
22 Eastern Pacific: California to Panama	Anchovy, anchoveta, sardine	>200,000 metric tons	4,000,000 scoops (14,500 metric tons)	Excellent
23 Southeastern Pacific: Panama to Chile	Anchoveta	Est. 10,000,000 metric tons	600,000 scoops (2,200 metric tons)	Very good

[1] The Japanese mention Formosa as a possible baitfish source.
[2] The Japanese mention Pusan as having a good supply of strong bait.
[3] The Japanese operate several boats in this area.
[4] The Japanese have 6 boats in this area; will increase to 11.
[5] The Japanese have been operating in the area.

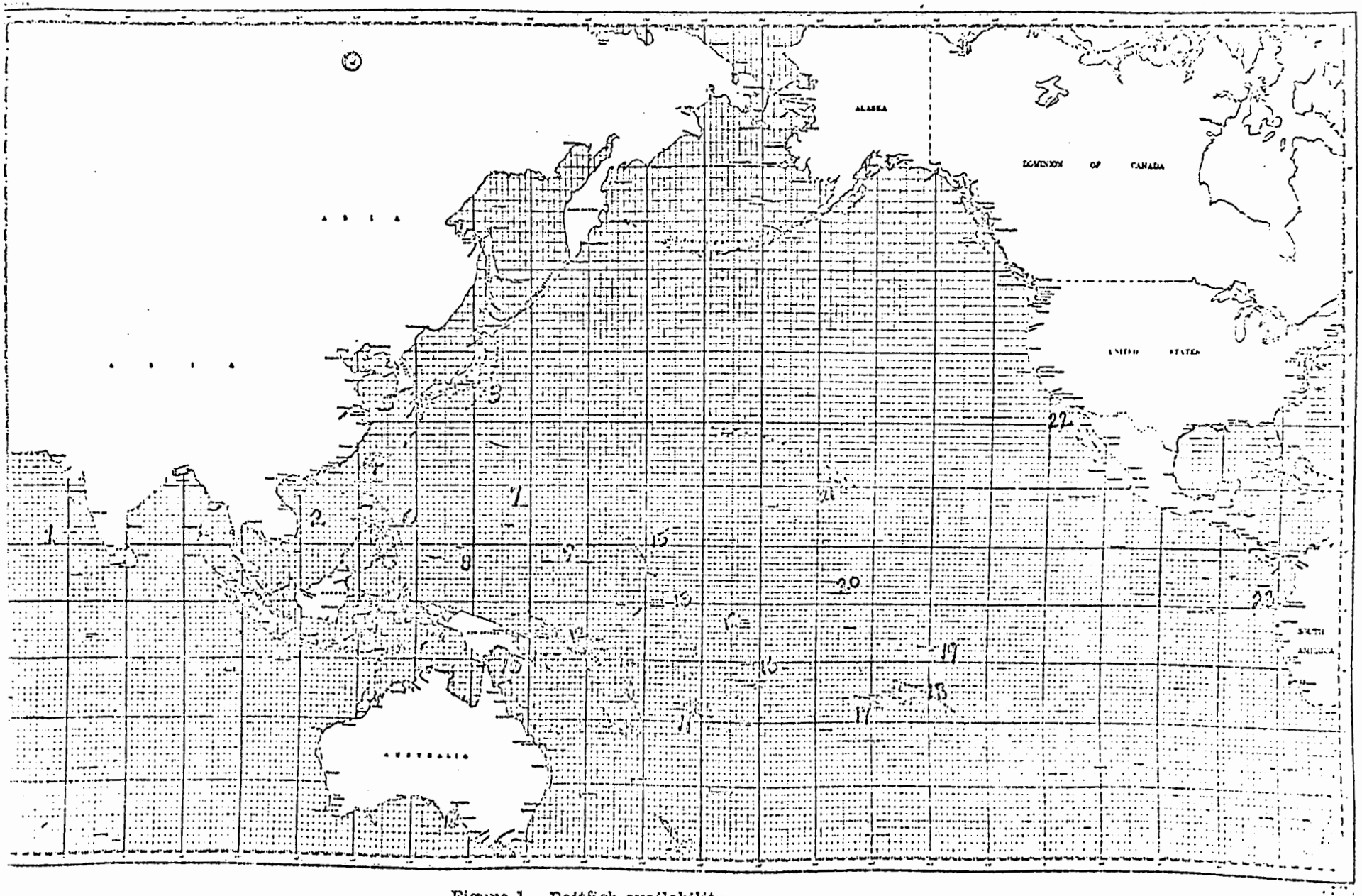

Figure 1. Baitfish availability