DISCUSSION ON THE USE OF ESCAPE PORTS IN CRAB TRAPS

by

Nelson E. Stewart

INTRODUCTION

One of the initial objectives of the State/Federal Dungeness Crab Management Program is to evaluate crab mortality caused by certain fishery practices and to develop methods or recommend changes in existing regulations to reduce or eliminate that mortality. One area of major concern is reducing mortality caused by sorting and discarding female, sublegal male, and softshell crabs from the catch.

Escape ports in crab traps provide a means by which smaller crabs can escape. Reasons for requiring escape ports include: (1) handling mortality to sublegal male and female crabs is reduced; (2) injury to small crabs resulting from fighting is reduced; (3) loss from cannibalism is reduced; (4) if traps are lost the sublegal crabs have an opportunity to escape; and (5) they benefit fishermen by retaining the legal-sized crabs and reducing the amount of sorting needed to remove the sublegal crabs from their catch.

At the present time virtually all crab traps are provided with at least one escape port. However, a major problem is that there is no uniformity as to size of the escape opening.

The purpose of this report is to summarize and evaluate the available information regarding the size of escape ports in use in the coastal crab fishery in relation to the present 6¼ inch minimum size limit.

REGULATIONS ON THE USE OF ESCAPE PORTS

Washington and Oregon have no regulations requiring escape ports. California law requires that north of Point Conception each crab trap shall have at least two rigid circular openings of not less than four inches inside diameter located on the top or side of the trap. If side openings are used, at least one of them shall be located so that at least one-half of the opening is in the upper half of the trap (Edgerton, 1971).

SIZE OF ESCAPE PORTS IN USE IN THE COASTAL FISHERY

Washington

In December 1973, the Washington Department of Fisheries collected data on the size of escape ports in crab traps employed in the Washington coastal crab fishery (Anonymous, 1974). A total of 442 rings in traps belonging to 41 fishermen were measured. The ring arrangements encountered were a single ring, two rings on opposite sides of the pot, two rings adjacent to one frame upright, and half-rings in frame corners. Escape ring inside diameters ranged from 3.4 to 4.6 inches with an average of 4.23 inches. The majority of the rings were close to 4¼ inches (82 percent of the rings were from 4.2 to 4.3 inches).

Oregon

There is no recent information available on the size of escape ports in use in Oregon. However, the results of various interviews conducted by Fish Commission biologists indicate that the majority of Oregon fishermen use at least 4¼ inch escape ports.

California

The size of escape rings in use in California vary from about 3.9 to 4.6 inches. However, in the San Francisco area the majority of escape rings are 4 inches and in the Bodega Bay area they range from about 4.1 to 4.3 inches.

STUDIES

Length-Width Measurements

The legal measurement of Dungeness crab is the carapace width. This is the straight-line distance measured across the carapace directly in front of the tenth anterolateral spines. Although crab lengths are not normally measured, they are the best measurement to use for determining the proper size of escape ports. Crabs normally move about laterally, although they are capable of moving forward and backward (Jow, 1961). The smallest opening through which a crab can crawl is about equal to his length, which is the smallest dimension. Therefore, to determine the size of the escape ports the relationship between carapace width and length is needed.

California biologists collected length-width data from 1,556 male and 373 female crabs taken in the San Francisco area in 1954-55 (Figure 1)[1/]. Jow (1961) gives data from measurements on 268 male and 63 female crabs (Figure 2). Oregon biologists collected length-width data from 1,000 male crabs in 1967 (Figure 3). In each case the length-width relationship shows that a legal male crab of 6¼ inches in width has a length very close to $4\frac{3}{8}$ inches.

Escape Opening Experiments

Jow (1961) presents data from several escape opening experiments done in California between 1955 and 1959. Following is a summary of results of the more pertinent experiments.

Comparison of Traps with No Escape Openings, Two 4-Inch Escape Ports, or Two 4¼-Inch Escape Ports

The fishing qualities of the three types of traps were tested at Bodega Bay in seven fathoms of water. Eight sets were made at five different fishing

---

1/ A length-width relationship was also determined for crabs collected from the Eureka area in 1956 which is in close agreement with that determined for crabs from the San Francisco area. However, that data is not included here because it is not known how many crabs were measured.

stations with each type of gear. The traps were pulled and emptied every two days.

No significant difference was found in the legal male catch. The average catch of legal males per trap for the three types of gear ranged from 1.1 to 1.4. However, the mean size of male crabs was significantly greater in those traps having 4¼-inch escape ports. The traps with 4¼-inch ports were also the most efficient in allowing non-marketable crabs (sublegal males plus females) to escape. Traps with 4¼-inch ports took on the average four non-marketable crabs for every legal male while traps with 4-inch ports and those without escape openings took 8 and 17, respectively.

Comparison of Traps with One 4-Inch, One 4¼-Inch, or One 4½-Inch Escape Port

Equal numbers of traps with the three escape port sizes were set at 10 stations in productive fishing areas off Crescent City, Eureka, Bodega Bay, and San Francisco. Traps were pulled and emptied every two days.

No significant difference was found in the numbers of legal males caught. The average catch of legal males per trap for the three types of gear ranged from 2.2 to 2.5. Traps with a 4½-inch port caught larger male crabs than did traps with a 4- or 4¼-inch port. Significant differences existed in the numbers of female and sublegal males the different traps caught. Traps with a 4½-inch port caught only two non-marketable crabs for every legal male while the traps with 4-inch and 4¼-inch ports caught five and six crabs, respectively.

Comparison of Traps with One 4-Inch, Two 4-Inch, Two 4¼-Inch, or Two 4½-Inch Escape Ports

Eight sets were made with each type of trap at seven stations off central California. Traps were pulled and emptied every two days.

The legal male catch did not differ significantly between the four types of traps fished. The average catch of legal males per trap ranged from 1.3

to 1.8. The mean size of male crabs increased with escape port size. The numbers of female and sublegal males caught by the different types of traps differed considerably. Traps with two 4½-inch ports caught one non-marketable crab for every legal male. Traps with two 4¼-inch ports caught two non-marketable crabs for every legal male, while traps with 4-inch ports caught four to six non-marketable crabs.

DISCUSSION AND CONCLUSIONS

At the present time most traps used in the Dungeness crab fishery have at least one escape port for the purpose of allowing small crabs to escape. The problem is that there is considerable variation in the size of escape ports used and it is permissible to fish traps without escape ports in Washington and Oregon. California requires that crab traps have at least two escape ports of not less than four inches inside diameter. However, this size of port does not appear to be large enough to allow adequate escapement of sublegal males and female crabs.

Length-width measurements from more than 2,800 male crabs show that a crab of 6¼ inches in width has a length close to $4\frac{3}{8}$ inches. Since the smallest opening through which a crab can crawl is about equal to his length, it appears that the optimum size of escape ports with respect to the present 6¼-inch minimum size limit should be $4\frac{3}{8}$ inches.

Escape opening studies reported by Jow (1961) indicate that traps with escape ports of 4, 4¼, and 4½ inches in diameter will catch approximately the same number of legal crabs. However, the larger the escape openings the more efficient the traps are for releasing sublegal male and female crabs. In actual fishing operations some legal crabs may escape through an escape port of $4\frac{3}{8}$ inches, but it appears the loss would be minimal and the potential savings of sublegal male and female crabs could be much greater.

Crabs reportedly often get caught in escape ports while trying to get out of the trap. Therefore, each trap should have at least two escape ports. The escape ports should be located in the upper half of the trap so that they can still function if the trap becomes partially sanded in.

RECOMMENDATION

Because of the desirability of providing protection to sublegal male and female crabs, it is recommended that all Dungeness crab traps be required to have a minimum of two circular escape ports of at least $4\frac{3}{8}$ inches inside diameter located on the top or side of the trap. If escape ports are placed on the side of the trap, they should be located in the upper half of the trap. It is also recommended that a period of at least 5 years be allowed for altering crab traps to conform with this regulation.

LITERATURE CITED

Anonymous. 1974. Escape rings in use on Dungeness crab pots in the Washington coastal fishery. Wash. Dept. Fish. Prepared Rept. 3 p.

Edgerton, L.F. (Compiler). 1971. State of California Department of Fish and Game, Fish and Game Code. 47th Ed.

Jow, T. 1961. Crab trap escape-opening studies. Pac. Mar. Fish. Comm. Bull. No. 5, pp. 49-72.

Prepared for the State/Federal Dungeness Crab Management Program, Policy Committee Meeting, April 1974.

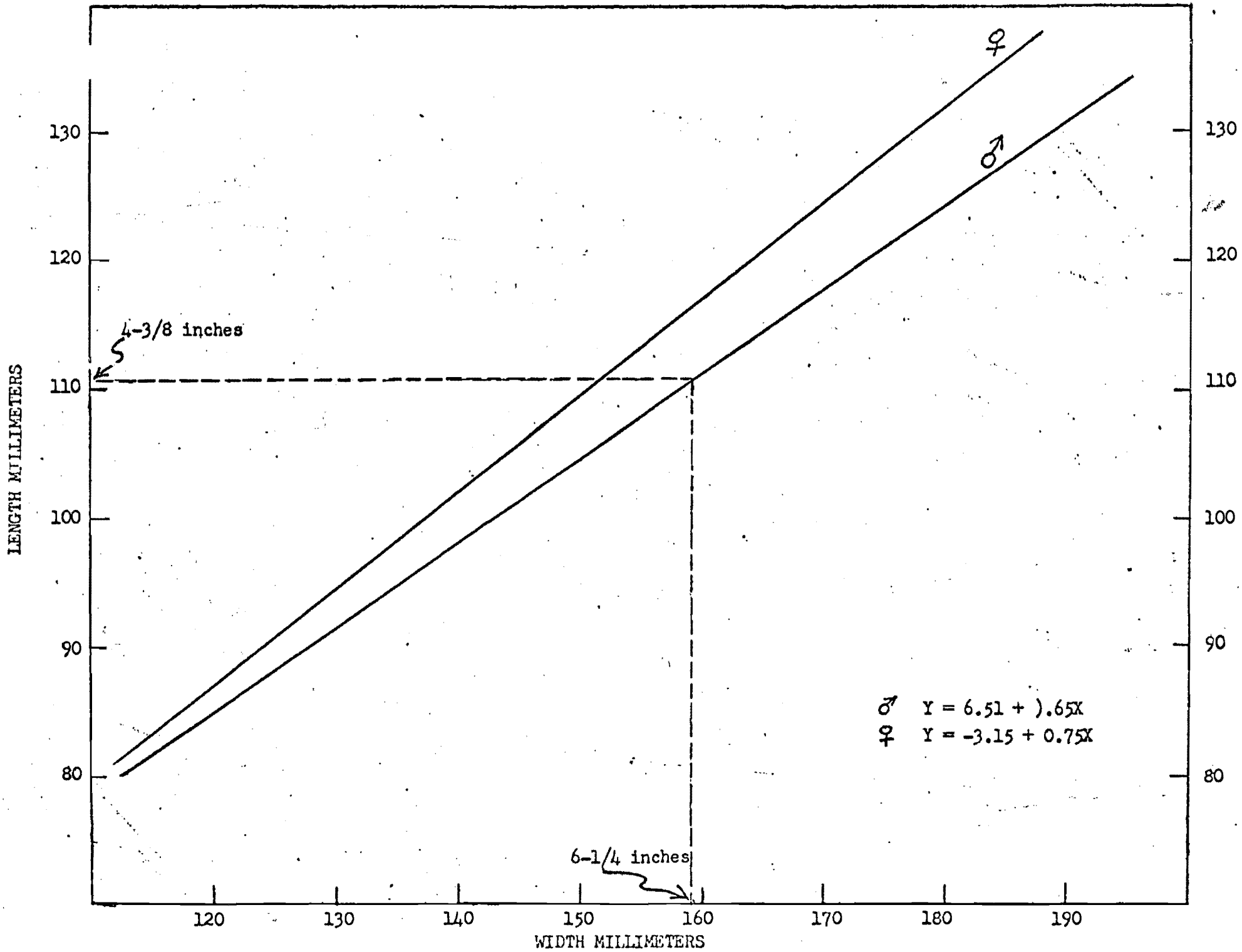

Figure 1. Length-width relationship of male and female Dungeness crabs. Regression lines based on measurements of 1,556 male and 373 female crabs taken in the San Francisco area in 1954-55. Data compiled by Walt Dahlstrom, California Department Fish and Game.

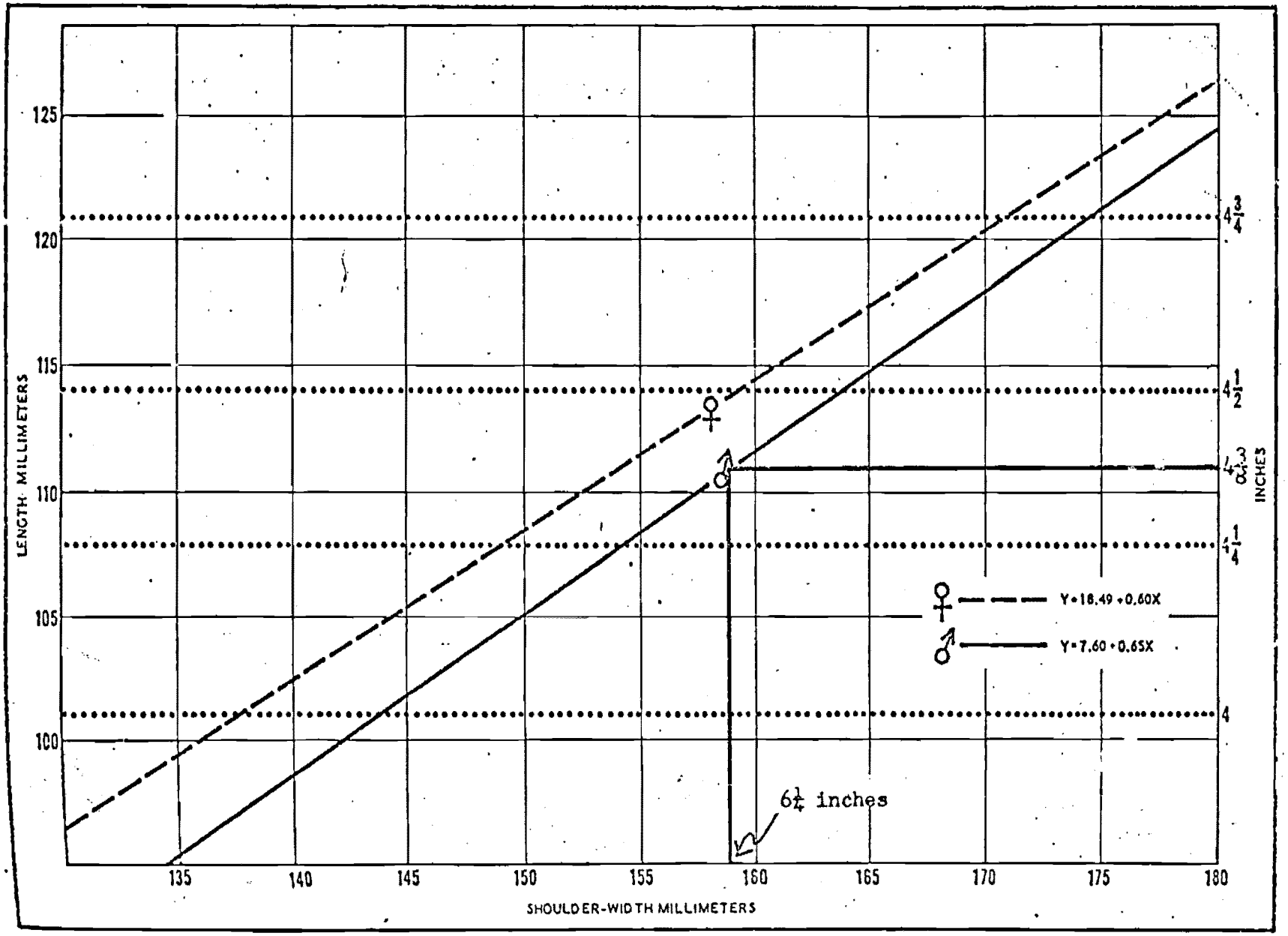

Figure 2. The length width relationship of male and female market crabs. Regression lines derived from measurements of 258 male and 63 female crabs taken from central California waters during 1958. (From Jow, 1961)

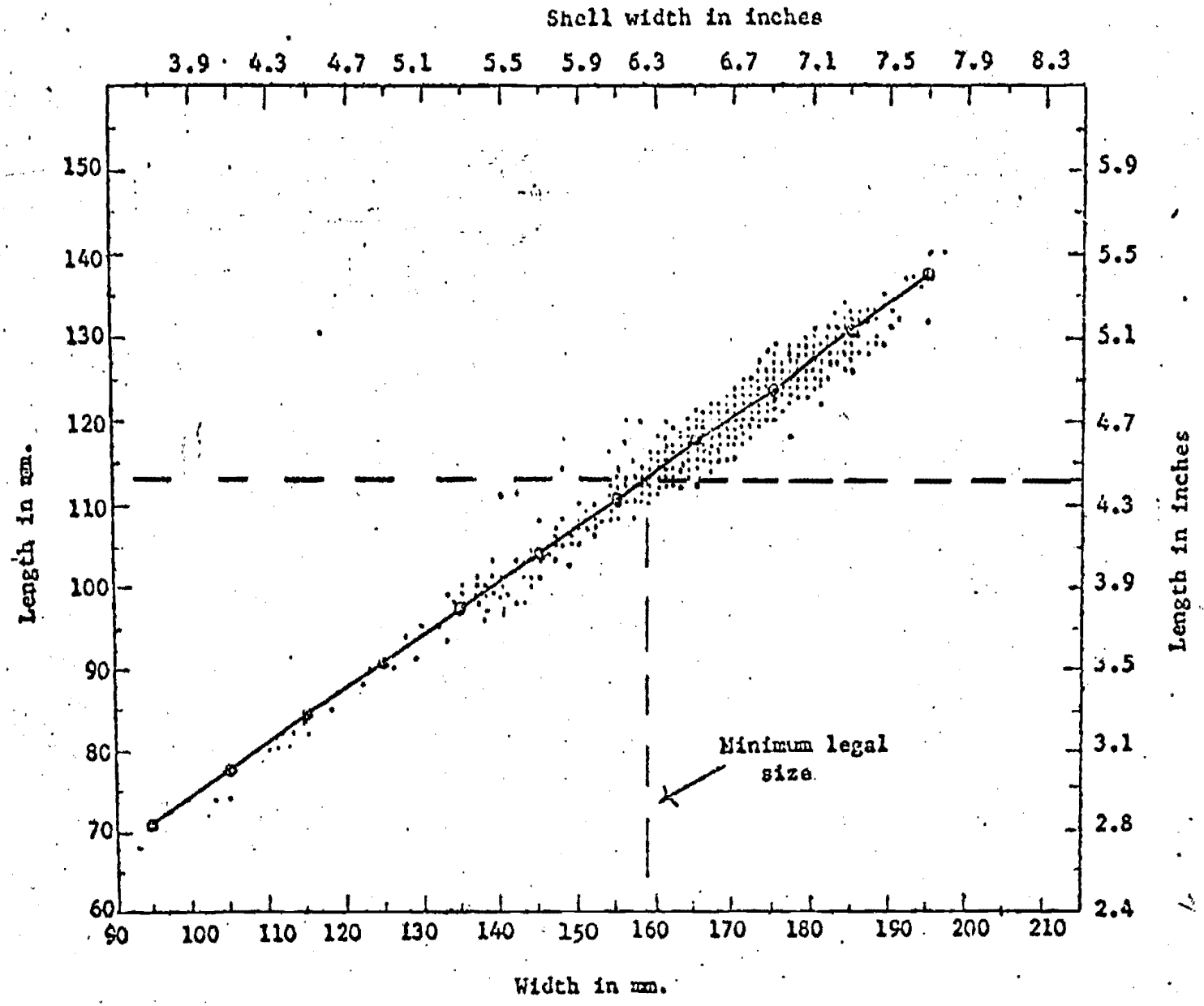

Figure 3. Length-width relationship of male Dungeness crabs. Data compiled by Dale Snow, Oregon Fish Commission, 1967.