

Spain's Silkworm Gut

BY LUIS MARDEN

WHEN Don Quixote, Spain's mad hero, started his knightly adventures, he and Sancho Panza were riding along a road in La Mancha.*

"After they had gone a couple of miles," Cervantes wrote, "Don Quixote caught sight of what appeared to be a great throng of people, who, as was afterward learned, were certain merchants of Toledo on their way to Murcia to purchase silk."

In 1605, *Don Quixote's* publication date, Murcia was already famous for its thread silk. It took an accident to establish a new and unusual silk product—silkworm gut.

A Discovery by Ragpickers

The story goes that, more than a century ago, a Murcian tossed off-size worms on a refuse heap. Strolling ragpickers, curious to examine the silk-producing mechanism, tore one open. Experimenting, they stretched its two gelatinous silk glands into long threads of tough, translucent silk. So was a new industry born.

Since that time Murcia has supplied the world with this filament. Some 20 plants, making gut and fishing equipment, place Murcia in competition with Redditch, England's famed tackle town.

In peak times Spain turns out 90,000,000 strands of gut a year. Lately, artificial substitutes have reduced gut exports sharply.

Fishermen, who buy 70 percent of all gut, use it to conceal the connection between lines and lures (page 108). Surgeons, taking the remainder, employ it to sew wounds.

Both anglers and doctors once used horsehair. Some English fishermen still prefer white horsehair, and plastic surgeons occasionally sew with horsehair sutures.

But just as the silkworm took the place of the horse, so nylon, product of the laboratory, now pushes the silkworm into the background. In similar fashion, nylon put the bristle hog out of the toothbrush business.

Moth Undergoes Three Transformations

Bombyx mori, the silkworm moth, has a four-stage life cycle: egg, larva, pupa, and imago, or mature moth.†

In the thread-silk industry, sericulturists kill the insect in its cocoon or pupal stage. Then they unwind the cocoon's thread and spin the filaments into raw silk.

Gut makers, eliminating the cocoon stage, stop development one step earlier. As the worms prepare to spin their silken chambers,

they are killed and cured in an acid solution. Then the two silk glands are removed and stretched into filaments (page 105).

Gut making is woman's work. Murcia farmwives buy silkworm eggs from breeders in autumn and keep them chilled until spring. On the first Friday in March they take the eggs to church to be blessed.

Most growers incubate the worms between folds of cloth, but some farm women hatch them in bags hung between their breasts. Now the Spanish Government is introducing oil-burning incubators.

When the minuscule worms hatch out, they begin a mulberry-leaf feast which they interrupt only for four moltings (page 102).

Finally, in three to five weeks, the worms, now grown to three inches, stop eating and prepare to spin cocoons. At this precise moment they are tossed into the lethal bath.

Each Murcia family has its own formula for the pickling. Some use beer and water, others vinegar and water, or vinegar and salt. One woman's recipe: "Add salt to vinegar until an egg will float three-quarters submerged."

Chickens Snap Up the Leavings

Old women draw the gut (page 104). Opening a pickled worm, the farmwife removes the silk sacs and tosses the looted carcass to a circle of eager chickens. Now, with one swift movement, she pulls the two sacs to their full length, 8 to 18 inches. When she has stretched several hundred filaments, she washes the bundles and finger-combs the strands (page 106). Finally the gut is dried in the hot sun (page 107).

This raw product goes to processing plants in bundles resembling carrot wigs.

The breaking point of most gut varies between 3 and 17 pounds. For more delicate, almost invisible, sizes, processors draw strands through pierced-diamond dies. Some of the finest measure three thousandths of an inch; they snap under a few ounces' strain.

Though nylon has the advantages of continuous length, exact, uniform diameter, and dry flexibility, many expert anglers prefer gut. It remains supple in icy water and it sinks more readily than nylon. Thus a future seems assured for Spain's strange industry.

* See "Speaking of Spain," by Luis Marden, NATIONAL GEOGRAPHIC MAGAZINE, April, 1950.

† See "Strange Habits of Familiar Moths and Butterflies," by William Joseph Showalter, NATIONAL GEOGRAPHIC MAGAZINE, July, 1927.



Señoritas Comb Golden "Wigs" of Silkworm Gut, Spain's Gift to Fishing and Surgery

Silkworm gut, made by stretching the twin silk sacs of *Bombyx mori*, goes into sutures and fishing leaders (page 108). These young women wash fresh filaments at Murcia, world's silkworm-gut center for more than a century.



A Silk Moth's Life, from Squirmy Caterpillar to Peanut-shaped Cocoon, Is a Glutton's Banquet of Mulberry Leaves

Thousands of worms ravenously feeding sound like rustling rain. When just about to spin cocoons, the worms are killed and toughened by 12 hours' immersion in vinegar, salt, and water. Then they are torn open and the silk sacs removed and stretched. These silk-encased pupas were spared to become breeding moths, which do no eating. Big peach-colored cocoons (upper center) indicate the Spanish gut breed. Gut worms spin larger, coarser cocoons than thread worms.

A Sericulturist, Demonstrating with a Giant Model, Points Out the Twin Silk Sacs, Source of Gut

Silkworms spin one filament from each sac, joining the two before they issue from the mouth (right) as a single thread. These girls study silkworm breeding under the director of the Spanish Government's Sericulture Station in Murcia.

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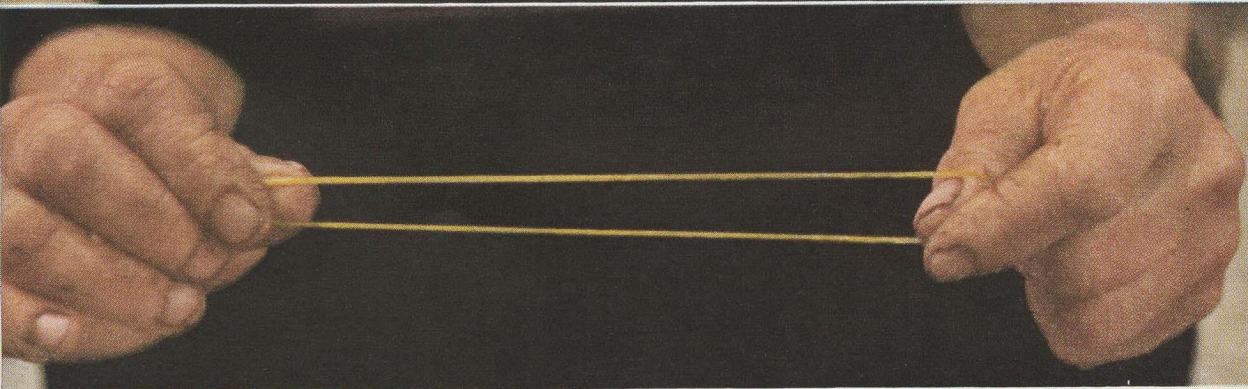
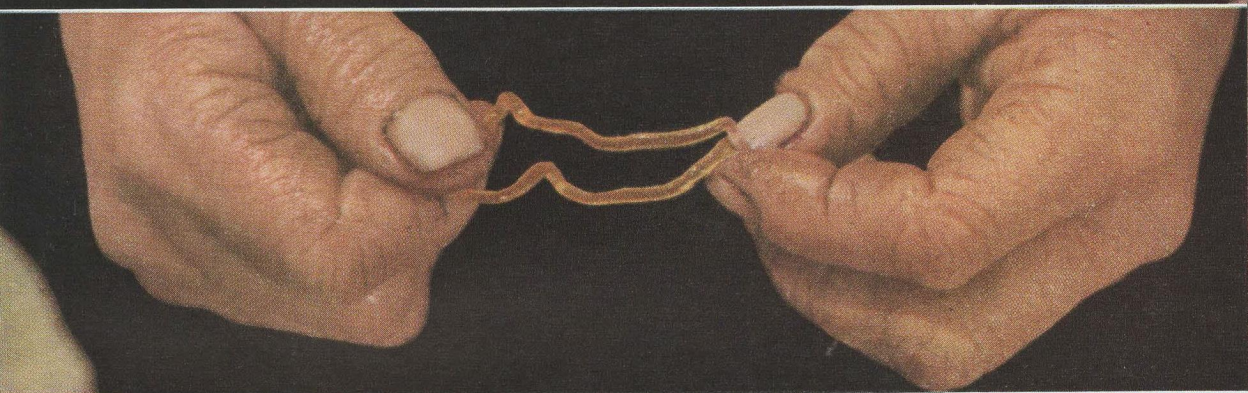
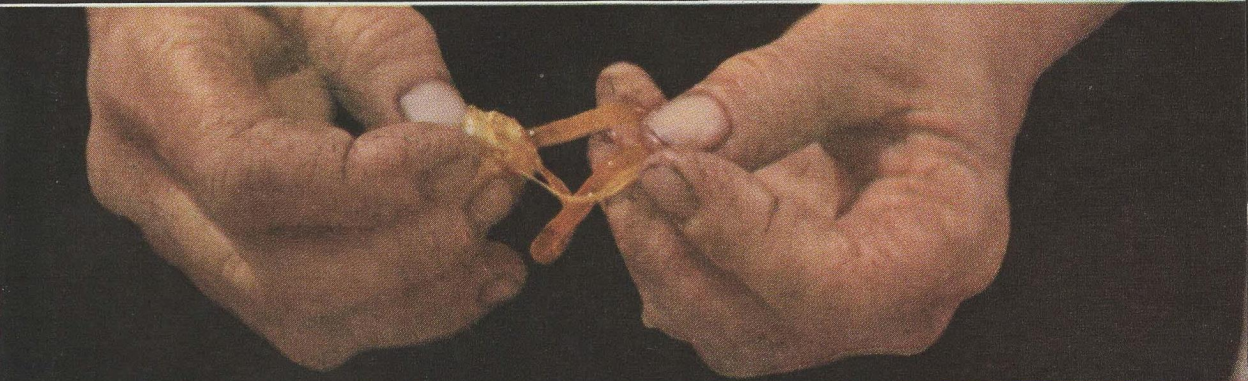


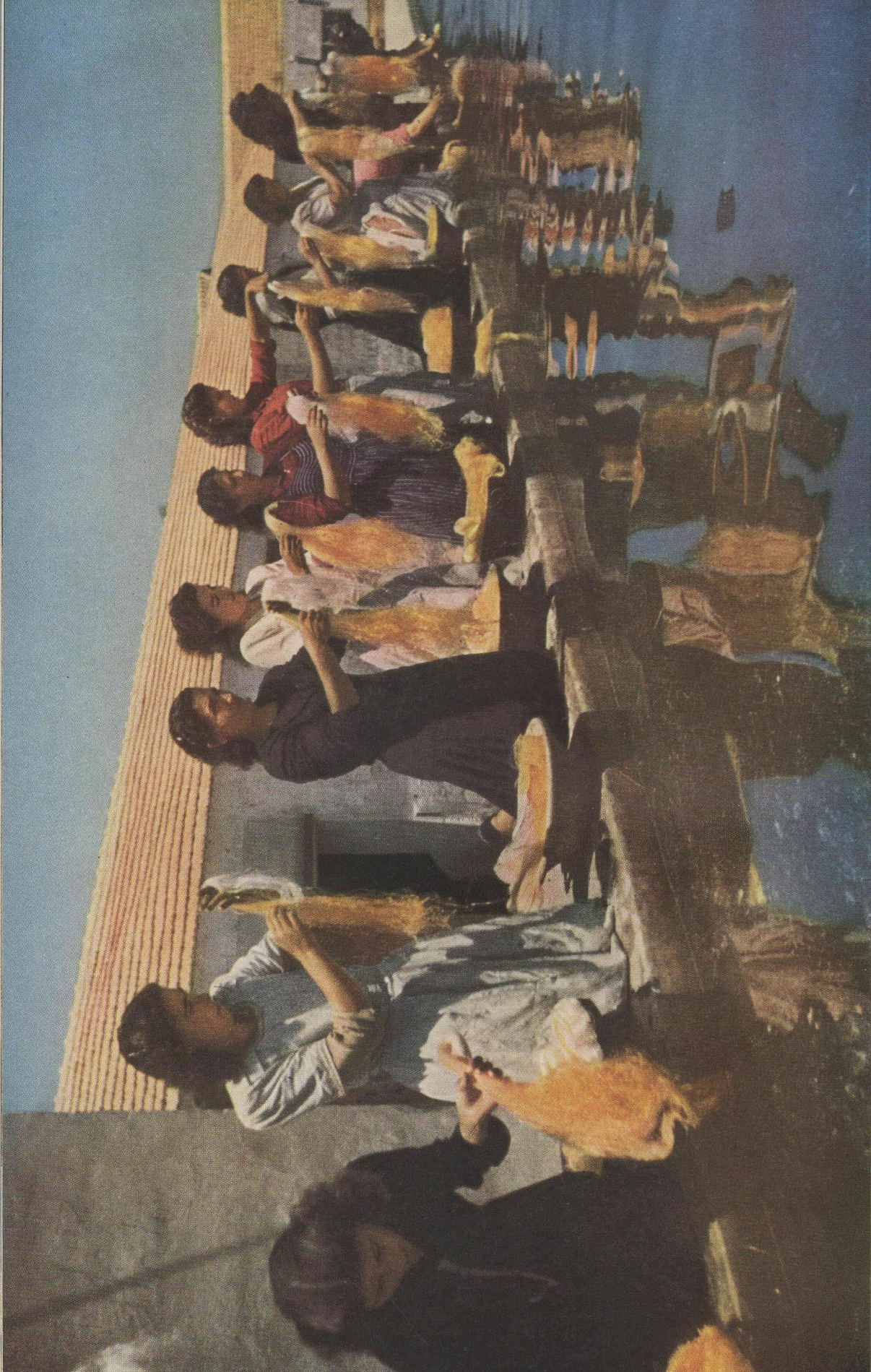


Work-etched Hands Stretch Silk Glands for Anglers and Doctors

Silk sacs, seemingly so fragile, possess an amazing tensile strength in the finished form. Gut strands range in length from 8 to 18 inches; they must be soaked for pliability. Nylon, gut's artificial rival, comes in continuous lengths and is naturally flexible. This countrywoman, who works with silk only in the spring, knows by long experience the exact pull which will stretch the filament to the utmost without breaking.

Opposite page: close-ups show opening of the worm, removal and washing of the sacs, and stretching of the two glands. Stained hands reflect the farmwife's work with the vinegar solution used to toughen silk sacs.





From Lowly Worms Comes Spun-gold Beauty. Drawn and Washed Filaments Dry in the Spanish Sun

When a woman has drawn her allotment of gut, she ties it in hanks, washes it (opposite page), combs it with fingers, and hangs it on a line. Later she ties strands from 700 silkworms into factory-bound bundles. Boiling soapy water removes the yellow outer skin. Sulphur fumes whiten strands further.

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↑ **36,000 Strands of Gut Represent
the Lifework of 18,000 Worms**

Left: Orange gut as it comes from the silk farm and (second hank) the factory-bleached product. Yarn-wrapped bundles have been sorted, stretched, polished, and trimmed. Pierced diamonds, shaving off excess thickness, form the finest diameters.

↓ **Fishermen Use 70 Percent of Gut;
Surgeons Take the Remainder**

These salmon flies are knotted to the heaviest gut, 21/1,000 inch; breaking point, about 17 pounds. Finer strands (not shown), some 1/2-pound test, catch trout. Sutures are sealed in tubes of distilled water. Stitches must be removed; the system does not absorb them.

