The Luminoc® insect trap

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Quebec Region • Information Leaflet LFC 26

Forestry Canada Forêts Canada

Canada

CANADIAN CATALOGUING IN PUBLICATION DATA

Jobin, L. J. (Luc Joseph), 1935-

The Luminoc® insect trap

(Information Leaflet ; LFC 26)
Issued also in French under title: Le piège à insectes Luminoc®.
Issued by the Laurentian Forestry Centre.
Includes bibliographical references.
ISBN 0-662-19567-1
DSS cat. no Fo29-4/26-1992F
1. Insect traps 2. Insects. I. Coulombe, Charles, 1943- . II. Canada. Forestry Canada. Quebec Region. III. Laurentian Forestry Centre. IV. Title. V. Series: Information Leaflet (Laurentian Forestry Centre) ; LFC 26.

SB959.J6213 1992 632'.9 C92-099657-4

Catalog No. Fo29-4/26-1992E
ISSN 0835-1627
ISBN 0-662-19567-1
Printed in Canada

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Laurentian Forestry Centre
1055 du P.E.P.S.
Sainte-Foy, Quebec
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Cette publication est aussi disponible en français sous le titre «Le piège à insectes Luminoc®» (N° de catalogue Fo29-4/26-1992F).
Cover photo: C. Moffet.

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INTRODUCTION

The study or monitoring of insect populations often requires the use of various capture tools such as emergence traps, pitfall traps, and traps for capturing insects in flight (Southwood 1978; Muirhead-Thompson 1991). Of the latter, light traps are the most frequently used for capturing nocturnal insects, even though these traps present certain disadvantages. Given their usual size, they allow the capture of many specimens, but this results in time-consuming sorting and counting. Furthermore, use depends on access to electricity or on the use of a large 12-volt battery, which has a short life. These features sizeably reduce versatile and unattended use of the traps. With a view to correcting these drawbacks, a portable light trap, registered under the trade name "Luminoc®", was invented based on the Multi-Pher® trap developed at the Laurentian Forestry Centre. Luminoc®, like its predecessor, can be used as a standard pitfall trap or adapted for use as a pheromone trap (Jobin 1986; Jobin and Coulombe 1988). Its smaller size and capacity to operate unattended for long periods of time account for its uniqueness and practicality. It can be suspended for sampling flying species or used as a pitfall light trap to study crawling insects.

The features and use of the Luminoc® trap are described in this leaflet. Selected results from experiments conducted for the capture of flying or crawling insects are also presented.

DESCRIPTION AND FEATURES OF THE TRAP

Features of the Luminoc® trap are illustrated and described in Figure 1. It comprises a removable container housing a 6-volt lantern battery, a fuse, and a light intensity switch (high or normal). The top part of the container is equipped with a steel hook for suspending the trap. A circuit container for electronic control and power circuits and a photocell are located at the uppermost part of the removable container. The photocell assures automatic operation of the trap through a timer which regulates operation time, either continuous or for one- to eight-hour periods. The trap can also operate on alternating current (110 volts). The life of the 6-volt battery for an operating period of four hours per night is given in days in Figure 2.

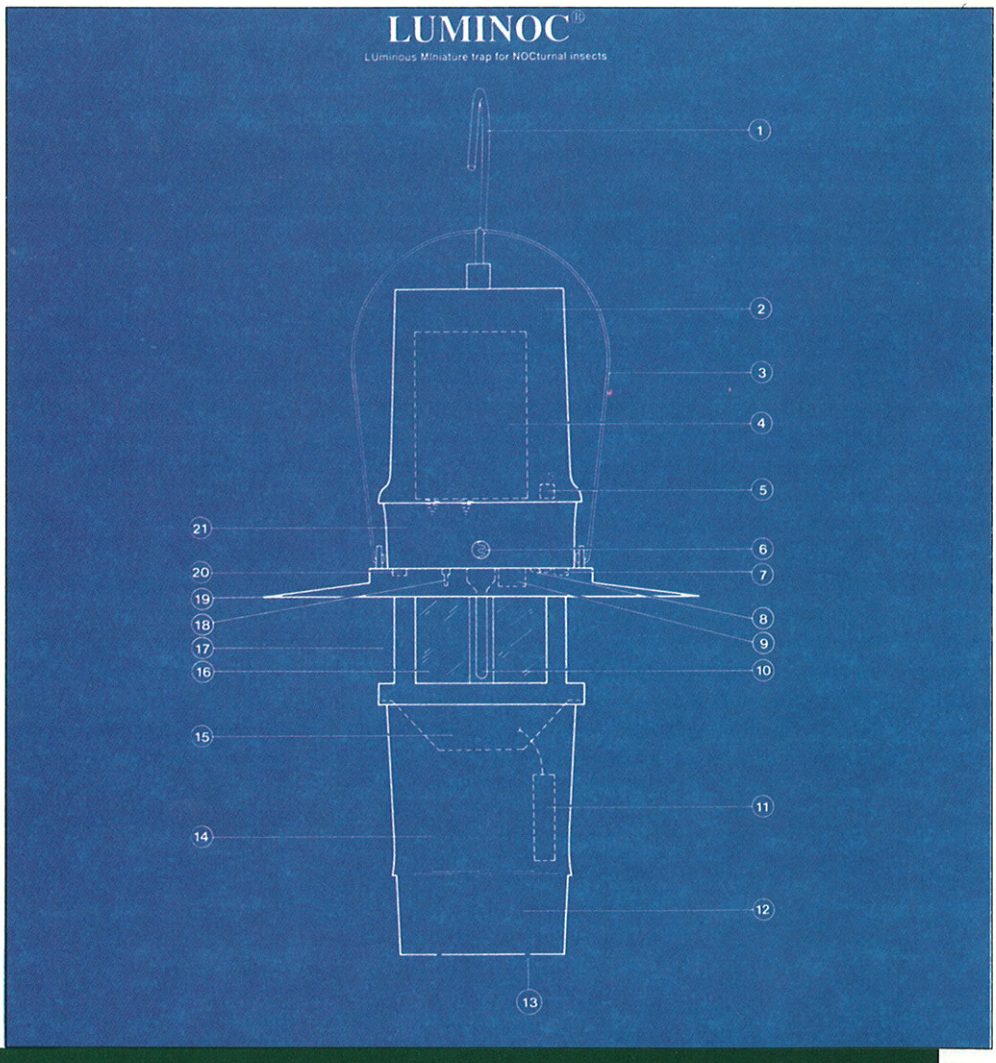

Figure 1.
Structural elements of the Luminoc® trap: (1) Hook for suspending trap; (2) Removable container housing 6-volt battery; (3) Arch for holding removable container in place; (4) Lantern battery (6-volt); (5) Light intensity switch (high or normal); (6) Photocell; (7) Outlet for motor (optional); (8) Diodes indicating battery state and tube status; (9) Timer for selecting operation time; (10) Miniature fluorescent tube; (11) Insecticide strip; (12) Removable section of trapping container; (13) Drainage holes; (14) Trapping container; (15) Removable funnel, also used for affixing insecticide strip; (16) Baffles (removable); (17) Ingress holes (four); (18) Indicator switch; (19) Cover preventing water infiltration; (20) Outlet for AC/DC power source (optional); (21) Container housing electrical circuit.

When the fluorescent tube is removed, the entire electrical circuit is disconnected, prolonging battery life. Four independent and removable baffles constructed from transparent plastic are inserted into the vertical slots that define four ingress holes leading to the 1.8 Watt miniature fluorescent tube. Four types of tubes, one of which emits light in or around the ultraviolet range (Figures 3 and 4), have been tried so far. Using low light intensity or different light frequencies allows capture of fewer insect samples at one time, and targetting of specific species, orders, or gena.

The 1 L collection container houses a funnel with an appended Vaportape II insecticide strip. The removable bottom is equipped with drainage holes. The bottom half of the container can be removed to allow other types of containers (screen bags, plastic bags) to be used to increase volume.

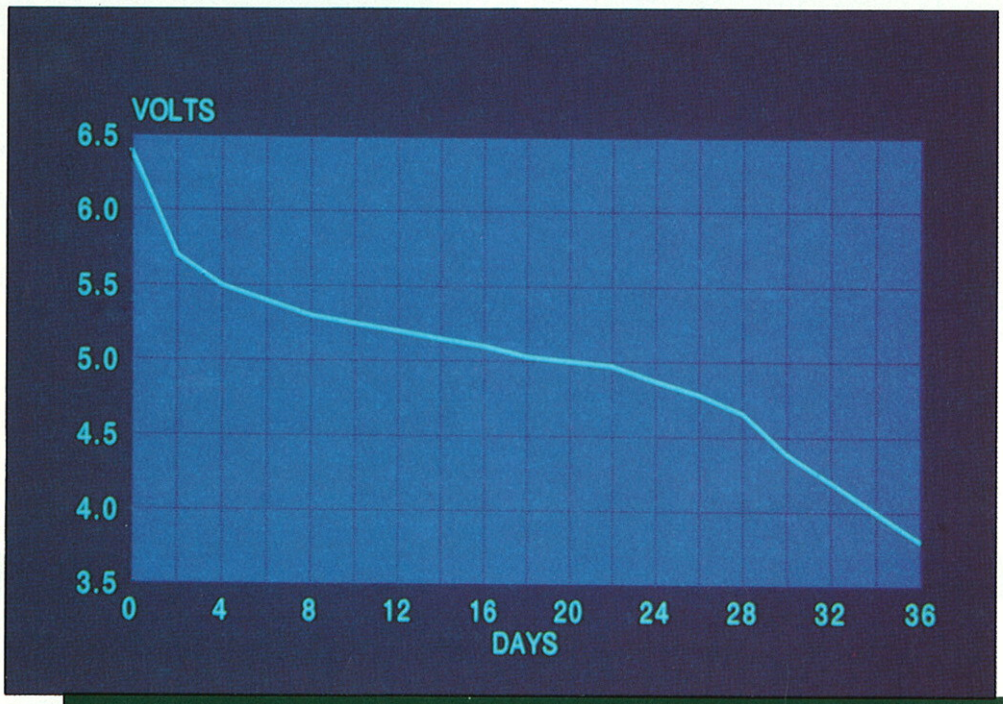

Figure 2.
Operation time, in days, of the 6-volt battery at four hours per night.

a

b

c

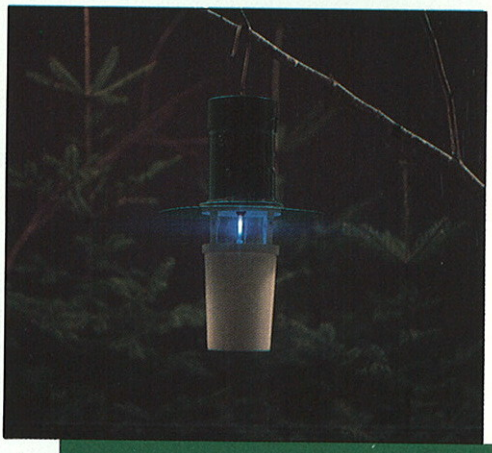

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Figure 3.
Photographs of the four types of light used: (a) Blue; (b) Green; (c) White; (d) Ultraviolet. (Photos : C. Moffet)

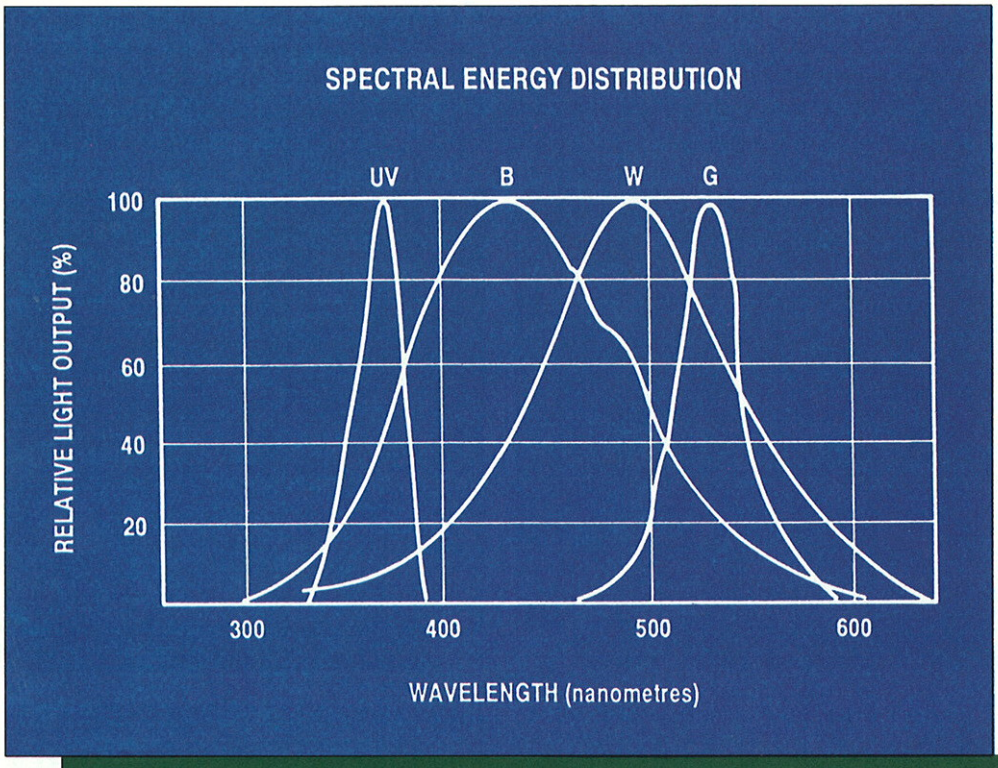


Figure 4.
Spectral energy distribution for four fluorescent tubes tested with Luminoc®: UV = Ultraviolet; B = Blue; W = White; G = Green.

A MULTIFUNCTIONAL TRAP

Small size and easy handling make the Luminoc® trap a multifunctional tool for capturing flying or crawling insects. It can be suspended from a branch (Figure 5a) with a rod or any other support mechanism, or buried up to the ingress holes (Figure 5b) and used as a pitfall light trap. The use of a light source as an attractant makes it a high calibre pitfall trap for the study and sampling of several species of crawling insects. A removable container with a slightly smaller diameter and volume than the 1 L variety is inserted into the bigger container so that captured insects can be retrieved without having to remove the larger container from the ground.

The Luminoc® trap can also be used to capture stinging insects such as mosquitoes

and biting midges (Figure 5c). A small photocell-activated motorized fan operated in conjunction with the fluorescent tube creates a draft that draws slow-flight insects toward a net replacing the container. To minimize capture of insects other than mosquitoes, a screen with an 8 mm weave is placed on the upper rim of the funnel.

a

b

c

d

Figure 5.
Four uses for the Luminoc® trap: (a) aerial trap; (b) pitfall trap; (c) mosquito trap; (d) pheromone light trap. (Photos: C. Moffet)

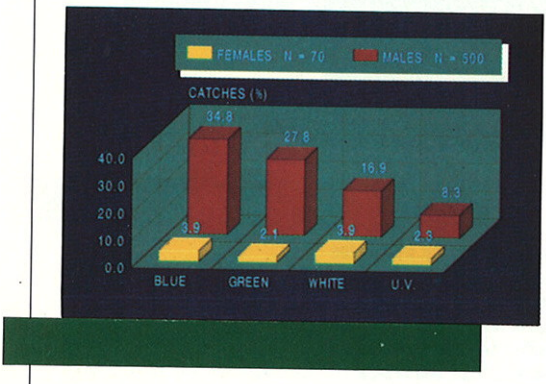
Some examples of use

Luminoc® can also be used as a double-lure trap, for example, using a light source and an appropriate sex pheromone (Figure 5d). The attractant is attached with an adhesive strip or a pin to the plastic base of the plug or in the plastic end of the tube.

Male hemlock looper moths (*Lambdina fiscellaria* [Guen.]) are more attracted by the different light sources than are females (Figure 6), whatever the population level, endemic (a) or epidemic (b). Furthermore, males are more attracted by the blue spectrum. Females are captured mostly with light in the blue or white spectra, whatever the population level.

The comparative efficiency of Luminoc® and sex pheromones for the capture of forest tent caterpillar moths (*Malacosoma disstria* Hbn.) (Figure 7a) and spruce budworm (*Zeiraphera canadensia* Mutt. and Free.) (Figure 7b) was evaluated. When the tube is used in conjunction with a sex pheromone, compared to tube use only, there is a marked increase in the number of male hemlock looper moths captured, the tube being more effective than the pheromone (Figure 7c). Female moths of both species are also attracted by the light source with or without the sex pheromone, compared to pheromone use only. However, joint use of both lures (tube and pheromone) attracts more male moths than the tube or the pheromone used singly.

The efficiency of Luminoc® as a pitfall light trap is shown in the results of tests conducted on the capture of specimens of five families of Coleoptera collected in a sugar bush (Figure 8). Seventy-five percent of Curculonidae were captured using the light traps, as were most of the Carabidae, Elateridae, Scarabaeidae, and Silphidae specimens.



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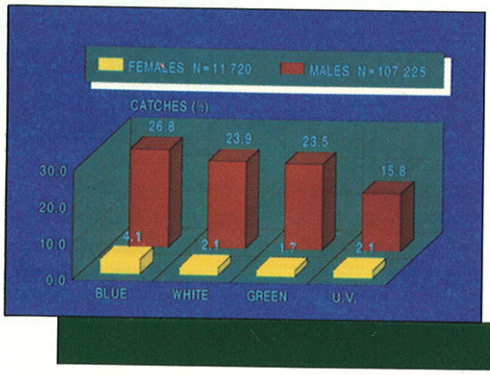

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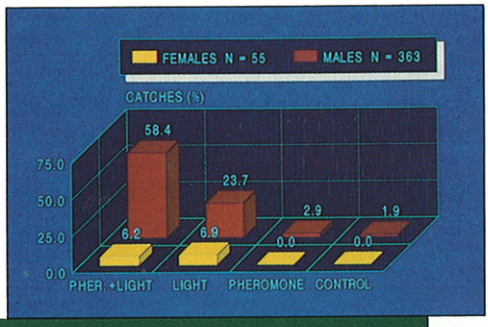
Figure 6.
Efficiency of four different light sources for the capture of hemlock looper moths (*Lambdina fiscellaria* [Guen.]) of both sexes in low (a) and high (b) insect population densities.



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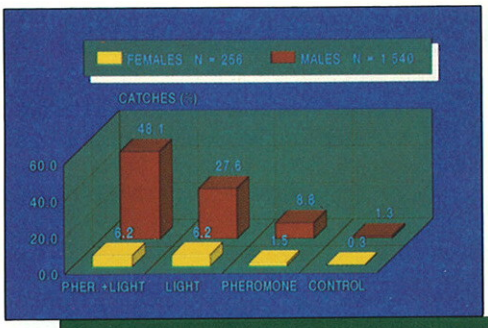

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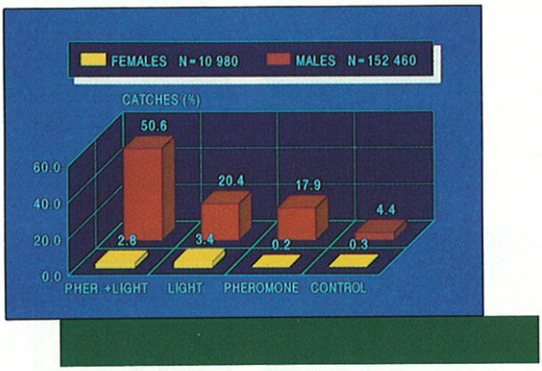

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Figure 7.
Comparative efficiency of the Luminoc® trap with a blue fluorescent tube used singly or with a sex pheromone for capturing forest tent caterpillar moths (*Malacosoma disstria* Hbn.) (a), spruce budworm moths (*Zeiraphera canadensis* Mutt. and Free.) (b), and hemlock looper moths (*Lambdina fiscellaria* [Guen.]) (c).

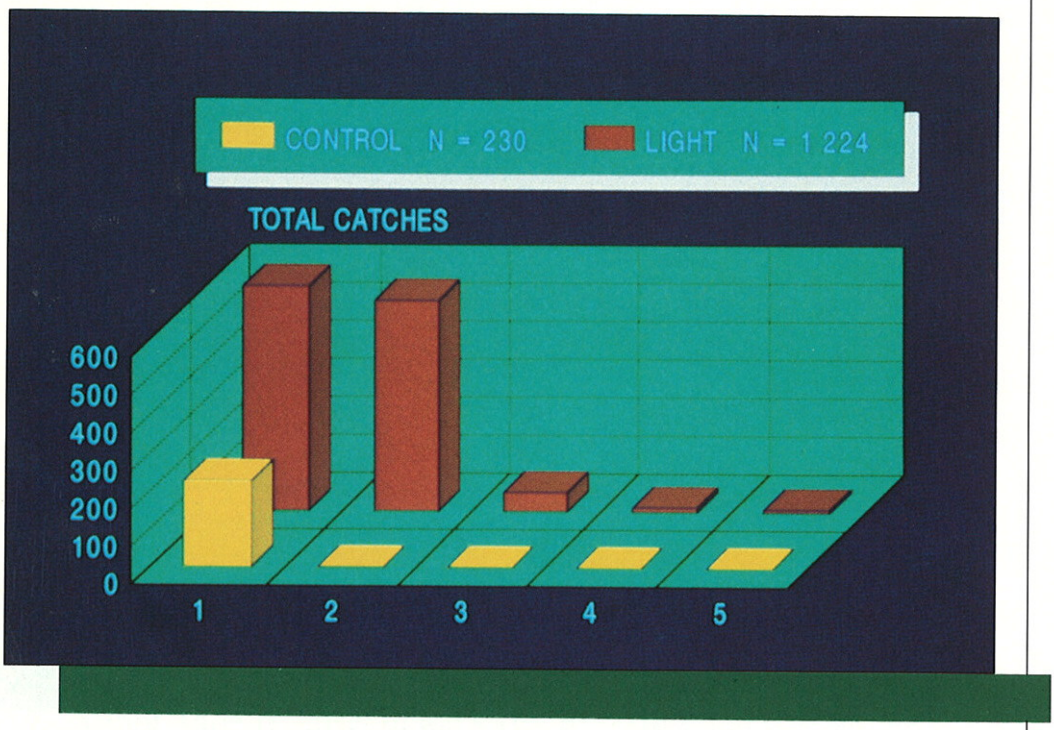

Figure 8.
Efficiency of Luminoc® as a pitfall trap for capturing Coleoptera from five families: (1) Curculionidae; (2) Carabidae; (3) Elateridae; (4) Scarabaeidae; (5) Silphidae.

CONCLUSION

On-site testing has demonstrated there are numerous advantages to using the Luminoc® trap. Given its reduced size and capacity to operate unattended for long periods of time, it can easily be installed where targetted insects are apt to be. Furthermore, its adaptability to different lures facilitates species-specific sampling (Figure 9). Further tests will eventually allow development of appropriate methods for the capture of many other insect species.

This light trap is a valuable instrument for the study of insect life in forests, swamps, and on farmland and for the detection and monitoring of insect pests harmful to forests, farms, and human health.

Figure 9.
Various removable receptacles to be placed in Luminoc® container.

ACKNOWLEDGEMENTS

We thank the staff of Forestry Canada, Quebec Region, Communications Department, especially Claude Moffet for the photographs and Benoit Arsenault and Colleen Bilodeau for the editing.

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Southwood, T.R.E. 1978. Ecological methods. 2nd ed. Chapman and Hull, New York. 524 p.

SOURCES OF PRODUCTS

Luminoc® trap and fluorescent tubes

BIOCOM
2120 Lavoisier
Sainte-Foy, Quebec
Canada G1N 4B1
Tel.: (418) 682-3380
Fax: (418) 687-4014

Vapor Tape II® insecticide strip. Registered in Canada for commercial use with insect traps.

Produced by: HERCON Laboratories Corp.
New Jersey, USA

Sold by: BIO-CONTRÔLE
2600 Dalton
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