Blue Mussel Winter Harvest Testing Program

Akulivik 1996

Final Report
97-03-27

Programme d'essai et d'expérimentation halieutiques et aquicoles

Fisheries and Aquaculture Testing and Experimentation Program

ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐱᕙᓪᓕᐊᑎᑦᓯᒐᓱᐊᕈᑏᑦ ᐱᓇᓱᐊᕐᑕᐅᒍᑎᖏᑦ

ᓇᓗᓇᐃᒃᑯᑕᖏᑦ 7900-002-942

ᐅᕝᕙᓗᕐᓂᐊᓂᖅ ᐅᑭᐅᖑᑎᓪᓗᒍ
ᐅᑦᑐᕿᕐᑕᐅᓂᕆᓚᐅᕐᑕᖏᓐᓄᑦ
ᐊᑯᓂᕕᒻᒥ 1996

ᑐᓴᕐᑎᓯᒍᑎᑦᓚᖐᑦ

97-03-27

ᑮᓇᐅᔭᖅᑲᕐᑎᓯᔪᑦ ᐅᑯᐊ

ᑲᓇᑕᐅᑉ ᐃᖃᓗᓐᓂᐊᓂᓕᕆᔨᖏᑦ ᐃᒪᕐᐱᓕᕆᔨᖏᓪᓗ
ᐊᑖᒍᑦ ᐅᑯᐊ
ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᐅᑕᓂᓪᓗ ᐱᕈᕐᓴᐃᕕᒻᒥᒃ ᐅᑦᑐᕿᕐᕙᖕᒐᓂᑦ

ᑰᑦᔪᐊᒃ ᖃᐅᔨᓴᓯᐊᕐᕕᖓᑦ
ᓄᑕᐅᓯᓕᕈᓐᓇᑐᓂᒃ ᐱᕕᑦᓴᓂᒃ ᐱᕙᓪᓕᐊᑎᑦᓯᒐᓱᐊᕐᕕᐅᑉ ᐱᓇᓱᐊᕐᕕᖓᑦ
ᒪᑭᕝᕕᒃ ᑯᐊᐳᕇᓴᓐ
ᑰᑦᔪᐊᖅ, ᑯᐸᐃᒃ

ᒪᑭᕝᕕᒃ ᑯᐊᐳᕇᓴᓐ
Makivik Corporation
Société Makivik

ᑕᐃᔭᐅᒥᐊᓖᑦ

ᐱᐅᑦ ᑐᐃᔅ ᐊᒻᒪᓗ ᔾ. ᑉᓈᒍᓐᑏᓐ, 1997. ᐅᕕᓗᕐᓂᐊᓂᕐᒥᒃ ᐅᑭᐅᖑᑎᓪᓗᒍ ᐅᑦᑐᕋᕐᓂᖅ: ᐊᑯᓕᕕᒻᒥ 1996, ᑐᓴᕐᑎᓯᒍᑏᑦ 12-287ᐸ ᒪᓂᔭᐅᓯᒪᔪᑦ ᐅᑯᓇᖓ ᑲᓇᑕᐅᑉ ᐃᒪᕐᐱᓕᕆᔨᖏᑦᑕ ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᐅᑕᓂᓪᓗ ᐅᑦᑐᕋᕕᖓᓂᑦ. ᓇᓗᓇᐃᒃᑯᑕᖏᑦ 7900-002-942. ᑰᑦᔪᐊᑉ ᖃᐅᔨᓴᔪᐊᕐᕕᖓᑦ, ᒪᑭᕝᕕᒃ ᑯᐊᐳᓈᓴᓐ, ᑰᑦᔪᐊᖅ, ᑯᐸᐃᒃ, 18-ᓂᒃ ᒪᑉᐱᒐᓖᑦ.

ᐃᓗᓕᖏᑦ

ᐱᒋᐊᕈᑎᖏᑦ 1

ᐅᕙᓗᕐᑕᐅᑎᑦᓴᐃᑦ ᐱᕋᑦᓕᐊᑎᑕᐅᓂᖏᑦ

ᐅᕙᓗᕐᓂᒃ ᖃᓗᕿᐅᑎᓕᐅᕐᓂᖅ 1

ᐅᕙᓗᕐᑕᓂᐊᕐᓂᒥᒃ ᐊᐅᓚᑦᓯᒍᑏᑦ

ᐅᕙᓗᕐᑕᕙᑦᓴᐃᑦ ᓇᑦᓕᑳᕐᑕᐅᓂᖏᑦ 2

ᐅᕙᓗᕐᑕᓕᓕᐊᕐᓂᓘᑦ 2

ᖃᓗᓯᒍᓰᑦ 3

ᐅᕙᓗᖅᑲᐅᑏᑦ ᖃᐅᔨᓴᕐᑕᐅᓂᖏᑦ

ᐱᑕᖅᑲᑦᑕᓚᐅᕐᓂᖏᓐᓄᑦ ᐱᔭᐅᖅᑲᑦᑕᓚᐅᕐᑐᓄᑦᓗ 3

ᐱᕈᕐᐸᓕᐊᓂᓇᓲᖏᓐᓄᑦ ᐅᑭᐅᖏᑦᓗ 4

ᑮᓇᐅᔭᓕᐅᕿᓱᐊᕈᑕᐅᓂᖏᑦ

ᓂᐅᕐᕈᓯᕐᕕᐅᒍᓐᓇᑐᓄᑦ ᐱᑕᖅᑎᕐᓯᒍᓐᓇᓂᕐᒧᓗ 5

ᓂᐅᕙᐊᑦᓴᐅᑎᑕᐅᔭᐃᑦ ᖃᓄᐃᓕᖕᒐᒐᔭᕐᓂᖏᑦ 5

ᑮᓇᐅᔭᓕᐅᕈᑕᐅᑐᐃᓐᓇᓇᐊᖅᑲᕐᓂᖏᓐᓄᑦ 5

ᐃᓱᒪᒋᔭᐅᓕᖅᑐᑦ ᐊᑑᑎᔭᐅᖅᑯᔭᐅᔭᐃᑦᓗ 7

ᓱᖅᑯᐃᑕᐅᒋᐊᓕᓐᓄᑦ 8

ᑕᑯᒋᐊᕐᑕᐅᒍᓐᓇᑐᑦ 9

ᑭᓯᑕᐅᒪᔭᑦ 11

ᐱᒋᐊᕈᑎᖏᑦ

ᐅᕕᓗᖃᑦᓯᐊᑐᒻᒪᕆᐅᓱᖕᒍᕙᖅ ᓄᓇᕕᒻᒥ ᓂᕿᑭᔭᐅᕙᑦᑐᓂᒃ ᐅᐱᕐᖔᖑᒐᓗᐊᕐᒪᑦ ᐅᑭᐅᖑᒐᓗᐊᕐᒪᓘᓐᓃᑦ. ᐅᐱᕐᖔᑯᑦ ᐅᕕᓗᕐᓂᐊᑕᐅᓲᑦ ᐊᒡᒐᒍᑦ ᑎᒍᓚᔭᐅᑦᓯᑎᒃ. ᐅᑭᐅᒃᑯᑕᐅᖅ, ᑎᓄᑦᔭᐅᓲᑦ ᐅᕕᓗᕐᑕᑕᐅᓲᖑᒻᒥᔪᑦ ᑎᒍᓚᔭᐅᒻᒥᓯᑎᑦᓴᐃᓇᖅ ᐊᒡᒐᒍᑦ ᓄᓇᓕᒻᒥᐅᓄᑦ, ᑖᕙᓂ ᓴᓪᓗᒥᓗ ᑲᖏᕐᓱᔪᐊᒥᓗ ᑕᐃᒪᐃᓕᐅᕈᓐᓇᓱᖕᒍᒻᒪᑕ ᑎᓂᖕᖅᑲᓱᖕᒍᓂᑯᖕᒐᓄᑦ 5 ᒦᑕᓂᒃ ᑕᑭᓂᓕᒻᒥᒃ ᑕᒐ ᐅᕕᓗᐃᑦ ᐱᔭᐅᒍᓐᓇᕕᖅᑲᓕᖅᑭᑦᓯᑎᒃ ᓯᑯᐃᑦ ᓯᕐᑯᒥᑦᓯᒪᔪᑦ ᐊᑯᓐᓂᖏᑎᒍᑦ. ᐊᑯᓕᕕᒻᒥᓕ, ᑎᓂᖅᑲᔭᑦᓯᐊᖏᑦᑑᑎᓪᓗᒍ (0.4 ᒦᑕᓂᒃ ᑎᓂᓐᓂᖅᑲᑦᓂᑯᖕᒐᓄᑦ) ᓯᑯᖃᐃᓐᓇᓕᒫᓱᖕᒍᒻᒪᑦ, ᐅᕕᓗᐃᑦ ᑎᓄᑦᔭᐅᒍᓐᓇᖏᑦᑐᑦ ᐱᔭᐅᒍᓐᓇᓱᑦ ᓯᑯᒥ ᑭᓪᓚᓕᐊᖑᓯᒪᔪᑎᒍᑦ ᖃᓄᕐᑕᐅᓯᑎᒃ ᖃᓄᕐᐅᑎᑯᑖᒍᑦ ᑕᑭᔪᒍᑦ. (ᒥᐊᓯ ᐊᒻᒪᓗ ᑐᐃᔾ 1995).

ᓂᕿᑦᓴᓂᒃ ᐅᕕᓗᕐᑕᕈᓯᐅᓯᓂᒃ ᑕᑯᓐᓈᑕᐅᔪᖃᓚᐅᔪᕙᖅ 1995-ᖑᑎᓪᓗᒍ (ᒥᐊᓯ ᑐᐃᔾ 1995). ᑖᒃᑯᐊ ᖃᐅᔨᓴᕐᑕᐅᒍᒪᓚᕐᑐᑦ ᒪᑯᓂᖓ ᓯᕙᓂᑦᓴᖅᑲᕐᑎᑕᐅᓂᖃᓚᐅᕐᑐᑦ:

- ᐱᐅᓯᓕᐅᒥᑎᒋᐊᕐᓗᒍ ᑎᒍᓚᒍᑎᒃ ᐅᕕᓗᕐᓂᒃ ᐊᒻᒪᓗ ᐅᕕᓗᕐᓂᐊᕈᓰᑦ,
- ᖃᐅᔨᓴᕐᑕᐅᑎᓪᓗᒋᑦ ᐅᕕᓗᕐᓂᐊᓂᖅ ᑮᓇᐅᔭᓕᐅᕈᑕᐅᒍᓐᓇᕕᖃᕐᒪᖔᑦ ᐱᓇᓱᒐᑦᓴᓂᒃ ᐊᑕᐅᓯᕐᒥᒃ ᒪᕐᕉᓐᓗᓃᑦ ᓄᐃᑦᓯᒍᑎᐅᒍᓐᓇᑐᓂᒃ.

ᒪᕐᕉᓂ ᐱᓇᓱᐊᕈᓯᕐᓂᒃ ᒫᑦᔨ 1996-ᒥ ᐊᑯᓕᕕᓕᐊᓚᐅᔪᒍᑦ ᐱᓇᓱᐊᖅᑲᑎᖅᑲᓯᑕ ᒪᕐᕉᓂᒃ ᒪᖅᑲᐃᑦᑏᓂᒃ ᐅᕕᓗᕐᑕᓂᐊᔫᑐᖅᑲᕐᓂᒃ. ᑕᒪᒃᑯᐊ ᐅᕕᓗᕐᑕᐅᑎᖏᑦ ᕿᒥᕐᕈᔭᐅᓕᓚᐅᔪᑦ ᐅᕕᓗᕐᑖᓯᑎᓪᓗ ᖃᐅᔨᓴᕋᑦᓴᒥᓂᒃ. ᑖᒃᑯᐊ ᑕᑯᓐᓇᕋᑦᓴᓂᒃ ᐊᑦᔨᓕᐅᓇᓚᐅᔪᒻᒥᔪᑦ ᑕᒪᒃᑯᓂᖕᒐ ᐅᕕᓗᕐᑕᓕᓐᓂᒃ, ᖃᓗᓯᒍᓯᐅᓯᓂᓪᓗ ᐊᒻᒪᓗ ᖃᓗᔭᐅᑐᐊᕐᒪᑕ ᖃᓄᖅ ᐊᐅᓚᑦᔭᑕᐅᓂᖃᓱᖕᒍᒻᒪᖔᑕ ᐱᕈᕐᓴᕕᒋᓲᖏᑦ ᐃᖅᑲᒦᑦᑐᑦ.

ᐅᕕᓗᕐᑕᐅᑎᑦᓴᓕᐅᕐᓂᖅ

ᖃᓗᓯᒍᑎᓕᐅᕐᓂᖅ

1980 ᐊᕐᕌᒍᖏᑦ ᐱᒋᐊᖅᑲᒥᐅᓚᕐᑎᓗᒋᑦ ᐅᕕᓗᕐᑕᓂᐊᔫᕈᓚᐅᔪᑦ ᖃᓗᕿᕐᓂᑯᑦ (ᑭᓯᑦᓯᒍᑎᓖᑦ 1-2ᖕᒐᓂ). ᖃᓗᒍᑎᖏᑦ ᓴᓇᒪᒍᓯᖅᑲᓯᒪᓚᐅᔪᑦ ᐊᒻᒪᓗᑭᑖᒥᒃ ᓄᓗᐊᑦᑕᓕᒻᒥᒃ ᕿᔪᑯᑖᒦᑦᑎᑕᐅᑎᓪᓗᒍ ᐊᖏᓂᓕᒻᒥᒃ 2X3-ᒥᒃ. ᐅᕕᓗᕐᑕᓂᐊᕐᑏᑦ ᐅᕕᓗᕐᑕᓂᐊᕈᑎᓚᐅᔪᑦ ᓇᑭᑐᐃᓐᓇᖅ ᐊᑐᐃᓐᓇᓯᑐᐃᓐᓇᓯᑎᒃ ᓱᓇᒃᑯᑎᓚᑲᑦᓴᖏᓐᓂᒃ. ᑕᒪᒃᑯᐊ ᖃᓗᓯᒍᑎᓕᐊᓇᓯᒪᓲᖏᑦᑕ ᓴᓇᒪᓂᖏᑦ ᐊᑦᔨᒌᖏᑦᑑᕚᑦᑐᑦ ᐅᐱᓐᓇᕿᑎᒃ, ᐊᒻᒪᓗ ᐱᐅᓯᒋᐊᑦᑕᐅᖃᑦᑕᓯᒪᓚᕐᑐᑦ ᑕᒪᒃᑯᓇᓂ ᐊᕐᕌᒍᓯᒪᓚᕐᑐᓂᒃ (ᒥᐊᓯ ᑐᐃᔾ 1995). ᓄᓗᐊᑦᓴᖅᑲᑦᓯᐊᓲᔪᕐᒋᓂᕐᒥᒃ ᐱᓇᐃᓗᑕᖅᑲᑉᐸᕐᒋᓐᓇᑐᑦ ᑕᒪᒃᑯᓇᓂ ᐊᕐᕌᒍᓯᒪᓚᕐᑐᓂ (ᐅᖃᐅᓯᕐᒐᑎᒍᑦ ᕿᐊᓐᓇᓇ ᐊᓚᐃᑯ ᓄᓇᓕᒻᒥᐅᔭᖅ).

ᒫᑉᐱᓂᒃ ᐅᕙᓗᕐᓂᒃ ᖃᓗᓯᐅᑎᑦᓴᔭᓂᒃ ᓴᓇᔭᐅᔪᖃᓚᐅᔪᖅ ᐊᑦᔨᐦᖏᑑᑎᓪᓗᒋᒃ ᐊᑦᔨᒋᔭᐅᓚᓚᐅᕐᑐᓂᒃ ᐅᕙᓂ ᑭᓯᑦᓯᐅᑎᓖᑦ 1-ᒥ ᓄᐃᑕᑎᑕᐅᔪᒧᑦ. ᖃᓗᓯᐅᑎᐅᑉ ᐃᑉᐱᐊᔪᖓ ᐊᑦᓱᓈᓗᑦ ᐊᑕᑎᑕᐅᓚᐅᔪᖅ ᓱᓪᓗᓕᓐᓄᑦ ᐊᑕᑎᑦᓯᐅᑎᖏᓐᓄᑦ. ᑖᓐᓇ ᐊᑕᕙᐅᔪᖅ ᕿᔪᑰᖑᓚᐅᔪᖅ 6-ᓂᒃ ᐃᑎᖁᕐᓂᒃ ᑕᑭᓂᖅᑲᕐᓯᓂ. ᑖᓐᓇ ᕿᔪᑰᖓ ᐊᒥᑦᑕᓯᔭᐅᒪᓚᐅᔾᒥᔪᖅ ᑎᑐᒥᐊᕆᐊᖓ ᕿᐅᔭᓇᕐᑎᓗᒍ ᐃᓱᐊᕐᓂᓴᐅᔫᓇᑐᕆᔭᐅᓐᓂᒪᑦ. ᓯᑕᒪᓄᑦ ᑎᑭᑦᑐᓂᒃ 6-ᓂᒃ ᐃᑎᖁᕐᓂᒃ ᑕᑭᓃᓐᓂᒃ ᕿᔪᑰᑦᑕᓐᓂᒃ ᑭᑭᐊᑦᑕᐅᔪᖅᑲᐳᓇᑐᖅ ᑎᑐᒥᐊᐳᑎᓕᐅᐳᑎᐅᓗᑎᒃ.

ᕿᔪᑰᑦ ᐊᒥᕐᑐᓯᒪᔪᐃᑦ ᐊᑐᕐᑕᐅᓂᑐᐊᕋᒥᒃ ᕿᑐᓗᐊᓚᐅᔪᑦ ᖃᓗᓯᐅᑎᖑᓂᒃ ᐊᑦᑐᐊᑎᑦᓯᓯᐊᐳᓇᓕᕐᓯᑎᒃ ᐃᖅᑲᖑᓄᑦ. ᑕᒐ ᐊᓯᑦᔨᑕᐅᓂᓚᐅᔪᑦ ᑭᑭᐊᓐᓄᑦ ᓱᓪᓗᓕᓐᓄᑦ. ᑏᒃᑯᐊ ᕿᑐᑦᑐᓯᐊᖑᓚᐅᔪᒐᓗᐊᕐᓯᑎᒃ ᐅᖁᒪᐃᓗᐊᓚᐅᔪᑦ ᐊᑐᑐᐃᓐᓇᕋᓯᐊᕋᓯᒋᐊᖏᑦ. ᕿᔪᐃᑦ ᐊᑐᕐᑕᐅᒋᐊᓪᓚᑐᐃᓐᓇᓚᖑᓯᓚᐅᔪᑦ ᐅᓄᕐᓂᓴᓄᑦ ᒪᖃᐃᑦᑎᓄᑦ ᐊᑐᕐᑕᐅᓲᑐᖅᑲᐅᒻᒪᑕᐅᓈᑦ.

ᐃᑉᐱᐊᔪᓂᐊᓇᔭᐅᒋᐊᖕᖑᓚᐅᔪᖅ ᓲᒃᑭᑕᐅᑎᓪᓗᒍ ᐊᖅᑭᑕᐅᒋᐊᖑᓚᐅᔪᖅ. ᖃᓗᓯᐅᑎᐅᑉ ᐃᓱᖓ ᐊᑦᑐᑕᓲᖅ ᐃᖅᑲᒧᑦ, ᐊᒻᒧᓗᑮᑲᕐᑎᑕᐅᒋᐊᓚᐅᔪᖅ ᕿᓱᐃᑦᑕᓂᕐᓴᐅᔫᓇᓂᖑᓄᑦ ᐃᖅᑲᖑᓂᒃ. ᖃᓗᓯᐅᑎᒃ ᑭᑭᐊᑦᑕᓯᓚᐅᓚᐅᔪᖅ ᐃᓱᐊᒍᑦ ᐳᐊᕐᓇᔭᐅᑎᓂᐊᓇᔭᐅᑎᓪᓗᒍ ᖃᓗᓯᐅᑎᖑᓄᑦ ᓄᓗᐊᖅᑲᕐᑎᓗᒋᑦ ᕿᑐᑦᑐᓂᒃ ᓄᓗᐊᑦᓴᔭᓂᒃ (ᑭᓯᑦᓯᐅᑎᓖᑦ 2).

ᐅᕙᓗᕐᑕᓂᐊᕐᓂᒥᒃ ᐊᐅᓚᑦᓯᐅᑏᑦ

ᐅᕙᓗᕐᑕᕙᑦᓴᐃᑦ ᓇᓪᓕᑳᕐᑕᐅᔪᑦ

ᐅᑭᐅᖑᑎᑦᑐᒍ, ᐅᕙᓗᐃᑦ ᐱᔭᐅᔪᓇᓲᖑᔪᒍᑦ ᐃᒪᕐᒥᑦ ᐃᑎᓂᖅᑲᓚᑦᑐᒥᒃ 4 ᒦᑕᓂᒃ. ᓂᕿᑦᓴᓂᒃ ᐅᕙᓗᕐᑕᕙᐅᔪᖅᑲᓲᖅ 2 ᑭᓚᒦᑕᓂᒃ ᐅᖓᓯᓐᓂᓕᒻᒥᑦ ᐊᑯᓕᕙᐅᑉ ᑕᕐᒐᖓᓂ (ᑭᓯᑦᓯᐅᑎᓖᑦ 3-ᒥ). ᑖᓐᓇ ᐅᕙᓗᕐᑕᕙᐅᓲᖑᓪᒥᐅᖅ ᐅᐱᕐᖕᖑᑐᓕᑐᐊᕐᒪᑦ. ᑖᓐᓇ ᐅᕙᓗᕐᑕᕙᐅᓲᖅ ᑲᖏᕐᓱᐊᐱᒍᓗᒻᒦᑐᖅ ᐅᔭᒐᓛᒦᑦᓱᓂ ᐅᓕᓐᓂᒧᑦ ᐊᑦᑐᐊᔭᐅᓯᒪᓲᖑᑦᓱᓂ.

ᐅᕙᓗᕐᑕᓕᒻᒨᓂᕐᒧᑦ

ᐅᑭᐅᖑᑎᑦᑐᒍ, ᑕᓇᐅᒃ ᓯᑯᖓ ᐅᕙᓗᐃᑦ ᖁᓖᖏᓐᓃᑐᖅ 2 ᒦᑕᓂᒃ ᐃᑦᔪᓂᖅᑲᓲᖑᔪᖅ. ᓯᑯᒥᒃ ᑭᓚᐃᒋᐊᖅᑲᓲᑦ 1.5 ᒦᑕᓂᒃ ᐊᖏᓂᓕᒻᒥᒃ ᐊᑐᕐᓯᑎᒃ ᐳᑐᖅᑭᑎᓂᒃ ᑑᑦᓂᑐ. ᐱᓇᓱᐊᓇᐊᓕᒪᓇᐅᓂᑯᖑᓄᑦ ᐱᖑᓯᓗᓕᓐᓂᒃ ᑲᐃᕝᓚᒍᓯᑦᑐᑕᐅᓲᖅ ᐱᓇᓱᐊᑦᑕᐅᓯᓂ ᒫᑉᐱᓄᑦ ᐱᖑᓯᓄᑦᑑᓃᑦ ᐃᓄᓐᓄᑦ.

ᐅᕙᓗᕐᑕᐅᕙᐅᓲᒥ, ᐃᒪᖅ ᐃᑎᓂᖅᑲᓚᐅᔪᖅ 4.1 ᒦᑕᓂᒃ. ᑭᓚᑯᑦ 1.5 ᒦᑕᓂᒃ ᐊᖏᓂᓕᒻᒧᑦ 2 ᒦᑕᓂ ᐃᑦᔪᓂᓕᒻᒥᒃ ᓯᑯᑎᒍᑦ. ᖃᓗᓯᐅᑎᒥᒃ 30 ᓰᓐᑎᒦᑕᓂᒃ ᓴᓂᒧᑦ ᐊᖏᓂᓕᒻᒧᑦ

ᑭᓕᐅᕐᑐᓂᒍᓐᓇᑦ 5 ᒦᑕᓂᒃ ᑕᑭᓂᓪᓕᒥᒃ ᐃᖅᑲᖓᓂᒃ 1.5-ᓂᒃ ᓯᒃᑭᑕᓂᒃ ᒦᑕᓂᒃ ᐊᖏᓂᓪᓕᒥᒃ. ᑕᒪ ᑭᓕᐅᕐᑐᑕᐅᔪᖃᕈᓐᓇᑐᖅ 19.6-ᓂᒃ ᓯᒃᑭᑕᓂᒃ ᒦᑕᓂᒃ ᑭᓯᐊᓂ ᐅᕕᓗᐃᑦ ᐱᒐᓱᐊᓇᐊᖏᑦ ᑲᕝᓗᐊᕐᐸᓕᐊᓂᒃᑯᑦ ᐱᔭᓇᐊᑐᓂᕐᓴᐅᒐᔭᓚᐅᔪᑦ.

ᖃᓗᓯᒍᓯᑦ

ᓇᐅᑑᐃᓐᓇᓄᑦ ᖃᓗᓯᒍᓯᓇᔭᐅᓰᑦ ᐊᑦᔨᒋᖏᑦᑑᓪᓗᐊᔭᖏᑦᑐᐃᓘᓐᓃᑦ (ᑭᓯᑦᓯᒍᑎᓖᑦ 4-ᒥ). ᖃᓗᓯᒍᑎᖓ ᑭᓪᓚᑯᑦᑎᑕᐅᓲᖅ ᐱᔪᓐᓇᕕᓕᒫᖓᓄᑦ ᐅᖓᓯᑦᑐᒨᕐᑎᑕᐅᒐᓱᐊᕐᓯᓂ ᒪᓕᑦᓯᒍ ᑭᓪᓚᐅᑉ ᐊᖏᓂᖓᓗ ᓯᑯᓪᓗ ᐃᑦᔪᓂᖓ. ᖃᓗᓯᒍᑎᖓ ᐊᑦᑐᐊᑎᑕᐅᑦᓯᐊᓯᒪᓗᐊᖑᒐᖅ ᐃᒪᐅᑉ ᐃᖅᑲᖓᓄᑦ ᑕᒪ ᓄᓯᐊᔭᐅᓯᑦᓯᓂ ᓴᔪᑲᓪᓛᑎᑕᐅᑎᓪᓗᒍ ᐊᐅᓚᑦᓯᔪᒍᑦ. ᑕᒪ ᓄᓯᐊᔭᐅᑏᑐᐊᕋᒥ ᐊᒻᒧᓕᖓᑲᓴᓕᑐᐊᕐᒪᑦ ᓄᓯᑦᑕᐅᓚᓇᓯᑦᓯᓂ. ᑕᐃᒪ ᖃᓗᓯᒍᑎᐅᑉ ᐃᑉᐱᐊᔪᖓ ᐃᓗᓃᔭᕐᑕᐅᓯᑦᓯᓂ ᐅᕕᓗᕐᓂᒃ ᓯᑯᑉ ᖃᖓᓄᑦ.

ᐊᓯᐊᓂᒃ ᐃᓄᒻᒥᒃ ᖃᓗᔭᐅᕋᑖᖅᑲᒥᓐᓂᒃ ᐱᓇᓱᐊᕐᑐᖅᑰᖅ ᐅᕕᓘᓂᖏᓐᓂᒃ ᓄᐊᑦᓯᓰᒥᒃ ᐊᓯᐊᓂᒃ ᖃᓗᓯᕚᐅᔪᖅᑎᓗᒍ. ᐅᕕᓗᐃᑦ ᐊᖏᓂᖅᑐᑦ 4.5 ᓯᓐᑕᒦᑕᓂᒃ ᐅᖓᑖᓄᑦᑑᓃᑦ ᑎᒍᓚᔭᐅᔫᑦ ᐱᒐᑦᓴᐅᑎᑦᑐᒋᑦ. ᐅᕕᓗᐃᑦ ᐊᑕᕕᖏᑦ ᐲᔭᕐᑕᐅᓯᔫᑦ ᓴᓗᒪᐃᓐᓃᔭᕐᑕᐅᓯᑎᑦᑐ (ᑭᓯᑦᓯᒍᑎᓖᑦ 5-ᒥ). ᑕᐃᒪ ᖃᑦᑐᑎᒨᔭᕐᑕᐅᓯᑦᓯᑎᒃ ᐃᒪᓕᒻᒧᑦ ᖁᐊᕐᑕᐃᓕᒪᒍᑎᑦᓴᖏᓐᓄᑦ ᓯᓚᒥ ᕿᐅᔭᓇᕐᓂᖅᑲᕈᓐᓇᓲᖑᒻᒪᑦ -30-ᓂᒃ. ᐅᕕᓗᐃᑦ ᒥᑭᓗᐊᕐᑐᑦ ᐃᒪᕐᒧᑦ ᐅᑎᕐᑎᑕᐅᑐᐃᓐᓇᓲᑦ ᑭᑦᓚᑯᑦ. ᑕᐃᒪ 5-ᓂᒃ ᐅᖁᒪᐃᓐᓂᖅᑲᓚᓕᑐᐊᕐᒪᑕ ᐅᐊᓂᐅᔭᖅᑲᐅᑎᕕᓂᕐᒧᑦ ᔪᑦᓗᓃᔭᒨᕐᑕᐅᓯᔫᑦ. ᑕᒪ ᔫᑦᓗᓃᔭᒥ ᔫᕐᓯᒪᓕᕐᑐᑦ ᐅᕕᓗᐃᑦ ᐃᒪᕐᒦᑎᑕᐅᑲᐃᓐᓇᓯᔫᑦ ᓯᑯᒥ ᑭᑦᓚᓕᐊᖑᓯᒪᔪᒥ. ᐅᕕᓗᐃᑦ ᓴᓗᒻᒪᑎᑦᑕᐅᒥᐊᑦᓚᕈᓐᓇᓲᖑᒐᑉ ᑕᓇᐅᑉ ᐃᒪᖓᓂᕐᑎᑕᐅᑲᐃᓐᓇᓯᑎᒃ ᐅᑦᓗᒥ ᐊᑕᐅᓯᕐᒥ ᒪᕐᕉᓂᑦᑑᓃᑦ ᑕᒪᒃᑯᐊ ᐲᔭᕈᓐᓇᓲᖑᒻᒪᑕ ᓯᐅᕋᐃᑦᑐ ᐃᖅᑲᒥᐅᑕᒐᓕᐃᑦᑐ.

ᐅᕕᓗᑦᑖᑦ ᖃᐅᔨᓴᕐᑕᐅᒍᑎᖏᑦ

ᐱᑕᖃᕐᓂᖏᓐᓄᑦ ᐱᔭᐅᒍᓐᓇᓚᐅᕐᑐᓄᑦᑐ

ᐊᑐᓇᐊᖅᖓᓚᖓᓚᐅᔪᑦ ᑖᑦᓯᒥᖓ Petersen ᐅᕕᓗᑦᑕᓕᒻᒥᒃ ᖃᐅᔨᓴᐅᑎᖓᓂᒃ.. ᓯᕗᓂᐊᒍᑦ ᑖᓐᓇ ᖃᐅᔨᓴᑦᑕᐅᓯᓂ ᐃᑉᐱᕆᔭᐅᓯᒪᔪᖅ ᐃᖅᑲᖓ ᐊᕐᑭᑦᑐᑐᐃᓐᓇᓇᐊᖅᑲᓇᐊᖓ (ᒥᐊᓯ ᑐᐃᕝ ᑖᓐᓇ 1995, ᑯᑦᔪᐊᑉ ᖃᐅᔨᒐᓯᐊᕐᕕᖓᑦ 1994). ᑭᓯᐊᓂ ᑕᒪᓂ ᓯᑕᒪᓂᒃ ᓯᑯᒥ ᑭᓚᐃᑦᓯᑎᒃ ᑖᓐᓇ ᖃᐅᔨᓴᐅᑎᖓ ᖃᐅᔨᓴᕐᓴᓂᒃ ᑎᒍᓯᒍᓐᓇᓚᐅᔪᖏᑦᑐᖅ ᐃᖅᑲᖓ ᐅᔭᕐᐃᓐᓇᐅᓂᑯᖓᓄᑦ ᓯᑎᔪᐊᓗᑦᓯᓂ.

ᖃᐅᔨᓴᕐᓴᓂᒃ ᓄᐊᑦᓯᒍᓐᓇᖏᑦᑐᐊᕐᒥᒃ ᐊᑐᖓᓯᑐᐃᓐᓇᓚᐅᔪᑦ ᐊᑦᔨᓕᐅᕈᑎᒥᒃ ᐃᒪᐅᑉ ᐊᑖᓂ ᐊᑐᑦᑕᐅᒍᓐᓇᑐᒥᒃ (ᐱᕕᑲᑎᓯᑎᑦᑐᒥᑦ ᐅᑯᐊ (Amphibico Inc. Lachine, Quebec). ᑕᐃᒪ

ᐊᑦᔨᐅᕐᑕᐅᓕᑐᐊᕐᒪᑦ ᑕᑯᓯᐅᓕᓚᐅᔪᑦ ᐅᕕᓗᐃᑦ ᑲᑎᒪᐅᑎᑲᓪᓛᔪᐃᑦ ᐱᑕᖃᕐᑎᓗᒋᑦ. ᐅᕕᓗᐃᑦ ᐅᔭᕋᕐᓃᖃᑦᑕᓚᐅᔪᑦ ᐃᖅᑲᖕᖓᓂᓪᓗ ᐊᕐᑭᑦᑐᒦᑦᓯᑎᒃ. ᖃᓗᕋᕐᕕᐅᓕᓃᑦ ᑕᑯᓯᐅᓚᐅᔪᒻᒥᔪᑦ ᐅᕕᓗᕐᓂᐊᕕᕕᓂᕐᒦᑐᐃᑦ. ᐊᓯᖕᒋᓐᓂ ᖃᓗᕋᕐᕕᐅᓗᐊᖕᖑᐊᓯᒪᔪᐃᑦ ᓯᖁᓂᐊᒍᑦ ᓱᓇᖃᑦᓯᐊᓚᐅᔪᒍᓇᐃᑐᑦ ᐅᕕᓗᕕᓂᑐᐃᓐᓇᑕᖃᓕᕐᓯᑎᒃ.

ᓯᑕᒪᓂᒃ ᓯᑯᒥ ᑭᓪᓚᑦᑕᐅᔪᖃᓚᐅᔪᖅ ᐃᑦᔨᓂᐅᓪᓗ ᐃᒃᑳᕈᓪᓗ ᐊᑯᓐᓂᖓᑎᒍᑦ 75 ᒦᑕᓂᒃ ᐅᖓᓯᓐᓂᓕᒻᒥᒃ ᓱᓈᖓᑕ ᓯᕐᑭᓂᖓᓂᑦ (ᑭᓯᑦᓯᒍᑎᓛᑦ 6-ᒥ). ᑭᓪᓚᓕᐊᖑᔪᖅ #1 ᐅᕕᓗᕐᑕᓂᐊᕐᑐᐃᑦ ᑭᓪᓚᓕᐊᕆᓯᒪᔭᖕᒋᑦᑕ ᑐᑭᒍᐊᕐᓂᖕᒋᓐᖑᓄᑦ ᓇᓛᓃᑦᑎᑕᐅᓚᐅᔪᖅ ᐃᑦᔨᓃᑦ ᓴᓂᐊᓂ ᐃᒃᑲᕈᕐᒥ. ᑭᓪᓚᓕᐊᖑᔪᑦ #2 ᐊᒻᒪᓗ #3 ᐃᑦᔨᓃᑦ ᓴᓂᐊᓃᓐᓂᓴᐅᓚᐅᔪᑦ. ᑭᓪᓚᓕᐅᕐᑕᐅᔪᖃᓚᐅᔪᒻᒥᔪᖅ ᓯᑕᒪᒋᓕᕐᑕᖕᓂᒃ ᑭᓪᓚᐅᑉ #1 ᓴᓂᐊᓃᓪᑐᒥᒃ. ᑖᒃᑯᓇᓂ ᑭᓪᓚᓂ #1-ᒥᓗ #4-ᒥᓗ ᐅᕕᓗᕐᑕᓯᐊᓚᐅᔪᖕᖏᑐᑦ 2-ᓂᒃ ᐅᖁᒪᐃᓐᓂᖃᖕᒋᑦᑐᓂᓪᓘᓃᑦ ᐱᑦᓯᑎᒃ. ᑭᓪᓚᓂ #2-ᒥᓗ #3-ᒥᓗ, ᖃᓗᔭᐅᖃᑦᑕᓚᐅᔪᑦ ᐊᖏᓂᖃᖃᑦᑕᓚᐅᔪᑦ ᐃᓖᒃ 20-ᓂᒃ ᐅᖁᒪᐃᓐᓂᓕᓐᓂᒃ ᑲᐃᕙᓪᓚᒍᓯᑕᓖᑦ ᐱᔭᐅᒍᓇᑑᑎᓪᓗᒋᑦ ᐅᑭᐅᒃᑯᑦ ᐅᑦᑐᕋᕐᑕᐅᔪᖃᕐᑎᓗᒍ 1995-ᒥ (ᒥᐊᓯ ᑐᐃᔾ 1995). ᑭᓯᐊᓂ ᑲᐃᕙᓪᓚᒍᓯᐅᑉ ᕿᑎᖕᒐᖓᓂ ᖃᓗᕋᖃᑦᑕᓯᒪᓕᑐᐊᕋᒥᒃ ᐱᓪᓗᐊᖃᑦᑕᐅᔪᒍᓇᐃᑐᑦ 9-ᑐᐃᓐᓇᓂᒃ ᐅᖁᒪᐃᓐᓂᓂᒃ ᐱᓯᒪᓕᕋᓗᐊᕐᓯᑎᒃ ᐅᕕᓗᕐᓂᒃ.

ᐱᕈᕐᐸᓕᐊᓂᕆᔫᖕᒋᑦ ᐅᑭᐅᖕᒋᓪᓗ

ᐅᕕᓗᐃᑦ ᐅᑭᐅᖕᒋᑦ ᓇᓗᓇᐃᑦᑐᒍᓇᑐᑦ ᓴᐅᓂᖕᒐᑎᒍᑦ ᕿᒥᕐᕈᓯᒍ ᑐᖕᖕᒐᕕᒋᔫᖕᒐ ᐲᑦᓯᕕᒋᑦᓯᒍ ᑭᑦ ᔫᑎᐊᐱᓪᒨᑦ ᓲᒃᑲᐃᑐᑦᓴᔫᑦ. ᑖᓐᓇ ᓴᐅᓂᖕᒐ ᑕᑯᓴᐅᑎᑦᓯᒍᓇᑐᖅ ᐊᕐᕌᒍᑕᒫᑦ ᓄᐃᑦᑕᔫᓂᒃ ᖃᐅᒪᓂᕐᑲᑐᓂᒃ ᑖᑦᑑᓂᕐᑲᑐᓂᓪᓗ ᓴᐅᓂᖕᒍᓃᑦᑐᓂᒃ (Lutz 1976, Thompson, Doidge ᒪᐃ 1993).

ᓄᓇᕕᒻᒥ, ᐅᕕᓗᐃᑦ ᒪᕐᕈᐃᓕᖕᒐᓂᕐᑲᑐᑦ ᓄᓇᓕᕐᑲᕐᕕᐅᔭᑎᒍᑦ ᐃᓪᒥᔫᓕᖕᒐᓂᕐᑲᑐᓂᒃ: ᐱᕈᒍᐊᕐᑐᕐᑲᑎᓗᒍ ᐊᖏᔮᕋᑦᑕᕐᓂᒃ ᐅᖕᒐᕿᒥ ᐊᒻᒪᓗ ᓱᒃᑲᐃᓂᕐᓴᒥᒃ ᐱᕈᕐᐸᓕᐊᔫᖑᑎᓪᓗᒋᑦ ᒥᑭᓂᕐᓴᐅᓯᑎᓪᓗ ᑕᓯᐅᔭᕐᔭᐊᒥᔫᑦ ᐊᒻᒪᓗ ᑯᐸᐃᒃ ᓄᑲᖕᒐᓂ (ᑰᔭᐊᑉ ᖃᐅᔨᒐᓯᐊᕐᕕᖕᒐᑎᒍᑦ 1994). ᐊᑯᓕᕕᐅᑉ ᐅᕕᓗᖕᒋᑦ ᐱᕈᕐᐸᓕᐊᓂᖕᒋᑦ ᓱᒃᑲᐃᓂᕐᓴᐅᔫᑦ ᒥᑭᓂᕐᓴᐅᔫᖑᑦᓯᑎᓪᓗ.

ᐅᑭᐅᖕᒋᑦ ᐅᕕᓗᐃᑦ ᖃᓗᔭᐅᓚᐅᔪᐃᑦ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᔪᒐᑦ (ᑭᓯᑦᓯᒍᑎᓛᑦ 7). 53 ᐅᕕᓗᐃᑦ ᖃᐅᔨᓴᕐᑕᐅᓯᑎᒃ ᐃᓗᓐᓇᒐᓚᑎᒃ ᐅᑭᐅᖃᕈᓇᐅᓚᐅᔪᑦ 11-ᓂᒃ. ᐅᑭᐅᑭᓐᓂᓴᐃᑦ 1-ᒥᑦ 8-ᒧᑦ ᐱᑕᖃᖃᑦᑕᖕᒋᓐᓂᓴᐅᓚᐅᔪᒻᒥᔪᑦ. ᐃᓚᖕᒋᑦ ᒥᑭᔪᐃᑦ ᐅᕕᓗᐃᑦ ᓄᓗᐊᑦᑐᒍᓇᖃᑦᑕᐅᔪᖕᒋᑐᑦ ᒥᑭᓗᐊᒧᑦ ᑭᓯᐊᓂ ᐊᒥᓱᒪᓇᐅᓚᐅᔪᑦ ᐅᕕᓗᑦᓛᑦ ᓄᓇᕕᒻᒥ ᐊᑦᔨᒌᖕᒋᓐᓇᒐᓚᓐᓂᒃ ᐅᑭᐅᓕᓐᓂᒃ ᐱᑕᖃᔫᖑᓕᐅᑦᑐᖅ (ᑰᔭᐊᑉ ᖃᐅᔨᒐᓯᐊᕐᕕᖕᒐᑦ 1994). ᐅᕕᓗᐃᑦ ᐅᑭᐅᖃᕐᓯᐊᖕᒋᑦᑐᑦ ᐱᑕᖃᕐᓯᐊᖕᒋᑦᑑᓕᕿᒍᓇᐅᓯᒪᔪᑦ ᐊᕐᕋᒍᑕᒫᑦ ᓄᐃᑦᑕᐅᓗᐊᔫᖑᖕᒋᓂᑯᖕᒋᓐᖑᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐱᓕᐅᑎᓂᕐᓴᐅᔫᖑᑐᐊᕈᑎᒃ ᐊᖕᒋᓂᕐᓴᓄᑦ ᓵᓚᐅᒪᔫᖑᔫᔪᕐᓴᐅᔪᖅ ᑕᒪᒃᑯᓇᓂ ᐃᓕᖕᒐᕕᒋᔫᖕᒋᓐᓂ.

ᐅᕕᓗᐃᑦ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᖅᑦ ᒦᑦᓰ 29, 1996-ᒥ ᑕᑯᔅᓴᐅᑎᓯᓚᐅᖅᑦ ᑕᐃᒪᔅᓴᐃᓇᓚᖓᒃ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᖅᑲᒥᖅᑯᑦ ᕕᒍᐊᕆ ᐃᓗᓐᓇᐃᑎᒍᑦ ᐱᕈᕐᐸᓕᐊᒍᓯᖄᔅᓴᐃᓇᕐᒥᑎᓪᓗᒋᑦ ᑕᒡᕙᓂᔅᓴᐃᓈᖅ ᐅᑦᔫᑎᒥᓗ 1995-ᖑᑎᓪᓗᒍ (ᑭᓯᑦᓯᒍᑎᓖᑦ 8). ᐅᕕᓗᐃᑦ ᐱᔭᑦᓯᐊᕈᓐᓇᓯᓯᑦ ᑭᓇᐅᔭᓕᐅᕈᑎᑦᓴᐅᒍᓐᓇᓯᑦᓯᑎᒃ 4-ᒥᑦ 5-ᒧᑦ ᓯᓐᑕᒥᑕᓂᒃ ᐊᖏᓂᖅᑲᓪᓗᐊᕐᒪᑕ 4-ᓂᑦ ᓅᓃᑦ 5-ᓃᑦ ᓅᓃᑦ ᐅᑭᐅᖅᑲᓪᓗᐊᕐᒪᑕ. 7-ᓂᒃ ᐅᑭᐅᖅᑲᓪᓗᐊᕋᒥᒃ ᐱᕈᕐᐸᓕᐊᒍᓐᓇᐃᓯᒃᓴᓯᑦ; ᐊᖏᓂᖅᑲᕐᓯᑎᒃ 5-ᒥᑦ 8-ᒧᑦ ᓯᓐᑕᒥᑕᓂᒃ. ᖁᑦᑎᖕᒋᐅᑎᑕᐅᑦᓯᐊᑐᐊᕋᒥᒃ, ᓂᕆᔭᐅᓚᖑᖏᑦᑐᐊᕐᒪᑕᓗ, ᑕᑦᑕᒪᒐᒪᓐᓂᒃ ᐅᑭᐅᓂᒃ ᐊᑯᓂᕐᓂᖅᑲᕋᔭᕐᑐᑦ ᐱᕋᕐᓯᐊᕐᓗᑎᒃ ᐱᔭᐅᒍᓐᓇᓯᓚᐅᕐᑎᓇᒥᑦ.

ᑮᓇᐅᔭᓕᐅᕈᑎᖃᕐᓯᐊᕐᓂᒧᑦ

ᓂᐅᕐᕈᓯᕕᓴᐃᑦ ᐊᒻᒪᓗ ᐱᑕᖃᕐᑎᓯᓂᖅ

ᐊᑐᐃᓐᓇᓂᒃ, ᓄᖑᔾᔪᖑᒐᓗᐊᓂᒃ, ᓂᐅᕐᕈᓯᖅᑦᓴᖃᕈᓐᓇᓱᖑᔪᖅ ᐅᕕᓗᕐᓂᒃ ᐊᑯᓕᕕᒻᒥ, ᐃᓄᓕᒻᒥᒃ 300-ᓂᒃ. ᐅᕕᓗᐃᑦ ᓂᐅᕐᕈᑎᒋᔭᐅᔪᖑᔪᑦ ᓄᓇᓖᑦ ᑯᐊᐸᖕᒐᓄᑦ $1.00 ᑖᓕᖅᑎᓗᒋᑦ ᐅᖁᒪᐃᓐᓂᖓᓄᑦ (ᒥᐊᓯ ᑐᐃ 1995). ᐃᓚᖓᓂ ᐅᕕᓗᖃᓗᐊᓱᖑᔅᓴᒪᕆᑦᑐᑦ; ᓯᒍᓂᐊᒍᑦ ᐅᕕᓗᐃᑦ ᐃᒍᓇᑐᐃᓐᓇᖅᑕᓯᒪᓂᑦᑐᑦ (ᐅᖃᐅᓯᖓᑎᒍᑦ ᑯᐊᐸᐅᑦ ᑲᒪᔫᒪᓇᖓᑕ). ᑭᓯᐊᓂ ᐅᕕᓗᐃᑦ ᓯᕙᑐᐃᓐᓇᖏᑦᑐᑎᑕᐅᓇᕈᓐᓇᓚᖓᕙᑦ ᐅᕕᓗᐃᑦ ᓯᑦᓗᓖᔭᓂᑦᑎᓗᒋᑦ ᑕᕆᐅᕐᒥᖕᖏᓐᓇᑎᑕᐅᖅᑕᑐᐊᕈᑎᒃ ᐊᑐᑦᑕᐅᒋᐊᖅᖏᓂᓕᒫᖏᓐᓂ.

ᓂᐅᕕᐊᑦᓴᐅᓚᔭᕐᑐᑦ ᖃᐅᔨᓴᕐᑕᐅᓂᖏᑦ

ᖃᐅᔨᓴᕐᑕᐅᖃᑦᑕᓚᐅᕐᑐᑦ ᖃᓗᔭᐅᓚᐅᕐᑐᓂᑦ ᐃᑭᓗᐊᓚᐅᕐᓂᑯᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᑕᐅᔭᕆᐊᖃᓚᐅᖏᑐᖅ ᐅᕕᓗᐃᑦ ᖁᐊᕐᑎᑕᐅᒍᑎᒃ ᓱᖁᐃᓂᖃᕐᔭᕐᒪᖓᑕ ᐅᕕᓘᑦ ᑎᐸᖓᓂᑦᓗ ᑕᑯᔅᓴᐅᓂᖓᓂᑦᓗ. ᑭᓯᐊᓂ, ᐅᕕᓗᐃᑦ ᓱᔪᒍᓇᓲᖑᖏᑐᑦ ᖁᐊᕐᑎᑕᐅᓗᐊᕋᒥᒃ. ᐃᓄᐃᑦ ᐊᑯᓕᕕᒻᒥᐅᑦ ᐅᕕᓗᕐᑐᓱᑦ ᖃᓚᒪᔪᓂᒃ ᖃᓚᒪᖕᖏᓗᒐᓗᐊᓂᑦᓗ ᖁᐊᕕᓂᐅᒐᓗᐊᕐᒪᑕ.

ᑮᓇᐅᔭᓕᐅᕈᑎᐅᑐᐃᓐᓇᕆᐊᖃᕐᓂᖏᓐᓄᑦ

ᓄᓇᓖᑦ ᐊᑯᓂᖏᑎᒍᑦ ᖃᖓᑦᑕᔫᑯᑦ ᐅᓯᔭᐅᑎᑦᓯᒍᑏᑦ ᐊᑭᑐᔪᒪᓇᐅᓂᑯᖏᓐᓄᑦ ᐅᕕᓗᕐᓄᑦ ᓄᓇᓖᑦ ᐊᓯᖏᓐᓄᑦ (ᑯᑦᔦᐊᑦ ᖃᐅᔨᒐᓯᐊᕐᕕᖓᑦ 1994). ᑮᓇᐅᔭᓕᐅᑎᔦᖃᕈᓐᓇᖏᑦᑐᖅ ᓄᓇᓖᑦ ᐊᓯᖏᓐᓄᑦ ᒥᐊᓯᓗ ᑐᐃᓪᓗ (1995) ᕿᒥᕐᕈᓚᐅᔪᖅ ᒪᑭᑕᒐᓯᐊᕈᑎᐅᒍᓐᓇᓂᖏᓐᓂᒃ ᐅᕕᓗᐃᑦ ᒥᐊᓯᓗ ᑐᐃᓪᓗ ᐅᑭᐅᑦᒧᑦᓚᑦᐅᔪᓂᑦ ᐅᐱᕐᖓᒧᑦᓚᑦᐅᔪᓂᑦᓗ. ᑐᖓᕕᒃᓯᑎᒃ 100-ᓂᒃ ᐅᖁᒪᐃᓐᓂᑦᓇᓂᒃ ᖃᐅᑕᒪᑦ

ᐅᕕᓗᕐᑕᖅᑲᑦᑕᓂᕐᒧᑦ ᑈᓇᐅᔭᓕᐅᕈᑎᒋᔭᐅᒍᓐᓇᑐᓂᒃ. 1996-ᒥᒃ ᖃᐅᔨᓴᖅᑕᕕᓃᑦ ᑕᑯᑦᓯᒋᑦ ᑕᑯᑦᓴᐅᑎᑦᓯᔪᑦ ᑕᐃᒪᐃᓪᓗᐊᑐᓂᒃ ᐅᖁᒪᐃᓐᓂᓕᓐᓂᒃ ᐱᔭᐅᔪᖅᑲᕆᓐᓇᕋᔭᕐᑎᓇᒍ; ᐱᔭᐅᖅᑕᑦᑕᓚᐅᔪᐃᑦ ᑭᓪᓚᒥ ᐊᑕᐅᓯᕐᒥᒃ 1996-ᖑᑎᓪᓗᒍ ᕿᑎᖅᑲᓗᐊᓇᔭᐅᑲᓴᓚᐅᕐᑐᑦ ᑖᒃᑯᓗᖓ 1995-ᒥ ᐱᔭᐅᖅᑕᑦᑐᕕᓂᕐᓗᑦ.

ᓯᑯᒥ* ᑭᓪᓚᓂᐊᖑᔪᐃᑦ ᐅᕕᓗᖅᑲᓪᓗᐊᑐᓄᑦ ᓈᒻᒪᓈᕐᓯᒪᑦᓯᐊᕈᓐᓇᑐᐊᕈᑎᒃ ᐅᕕᓗᐃᑦ ᐱᔭᐅᓂᕐᓴᐅᖅᑕᑦᑕᕋᔭᕐᑐᑦ. ᐅᕕᓗᑦᑕᓃᑦ ᐅᐱᖕᖓᖑᓂᕐᐸᑦ ᐃᒪᕐᒥ ᐊᑦᓴᓂᐅᑦᑕᐅᒍᓐᓇᕋᔭᑐᐊᕈᑎᒃ ᐅᕕᓗᑦᑕᓂᐊᕐᑏᑦ ᓯᑯᒥ ᑭᓚᐃᒋᐊᖅᑲᓯᒍᑎᒃ ᖃᐅᔨᒪᒍᓐᓇᕋᔭᕐᑐᑦ ᓇᓪᓂᐊᒍᑦ ᑭᓚᐃᒋᐊᖅᑲᓂᕋᔭᕐᒪᖔᕐᒥᒃ ᐅᕕᓗᑦᑕᓂᓪᒥᒃ ᐅᕙᓗᓐᓃᑦ ᓇᓪᓂᐊᒍᑦ ᐃᖅᑲᖓ ᐊᕐᑭᓐᓂᖅᑲᕐᒪᖔᑕ. ᐊᒻᒪᓗᑦᑕᐅᖅ ᑭᓚᐃᒐᓯᐊᓇᐊᖅᑲᕐᓂᐅᔪᖅ ᐱᔭᕐᓃᕈᖕᒋᓂᕐᓴᐅᒍᓐᓇᑐᐊᕈᓂ ᐊᑯᓂᐅᓂᕐᓴᖅ ᐅᕕᓗᑦᑕᓂᐊᕐᓂᓴᐅᓂᖅᑲᕋᔭᕐᒥᔪᑦ.

ᒪᓐᓇᐅᑎᓪᓗᒍ, ᐅᕕᓗᐃᑦ ᐱᔭᐅᑦᓯᐊᖅᑕᑦᑕᖕᒋᓐᓂᓇᓚᐅᕐᑕᖕᒋᑦ ᐊᒻᒪᓗ ᓯᑯᒥ ᑭᓪᓚᓂᐅᕋᓯᐊᓇᐊᖅ ᐱᔭᓇᐊᑐᔪᓪᓚᓇᐅᓂᑯᖕᒐᓄᑦ ᒥᑭᔫᓂᖅᑲᖖᒐᓗᐊᒥᒃ ᑈᓇᐅᔭᓕᐅᕈᑎᒋᔭᐅᑦᓯᐊᕈᓐᓇᖕᒋᑦᑐᑦ. ᐊᑐᓂᑦ ᑭᓪᓚᐃᑦ ᐅᕕᓗᕐᓂᒃ ᐱᕕᐅᑦᓯᐊᓂᕐᓴᐅᖅᑲᕆᓐᓇᑐᐊᕐᐸᑕ, ᑈᓇᐅᔭᓕᐅᕋᓯᐊᕈᑎᐅᓕᕈᑎᒃ ᐱᓇᓱᑦᑎᓯᒍᓐᓇᕋᔭᕐᑐᖅ ᐊᑕᐅᓯᕐᒥᒃ ᒪᕐᕉᓂᓪᓘᓃᑦ ᐃᓄᒻᒥᒃ.

ᐃᓱᒪᒋᔭᐅᓚᕐᑐᑦ ᐊᑑᑎᔭᐅᖁᔭᐅᔪᐃᓪᓗ

- ᓯᕗᓂᐊᒍᑦ ᕐᑲᐅᔨᒪᔭᐅᔪᕐᑲᕐᑎᓇᒍ ᐅᕙᓗᐃᑦ ᓇᓂᓐᓂᖕᖏᓐᓂᒃ ᐱᑕᕐᑲᕐᓂᖕᖏᓐᓂᓗ, ᐊᒻᒪᓗ ᓯᑯᒥ ᑭᓚᐃᒐᓱᐊᕆᐊᖅ ᐱᔭᕆᐊᑭᓐᓂᓴᕐᑲᕐᑎᓇᒍ, ᑮᓇᐅᔭᓕᐅᕋᓱᐊᕈᑎᕐᑲᕐᓂᐅᔪᖅ ᐱᔪᓐᓇᓯᑦᓯᐊᕆᓐᓇᓚᖕᒐᖕᒋᑐᖅ.

- ᐅᕙᓗᐃᑦ ᓇᓂᓐᓂᖕᒋᑦ ᓄᓇᖕᖑᐊᒥ ᑎᑎᕐᑕᐅᑐᐊᕐᐸᑕ, ᐅᐱᕐᖓᒍᑦ, ᐊᑐᕐᓗᓂ ᐃᒪᕐᒥ ᐊᕐᐸᓚᐅᕆᑎᐅᒍᓐᓇᑐᒥᒃ ᖁᒻᒧᐊᓯᒪᔪᕐᑎᒍᑦᓗ ᕐᑲᐅᔨᒪᒍᑎᐅᒍᓐᓇᑐᒥᒃ ᐅᕙᓗᕐᓂᐊᓂᑕᒫᑦ ᐱᓂᕐᓴᐅᕐᑲᑦᑕᕆᓐᓇᑐᑦᓴᐅᓚᖕᒐᔪᑦ ᐊᒻᒪᓗ ᒥᑭᔫᓂᕐᑲᕐᑐᒥᒃ ᑮᓇᐅᔭᓕᐅᕆᑎᒋᔭᐅᒍᓐᓇᕋᔭᕐᓯᓂ.

- ᐅᕙᓗᕐᓗᑦ ᐱᕆᕐᕕᒋᔭᐅᒍᓐᓇᓱᑦ ᕐᑲᐅᔨᓴᕐᑕᐅᒍᓐᓇᓕᐅᔪᖕᖏᑐᑦ ᐅᑭᐅᒃᑯᑦ ᓯᑯᒥᒃ ᑭᓚᐃᒐᓱᐊᓇᐊᒥᒃ ᐱᔭᕆᐊᑐᔫᓂᑯᖕᒐᓗᑦ ᐊᒻᒪᓗ ᑖᓐᓇ ᐱᑕᓴᓐ ᐅᕙᓗᕐᓂᒃ ᑎᒍᓪᓚᕆᑎᖕᒐ ᐊᑐᕆᓐᓇᓚᐅᔪᖕᖏᒪᑦ ᐃᖅᑲᖕᒐ ᓯᑎᔫᑐᐊᕐᒪᑦ ᐅᔭᕋᐃᓐᓇᓱᓂ. ᐅᕙᓗᐃᑦ ᐱᑕᕐᑲᕐᓂᖕᖏᑦ ᓇᓗᓇᐃᕐᑕᐅᒍᓐᓇᕐᑲᑦᑕᓚᐅᔪᑦ ᐅᐱᕐᖓᒍᑦ ᐊᑐᕐᑕᐅᔪᕐᑲᕐᑎᓗᒍ ᐃᒪᕐᒥ ᐊᕐᐸᓚᐅᕆᑎᒥᒃ ᐅᑎᕐᑕᓱᑎᒃ ᐅᖕᒐᓱᓪᓚᕆᓪᓚᐊᕐᑲᑦᑕᓱᑎᒃ. ᓯᑯᒥ ᑭᓚᐃᕐᑲᑦᑕᓂᒃᑯᑦ ᐅᕙᓗᕐᑕᓂᐊᕐᓗᑎᒃ ᑮᓇᐅᔭᓕᐅᕆᑎᕐᑲᕆᓇᕕᕐᑲᑐᐊᕆᑎᒃ. ᐱᔭᐅᔭᓗᑦ ᐊᖕᒋᓂᖕᒐᓂᒃ ᕐᑲᐅᔨᒪᒍᑎᑦᓴᐃᑦ ᐊᑐᕐᑕᐅᒍᓐᓇᕋᔭᕐᑐᑦ ᐃᓱᒪᒐᓱᐊᕆᑎᒋᓗᒋᑦ ᐱᕆᕐᕕᐅᒍᓐᓇᓱᑦ ᐊᖕᒋᓂᖕᒐᓂᒃ ᕐᑲᐅᔨᓴᕆᓯᖕᒐᓂᒃ ᐊᑐᕐᓗᓂ ᓚᐅᕐᓚᐅᑉ ᕐᑲᐅᔨᓴᕆᓯᖕᒐᓂᒃ (Ricker 1975).

- ᕐᑲᓗᕋᐅᑏᑦ ᓄᓗᐊᖕᒋᑦ ᐊᖕᒋᕐᕋᒥ ᓴᓇᔭᐅᒍᓐᓇᓯᓕᕐᑎᑕᐅᓚᐅᔪᑦ ᑮᓇᐅᔭᕐᑐᓗᐊᕆᑕᐅᖕᒍᒍᓐᓇᐅᑎᓪᓗᒍ.

- ᐊᑐᕐᑕᐅᔪᕐᑲᕆᓇᒪᖕᒑᑦ ᑭᑦᔫᑎᓂᒃ ᐊᐅᓚᔪᓐᓂᒃ ᕐᑲᐅᔨᓴᕐᑕᐅᔪᕐᑲᕐᑐᓴᐅᕋᖅ ᐳᑐᕐᕆᑎᒥᒃ ᐊᑐᖕᒋᓂᕐᓴᐅᒍᑎᐅᒍᓐᓇᕋᔭᕐᒪᖕᒑᑕ ᓯᑯᒥᒃ ᑭᓚᐃᒍᑎᐅᒥᐊᓕᓪᒧᑦ.

- ᓱᑦᓗᓛᔭᐃᑦ ᐱᐅᓂᕐᐸᐅᔪᑦ ᐅᕙᓗᕐᓂᒃ ᔫᕐᓯᒪᑎᑦᓯᒍᑎᒋᑦᓱᒋᑦ. ᑕᐃᒪᐃᑦᑐᓃᑐᐊᕋᒥᒃ ᐅᕙᓗᐃᑦ ᐆᒪᖕᒋᓐᓇᕈᓐᓇᓱᑦ ᑕᓇᐅᒦᑦᑎᑕᐅᑐᐊᕋᒥᒃ ᐊᑐᑦᑕᐅᖕᒋᓐᓂᖕᒋᓐᓂ, ᐊᑕᐅᑦᓯᑯᑦ ᓴᓗᓪᒪᓴᑦᐸᓕᐊᑦᓯᑎᑦᓗ ᓯᐅᕋᐃᑦ ᓱᓇᑦᓗᑲᐃᑦᓗ ᐲᔭᑦᑕᐅᕖᑦᓕᐊᓱᖕᒍᓪᒥᒪᑕᑦᑕᐅᖅ.

ᓱᖅᑯᐃᑕᐅᑎᐊᓛᑦ

ᑕᒪᓐᓇ ᐱᓇᓱᐊᕐᑕᐅᓚᐅᕐᑐᖅ ᑮᓇᐅᔭᖃᕐᑎᑕᐅᓚᐅᓂᒐᖅ ᑲᕿᒪᑐᖅᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖕᒋᑦᑕ ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᓗ ᐱᕈᕐᓴᐃᓂᕐᒥᒃ ᐅᑦᑐᕋᕐᕕᖕᒐᓄᑦ. ᓇᑯᕐᒦᑐᒍᑦ ᔨᐅᑉ ᓴᓐᑎᓂᒥᒃ ᐃᑲᔪᓚᐅᕐᒪᑦ, ᑐᑭᒧᐊᑦᑎᓯᑦᓯᓂᓗ ᕿᓄᐃᓵᑦᓯᐊᖃᑦᑕᓯᓂᓗ ᑕᒪᓐᓇ ᖃᐅᔨᓴᕐᑕᐅᓂᖃᕐᑎᓗᒍ. ᑖᓐᓇ ᔨᐅᑉ ᐅᐃᓕᐊᑦ ᑯᐸᐃᒃᑯᑦ ᐆᒪᔪᓕᕆᔨᖕᒋᓐᓂᑦ ᐱᓯᒪᔪᖅ ᖃᐅᔨᑎᑦᓯᔨᐅᓚᐅᕐᑐᖅ ᐃᒪᕐᒥ ᐊᑦᔨᓕᐅᕆᒍᑎᓄᑦ ᔫᑦᓴᔭᖕᒋᓐᓂᒃ ᓇᑭᑦ ᐱᔭᐅᒍᓐᓇᕆᐊᖕᒋᓐᓂᒃ. ᐊᑦᔨᓕᐅᕈᑎᒧᑦ ᖃᐅᔨᓴᕐᓂᕆᓚᐅᕐᑕᒐᑦ ᑲᔪᓯᑦᓯᐊᕈᓐᓇᕋᔭᓚᐅᖕᒋᑐᖅ ᐃᑲᔪᕐᑕᐅᓚᐅᖕᒋᑐᐊᕈᑦᑕ ᒦᒃ ᖄᓐᓕᒧᑦ ᑭᖕᑕ ᐊᓐᑎᐅᔨᐅᒥᐅᒧᑦ. ᐃᑦᑭᓐ ᑐᐃᔅ ᓴᓇᓚᐅᔪᒻᒥᔪᖅ ᖃᓗᓯᒍᑏᑦ ᑎᒍᒥᐊᕈᑎᖕᒋᑦᑕ ᐊᒥᐊᖕᒋᓐᓂᒃ ᐊᒻᒪᓗ ᐊᑦᔨᓕᐅᕈᑎᒥᒃ ᐃᑯᒪᖃᕐᑎᓯᔨᒋᔭᐅᑦᓯᓂ. ᕿᐊᓐᓇᓂ ᖁᐊᓴᖅ ᐊᒻᒪᓗ ᓴᑲᓂᐊᓯ ᓇᑉᐸᑐᖅ ᑕᒪᑦᓯᒧᖕᒐ ᖃᐅᔨᓴᕐᓂᒧᑦ ᐱᓇᓱᐊᖅᑕᐅᓚᐅᔪᑦ ᖃᐅᔨᔭᐅᑎᑦᓯᓯᑎᑦᓗ ᐅᕕᓗᕐᓂᐊᕈᓯᑭᓲᒥᓂᒃ. ᐊᑯᓕᕕᐅᑦ ᓄᓇᓕᖕᒐᓂᒥᐅᑦ, ᐱᓗᐊᕐᑐᒥᒃ ᕿᐊᓐᓇᓂ ᐊᓚᐃᑯ, ᐅᕿᑦᑎᓂᒃ ᑐᖕᒐᓯᑦᑎᓯᑦᓯᐊᓚᐅᔪᑦ ᓴᐳᒻᒥᓂᖃᕐᓯᑎᑦᓗ. ᑰᑦᔪᐊᑉ ᖃᐅᔨᒐᓯᐊᕐᕕᖕᒐᑕ ᐱᓇᓱᐊᕐᕕᖕᒐᓄᑦ ᐱᓇᓱᑦᑏᑦ ᐃᑲᔪᖃᑦᑕᓚᐅᔪᑦ ᓴᐳᒻᒥᔭᐅᑎᐊᓕᑎᒍᑦ. ᐃᓯᒪᑎᔭᐅᓚᐅᕐᑐᑦ ᑖᒃᑯᓄᖓ ᔨᐅᑉ ᓴᓐᑏᓂᒧᑦ, ᒪᕐᓯᐊᑉ ᒍᓇᓯᐊᑦᒧᑦᓗ ᒪᕐᓯᐊᑉ ᔫᑦᕉᒧᑦᓗ ᑲᕿᒪᑐᖅᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖕᒋᓐᓂᑦ ᐱᓯᒪᔪᒧᑦ ᐃᑲᔪᕐᓯᓚᐅᕐᑐᑦ ᑖᒃᑯᓂᖓ ᑐᓴᕐᑎᓯᒍᑏᑦ ᐊᑦᓚᑕᐅᓂᓇᓚᐅᕐᑕᖕᒋᓐᓂᒃ. ᐃᓗᓐᓇᓯᓐᓂᒃ ᓇᑯᕐᒦᐳᒍᑦ.

ᑕᑯᒋᐊᕐᑕᐅᒍᓐᓇᑐᑦ

ᑰᑦᔭᐊᒃ ᖃᐅᔨᒪᔪᐊᕐᕕᖕᒪᑕ ᐱᓇᓱᐊᕐᕕᖓ, 1994. ᐅᕙᓗᐃᑦ ᓄᓇᕕᒻᒥ: ᐊᖏᓂᖏᑦ, ᐱᕈᕐᐸᓕᐊᓂᓪᓗᖏᓪᓗ ᑮᓇᐅᔭᓕᐅᕈᑕᐅᑐᐃᓐᓇᓂᐊᖃᕐᓂᖏᓐᓄᓗ (ᐱᓇᓱᐊᕐᑕᐅᓂᖓ 3). ᑐᓴᕐᑎᓯᒍᑏᑦ ᒪᓂᔭᐅᔪᑦ ᑲᑭᒪᑐᖃᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖏᑦᑕ ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᓗ ᐱᕈᕐᓴᐃᓂᕐᒥᒃ ᐅᑦᑐᕋᕐᕕᖓᓄᑦ. ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐱᑲᓪᓕᐊᑎᑦᓯᒪᔪᐊᕐᓂᖅ 7900-002-920. ᒪᑭᕝᕕᒃ ᑯᐊᐳᓈᓴᓐ, ᑰᑦᔭᐊᖅ, ᑯᐸᐃᒃ. 34-ᓂᒃ ᒪᑉᐱᖓᓕᒃ.

Lutz, R.A. 1976. ᐊᕐᕿᑐᑕᒫᑦ ᐱᕈᕐᐸᓕᐊᓂᓪᓘᖏᑦᑕ ᐊᖅᑭᓱᕐᓯᒪᓂᓪᓘᖏᓐᓄᑦ ᓴᐅᓂᖏᓐᓂ ᑕᑯᑦᓴᐅᔪᑦ. ᓇᓗᓇᐃᒃᑯᑕᖏᑦ 56:723-731.

ᒥᐊᓱ ᓯᐊᓪᓕ ᐊᒻᒪᓗ ᐱᐅᑦ ᑐᐃᔅ, 1995. ᐅᕙᓗᕐᓂᐊᓂᕐᒥᒃ ᐅᑦᑐᕋᕐᓂᐅᔪᖅ ᓄᓇᕕᒻᒥ. ᑐᓴᕐᑎᓯᒍᑏᑦ ᒪᓂᔭᐅᔪᑦ ᑲᑭᒪᑐᖃᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖏᑦᑕ ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᓗ ᐱᕈᕐᓴᐃᓂᕐᒥᒃ ᐅᑦᑐᕋᕐᕕᖓᓄᑦ. ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐱᑲᓪᓕᐊᑎᑦᓯᒪᔪᐊᕐᓂᖅ 7900-002-936. ᒪᑭᕝᕕᒃ ᑯᐊᐳᓈᓴᓐ, ᑰᑦᔭᐊᖅ, ᑯᐸᐃᒃ. 27-ᓂᒃ ᒪᑉᐱᖓᓕᒃ.

Ricker, W.E. 1975. ᑭᓯᑕᐅᓂᖏᑦ ᑐᑭᖃᕐᑎᑕᐅᓂᖏᓪᓗ ᐃᖃᓗᐃᑦ ᐱᕈᓐᓇᓂᖏᑦᑕ ᑭᓯᑕᐅᒪᒍᑎᖏᑦ. ᑐᓴᕐᑎᓯᒍᑏᑦ 191. ᑲᑭᒪᑐᖃᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖏᑦ, ᐊᑐᕚᒥ. 382-ᓂᒃ ᒪᑉᐱᖓᓖᑦ.

Thompson, R.J., ᐱᑕ ᒪᐃ ᐊᒻᒪᓗ ᐱᐅᑦ ᑐᐃᔅ, 1993. ᐅᕙᓗᐃᑦ ᐅᑭᐅᖏᓐᓂᒃ ᓇᓗᓇᐃᕐᓯᒍᓐᓇᐅᑎᓄᑦ ᑲᑎᒪᒍᑎᕕᓃᑦ. ᑐᓴᕐᑎᓯᒍᑏᑦ ᒪᓂᔭᐅᔪᑦ ᑲᑭᒪᑐᖃᒃᑯᑦ ᐃᒪᕐᐱᓕᕆᔨᖏᑦᑕ ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐃᒪᕐᒥᓗ ᐱᕈᕐᓴᐃᓂᕐᒥᒃ ᐅᑦᑐᕋᕐᕕᖓᓄᑦ. ᐃᖃᓗᓐᓂᐊᓂᕐᒥᒃ ᐱᑲᓪᓕᐊᑎᑦᓯᒪᔪᐊᕐᓂᖅ 7900-002-L670-926. ᒪᑭᕝᕕᒃ ᑯᐊᐳᓈᓴᓐ, ᑰᑦᔭᐊᖅ, ᑯᐸᐃᒃ. 7-ᓂᒃ ᒪᑉᐱᖓᓕᒃ.

ᐊᑦᔨᖑᐊᑦ ᒪᑉᐱᒐᕐᒥ 11-ᒥ ᐱᙱᐊᕐᑐᑦ ᖃᓪᓗᓇᑎᑐᕐᑐᑦ ᐃᓱᐊᓂ.

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Blue Mussel Winter Harvest Testing Program Akulivik 1996

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Introduction

The blue mussel is widely distributed in Nunavik and is used as country food, both in summer and winter. In summer, intertidal mussels are harvested by hand. In winter, intertidal mussels are harvested by hand at communities, such as Salluit and Kangiqsujuaq, where tidal amplitude is great (5 m) and allows access to mussel beds through broken and rafted ice. In Akulivik, where tides are smaller (0.4 m) and ice cover is continuous, subtidal mussels are harvested through holes in the ice using long scoops (Mesher and Doidge 1995).

The methods used to harvest mussels for subsistence purposes were observed in 1995 (Mesher and Doidge 1995). The objectives of the present study are:

- to improve gear design and harvest techniques,
- to assess if mussel harvesting has the commercial potential to create seasonal employment for one or two persons.

During the last two weeks of March 1996, we visited Akulivik to work with two hunters who are active mussel harvesters. Assessment of gear and sample collection was made at this time. Video tape was taken to document the extent of the mussel beds, the scooping techniques and the effect of scooping on the habitat.

Gear Development

Design of scoop

Scoops have been used to harvest mussels in Akulivik since the early 1980s (Figure 1). The basic design consists of a metal hoop and net attached to a long pole, usually made of 2"x3" (4 cm x 6 cm) wood. Harvesters make their scoops from available

material. Hence, individual scoops vary in design, and improvements have been made over the years (Mesher and Doidge 1995). Finding suitable net material has been a problem in past years (H. Alayco, pers. comm.).

Two prototype scoops were made similar to that shown in Figure 1. The scoop basket threaded to the handle via 2" (5 cm) diameter pipe connectors. Initially, the handles were made of 6' (1.8 m), 2" (5 cm) diameter sections of PVC pipe having a solid spruce core. A PVC covered, round pole was thought to be easier and more comfortable to grip in the cold. The wood core was used to reinforce the hollow piping. Up to four, 6' sections could be bolted together to form the handle.

The PVC-wood handles proved to be too flexible and didn't permit the scoop to be driven into the substrate. Initially the handles were replaced with 1 1/4" (3.2 cm) galvanized steel pipe. Although sufficiently strong, these proved too heavy for easy use. Finally, it was decided to return to the 2"x3" (4 cm x 6 cm) wooden handles commonly used by most harvesters.

The initial scoop design had a square shape. The tip of the scoop, which contacts the substrate, was modified to a curve to allow greater penetration of the substrate. A band of steel, 3 cm wide was welded onto the leading edge of the scoop, perpendicular to the handle. The purpose of this band was to act as a small shovel. Stiff nylon netting, 1 cm stretched mesh, was used to form the basket of the scoop (Figure 2).

Harvesting Operations

Site selection

In winter, mussels are harvested in areas where water depth is approximately 4 m. The favoured place for subsistence harvesting (60°48'56"N 78°14'13"W) is 2 km NW of the village of Akulivik (Figure 3). This site is also harvested in summer. The area is adjacent to a rocky islet where a moderate tidal current is present.

Access to mussel beds

In winter, the sea-ice above the beds is 2 m thick. To gain access to the beds, a hole, approximately 1.5 m in diameter, is made in the ice using ice augers and chisels. This is fairly heavy work requiring about three hours of strenuous work by two or three people.

At the harvesting site, the water was 4.1 m deep. Through a hole 1.5 m wide in 2 m ice, a scoop, with a mouth 30 cm wide, can scrape a 5 m long strip which covers an area 1.5 m^2 of sea-bottom. The potential scraping area beneath the hole is 19.6 m^2, but it would be difficult to harvest the total area scraping radially.

Scooping techniques

The technique used for scooping varies little between operators (Figure 4). The scoop is fed into the hole at the lowest angle possible for that size of hole and thickness of ice. This is done to maximize the distance scooped. The leading edge of the scoop is pressed firmly into the bottom. Using the edge of the hole as a pivot, the scoop is then drawn towards the operator using a vertical jiggling motion. On passing the vertical position, the operator continues to push the scoop away until the handle forms a 60°-

45° angle to the horizontal. The scoop is then lifted to the surface by hauling along the handle. The scoop basket is then inverted which dumps the mussels on the ice.

Sorting is usually done by another person while the first person keeps scooping. Mussels, 4.5 cm or greater in length are to be kept for consumption. They are de-clumped and cleaned of debris (Figure 5). They are then placed in a bucket of sea-water to prevent freezing - ambient temperatures can be -30°C. Under-sized mussels are thrown back down the hole. When approximately 5 kg of mussels have been processed they are transferred to onion bags. The bags are then secured with a rope and suspended from one of the holes in the ice. Further cleaning is accomplished by rinsing the bag in the sea-water. Mussels left suspended in the sea for one or two days cleanse themselves of sand and silt.

Assessment of mussel beds

Density and yield

Initially, it was planned to use a Petersen grab to assess mussel density. Previous sampling at this site (AK-1) indicated that the bottom could be soft (Mesher and Doidge 1995, KRC 1994). However, at four holes which were made in the ice, the grab failed to sample due to a hard, rocky bottom.

As an alternate to grab sampling, video footage was taken using a Hi8 camcorder (SONY Model TR81) in an underwater housing (Amphibico Inc, Lachine, Quebec). Analysis of the video revealed that the distribution of mussels was patchy. Mussels occurred on both rocky and soft bottoms. Scoop marks were clearly seen in existing beds. Other areas, which have been heavily scooped in the past, were more or less barren containing only empty shells.

Four holes were made in the ice between the rocky islet and a shoal, ca 75 m to the south (Figure 6). Hole #1 was made as a continuation of a line made by other harvesters, close to the shore of the rocky islet. Holes #2 and #3 were closer to the shoal. The fourth hole was made in the same line series as hole #1. Yields at holes #1 and #4 were poor totaling less than 2 kg. At holes #2 and #3, initial scooping rates were similar to the 20 kg/hr experienced in winter sampling in 1995 (Mesher and Doidge 1995), however scooping success diminished after half an hour when ca 9 kg of mussels had been gathered.

Growth rates and age structure

The age of a mussel is determined by taking a thin section from the shell through the umbo region using a diamond-tipped slow speed saw. Annual growth icrements are represented by light and dark bands in the nacreous layer of the umbo (Lutz 1976, Thompson, Doidge and May 1993).

In Nunavik, mussels fall into two broad categories by region: fast growing, large sized mussels of Ungava Bay and slower growing, smaller mussels of Hudson Bay and Hudson Strait (KRC 1994). Mussels at Akulivik fall into the latter category.

The age structure of the mussel beds was obtained from a scooped sample (Figure 7). The modal age of the sample of 53 mussels was 11 years. Younger age classes (1 -8) are generally absent. Some small mussels slip through the mesh of the scoop but many mussel beds in Nunavik show a similar age distribution (KRC 1994). The lack of young could result from sporadic success of annual recruitment or the exclusion, by competition or other means, of small sized mussels from the beds.

The mussels sampled on March 29, 1996 show the same general growth characteristics of those from the same site in February 1995 (Figure 8). Mussels reach harvestable, ie commercial size of 4-5 cm, by 4 to 5 years of age. By age 7 years, growth in size has almost ceased; the mussels range in size from 5 to 8 cm. With adequate recruitment, and ignoring the effects of predation, it would take about five years for depleted beds to re-seed themselves and grow to a harvestable size.

Commercialization

Market and supply

There is a ready, although limited, market for mussels in Akulivik, which is a village of 300 people. Mussels are sold at the local Co-op for $1.00/lb ($2.20/kg) (Mesher and Doidge 1995). Sometimes an over-abundance of supply exists; mussels have spoilt in the store in the past (Co-op manager, pers. com.). However, this can be avoided by leaving mussels in the onion bags in the sea until needed for use.

Product assessment

Test yields from the scooping operation were too low to assess the effects of freezing the product on taste and appearance. Mussels, however, do have tolerance to freezing. People in Akulivik consume mussels, both cooked and raw, which have been previously frozen.

Commercial potential

High air cargo tariffs between communities limit commercialization of mussels to within communities (KRC 1994). Mesher and Doidge (1995) compare the economics of winter versus summer harvesting, based on a daily yield of 100 kg of commercial grade mussels. The data from March 1996 indicate that this yield estimate is too optimistic; the yields-per-hole in 1996 were close to half of those in 1995.

Yields would be greater if the holes were situated over dense mussel beds. Mapping of the mussel beds in summer, using an underwater video camera, would allow harvesters to concentrate on denser mussel beds, on softer bottoms. Also, if holes were easier to make, more time could be spent harvesting.

Presently, low yields, coupled with the arduous task of making the hole in the ice, appear to make local commercialization on the small scale unviable. If yields-per-hole were higher, commercialization, which would employ one to two people, may be possible.

Conclusions and Recommendations

- Without prior knowledge of the density and location of mussel beds, and easier ways of making holes, commercialization is not economically feasible.

- Mapping of mussel distribution, in summer, using underwater video coupled with a geographic positioning system (GPS) would enable harvesters to maximize yields per-unit-effort, and may make a small commercial operation economical.

- Biomass could not be assessed in winter due to the difficulty of making holes in the ice and the Petersen grab did not work on the hard bottom. Mussel density could be measured in summer using an underwater video camera on a grid system. If making holes in the ice was feasible enough to allow a commercial operation, catch-effort data could be used to indirectly estimate the biomass using the Leslie method (Ricker 1975).

- The design of scoops has been optimized within a reasonable cost for home construction.

- The use of chainsaws, modified to cut ice, should be investigated as an alternate to using ice augers for making holes in the ice.

- Onion bags are the best containers for mussels. They allow mussels to remain alive in storage in the sea for later use, at the same time as allowing the mussels to cleanse themselves of sand and silt particles.

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References

Kuujjuaq Research Centre. 1994. Blue mussels (Mytilus spp.) in Nunavik: Size, growth rates and commercial potential (Phase III). Report submitted to the Fisheries and Aquaculture Testing and Experimentation Program of the Department of Fisheries and Oceans. Fisheries Development Project DEV 7900-002-920. Makivik Corporation, Kuujjuaq, Quebec. 34 p.

Lutz, R.A. 1976. Annual growth patterns in the inner shell layer of *Mytilus edulis* . J. mar. biol. Ass. U.K. 56:723-731.

Mesher, C. and D.W. Doidge. 1995. The Blue Mussel Harvest Testing Program in Nunavik. Report submitted to the Fisheries and Aquaculture Testing and Experimentation Program of the Department of Fisheries and Oceans. Fisheries Development Project DEV 7900-002-936. Makivik Corporation, Kuujjuaq, Quebec. 27 p.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191. Department of Fisheries and Oceans. Ottawa. 382 p.

Thompson, R.J., W. Doidge and P. May. 1993. Mussel age determination workshop. Report submitted to the Fisheries and Aquaculture Testing and Experimentation Program of the Department of Fisheries and Oceans. Fisheries Development Project DEV 7900-002-M670-926. Makivik Corporation, Kuujjuaq, Quebec. 7 p.

Figure 1. Mussel scoop at harvest site near Akulivik, Nunavik, Quebec.

ᑭᓯᑦᓯᒍᑎᓛᑦ 1. ᐅᕕᓗᕐᓂᒃ ᖃᓗᒍᑎᒃ
ᐅᕕᓗᕐᓂᐊᕕᒻᒥ ᓴᓂᐊᓂ ᐊᑯᓕᕕᐅᑉ
ᓄᓇᕕᒻᒥ ᑯᐸᐃᒻᒥ.

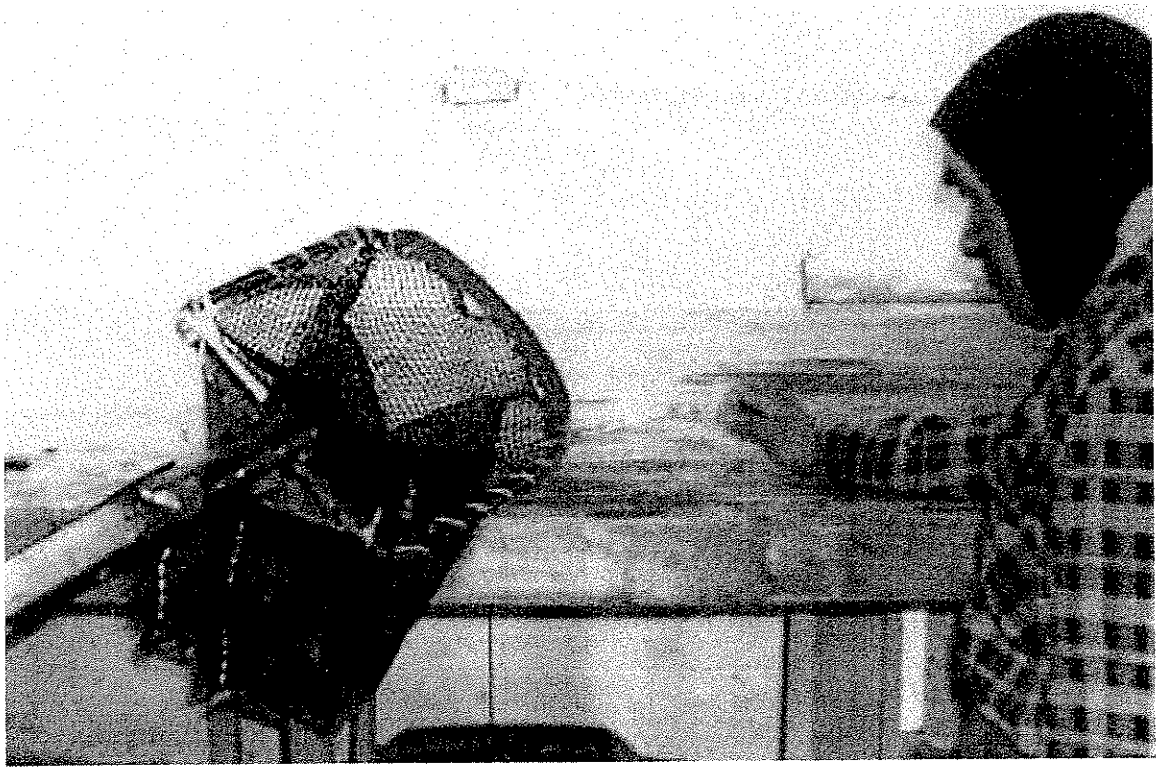

Figure 2. Details of scoop basket. Nylon netting is attached to metal frame. This scoop has a 3 cm metal band on its leading edge. Akulivik, March 1996.

ᑭᓯᑦᓯᔪᑎᓂᑦ 2. ᖃᓄᐃᔪᑎᐅᑉ ᐃᑉᐱᐊᐊᕐᖏᓐ.
ᐃᑦᓪᓗᐃᔪᑎᑦᓴᓴᐅᑦᓯᑎᒃ ᓄᓄᐊᖏᑦᑐᑦ ᐊᑕᑎᑦᓄᐃ
ᑭᑭᐊᒍᑦ ᐊᑕᑎᑦᓯᔪᑎᒍᑦ. ᑕᑯᓐᓇ ᖃᓄᐃᔪᑎᒃ
ᑭᑭᐊᑦᑕᓯᓯᒪᔪᖅ 3 ᓯᓐᑕᒥᑕᓂᒃ ᐊᖏᕈᓂᓪᒥᒃ.
ᐊdᓪᕆᒪᒥ, ᒪᑦᔨ 1996.

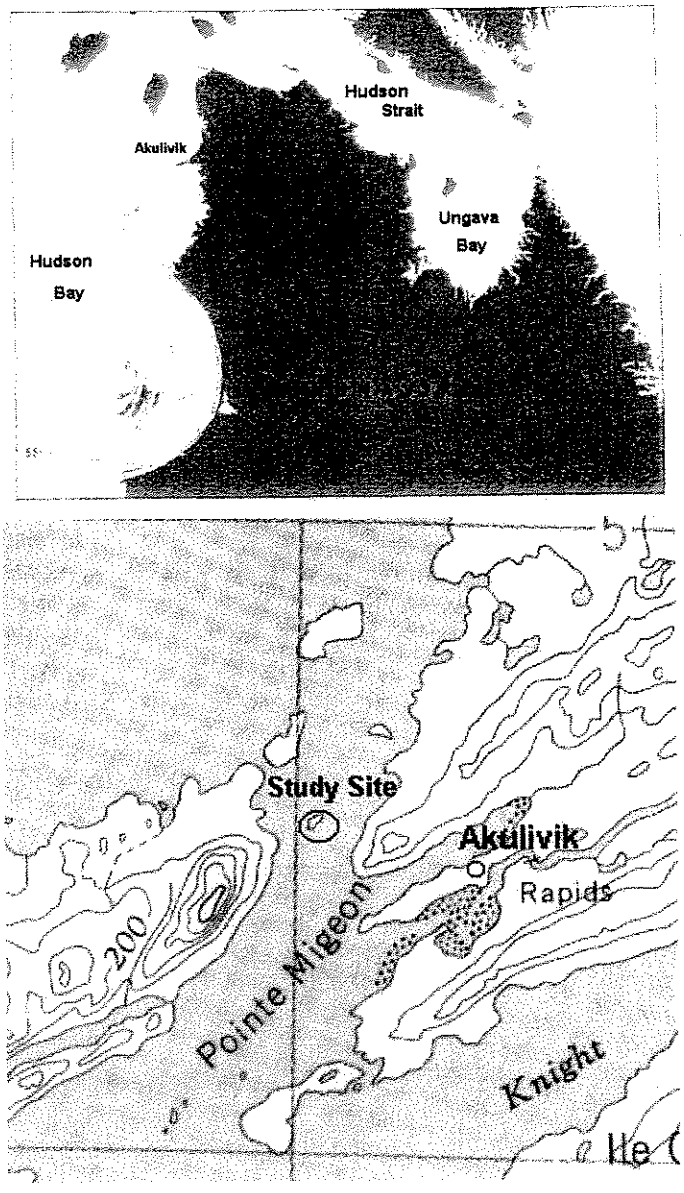

Figure 3. Study site situated 2 km NW of the village of Akulivik on the northeastern Hudson Bay coast.

ᑭᓯᑦᓱᔪᓐᓄᑦ 3. ᖃᐅᔨᓴᖅᑕᐅᓂᐅᔪᖅ 2
ᑭᓪᓗᑕᓂᒃ ᐅᖃᓗᓯᓂᒃ ᐊdᓂᕆᐅᕐ
ᓄᓇᓕᖅᑕ ᑕᕐᖃᖅᓂ ᑕᓯᐅᔨᖅᔪᐊᕐ ᓯᓇᖅᓂ.

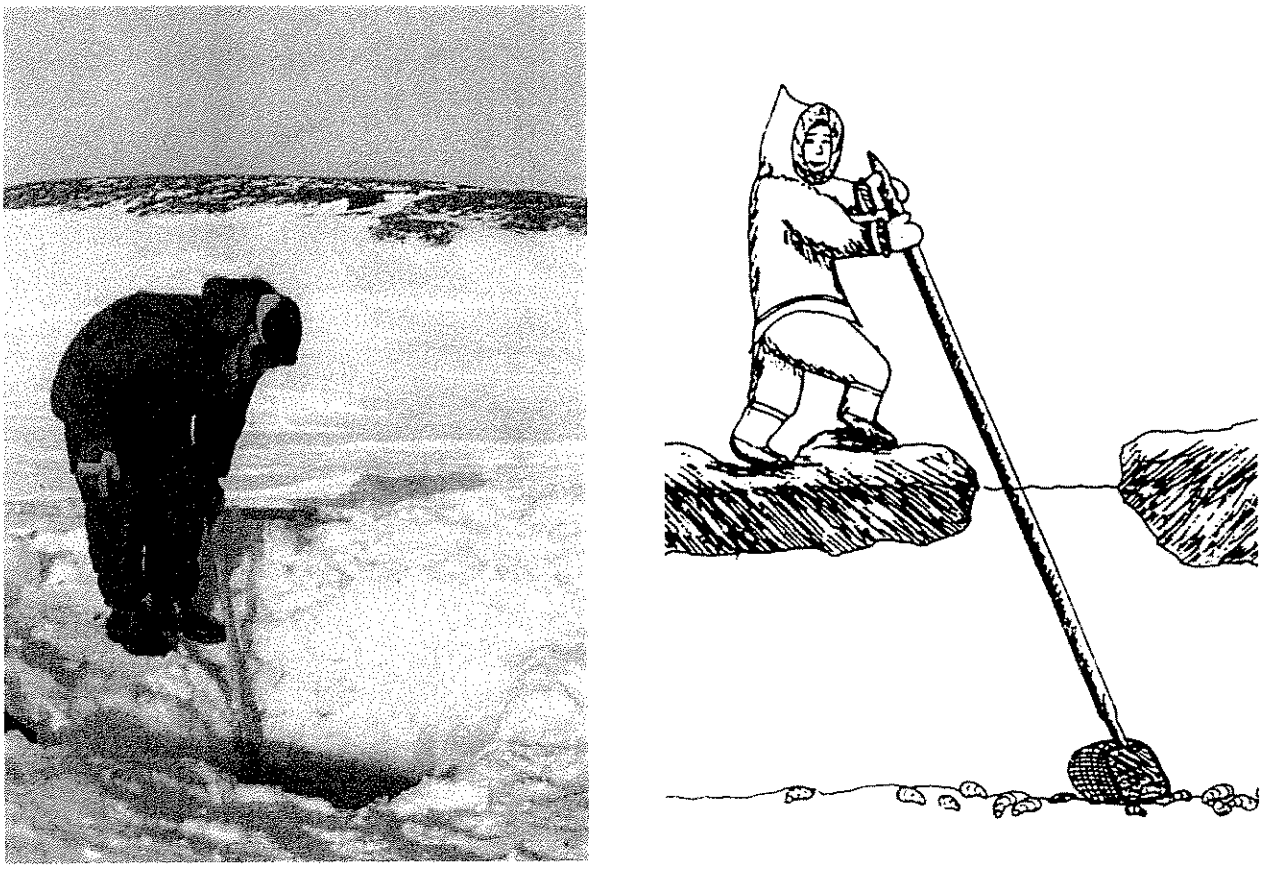

Figure 4. Method of scooping mussels through the ice from the sea-bottom.

ᑭᓯᑦᓯᔪᑎᓐᓂᑦ 4. ᓯᑯᒃᑯᑦ ᐅᕕᓗᖏᓂᒃ
ᖃᓗᔪᓯᑎᕆᐅᓯᓱᒃ ᐃᒪᐅᑦ ᐃᖅᑲᒃᖃᓚᓂᑦ.

Figure 5. Sorting, declumping and cleaning mussels on the ice.

ᑭᓯᑦᓯᔪᑎᓪᓗᑦ 5. ᓯᑯᒥ ᐅᕐᓴᓂᓕᖅᑎᑦ
ᓄᐊᑕᐅᔾᔨᑦ ᓯᓚᒃᓪᓗᐃᔾᔪᑕᐅᓯᔪᑎᑦᓗ.

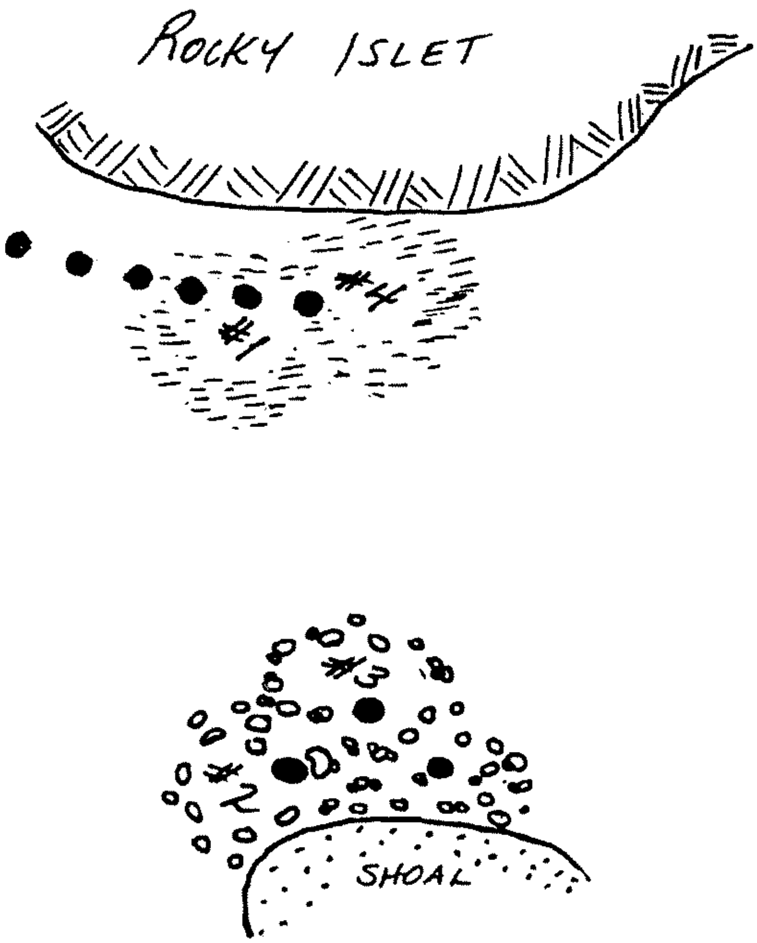

Figure 6. Field sketch of the sampling site. Black circles represent holes in the ice. Bottom is flat and smooth at holes #1 and #4, rocky and uneven at holes #2 and #3. Un-numbered holes were made by subsistence harvesters. The distance between the shoal and rocky islet is approximately 75 m.

ᑭᓯᑦᓯᒍᑎᓛᑦ 6. ᖃᐅᕐᓵᕐᕕᐅᓚᐅᕐᓘᑉ ᐊᕿᑎᖅᒐ. ᕿᕐᓂᑕᐃᑦ ᐊᒻᒪᓗᑭᑖᑦ ᑎᑎᕐᑐᐃᒪᒍᑎᐅᔪᑦ ᓯᑯᒥ ᑭᓪᓚᓂᐊᓇᔭᐅᓚᐅᕐᑐᓂᒃ. ᐃᒪᐅᑉ ᐃᖅᑲᖅᖄ ᒪᓂᕋᕐᑑᓚᐅᔪᖅ ᑭᓪᓚᒥ #1-ᒥᓗ #4-ᒥᓗ, ᐅᔭᕋᐃᓐᓇᐅᓯᓂᓗ ᒪᓂᕐᑑᓯᓂᓗ ᑭᓪᓚᒥ #3-ᒥᓗ #2-ᒥᓗ. ᑭᓪᓚᐃᑦ ᑭᓯᑦᓯᒍᑎᑕᖃᖏᑐᑦ ᑭᓪᓚᑦᑕᐅᓯᒪᓚᐅᕐᑐᑦ ᐅᕕᓗᕐᓂᐊᑎᓄᑦ.

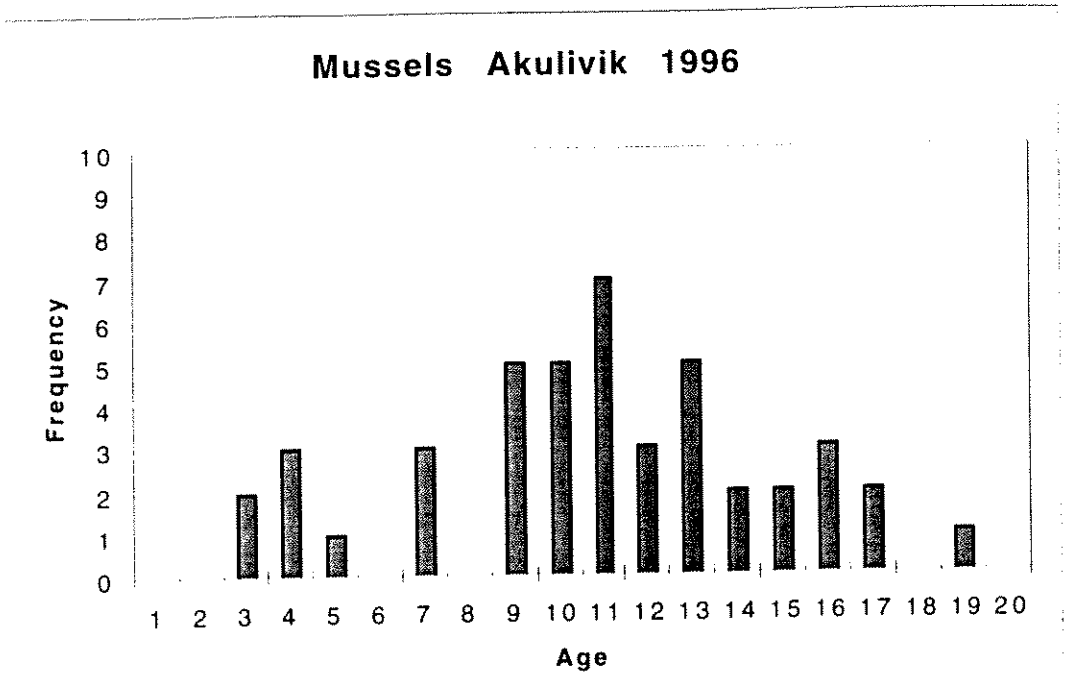

Figure 7. Age structure of mussels (n=52) sampled from Site AK-1, Akulivik, March 1996.

ᑭᓯᑦᓯᔪᑎᓪᓗᑦ 7. ᐅᕆᓗᓄᐃᑦ ᐅᑭᐅᖏᑦᑕ
ᐊᖏᕈᓯᖏᓚᐅᑎᖏᑦ (52 ᐅᕆᓗᓄᐃᑦ
ᖃᐅᔨᓴᖏᑕᐅᑎᑦᓄᑦ ᐊᑯᓕᕆᔨᒥ, ᒪᑦᔨ 1996

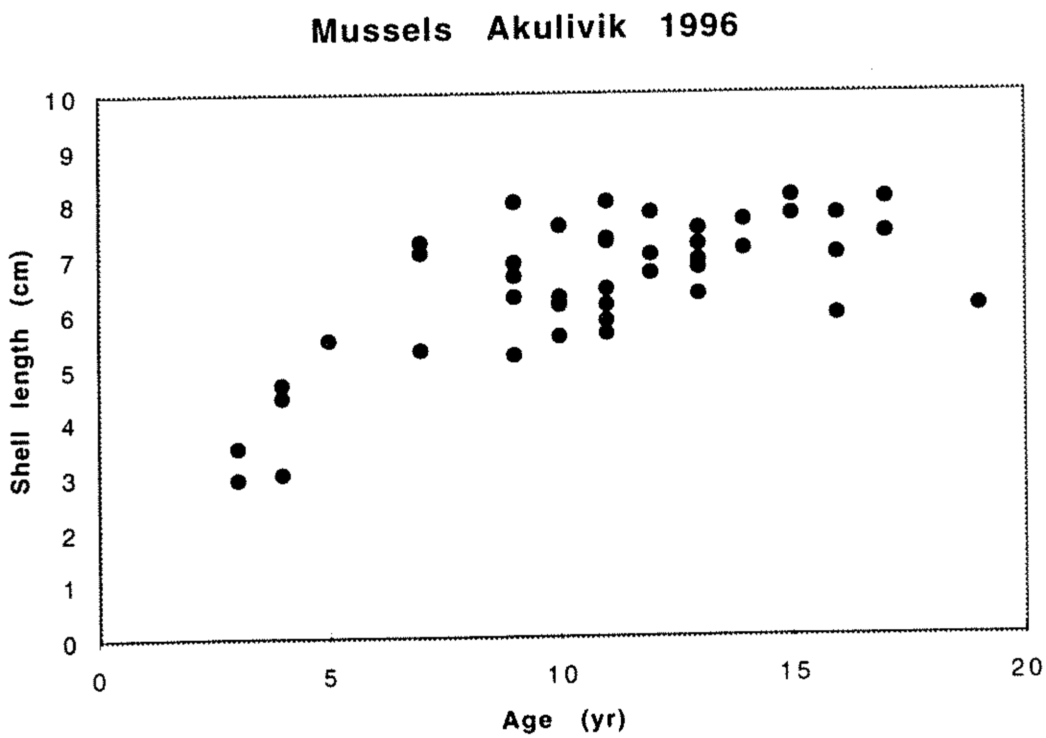

Figure 8. Age - length relationship of mussels from Akulivik, March 1996.

ᑭᓯᑦᓯᒍᑎᓛᑦ 8. ᐅᑭᐅᖅᒋᑦ
ᑕᑭᓂᖅᒋᓐ ᕘᓚᖅᑲᑦ ᐅᕕᓗᕐᓂ
ᐊᑯᓕᕕᒻᒥ, ᒫᑦᓯ 1996.