Mosquito Collection in Endemic Areas of Japanese Encephalitis in Hokkaido, Japan

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ABSTRACT. A study was conducted during 1985 and 1986 to evaluate the roles of mosquito species as possible vectors of Japanese encephalitis (JE) virus in Hokkaido. The number of *Culex tritaeniorhynchus* was very low among the four pig farms where outbreaks of abortion caused by JE virus were observed in swine populations. At one farm near Sapporo, only one *Cx. tritaeniorhynchus* was found among a total of 510 mosquitoes collected during the survey period from July to October 1985, even when JE virus activity among sentinel pigs was revealed by seroconversion. At another farm in the south, no individuals of this mosquito species were found among 987 mosquitoes collected at the time of the outbreaks of abortion. *Cx. pipiens pallens*, *Anopheles* species, *Aedes vexans nipponii*, and *Ae. japonicus* were predominant over *Cx. tritaeniorhynchus*. *Cx. tritaeniorhynchus*, almost a solve vector species of JE virus in the southern part of Japan, is probably not a vector of the virus in Hokkaido. The collected mosquitoes (2,332 from 1985 and 1,403 from 1986) were processed for virus isolation but no JE virus was isolated. More extensive field studies are necessary to provide further information on the role of mosquito species other than *Cx. tritaeniorhynchus* in the transmission of JE virus in the northern limits of its range including Hokkaido.—**KEY WORDS:** Japanese encephalitis virus, mosquito collection.

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Japanese encephalitis (JE) is an important and widespread mosquito-borne viral zoonosis which causes encephalitis in humans and equines and abortion in swine. Although human cases of JE in Japan have declined in recent years, epidemic JE is of major concern in east Asian countries such as Thailand, India, and China [17]. Past epidemiological studies in Japan revealed that *Culex* (*Cx.*) *tritaeniorhynchus* was the most important vector of the virus to humans when the mosquitoes feed on amplifying hosts, such as pigs [1, 4]. These studies were done in rural areas in the southern part of Japan, Kyushu or Honshu. All the areas showed a uniform ecological setting, that is, rice fields and pig farms. In view of the wide geographic range of the virus distribution, the ecological setting in which humans or domestic animals acquire the infection is not

uniform, and mosquito vectors of JE virus may vary from one locality to another.

Hokkaido is located at the northernmost area of JE virus distribution in Japan and provides the most adverse climatic conditions for JE virus survival in nature. Sporadic JE cases in swine and equines have been reported in the past [8]. However, it was not known what mosquito species was acting as a vector of the virus, because little mosquito collection related data were available. Between 1984 and 1986 interepidemic outbreaks of JE abortion and inapparent infection were observed among swine populations at several localities in Hokkaido [14]. Three strains of JE virus were isolated from aborted fetuses at different localities. Our seroepidemiological study suggests that JE virus passed the winter locally in a distinct endemic focus for some years [14]. There-

fore, it became important to reveal the vector mosquito in the endemic focus and its possible role in overwintering of the virus.

This study describes mosquito collection data obtained at several pig farms with JE abortion cases, and it discusses the possible role of the mosquito species for the transmission of JE virus in Hokkaido.

MATERIALS AND METHODS

Mosquito collection sites and methods: In Hokkaido, JE abortions were observed at several pig farms in 1984 and 1985 [14]. Mosquitoes were collected at some of these farms, including farms A and B in Hiroshima near Sapporo, farm S in Imagane, and farm K in Kamiiso (Fig. 1). At pig farms A and B, mosquitoes were collected by the light trap method at least once a week from July to October 1985. Collection was done twice in July and August at farm S and once in August at farm K by the light trap and dry ice sweeping methods. In 1986, mosquito collection was concentrated in the areas around farms A and B by light trap, dry ice sweeping, and CDC miniature light trap methods. Mosquitoes were classified to species according to descriptions given by Tanaka *et al.* [16], pooled, each pool consisting of approximately 50 mosquitoes, and stored at -80°C .

Virus isolation procedure: Each mosquito pool, consisting of up to 50 individuals, was placed in a chilled mortar and ground into suspension by adding 2 ml of phosphate-buffered saline containing 20% fetal calf serum, 200 $\mu\text{g}/\text{ml}$ streptomycin, and 200 units/ml penicillin. For 1985 specimens, virus isolation was achieved using the *Aedes (Ae.) albopictus* cell culture (C6/36) system as described by Igarashi *et al.* [7]. Mosquito samples of 1986 were inoculated into *Toxorhynchites amboinensis* via an intrathoracic route for virus isolation as described by Rosen [11]. The indirect im-

Fig. 1. Mosquito collection sites and JE abortion cases in Hokkaido, Japan.

munofluorescent antibody technique was used to detect JE virus antigen in C6/36 cell culture or in the head squash of *Toxorhynchites amboinensis* mosquitoes.

Determination of JE antibody in sera from sentinel pigs and birds: Swine sera were collected from 6-month-old individuals at slaughter houses. Sentinel chickens and pigeons free from JE antibody were kept at mosquito collection sites outside the pig pens from June to October, and sera were obtained from them at least once a month. JE antibody was examined by the hemagglutination inhibition (HI) test using acetone-treated sera, sucrose-acetone-extracted antigen of JE JaGAR-01 strain, and goose red blood cells as described by Clarke and Casals [2]. HI titers of the sera equal to or higher than 1:20 were judged positive.

RESULTS

Distribution of the virus at mosquito collection sites from 1984 to 1986: Table 1 summarizes the distribution of the virus at mosquito collection sites from 1984 to 1986. In 1984, the distribution of the virus was recognized at farm A in Hiroshima and at farm S in Imagane either by seroconversion in 6-month-old pigs or by abortions in sows. At farm S, JE virus was isolated from one of the aborted fetuses. In 1985, the distribution of the virus was evident at farms A and B in

Table 1. The distribution of the virus revealed by antibody conversion in sentinel pigs and birds and abortions in sows at mosquito collection sites from 1984 to 1986

Month	Antibody conversion rate ^{a)} and (abortion)									
	1984		1985				1986			
	Farm A	Farm S	Farm A	Farm B	Farm K	Farm S	Farm A	Farm B	Valley	Ex.Agr.Sta.
June	— ^{b)}	—	0/36	3/5 (5/70)	—	0/20	—	—	0/5	0/8
July	—	—	0/7	1/13 (3/70)	— (17/149) ^{c)}	—	0/5	0/12	0/5	0/8
Aug.	—	—	9/20	0/5	— (1/149)	—	3/14	0/20	0/5	0/8
Sept.	—	— (20/101) ^{c)}	—	—	—	—	—	—	0/5	0/8
Oct.	2/15	— (12/101)	2/19 (2/85)	4/28	5/20	—	—	0/13	0/5	0/8

a) Antibody was monitored by HI test in the sera from 6-month-old pigs at the farms and from sentinel chickens and pigeons kept at a valley and Hokkaido Experimental Agricultural Station (Ex. Agr. Sta.) near farms A and B. The rate was expressed as positive sera/total No. tested.

b) —; not tested.

c) JE virus was isolated from one of the aborted fetuses. In this month, 20 of 101 sows showed abortions.

Hiroshima and at farm K in Kamiiso but not at farm S in Imagane. JE abortion of swine and seroconversion in 6-month-old pigs was recorded at the former three farms, and JE virus was isolated from one of the aborted swine fetuses at farm K. In 1986, positive antibody was only detected in the sera in farm A but not in the sera in farm B. Sentinel birds were kept at outdoor mosquito collection sites near farms A and B, and no positive antibody was detected in these bird sera at a valley (5 chickens) and at Hokkaido Experimental Agricultural Station (3 chickens and 5 pigeons). Mosquitoes were collected systematically at farms A and B in Hiroshima in 1985 and 1986. Only point collections were done in 1985 at farm S in Imagane and at farm K in Kamiiso because of far location of these farms from our university. Mosquito collections were also extended at the outdoor sites near farms A and B in 1986.

Relative abundance of mosquitoes at several localities in Hokkaido in 1985: In Table 2, mosquito collection data of 1985 are summarized. At farm A in Hiroshima, a total of 510 mosquitoes was collected by

light trap method during July to October (28 nights). *Cx. pipiens pallens* was predominant, followed by *Ae. vexans nipponii*, *Anopheles* (An.) species, *Ae. japonicus*, and *Cx. tritaeniorhynchus* (only one mosquito at farm A). Most of *Anopheles* spp. mosquitoes were *An. sinensis*; a few *An. lindesayi japonicus* were present.

At farm B in Hiroshima, the major mosquito species was *Cx. pipiens pallens*, followed by *Ae. vexans nipponii*, *Anopheles* species, *Ae. japonicus*, and *Cx. tritaeniorhynchus*.

At farm S in Imagane, mosquitoes were collected in July and August 1985 by light trap and sweeping methods. *Anopheles* spp., mostly *An. sinensis*, and *Cx. pipiens pallens* were predominant, followed by *Ae. vexans nipponii*, *Cx. tritaeniorhynchus*, and *Ae. japonicus*.

At farm K in Kamiiso, mosquitoes were collected once in August by light trap and sweeping methods. *Anopheles* spp., mostly *An. sinensis*, were predominant, followed by *Cx. pipiens pallens*. No other mosquitoes were collected.

The average number of mosquitoes per

Table 2. Relative abundance of mosquitoes collected by light trap and/or dry ice sweeping methods at several localities in Hokkaido in 1985

Mosquitoes ^{a)}	July-Oct. ^{b)}		July & Aug.		Aug.	
	Farm A	Farm B	Farm S		Farm K	
	L.T.(28)	L.T.(28)	L.T.(2)	S.W.(2)	L.T.(1)	S.W.(1)
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
<i>Cx. pipiens</i>	422(82.7)	261(50.8)	97(19.7)	193(73.4)	52(7.3)	37(13.7)
<i>Cx. tritaе.</i>	1(0.2)	10(1.9)	6(1.2)	1(0.4)	0 (0)	0 (0)
<i>Ae. japo.</i>	9(1.8)	17(3.3)	3(0.6)	0 (0)	0 (0)	0 (0)
<i>Ae. vexans</i>	46(9.0)	146(28.4)	9(1.8)	0 (0)	0 (0)	0 (0)
<i>Anopheles</i> spp.	32(6.3)	80(15.6)	377(76.6)	69(26.2)	664(92.7)	234(86.3)
Total No.	510	514	492	263	716	271
Average No. in August	25	27	66	102	716	271

a) Mosquito species are listed as follows: *Culex*(*Cx.*) *pipiens pallens*(*pipiens*), *Culex*(*Cx.*) *tritaeniorhynchus*(*tritaе.*), *Aedes*(*Ae.*) *japonicus*(*japo.*), *Aedes*(*Ae.*) *vexans nipponii*(*vexans*), and *Anopheles* species(*spp.*). Mosquito number per trap night was standardized as to average no. in August.

b) Mosquitoes were collected by light trap(L.T.) and/or sweeping(S.W.) methods for (28) nights at farms A and B, for (2) nights at farm S and for (1) night at farm K.

night in August was extremely low at farms A and B (25 and 27) in Hiroshima, but they were higher at the collection sites in the south (66 and 102 at farm S, 716 and 271 at farm K). The very low percentage of *Cx. tritaeniorhynchus* (<2.0%) was common to the 4 pig farms. Only one individual was collected at farm A, and none of this species was collected at farm K.

We attempted to isolate virus by the C6/36 cell culture inoculation method from mosquito specimens collected in 1985. A total of 2,232 mosquitoes including 986 *Cx. pipiens pallens*, 17 *Cx. tritaeniorhynchus*, 29 *Ae. japonicus*, 201 *Ae. vexans nipponii* and 999 *Anopheles* spp. was processed, but no JE virus was isolated.

Relative abundance of mosquitoes at several localities in Hokkaido in 1986. In Table 3, mosquito collection data of 1986 are summarized. Mosquito collection was continued in 1986 at farms A and B and extended to several outdoor sites near these two farms, at latter by sweeping, CDC miniature light trap, or both. At farms A and B, only small numbers of mosquitoes were collected and *Cx. tritaeniorhynchus* did

not predominate. At bushes outside the pig pens in farm B and in a valley near farms A and B, *Ae. japonicus* was the major species collected and *Tripteroides bambusa* was found. At Hokkaido Experimental Agricultural Station located near farms A and B, *Ae. vexans nipponii* and *Ae. japonicus* were collected in considerable numbers. *Cx. tritaeniorhynchus* was not found at the outdoor collection sites other than pig farms.

Virus isolation was attempted by the intrathoracic inoculation method using *Toxorhynchites amboinensis* mosquitoes. In all, 1,403 mosquitoes, 106 *Cx. pipiens pallens*, 10 *Cx. tritaeniorhynchus*, 883 *Ae. japonicus*, 182 *Ae. vexans nipponii*, 94 *Anopheles* spp., and 128 *T. bambusa*, were processed, but no JE virus was isolated.

DISCUSSION

This study was conducted to evaluate the roles of mosquito species in Hokkaido as vectors of JE virus. Mosquito collection data show that the number of *Cx. tritaeniorhynchus* was low at the pig farms studied in 1985. Only one of this species was

Table 3. Relative abundance of mosquitoes collected by light trap and/or dry ice sweeping methods at several localities in Hokkaido in 1986

Mosquitoes ^{a)}	July-Oct. ^{b)}		Aug.-Sept.	July-Aug.		June-Aug.	
	Farm A	Farm B	Bush at B	Valley		Exp. Agr. Sta.	
	L.T.(11)	L.T.(10)	S.W.(11)	M.L.T.(4)	S.W.(5)	M.L.T.(12)	S.W.(9)
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
<i>Cx. pipiens</i>	48(64.0)	11(20.0)	11(1.6)	14(28.6)	1(0.9)	21(5.5)	0 (0)
<i>Cx. tritaе.</i>	8(10.7)	2(3.6)	0(0)	0(0)	0 (0)	0 (0)	0 (0)
<i>Ae. japo.</i>	6(8.0)	19(34.5)	585(84.3)	25(51.0)	76(67.3)	153(40.4)	69(13.0)
<i>Ae. vexans</i>	10(13.3)	16(29.1)	15(2.2)	3(6.1)	1(0.9)	134(35.4)	446(84.0)
<i>Anopheles</i> spp.	3(4.0)	7(12.7)	55(7.9)	2(4.1)	4(3.5)	23(6.1)	0 (0)
<i>Trip. bamb.</i>	0(0)	0(0)	28(4.0)	5(10.2)	31(27.4)	48(12.7)	16(3.0)
Total No.	75	55	694	49	113	379	531
Average No. in August	13	4	72	5	23	16	38

a) Mosquito species are listed as follows: *Culex*(*Cx.*) *pipiens pallens*(*pipiens*), *Culex*(*Cx.*) *tritaeniorhynchus*(*tritaе.*), *Aedes*(*Ae.*) *japonicus*(*japo.*), *Aedes*(*Ae.*) *vexans nipponii*(*vexans*), *Anopheles* species(*spp.*), and *Tripteroides*(*Trip.*) *bambusa*(*bamb.*). Mosquito number per trap night was standardized as to average no. in August.

b) Mosquitoes were collected by light trap(L.T.) and/or sweeping(S.W.) methods at farm A for (11) nights and also at farm B, a bush at farm B(Bush at B), a valley (Valley) and Hokkaido Experimental Agricultural Station(Exp. Agr. Sta.) near farms A and B for indicated(no.) of nights.

collected at a farm near Sapporo during the whole survey period in 1985, though JE virus activity was revealed by antibody monitoring in swine sera. Furthermore, none of this species was collected at another farm in Kamiiso during a period of outbreak of JE-induced abortion in sows at the farm. *Cx. tritaeniorhynchus*, almost a sole vector species of JE virus in the southern part of Japan, is probably not a vector of the virus in Hokkaido.

Epidemiological data provide the circumstantial evidence that JE virus activity was present at farm A near Sapporo and at farm K in Kamiiso during the summer mosquito season in 1985. At farm A, 9 of 20 sera from 6-month-old pigs had high HI antibody titers (1:80 to 1:320) in August. JE abortion was reported in 2 of 85 sows in October. At farm K, JE virus was isolated from aborted fetuses in July, and JE antibody (>1:160) was detected in 5 of 20 sera of 6-month-old pigs in October. At farm B near Sapporo and farm S in Imagane, virus activity was not evident during summer mosquito season

in 1985, although outbreaks of JE-induced abortion were reported in 1984 or 1985. In 1986, virus dissemination was limited at the study sites, and only 3 of 19 pig sera at farm A exhibited detectable antibody (1:20).

Culex tritaeniorhynchus is known to be attracted to light and has been collected from light traps for the purpose of JE virus isolation in many studies in Japan [5, 7, 9]. In this study we also used the sweeping method at two pig farms (S and K), and there was not much difference in the relative abundance of species collected by the two methods. Larvae collection was conducted in 1985 around the pig pens of farms A and B, which showed that most of them were *Cx. pipiens pallens* (882 of 945 larvae) and the rest were *Ae. japonicus* (I. Takashima: unpublished data). Moreover, a total of 763 mosquitoes was collected by sweeping at resting sites of mosquitoes in bushes around farm A in 1985, and all of the mosquitoes collected were *Cx. pipiens pallens* (I. Takashima: unpublished data). We concluded that the small numbers of *Cx. tri-*

taeniorhynchus were a true reflection of an extremely small population near the study sites.

Species of mosquito other than *Cx. tritaeniorhynchus* should be considered as possible vectors of JE virus in Hokkaido. At pig farms A and B near Sapporo, *Cx. pipiens pallens* was the major species collected, and a considerable number of *Aedes* spp. were collected. In pig farms S and K in southern part of Hokkaido, *Anopheles* spp., mainly *An. sinensis*, were predominant, followed by *Cx. pipiens pallens*.

In Japan, JE virus has been occasionally isolated from *Cx. pipiens pallens* [4, 9, 13]. This species has transmitted the virus in experiments, but it is a relatively inefficient vector [3]. The virus has been isolated also from *Ae. vexans nipponii* several times in the southern part of Japan [4, 6, 12]. Soviet workers have listed *Ae. japonicus* as important in the transmission of JE virus to humans in southeastern region of the U.S.S.R. [10]. We proved that *Ae. japonicus* can transmit the virus after feeding upon a viremic chick [15]. In Japan, JE virus has not been isolated from *An. sinensis*, the predominant *Anopheles* species there [4].

In Honshu or Kyushu in southern Japan, the transmission cycle of JE virus is formed between *Cx. tritaeniorhynchus* and pigs in a uniform ecological setting. If we consider that JE virus is distributed over a wide range in east Asian countries and that the ecological setting in different localities is not uniform, it is not surprising that mosquito vectors of JE virus vary from one locality to another.

Isolation of JE virus from mosquitoes was unsuccessful in this study. C6/36 cell culture inoculation was used for the 1985 specimens, and the *Toxorhynchites* inoculation method was used for 1986 specimens. These methods are known to be sensitive for the isolation of this flavivirus [7, 11]. The obtained rate of JE positives in swine sera

suggests that the field infection rate of JE virus in vector mosquitoes is low in Hokkaido. Successful virus isolation from mosquitoes may require a far larger collection of mosquitoes from the study areas.

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REFERENCES

1. Buescher, E. L. and Scherer, W. F. 1959. Ecologic studies of Japanese encephalitis in Japan. IX. Epidemiologic correlation and conclusion. *Am. J. Trop. Med. Hyg.* 8: 719-722.
2. Clarke, D. H. and Casals, I. 1958. Techniques for hemagglutination inhibition with arthropod borne viruses. *Am. J. Trop. Med. Hyg.* 7: 561-573.
3. Doi, R., Shirasaka, A. Sasa, M., and Oya, A. 1977. Studies on the susceptibility of three species of mosquitoes to Japanese encephalitis virus. *J. Med. Entomol.* 13: 591-594.
4. Fukumi, H., Hayashi, K., Mifune K., Shichijo, A., Matsuo, S., Omori, N., Wada, Y., Mogi, M., and Mori, A. 1975. Ecology of Japanese encephalitis virus in Japan. I. Mosquito and pig infection with the virus in relation to human incidences. *Trop. Med.* 17: 97-110.
5. Hayashi, K., Mifune, K., Shichijo, A., Suzuki, H., Matsuo, S., Makino, Y., and Akashi, M. 1975. Ecology of Japanese encephalitis virus in Japan. III. The results of investigation in Amami island, southern part of Japan, from 1973 to 1975. *Trop. Med.* 17: 129-142.
6. Hayashi, K., Mifune K., Schichijo, A., Wada, Y., and Nishigaki, J. 1970. Ecological studies of Japanese encephalitis virus. Results of investigations in the Nagasaki area, Japan, in 1968. *Trop. Med.* 11: 212-220.
7. Igarashi, A., Buei, K., Ueba, N., Yoshida, M., Ito, S., Nakamura H., Sasao, F., and Fukai, K. 1981. Isolation of virus from female *Culex tritaeniorhynchus* in *Aedes albopictus* cell culture. *Am. J. Trop. Med. Hyg.* 30: 449-460.
8. Kimura, H. 1971. Epidemiological study of Japanese encephalitis virus in Hokkaido. 1. Historical review of the occurrence of Japanese encephalitis in man and domestic animals. *Sapporo Med. J.* 39: 41-45 (in Japanese).
9. Maeda, O., Karaki, T., Kuroda, A., Karoji, Y., Sasaki, O., and Takenokuma, S. T. 1978.

- Epidemiological studies on Japanese encephalitis virus in Kyoto city area, Japan. II. Annual patterns of virus dissemination on virus recoveries from unfed *Culex tritaeniorhynchus summorosus*. *Jpn. J. Med. Sci. Biol.* 31: 39–51.
10. Petrishcheva, P. A., Levikovich, Y. N., and Boldyrev, S. T. 1963. *Japanese encephalitis*. Moscow: Medgiz (Translation available from the U.S. Clearinghouse for Federal Scientific and Technical Information).
 11. Rosen, L. 1981. The use of Toxorhynchites mosquitoes to detect and propagate dengue and other arboviruses. *Am. J. Trop. Med. Hyg.* 30: 177–183.
 12. Shichijo, A., Mifune, K., Chin, C. C., Hayashi, K., Wada, Y., Ito, S., Oda, T., Omori, M., Suenaga, O., and Miyagi, I. 1970. Isolation of Japanese encephalitis virus and group A arboviruses from *Aedes vexans nipponii* caught in Nagasaki area, Japan. *Trop. Med.* 12: 91–97 (in Japanese).
 13. Schichijo, A., Mifune K., Hayashi K., Wada, Y., Ito, S., Kawai, S., Miyagi, I., and Oda, T. 1968. Ecological studies on Japanese encephalitis virus. Survey of virus dissemination in Nagasaki area, Japan, in 1966 and 1967. *Trop. Med.* 10: 168–180.
 14. Takashima, I., Watanabe, T., Ouchi, N., and Hashimoto, N. 1988. Ecological studies of Japanese encephalitis virus in Hokkaido: Inter-epidemic outbreaks of swine abortion and evidence for the virus to overwinter locally. *Am. J. Trop. Med. Hyg.* 38: 420–427.
 15. Takashima, I. and Rosen, L. 1989. Horizontal and vertical transmission of Japanese encephalitis virus by *Aedes japonicus* (Diptera: culicidae). *J. Med. Entomol.* (in press).
 16. Tanaka, K., Mizusawa, K., and Saugstad, E. S. 1979. A reversion of the adult and larval mosquitoes of Japan (including the Ryukyu Archipelago and the Ogasawara Island) and Korea (Diptera: Culicidae). *Contrib. Am. Entomol. Inst.* (Ann Arbor), 19: 1–987.
 17. Umenai, T., Krzysko, R., Bektimirov, T. A., and Assaad, F. A. 1985. Japanese encephalitis: current world wide status. *Bull. W.H.O.* 63: 625–631.

要 約

北海道の日本脳炎の地方病的流行地域における蚊採集成績：高島郁夫・橋本信夫・渡辺卓俊¹⁾・Leon Rosen²⁾ (北海道大学獣医学部獣医公衆衛生学教室，¹⁾北海道石狩家畜保健衛生所，²⁾ Arbovirus Research Program, Pacific Biomedical Research Center, University of Hawaii)——北海道における日本脳炎 (JE) ウイルスの媒介蚊を推定するために1985年と1986年に蚊の採集調査を行った。コガタアカイエカ (*Culex tritaeniorhynchus*) の採集数は JE の異常産の発生した4養豚場のいずれでも極めて少なかった。札幌近郊の1養豚場では、1985年の7月から10月の採集期間に510匹の蚊が採集されたが、コガタアカイエカはわずか1匹のみであった。上磯町の1養豚場では、流産の発生している期間に987匹の蚊が採集されたが、コガタアカイエカは全く認められなかった。アカイエカ (*Culex pipiens pallens*)、ハマダラカ種 (*Anopheles* species)、キンイロヤブカ (*Aedes vexans nipponii*)、とヤマトヤブカ (*Ae. japonicus*) がコガタアカイエカより優勢な蚊種であった。コガタアカイエカは、日本において主な JE 媒介蚊とされているが、北海道においては多分 JE 媒介蚊ではないと考えられた。採集蚊 (1985年の2,332匹と1986年の1,403匹) からウイルス分離を試みたが、JE ウイルスを分離できなかった。JE ウイルス分布の北限地域である北海道における JE ウイルスの媒介蚊種を明らかにするためには、今後より広範な疫学調査が必要とされる。