Fifty Three New Record Species of Benthic Diatoms from Mekong River and Its Tributaries in Thailand
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ABSTRACT
A study on the diversity of benthic diatoms in Mekong River and its tributaries in Thailand was carried out during July 2005 to April 2007. Two hundred and fifty three species of benthic diatoms were found. Fifty three species have never been previously recorded in Thailand. It could be classified into 3 classes, 11 orders, 22 families and 32 genera. The detailed descriptions of these new records were reported.

Keywords: benthic diatoms, mekong river, new record of Thailand.

1. INTRODUCTION
Studies on freshwater benthic diatoms are relatively limited in America, Europe, Australia and Asia. The studies of diatoms in Asia were lead by Japanese scientist for long time. However, there are now widely study in many Asian countries. In Thailand, even less work has been done. Diatom flora was studies by foreign scientists for many years. In recent day, there has been increased interest in the diatoms of Thailand by Thai researchers.

However, very little is known about the diatoms of Mekong River, the biggest international river in mainland Southeast Asia. This contribution deals with the description of 53 new records from Thailand.

2. MATERIAL AND METHODS
2.1 Sampling sites
Fourteen sampling sites along the Mekong River and their tributaries in Chiang Rai, Loei, Nong Khai, Nakhon Phanom, Sakonnanor, Mukdahan, Amnat Charoen and Ubon Ratchathani Provinces were selected. The details of each sampling site are show in Figure 1.

2.2 Sampling and Benthic Diatoms Study
The samples were collected 3 times per year from July 2005 to April 2007. In each sampling site, diatom samples were scraped off 10 stones with a toothbrushes using a plastic sheet with a 10 cm² cutout placed on the upper surface of the selected stone and kept in the boxes. Diatoms valves, cleaned with concentrated nitric acid (HNO₃) were mounted in diatoms mountant. Up to 300 valves were counted and identified in each sample.

3. RESULTS
In Mekong River and its tributaries, 252 diatom taxa have been identified. *Nitzschia* was the most species rich genus (24 species) followed by *Navicula* (16 species), *Gomphonema* and *Eunotia* (11 species). In addition, fifty three
species of benthic diatoms were considered to be newly recorded in Thailand. It could be classified into 3 classes, 11 orders, 22 families and 32 genera. The species of diatoms were compared with the checklist of freshwater algae in Thailand by Lewmanomont et al. [1], Pekthong [2-4], Waiyaka [5], Kunpradid [6,7], Wanathong et al. [8], Peerapornpisal et al. [9], Suphan [10], Peerapornpisal [11], Inthasotti [12,13], Leelahakriengkrai [14,15] and Preuthiworanon [16]. The species list of new records of Thailand was shown in Table 1. The structural data are abbreviated as follows, D: Diameter, L: Length, W: Width, Str: Striae, Cs: Costae, Fb: Fibulae, Ar: Areolae, Ma: Mantle.

Order Thalassiosirales

Family Stephanodiscaceae

Discostella pseudostelligera (Hustedt) Houk & Klee (Figure 2:1, 5:1)

D: 5–8 mm, Str: 20–24 in 10 mm, Ar: 55–80 in 10 mm.

Heterovalvar, shortly cylindrical frustules. central area occupies half the valve diameter and is ornamented with a ring of areolae or short striae surrounding an isolated central areola.

Discostella stelligera (Cleve & Grunow) Houk & Klee (Figure 2:2, 5:2)

D: 7.5–20 μm, Str: 8.9–11.5 in 10 μm, Ar: 28–

Figure 1. Sampling sites in Mekong River and their tributaries.
Table 1. New record species of benthic diatoms that found in Mekong River and its tributaries of Thailand.

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<tr>
<th>Division Bacillariophyta</th>
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Valve circular, convex central areas always with a star-shaped structure composed of circular to elongated areolae. Concave central areas always lack areolae, marginal area is occupied by striae, each composed of a double row of areolae. Areolae tend to fuse towards the centre of the valve, ending in a bigger areola in most cases.

Order Aulacoseirales
Family Aulacoseiraceae
Aulacoseira ambigua (Grunow) Simonsen
(Figure 2:3, 5:3)
D: 4-17 μm, Ma: in 5-13 μm, Ar: in 10 mm.
Cylindrical frustules and chains form, 1 or 2 large mantle and 4-8 short spines in the margin of the valve, with longitudinal grooves where large spines match to the neighboring cell. Parallel striae and thick areolae.

Order Biddulphiales
Family Biddulphiaceae
Hydrosera whampoensis (Schwarz) Deby
(Figure 2:4, 5:4)
D: 60-110 μm, L: 80-170 μm.
Multipolar, thick and appear as two superimposed triangles in valve view. The protuberances that form one of the triangles have well-developed pore fields at their apices. In girdle view the cells are quite elongate and appear grooved due to the shape of the valves.

Order Fragilariales
Family Fragilariaceae
Diatoma mesodon (Ehrenberg) Kützing
(Figure 2:10, 5:10)
Valve elliptical to elliptical-lanceolate, some time rhombic in shape. Pseudoraphe linear and narrow. Costae very few.

Synedra ulna var. amphirhynchus (Ehrenberg) Grunow
(Figure 2:6, 5:6)
L: 180-250 μm, W: 4-7 μm, Str: 10-12 in 10 μm.
Valve linear, suddenly constricted to the attenuate-rostrate or sometimes slightly capitate apices. Pseudoraphe very narrow. Central area absent. Striae parallel.

Synedra ulna var. spathulifera Grunow
(Figure 2:8, 5:8)
L: 100-600 μm, W: 6.5-8 μm, Str: 10-12 in 10 μm.

Synedra ulna var. subaequalis Grunow
(Figure 2:7, 5:7)
L: 200-250 μm, W: 3-5 μm, Str: 7-9 in 10 μm.
Valve linear, slightly narrowed at the somewhat rostrate ends. Pseudoraphe very narrow. Central area absent.

Tabularia fasciculata (C. Agardh) D.M. Williams & Round
(Figure 2:12, 5:12)
L: 20-400 μm, W: 2-8 μm, Str: 7.5-26 in 10 μm.
Linear or linear-lanceolate valves narrowing to blunt sub-rostrate or rostrate apices. Central area distinct, roughly square in outline and usually reaching the valve margin. Striae parallel.

Order Eunotiales
Family Eunotiaceae
Eunotia camelus var. arcuata Frenguelli
(Figure 2:13, 5:13)
L: 35.0-52.5 μm, W: 6.2-6.5 μm, Str: 10-14 in 10 μm.
Valves dorsiventral and symmetrical to the transapical axis, Valves highly arched, with 4 humps. Ventral margin is continuous, without swellings. Ends of the valves are sub-capitate.

Eunotia repensa A. Berg
(Figure 2:9, 5:9)
L: 81-218 μm, W: 3.0-7.7 μm, Str: 8-10 in 10 μm.
Valves dorsiventral and symmetrical to
the transapical axis. Dorsal margin convex, smooth, ventral margin concave. Raphe fissures positioned apically. Striae are parallel.

**Order Cymbellales**

**Family Cymbellaceae**

*Encyonema prostratum* (Berkeley) Kützing (Figure 2:14, 5:14)


Valves robust, broadly dorsiventral and symmetrical to the transapical axis. Dorsal margin normally arched, ventral margin biarcuate to convex. Valve apices bluntly rounded. Raphe straight with central endings deflected dorsally and apical ends deflected ventrally. Striae course.

*Encyonopsis microcephala* (Grunow) Krammer (Figure 2:11, 5:11)

L: 20-25 μm, W: 5.0-6.5 μm, Str: 14-16 in 10 μm.

Valves are cymbelloid with dorsal margin strongly curved and straight ventral margin. Axial area narrow, straight and without a central area. Small central nodule. A stigmoid presented near the dorsal central striae.

*Placoneis gracilis* Metzeltin, Lange-Bertalot & García-Rodriguez (Figure 3:3, 6:3)

L: 15-25 μm, W: 15-25 μm, Str: 8-10 in 10 μm.

Valves lanceolate to elliptical-lanceolate, with obtuse, slightly protracted ends. Striae radiate throughout. Axial area narrow, slightly winded toward the center area. Striae radiate throughout the valve.

*Placoneis symmetrica* (Hustedt) Lange-Bertalot (Figure 3:4, 6:4)


Valves linear with subcapitate apices. Striae porate, radiate over almost all the valve, central striae shorter, forming a transverse, central area occupying more than half the valve width.

**Family Gomphonemataceae**

*Gomphonema contraturris* Lange-Bertalot & Reichardt (Figure 3:7, 6:7)

L: 45-86 μm, W: 10-14 μm, Str: 8-12 in 10 μm.

Valves only slightly asymmetrical to transapical axis. Apices rounded, sub-rostrate or rostrate. Raphe often slightly sinuous. A single stigma presented. Striae coarse and parallel.

*Gomphonema pseudoaugur* Lange-Bertalot (Figure 3:6, 6:6)

L: 25-55 μm, W: 7-10 μm, Str: 9-12 in 10 μm.


*Gomphonese rhombica* (Fricke) Merino et al. (Figure 3:5, 6:5)

L: 39-53 μm, W: 5-9 μm, Str: 9-12 in 10 μm.


**Order Achnanthales**

**Family Achnanthaceae**

*Achnanthidium catenatum* (Bily & Marvan) Lange-Bertalot (Figure 3:8, 6:8)

L: 8-26 μm, W: 2-3 μm, Str: 28-34 in 10 μm.

Valve linear-lanceolate with subcapitate to capitate ends. Raphe valve with narrow, raphe filiform. Striae slightly radiate. Central area small or lacking in pseudoraphe valve.

*Achnanthidium convergens* (H. Kobayasi) H. Kobayasi (Figure 3:10, 6:10)

L: 9-20 μm, W: 3.5-5 μm, Str: 20-22 in 10 μm.

Valve elliptical-lanceolate to linear-lanceolate with capitate ends. Raphe valve with rhombic central area. Striae slightly radiate. Pseudoraphe valve with linear pseudoraphe, Central area lacking.

*Achnanthidium minutissimum* (Kützing) Czarnecki (Figure 3:9, 6:9, 8: 4-5)

L: 6-15 μm, W: 1.5-3.5 μm, Str: 20-30 in 10 μm.

Valve linear-elliptic, slightly or more elongated near the end, and with bluntly rounded poles. Striae slightly radiate and often
a shortened striae near the small central area, Axial area narrow.

**Planothidium delicatulum (Kützing)**
Round&Bukhtiyarova (Figure 3:15, 6:15-16)
L: 9-31 μm, W: 6-10 μm, Str: 10-12 in 10 μm.
Valve elliptic, elliptic-lanceolate or lanceolate. The rapheless (convex) valve has a similar density of striae to that on the raphe valve. Lacking of the horseshoe shaped structure on the rapheless valve

**Order Naviculales**

**Family Diadesmidaceae**

**Diadesmis confervacea Kützing**
(Figure 3:2, 6:2)
L: 9-28 μm, W: 4-10 μm, Str: 18-26 in 10 μm.
Valve broadly lanceolate to elliptical-lanceolate with rounded apices. Raphe straight. Central raphe endings slightly expanded. Striae slightly radiate, comprised of distinct pores that are sometimes slightly elongate in a transapical direction.

**Luticola nivalis** (Ehrenberg) D.G. Mann
(Figure 3:16, 6:17)
Valve linearly to linear-elliptical. Transapical striae radiate throughout, composed of two to four rounded areolae. Largest areolae near the valve margins. One isolated, circular stigma present.

**Luticola peguana** (Grunow) D.G. Mann
(Figure 3:17, 6:18)
Valve lanceolate with bluntly rounded apices. Central raphe endings deflected to one side and polar raphe fissures hooked over valve apices. Axial area widening towards the broad, transverse central area. Striae radiate. Stigma on one side of central area.

**Family Amphipleuraceae**

**Frustulia parahomboideus var. parahomboideus** Lange-Bertalot (Figure 3:18, 6:19)
Valve rhombic-lanceolate, narrowing sharply to the rounded apices. Axial and central areas narrow but distinct. Transverse striae perpendicular to the raphe at the center of the valve, sometimes becoming slightly convergent toward the ends of the valve, but radiate at the apices.

**Family Neidiaceae**

**Neidium floridanum Reimer**
(Figure 3:19, 6:20)
L: 50-57 μm, W: 12-14 μm, Str: 24 in 10 μm.
Valve triundulate with protracted, distinctly rostrate ends. Axial area narrow, Raphe straight or slight diagonal, narrower near the central area and the ends. Striae radiate, becoming convergent or oblique at the ends.

**Family Fallacaceae**

**Fallacia insociabilis** (Krasske) D.G. Mann
(Figure 3:12, 6:12)
L: 12-20 μm, W: 10-15 μm, Str: 22-30 in 10 μm.
Valve linear, lanceolate to elliptical, with bluntly rounded apices, girdle view narrowly rectangular. Striae uniseriate, but interrupted by lateral hyaline areas that connect with the central area. Raphe central in a narrow axial area, central fissures straight and expanded.

**Family Diploneidaceae**

**Diploneis pseudovalis** Hustedt
(Figure 3:11, 6:11)
L: 16-31 μm, W: 9-14 μm, Cs: 8-12 in 10 μm.
Valve linear-elliptical with rounded ends. Central area large. Longitudinal canals narrow and district, suddenly swollen around the central area. Costae radiate.

**Family Naviculaceae**
**Eolimna minima** (Grunow) Lange-Bertalot
(Figure 3:22, 6:22, 8:11)
L: 5-18 μm, W: 2-4.5 μm, Str: 25-30 in 10 μm.
Valve linear to linear-elliptical with bluntly rounded apices. Striae fine, slightly radiate but shorter and more widely spaced at the centre, forming a butterfly-shaped to rectangular central area. Axial area narrow. Raphe fissures straight, slightly expanded at the centre.

**Eolimna subminuscula** (Manguin) Gerd Moser
(Figure 3:20-21, 6:21)
L: 7-12.5 μm, W: 3.5-6 μm, Str: 15-26 in 10 μm.
Valve broadly lanceolate with rounded apices. Striae transverse or slightly radiate, central striae slightly wider apart. Raphe slit in a well-defined axial area, the raphe fissures curving slightly to one side at each end. Central area of similar width to axial area.

**Eolimna tantula** (Hustedt) Lange-Bertalot
(Figure 3:23, 6:23, 8:10)
L: 7-13 μm, W: 4-7 μm, Str: 13-25 in 10 μm.
Valve linear-elliptical to elliptical. Valve lightly silicified. Axial area narrow. Central area slightly wider than the axial area. Striae transverse or slightly radiate.

**Geissleria punctifer** (Hustedt) Metzeltin, Lange-Bertalot & Garcia-Rodriguez
(Figure 3:1, 6:1)
L: 17-25 μm, W: 6-7.5 μm, Str: 14-16 in 10 μm.
Valve elliptical-lanceolate with slightly rostrate ends. Axial area district, becoming wider toward the center of the valve. Striae slightly radiate, central striae widely spaced than the striae in the rest of valve.

**Hippodonta capitata** (Ehrenberg) Lange-Bertalot, Metzeltin & Witkowski
(Figure 3:14, 6:14)
L: 20-30 μm, W: 5-7 μm, Str: 8-10 in 10 μm.
Valve elliptic-lanceolate, ends subcapitate to capitata. Raphe straight, Filiform, central pores fairly close. Striae noticeably broad, radiate in the middle, convergent at the ends.

**Navicula cryptotenelloides** Lange-Bertalot
(Figure 3:24, 6:24)
L: 9-18 μm, W: 3-4.5 μm, Str: 16-18 in 10 μm.
Valve lanceolate, ends acutely rounded. Raphe filiform. Central pores very delicate, axial area very narrow, linear. Striae radiate, convergent at the ends.

**Navicula kuseliana** Lange-Bertalot & Rumrich
(Figure 3:28, 6:28)
L: 30-55 μm, W: 5-9 μm, Str: 12-15 in 10 μm.

**Navicula phylepta** Kützing
(Figure 3:25, 6:25)
Valve lanceolate, ends acutely rounded.

**Navicula radiosafallax** Lange-Bertalot
(Figure 3:27, 6:27)
L: 30-50 μm, W: 5-7 μm, Str: 17-14 in 10 μm.

**Family Pleurosigmataceae**

**Gyrosigma obscurum** (W.Smith) J.W. Griffith & Henfrey
(Figure 4:1, 7:1)
Valve slightly sigmoid and narrowly rounded. Axial area and raphe eccentric throughout, sigmoid, closed to the margin near the ends. Proximal raphe ends indistinct, but appearing straight. Central area small, orbicular or longitudinally elliptical. Terminal area inconspicuous. Longitudinal striae very fine.

**Order Bacillariales**

**Family Bacillariaceae**

**Nitzschia linearis** (C.Agardh ex.W.Smith) W.Smith var. linearis
(Figure 4:2, 7:2)
L: 70-180 μm, W: 2.5-7.5 μm, Str: 28-32 in 10 μm.
Valve bilaterally symmetrical, linear or linear-lanceolate. Transverse striae. Raphe system fibulate, marginal. Fibulae appearing like short transverse ribs in girdle and valve view. Central pair of fibulae more widely separated than the others.

*Nitzschia liebetruthii* Rabenhorst
(Figure 4:6, 7:6, 8:6)
L: 6-45 \(\mu\)m, W: 3-5 \(\mu\)m, Str: 24-27 in 10 \(\mu\)m.

Valve bilaterally symmetrical, linear to linear-lanceolate with subrostrate or cuneate poles. Raphe system fibulate. Fibulae small, dot-like to square. Central raphe endings absent.

*Nitzschia pseudofonticola* Hustedt
(Figure 4:4, 7:4, 8:7-8)
L: 19-40 \(\mu\)m, W: 4-5.5 \(\mu\)m, Str: 40-44 in 10 \(\mu\)m.

Valve bilaterally symmetrical, linear-lanceolate, with subcapitate or capitate poles. Central part of the valve with slightly convex sides. Raphe system fibulate. Marginal. Fibulae small, dot-like to square.

*Nitzschia supralitorea* Lange-Bertalot
(Figure 4:5, 7:5)
L: 45-55 \(\mu\)m, W: 7-12 \(\mu\)m, Str: 35-45 in 10 \(\mu\)m.

Valves linear-lanceolate, slightly wide at the center, parallel margins, acute apices and rounded poles. Apical and pervalvar straight. Raphe marginal with irregularly distant fibulae.

*Nitzschia tabellaria* (Grunow) Grunow
(Figure 4:7, 7:7)
L: 20-22 \(\mu\)m, W: 7-7.5 \(\mu\)m, Str: 18-25 in 10 \(\mu\)m.

Valve narrowly linear to linear-lanceolate or lanceolate valves with rounded or capitate ends. Valve surface is undulate and has a wide keel. Raphe system fibulate. Marginal. Areolation is coarse.

*Nitzschia terrestris* (J.B.Petersen) Hustedt
(Figure 4:3, 7:3)
L: 23-60 \(\mu\)m, W: 6-9 \(\mu\)m, Str: 34-40 in 10 \(\mu\)m.

Valve linear-lanceolate or linear, slightly sigmoid at the ends. Apices rounded and blunt poles. Raphe system fibulate, marginal. A slight central constriction and slightly sigmoid poles.

**Tryblionella acuminata** W.Smith
(Figure 4:11, 7:12)
L: 50-100 \(\mu\)m, W: 13-18 \(\mu\)m, Str: 12-16 in 10 \(\mu\)m.

Valve broadly linear or linear-lanceolate, sometimes slightly constricted centrally. Poles cuneate or subrostrate. Transverse striae prominent. Raphe system fibulate, marginal. Central raphe endings presented.

**Tryblionella balatonis** (Grunow in Cleve & Grunow) D.G.Mann
(Figure 4:8, 7:8)
L: 12-23 \(\mu\)m, W: 8-11 \(\mu\)m, Str: 9-11 in 10 \(\mu\)m.

Valve small, linear and straight with parallel margins and acute-cuneate apices that have rounded poles. Striae coarse.

**Tryblionella calida** (Grunow) D.G.Mann
(Figure 4:12, 7:11)
L: 45-70 \(\mu\)m, W:10-16 \(\mu\)m, Str:17-22 in 10 \(\mu\)m.

Valve panduriform, isopolar, isobilateral with cuneate ends. Striae coarse to very fine transverse the cell.

**Tryblionella coarctata** (Grunow) D.G. Mann
(Figure 4:10, 7:10)
L: 30-50 \(\mu\)m, W:12-16 \(\mu\)m, Str:25-30 in 10 \(\mu\)m.

Valve panduriform, isopolar, isobilateral with cuneate ends. Striae coarse in central area and slightly curve in the ends.

**Tryblionella levidensis** W. Smith
(Figure 4:9, 7:9)
L: 12-20 \(\mu\)m, W: 10-15 \(\mu\)m, Str: 9-11 in 10 \(\mu\)m.

Valve linear or sigmoid. Ends rostrated or capitated. Raphe along one margin and fibulae present. Striae coarse to very fine transverse the cell and central area absent.

**Order Rhopalodiales**
**Family Rhopalodiaceae**
*Rhopalodia operculata* (C.Agardh) Häk.
(Figure 4:13-14, 7:13-14, 8:3)
L: 20-30 \(\mu\)m, W: 7-10 \(\mu\)m, Str: 15-19 in 10 \(\mu\)m.

Valve isopolar and dorsiventral, lanceolate-elliptical in shape, acute apices. The dorsal margin curved and straight at the ventral margin. Striae composed of a single row of puncta composes. Fibulae radiate.
Figure 2. Light micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 μm).

Figure 3. Light micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 µm).

Figure 4. Light micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 μm).

Figure 5. Hand drawing micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 mm).

Figure 6. Hand drawing micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 mm).

Figure 7. Hand drawing micrographs of cleaned diatoms in Mekong River and its tributaries in the part of Thailand (scale bar = 10 mm).

Figure 8. Scanning Electron Micrographs of new record species of diatoms in Mekong River and its tributaries of Thailand.

4. DISCUSSION

The study of diatoms in Thailand was started by Ostrup [17] reported 81 different diatoms from the island of Koh Chang in the Gulf of Thailand. Then, Patrick [18] reported a total of 185 diatom species in the study of the intestinal contents of tadpoles from Thailand and the Federal Malay States. Furthermore, Hirano [19] published an account of 143 diatom species, 114 of them were found in the samples from Thailand. Most of these samples were collected in Chiang Mai areas and the others from localities in the central and southern parts of Thailand. Foged [20] reported the freshwater diatoms in Thailand. The material collected in central and northern parts of Thailand. Three hundred and seventy eight taxa of diatoms were published. In this work, 8 new species, 5 new varieties and 2 forms were additionally reported.

In this study, 53 species of benthic diatoms were new record of Thailand. The comparison between the number of new records in Thailand from another works was considered. Fifty one species were found in Mae Sa stream [4], 45 species were found in many streams of Thong Pha Phum National Park and Huay Kha Yang Watershed [10], 28 species were found from Ping and Nan River [7] and 24 species were from Mae Kham River [13]. The list of diatoms species in Thailand was increased with each time of publication. According to van den Hoek et al. [21] estimated numbers of diatom were as many as 100,000 species in total, only 12,000 species have been described so far. Consequently, there are many diatoms species waiting for discovery especially in Thailand.

Some species found in this research were similar to a reported diatom flora of the Mekong water system in Cambodia by Ohno et al. [22]. Thirty six taxa of diatoms were found in the Mekong River. The dominant species were Melosira granulata (This name is currently regarded as a synonym of Aulacoseira granulata (Ehrenberg) Simonsen), Cyclotella stelligera (This name is currently regarded as a synonym of Discostella stelligera (Cleve & Grunow) Houk & Klee) and Synedra ulna (This name is currently regarded as a synonym of Ulnaria ulna (Nitzsch) Compère). In addition, Fragilaria ulna (This name is currently regarded as a synonym of Ulnaria ulna (Nitzsch) Compère) was one of the most abundant diatoms in New Zealand [23].

There were marked variations in richness and diversity between sites that reflected variations in physico-chemical parameters and habitat characters. The dominant species such as Eolimna minima and Achnanthidium minutissimum were found in many sampling sites. Achnanthidium minutissimum were common species in streams in agricultural catchments of Kathmandu Valley, Nepal Jütter et al. [24]. Similarly Eolimna minima was found in Tolich River that impacted from urban pollution in Hanoi, Vietnam [25].

Cosmopolitan as diatoms can be, diatoms in the tropics may have different environmental preferences than those in the well studied temperate streams. This present research provider basic information of diatom in tropical streams which can be applied to monitor water quality of the rivers in Thailand and neighbor countries. The checklist of freshwater algae including diatom of Thailand is under preparation by Office of Natural Resources and Environmental Policy and Planning, Thailand. It will be published in September 2010.

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