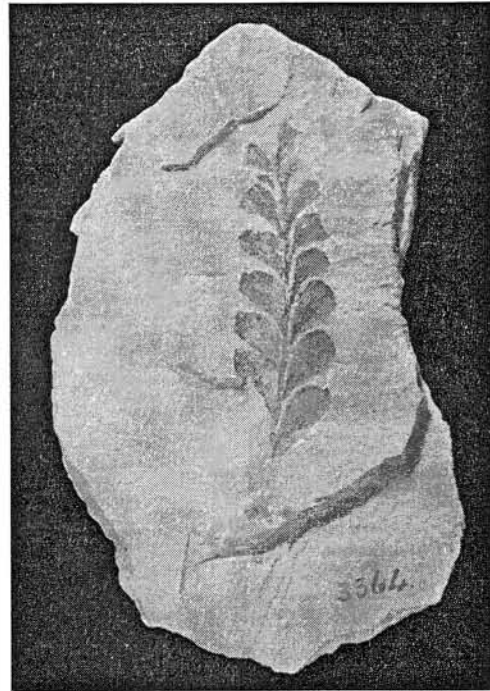


# CANADIAN PALEONTOLOGY CONFERENCE PROCEEDINGS NO. 4



*Archaeopteris gaspiensis*, RM 3364  
Upper Devonian, Escauminac, Gaspé, Quebec  
Photo © H. Larsson

## 16<sup>th</sup> Canadian Paleontology Conference

Edited by Virginie Millien

CPC 2006  
Redpath Museum, McGill University  
Montreal, Quebec  
October 13 – 16, 2006



## ADDITIONS TO THE CHAMPLAIN SEA FAUNAL ASSEMBLAGE FROM SAINT-NICOLAS, QUÉBEC, WITH REMARKS ON ITS PALEOECOLOGY

COURNOYER, Mario E. <sup>1,2</sup>

CHARTIER, Michel D. <sup>1</sup>

DUBREUIL, Martin <sup>1</sup>

OCCHIETTI, Serge <sup>3</sup>

<sup>1</sup> Musée de Paléontologie et de l'Évolution, 541 de la Congrégation, Montréal, Québec H3K 2J1

<sup>2</sup> PaléoVision, 533 de la Congrégation, Montréal, Québec H3K 2J1 paleovision@videotron.ca

<sup>3</sup> Université du Québec à Montréal, C.P. 8888, Succ. Centre-ville, Montréal, Québec H3C 3P8

The Saint-Nicolas site, near Québec City, is one of the most significant Champlain Sea (between 11 100 ± 100 and ca. 9400 <sup>14</sup>C years B.P.) fossil localities. It has yielded the richest macrofaunal assemblage so far recorded: at least 45 species, in contrast to the Ottawa area nodule assemblages, which comprise around 40 species. This is a typical boreal-arctic marine fauna, with no freshwater or terrestrial representatives. Based on fieldwork spanning the years 1979-1999, Occhietti *et al.* (2001) listed 34 types of invertebrates and 11 species of vertebrates from a 10 m-thick unit of massive to cross-bedded sands exposed in the sandpits located south of the town of Saint-Nicolas. This unit, part of a regressive sequence, was deposited in the earliest Holocene, between ca. 9650 and 9400 years B.P. (wood equivalent <sup>14</sup>C ages), within the interval 11.2-10.7 ka Cal B.P. (calibrated <sup>14</sup>C ages using CALIB 5.0.1). Continued investigation at the site since 2000 has led to the discovery of a large quantity of new fossil material. The collection is now composed of more than 3000 macroinvertebrate specimens, including several new taxonomic occurrences, as well as approximately 300 isolated skeletal elements, nearly doubling the known sample size of vertebrates. This paper provides an updated taxonomic list of the fossil remains found in the tidal current sands of the Saint-Nicolas site (Table 1), and lays the groundwork for a more comprehensive study of the collections from that locality.

New invertebrate taxa recovered through field collecting, and processing of stratigraphically-controlled bulk sediment samples in the lab, include one polyplacophoran, five gastropods and one echinoid. The polyplacophoran material consists of two medial plates not yet identified to genus. The gastropods are represented by: a) a dozen specimens of the bobtail trophon, *Boreotrophon truncatus*, b) a fragmentary individual of the spindle shell, *Colus* sp., c) three complete specimens of *Oenopota* sp., d) one specimen of the widemouth lamellaria, *Piliscus commodus*, and e) some twenty specimens of the solitary glassy-bubble, *Haminoea solitaria*. In the latter case, our identification is problematic since this taxon is a thermophilous mollusk (see Dyke and McNeely 2000). The echinoid material is composed of more than 20 spines and plates and is attributed to the green sea urchin, *Strongylocentrotus* sp. Except for the questionable species *Haminoea solitaria*, and the echinoid *Strongylocentrotus*, previously noted by Hillaire-Marcel (1980), all the macroinvertebrate taxa listed here are new to the global fauna of the Champlain Sea. In total, the invertebrate assemblage from Saint-Nicolas now includes 38 species or types.

The osteichthyan component of the assemblage has not yet been studied extensively. In number of specimens, the fish material constitutes about two-thirds of the entire vertebrate sample. Based on results obtained for other groups, it is likely that a detailed examination of these fossils will bring to light several new species in addition to the five currently recognized taxa from the site.

The taxonomic diversity and relative abundance of avian remains are distinguishing features of the Saint-Nicolas site. Bird specimens make up between 10 and 15% of the vertebrate assemblage. Apart from the previously reported thick-billed murre (*Uria lomvia*) and oldsquaw duck (*Clangula hyemalis*) material, two other species have recently been identified in the collections. A complete cervical vertebra confirms the presence of the common eider duck, *Somateria mollissima*, in Saint-Nicolas. A partial femur and a rib (see Occhietti *et al.*, 2001) may also belong to that species. This is the third record of this seabird from Champlain Sea deposits. The partial pelvis of an eider found near Shawinigan, north of Trois-Rivières, was described by Harington and Occhietti (1980), and an almost complete carpometacarpus from the sandpit at Saint-Césaire, east of Montréal, has been studied by the second author (research in progress). The fourth bird identified from Saint-Nicolas is based on a complete carpometacarpus. It is provisionally assigned to the Arctic tern, *Sterna paradisaea*, a species formerly unknown in the Champlain Sea global fauna.

The marine mammals account for approximately 20% of the vertebrate sample, and are represented by a variety of skeletal elements belonging to several species. Progress has been made in the identification of seal remains. The existence of at least two species is now established: the bearded seal, *Erignathus barbatus*, based on a complete second rib, and the ringed seal, *Phoca hispida*, whose presence is indicated by, among other specimens, a partial auditory bulla and the tiny femur, lacking epiphyses, of a pup. The Atlantic walrus, *Odobenus rosmarus*, appears to have been more common than originally thought: the second metatarsal of a young individual, an almost complete ulna, and a skull fragment (squamosal with tympanic bulla) are added to the previously reported os coxae and complete skull (the latter owned by a local collector).

The macrofossils from the Saint-Nicolas site are interpreted as a parautochthonous assemblage. As already noted by Occhietti *et al.* (2001), some elements have been reworked from earlier deposits. This concerns primarily the barnacle *Balanus hameri*, whose complete or fragmentary plates are, despite their robustness, usually very worn compared to other invertebrate shells. The variable levels of abrasion of vertebrate remains, most of which were found in the middle to upper part of the fossiliferous unit, also suggest a certain amount of time-averaging of the assemblage. Some specimens are very well preserved, whereas others show moderate to heavy wear, especially the extremities of long bones in birds and mammals. Nevertheless, considering that deposition of the tidal channel sands is estimated to have lasted only about 250 years, and given the similarity of the fossil assemblage to modern animal communities of the eastern Canadian arctic waters, we think that a reasonably accurate portrait of the fauna inhabiting the entrance of the Champlain Sea during its penultimate phase can be reconstructed. Although detailed numerical analyses of the samples have yet to be carried out, these should eventually allow us to identify the various taphonomic biases in the preservation of the Saint-Nicolas fossils.

A few general observations on the paleoecology and paleoenvironments of the Québec City Strait during the period between ca. 9650 and 9400 years B.P. can be made. In the vicinity of Saint-Nicolas, deposition occurred in an archipelago composed of elongated rocky islands. A temporary stabilization of the relative sea level permitted the establishment of a rich ecosystem. The discovery of a seal pup specimen suggests that land-fast ice was present in the area, at least during the winter and spring (Harington, pers. comm.). Fast ice is also the preferred substrate of the Atlantic walrus. The birds listed here share some of the same habitats, namely coastal islands, and we speculate that they may have

nested on the Appalachian rocky ridges which surrounded the local tidal flats. The submerged rocky shores of these islands could also have been a favored setting for chitons, brachiopods, barnacles and certain mollusks. Blue mussels, a choice prey of eider ducks and walrus, appear to have been very common. The abundance of pelecypods more generally would have supported a diverse community of gastropods, fishes, seabirds and marine mammals. Capelins probably frequented the sandy flats during the spawning season, as attested by the finding of lenticular deposits preserving several articulated individuals of the species, thereby providing ample, albeit short-lived, food for many birds, mammals, and other fish. Comparisons with similar modern faunas demonstrates that various key taxa appear to be absent or unrecorded in the Saint-Nicolas fossil assemblage. These include sea stars, crabs and shrimps, a number of different fish species, as well as some sea and coastal birds (e.g. seagulls, plovers, sandpipers).

**Table 1.** Taxonomic list of invertebrates and vertebrates found in tidal current sands of the Saint-Nicolas site.

Bryozoa

Gen. et sp. indet. 1 (encrusting form)

Gen. et sp. indet. 2 (branching form)

Brachiopoda

*Hemithiris psittacea* parrot-beak lamp shell

Polyplacophora

Gen. et sp. indet. \*

Gastropoda

<i>Acirsa borealis</i>	chalky wentletrap
<i>Boreotrophon truncatus</i> *	bobtail trophon
<i>Buccinum glaciale</i>	glacial whelk
<i>Buccinum plectrum</i>	sinuous whelk
<i>Buccinum scalariforme</i> <sup>1</sup>	ladder whelk
<i>Buccinum undatum</i>	waved whelk
<i>Colus</i> sp. *	spindle shell
<i>Epitonium</i> cf. <i>E. greenlandicum</i>	Greenland wentletrap
<i>Haminoea solitaria</i>	solitary glassy-bubble
<i>Lepeta caeca</i>	northern blind limpet
<i>Littorina</i> cf. <i>L. saxatilis</i>	rough periwinkle
<i>Cryptonatica affinis</i> <sup>2</sup>	arctic moonsnail
<i>Neptunea despecta</i>	common northern neptune
<i>Oenopota</i> sp. *	
<i>Puncturella</i> cf. <i>P. noachina</i>	diluvian puncturella
<i>Piliscus commodus</i> *	widemouth lamellaria
<i>Trichotropis borealis</i>	boreal hairsnail
<i>Velutina</i> cf. <i>V. velutina</i>	smooth lamellaria
<i>Volutopsius</i> cf. <i>V. norwegicus</i>	Norway whelk

Pelecypoda

*Astarte montagui* narrow-hinge astarte

<i>Axinopsida orbiculata</i>	orbicular axinopsid
<i>Chlamys islandica</i>	Iceland scallop
<i>Crenella faba</i>	bean crenella
<i>Hiatella arctica</i>	arctic hiatella
<i>Macoma balthica</i>	Balthic macoma
<i>Macoma calcarea</i>	chalky macoma
<i>Mya arenaria</i>	softshell
<i>Mya truncata</i>	truncate softshell
<i>Mysella planulata</i>	plate mysella
<i>Mytilus edulis</i>	blue mussel
<i>Serripes groenlandicus</i>	Greenland smoothcockle

#### Cirripedia

<i>Balanus crenatus</i>	notched acorn barnacle
<i>Balanus hameri</i>	turban barnacle

#### Echinoidea

<i>Strongylocentrotus</i> sp.	green sea urchin
-------------------------------	------------------

#### *Acipenser* sp.

<i>Cryptacanthodes maculatus</i>	sturgeon
----------------------------------	----------

#### *Lycodes* sp.

<i>Mallotus villosus</i>	Atlantic wrymouth
--------------------------	-------------------

Salmonidae gen. et sp. indet.	eelpout
-------------------------------	---------

	capelin
--	---------

#### **Aves**

<i>Clangula hyemalis</i>	oldsquaw duck
--------------------------	---------------

<i>Uria lomvia</i>	thick-billed murre
--------------------	--------------------

<i>Somateria mollissima</i>	common eider
-----------------------------	--------------

<i>Sterna paradisaea</i> *	Arctic tern
----------------------------	-------------

#### **Mammalia**

<i>Phoca hispida</i>	ringed seal
----------------------	-------------

<i>Erignathus barbatus</i>	bearded seal
----------------------------	--------------

<i>Odobenus rosmarus</i>	Atlantic walrus
--------------------------	-----------------

<i>Delphinapterus leucas</i>	white whale
------------------------------	-------------

<sup>1</sup> previously identified as *B. tenue* in Occhietti *et al.* (2001)

<sup>2</sup> previously identified as *Natica clausa* in Occhietti *et al.* (2001)

\* new addition to the Champlain Sea fauna

#### ACKNOWLEDGMENTS

We would like to express our gratitude to Stephen L. Cumbaa and J.-M. Gagnon for giving us access to comparative collections under their care at the Canadian Museum of Nature, and for assisting us in identifying several of the fossils from Saint-Nicolas. C.R. Harington, of the same institution, also confirmed some of our identifications, and lead us in the right direction with regard to the seal pup femur. Finally, we thank the operators of the Saint-Nicolas sandpits for allowing us to work on their

lands, as well as the many friends and family members who helped collect the numerous specimens now kept at the Musée de Paléontologie et de l'Évolution.

#### REFERENCES

- Dyke, A.S. and McNeely, R.N. 2000. The tardy, tasty and chilly thermophiles of the Champlain Sea. *Géographie physique et Quaternaire* 54: 123-125.
- Harington, C.R. and Occhietti, S. 1980. Pleistocene eider duck (*Somateria cf. mollissima*) from Champlain Sea deposits near Shawinigan, Québec. *Géographie physique et Quaternaire* 34: 239-245.
- Hillaire-Marcel, C. 1980. Les faunes des mers post-glaciaires du Québec : quelques considérations paléoécologiques. *Géographie physique et Quaternaire* 34: 3-59.
- Occhietti, S., Chartier, M., Hillaire-Marcel, C., Cournoyer, M., Cumbaa, S.L., and Harington, C.R. 2001. Paléoenvironnements de la Mer de Champlain dans la région de Québec, entre 11 300 et 9750 BP : le site de Saint-Nicolas. *Géographie physique et Quaternaire* 55: 23-46.