# **Information about phytoplankton/microalgae**

Phytoplankton is also known as microscopic algae/microalgae. Most of them are photosynthetic, free-floating, single-celled eukaryotic organisms that usually live in water bodies (in both freshwater and marine ecosystems).

They contain chlorophyll and require sunlight in order to live and grow. Thus they provide us with most (> 50%) of our oxygen via photosynthesis. While phytoplankton can photosynthesize like plants, they are not considered plants.

Phytoplankton require inorganic nutrients such as nitrates, phosphates, and sulfur to synthesize proteins, fats, and carbohydrates. Their ability to convert these nutrients into organic compounds allows them to serve as the foundation of the aquatic food web and help maintain the balance of the aquatic food web.

**Information about phytoplankton in Hong Kong**

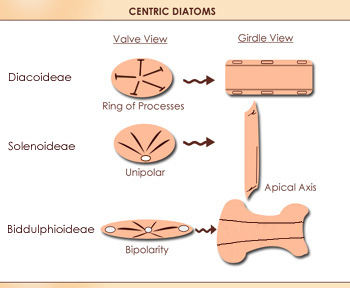
There are more than 300 aquatic organisms known to cause red tide in the world, of which 83 species have been recorded to cause red tide in Hong Kong.

There are three groups of phytoplankton known to be responsible for red tides in Hong Kong, namely **diatoms**, **dinoflagellates** and **others** like Chlorophytes, Raphidophytes, Cyanophytes and Cryptophytes, etc.

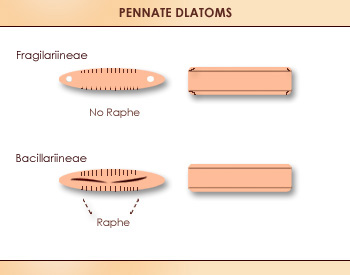
**Figure 1 Percentage of red tide incidents caused by different phytoplankton groups   
(from 1975 to 2017)**

**Diatoms**

They are commonly between 20 – 200 microns in diameter or length. There are two groups of diatoms, centric diatoms and pennate diatoms.



**Figure 2 Morphology of centric diatoms**

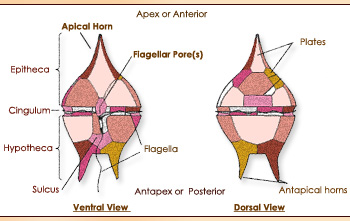


**Figure 3 Morphology of pennate diatoms**

**Dinoflagellates**

They are commonly between 5 – 2000 microns in length/diameter. There are two groups of dinoflagellates, armoured dinoflagellate (possessing a theca) and naked dinoflagellate (without a theca).

We can identify phytoplankton (microalgae) found in Hong Kong waters by their appearance under a compound microscope.

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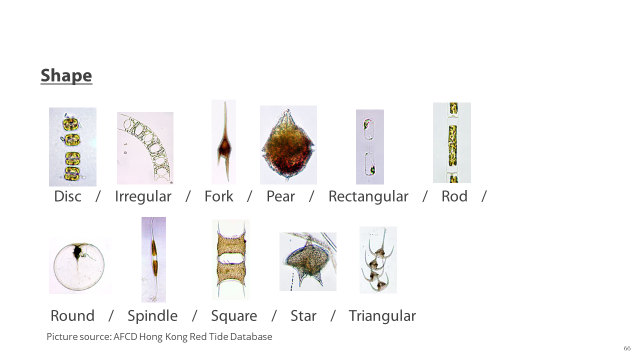
**Figure 4 Morphology of dinoflagellates**

**Suggested ways of identification**

Primary: shape and form of colony.

* Shape: Disc / Irregular / Fork / Pear / Rectangular / Rod / Round / Spindle / Square / Star / Triangular

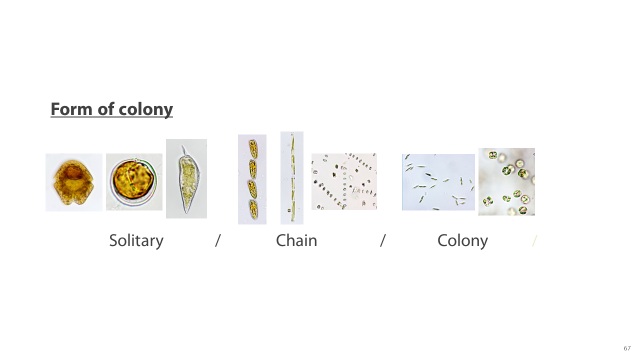
**Shape**



*Picture source: AFCD Hong Kong Red Tide Database*

* Form of colony: Solitary / Chain / Colony

**Form of colony**



Secondary: size (um) and/or region of occurrence in Hong Kong

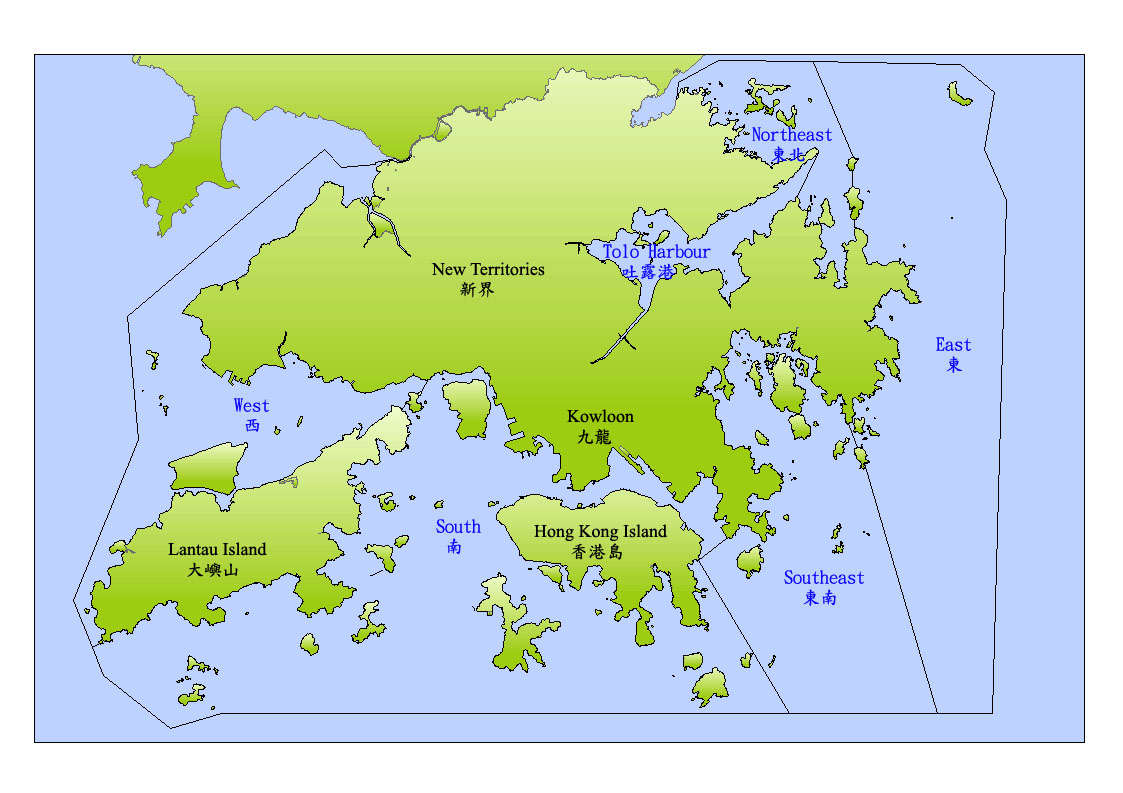
There are 28 species of diatoms recorded to cause red tide in Hong Kong.

|  | Species name of diatoms | Picture (Source: AFCD, unless otherwise stated) | Shape | Form of colony |
| --- | --- | --- | --- | --- |
| 1 | *Amphora sp.* |  | Spindle | Solitary |
| 2 | *Cerataulina pelagica* |  | Rod | Chain |
| 3 | *Ceratoneis closterium* |  | Spindle | Solitary |
| 4 | *Chaetoceros curvisetus* |  | Rectangular | Chain |
| 5 | *Chaetoceros pseudocurvisetus* |  | Square | Chain |
| 6 | *Chaetoceros salsugineum* |  | Square | Chain / Solitary |
| 7 | *Chaetoceros socialis* |  | Square | Chain / Colony |
| 8 | *Chaetoceros tenuissimus* |  | Square | Solitary |
| 9 | *Conticribra weissflogii* |  | Disc | Chain / Solitary |
| 10 | *Cyclotella choctawhatcheeana* |  | Disc | Chain / Solitary |
| 11 | *Dactyliosolen fragilissimus* |  | Rod | Chain / Solitary |
| 12 | *Dactyliosolen phuketensis* |  | Rod | Chain / Solitary |
| 13 | *Diadesmis sp.* |  | Rectangular | Colony / Solitary |
| 14 | *Eucampia zodiacus* |  | Irregular | Chain |
| 15 | *Guinardia delicatula* |  | Rod | Chain / Solitary |
| 16 | *Guinardia striata* |  | Rod | Chain / Solitary |
| 17 | *Leptocylindrus danicus* |  | Rod | Chain / Solitary |
| 18 | *Leptocylindrus minimus* |  | Rod | Chain / Solitary |
| 19 | *Nitzschia longissima* |  | Spindle | Chain / Solitary |
| 20 | *Odontella sinensis* |  | Square | Chain / Solitary |
| 21 | *Pseudo-nitzschia delicatissima* |  | Spindle | Chain / Solitary |
| 22 | *Pseudo-nitzschia pseudodelicatissima* |  | Spindle | Chain / Solitary |
| 23 | *Pseudo-nitzschia pungens* |  | Spindle | Chain / Solitary |
| 24 | *Skeletonema costatum* |  | Rectangular | Chain |
| 25 | *Thalassiosira mala* |  | Disc | Colony / Solitary |
| 26 | *Thalassiosira pseudonana* |  | Disc | Solitary |
| 27 | *Thalassiosira tealata* |  | Disc | Chain / Solitary |
| 28 | *Trieres mobiliensis* |  | Square | Chain / Solitary |

There are 37 dinoflagellate species recorded to cause red tide.

|  | Species name of dinoflagellates | Picture (Source: AFCD, unless otherwise stated) | Shape | Form of colony |
| --- | --- | --- | --- | --- |
| 1 | *Akashiwo sanguinea* |  | Round | Solitary |
| 2 | *Alexandrium catenella* |  | Round | Chain |
| 3 | *Alexandrium tamarense* |  | Round | Chain |
| 4 | *Cochlodinium convolutum* |  | Pear | Solitary |
| 5 | *Gonyaulax polygramma* |  | Pear | Solitary |
| 6 | *Gonyaulax verior* |  | Pear | Solitary |
| 7 | *Gymnodinium impudicum* |  | Pear | Chain |
| 8 | *Gymnodinium simplex* |  | Pear | Solitary |
| 9 | *Gymnodinium sp.*  *Picture source: Center for Freshwater Biology - University of New Hampshire* | 「Gymnodinium」的圖片搜尋結果 | Pear | Chain / Solitary |
| 10 | *Gymnodinium sp.X* |  | Pear | Solitary |
| 11 | *Gyrodinium spirale* |  | Spindle | Solitary |
| 12 | *Heterocapsa circularisquama* |  | Pear | Solitary |
| 13 | *Heterocapsa pygmaea* |  | Pear | Solitary |
| 14 | *Heterocapsa rotundata* |  | Pear | Solitary |
| 15 | *Karenia digitata* |  | Pear | Solitary |
| 16 | *Karenia longicanalis* |  | Pear | Solitary |
| 17 | *Karenia mikimotoi* |  | Pear | Solitary |
| 18 | *Karenia papilionacea* |  | Pear | Solitary |
| 19 | *Karlodinium veneficum* |  | Pear | Solitary |
| 20 | *Levanderina fissa* |  | Pear | Solitary |
| 21 | *Margalefidinium polykrikoides* |  | Pear | Chain |
| 22 | *Noctiluca scintillans* |  | Round | Solitary |
| 23 | *Peridinium quinquecorne* |  | Pear | Solitary |
| 24 | *Polykrikos geminatum* |  | Pear | Chain / Solitary |
| 25 | *Prorocentrum balticum* |  | Round | Solitary |
| 26 | *Prorocentrum cordatum* |  | Round | Solitary |
| 27 | *Prorocentrum dentatum* |  | Pear | Chain / Solitary |
| 28 | *Prorocentrum gracile* |  | Spindle | Solitary |
| 29 | *Prorocentrum mexicanum* |  | Round | Solitary |
| 30 | *Prorocentrum micans* |  | Pear | Solitary |
| 31 | *Prorocentrum triestinum* |  | Spindle | Solitary |
| 32 | *Protoperidinium depressum* |  | Star | Solitary |
| 33 | *Scrippsiella trochoidea* |  | Pear | Solitary |
| 34 | *Takayama pulchella* |  | Pear | Solitary |
| 35 | *Takayama tuberculata* |  | Pear | Solitary |
| 36 | *Tripos furca* |  | Fork | Solitary |
| 37 | *Tripos muelleri* |  | Triangular | Colony / Solitary |

**Hong Kong Waters**



**Map: AFCD Hong Kong Red Tide Database**

***Reference:***

“Introduction to Phytoplankton”, Agriculture, Fisheries and Conservation Department (AFCD), The Government of the HKSAR Retrieved February 11, 2021, from <https://www.afcd.gov.hk/english/fisheries/hkredtide/database/database_intro.html>.

Law P.C. 2018, *Red Tide Species in Hong Kong*, pp.17-34, -36-37, 94-95, 211-213. Agriculture, Fisheries and Conservation Department, the HKSAR Government, Hong Kong.

***Picture source:***

<http://cfb.unh.edu/phycokey/Choices/Dinophyceae/PS_dinos/GYMNODINIUM/Gymnodinium_Image_page.html>

<https://www.afcd.gov.hk/english/fisheries/hkredtide/database/search.result.php?group_code=UTEUKVEI&class_en=&species_en=&species_zh=&shape_code=&appearance_code=&occurrence_freq_code=&harmful_to_fish=&kill_in_hk=&produce_shellfish_toxin_code>=

[https://www.afcd.gov.hk/english/fisheries/hkredtide/database/search.result.php?page\_no=1&group\_code=GTWJUQCR&class\_zh=GTWJUQCR&species\_en=&species\_zh=&shape\_code=&appearance\_code=&occurrence\_freq\_code=&harmful\_to\_fish=&kill\_in\_hk=&produce\_shellfish\_toxin\_code=#](https://www.afcd.gov.hk/english/fisheries/hkredtide/database/search.result.php?page_no=1&group_code=GTWJUQCR&class_zh=GTWJUQCR&species_en=&species_zh=&shape_code=&appearance_code=&occurrence_freq_code=&harmful_to_fish=&kill_in_hk=&produce_shellfish_toxin_code=)