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## Mimicry

Conspicuous colouration of marine invertebrate animals (sponges, soft corals, tunicates) is often associated with the presence of toxic or distasteful defense substances. The usage of such a warning display for defence and better survival is known as *aposematic colouration*, a strategy also commonly found among nudibranchs (*Opisthobranchia*, *Mollusca*). In particular many species of the nudibranch families *Chromodorididae* and *Phyllidiidae* have spectacular and obvious colour patterns for warning potential predators. Many chromodorid nudibranchs take distasteful chemicals from the sponges they feed on and store it in special glands which are located around the mantle edge (= *repugnatorial glands*). Contact with these antifeedant compounds is an extremely unpleasant dining experience and visual predators, such as fish, will quickly learn to avoid them by recognition of their distinct and bright colour pattern.

In some geographical areas groups of unrelated chromodorid nudibranchs have evolved very similar colour patterns, so that they share the task of teaching fish to leave the colour pattern alone. One example in southeastern Australia are a group of about ten red-spotted chromodorid species, some of which are very difficult to tell apart. Interestingly, not all have repugnatorial glands. Thus, the colour pattern of a few nasty distasteful species is copied by other, quite edible species. These species gain considerable protection from feeding fish who have learnt from experience to leave the distasteful species alone. This phenomenon where a species evolves to resemble another species (the model) for gaining some biological benefit is called *mimicry*.

Mimicry has been observed for at least some polyclad flatworm species which are found to mimic distasteful or toxic opisthobranch molluscs. It is still unclear whether these worms represent really unpalatable (*Müllerian mimicry*) or edible species (*Batesian mimicry*). The following examples demonstrate how pseudocerotid flatworms rely on their similarity to phyllidiid and chromodorid species for protection against fish attack.



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[Pseudoceros imitatus](#) (Family *Pseudocerotidae*, Order *Polycladida*), described by Newman & Cannon 1994, is an obvious example for a number of invertebrates which are very similar in shape and colour to phyllidiid nudibranchs. *P. imitatus* relies on its similarity to *Phyllidiella pustulosa* for protection.

(PHOTO © Michael D. Miller, [The Slug Site](#)).



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[Phyllidiella pustulosa](#) Cuvier, 1804 (Family Phyllidiidae, Order Nudibranchia) is a tropical reef nudibranch which displays itself obviously during the day, apparently immune to fish attack by extremely noxious chemicals which they can exude as a milky white secretion. *P. pustulosa* seems to serve as mimicry model for *Pseudoceros imitatus*.

(PHOTO © Michael D. Miller, [The Slug Site](#)).

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This undescribed flatworm of the genus [Pseudobiceros](#) (upper photo) mimics the colour pattern of [Chromodoris magnifica](#) (lower photo), which is known from Australia, Papua New Guinea, Indonesia and the Philippines.

(PHOTOS © Michael D. Miller, [The Slug Site](#)).



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This undescribed flatworm of the genus [Pseudoceros](#) (upper specimen) mimics the colour pattern of [Chromodoris geometrica](#) (lower specimen), which is known from Australia, Papua New Guinea, Philippines and the Maldives.

(PHOTO © Terry Gosliner)



For more information about chromodorid and phyllidiid nudibranchs mimicry check out the [Sea Slug Forum](#) of Bill Rudman at the Australian Museum Online.

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This undescribed flatworm of the genus *Eurylepta* (upper photo) mimics the colour pattern of *Phyllidia polkadotsa* Brunckhorst, 1993 (lower photo). This sea slug belongs to the family *Phyllidiidae* and is known from Hawaii, the Banda Islands of Indonesia and Taiwan.



(PHOTOS © Michael D. Miller, [The Slug Site](#)).



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*Pseudoceros bajae* Hyman, 1953 (upper specimen) mimics the colour pattern of the sea slug *Hypselodoris ghiselini* Bertsch, 1978 (lower panel), which can be observed in Californian waters.

(PHOTOS © Michael D. Miller, [The Slug Site](#))



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 This flatworm of the genus *Pseudobiceros* (upper photo) mimics the colour pattern of *Glossodoris symmetricus* Rudman, 1990 (lower photo), a chromodorid nudibranch (Family: *Chromodorididae*) which is commonly found in the Indian Ocean.



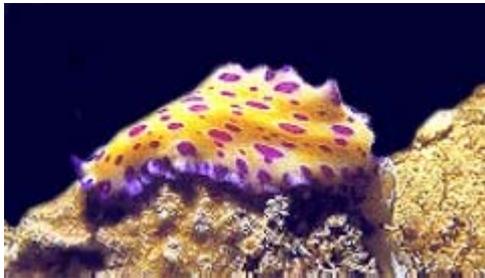
(PHOTO © Valda Fraser)

(PHOTO © Phil Woodhead)



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Another unidentified polyclad flatworm (*Pseudoceros sp.*) derived from Singapore waters shows an amazing similarity to the brilliant colour pattern of *Chromodoris kuniei* Pruvot-Fol, 1930 (Family: *Chromodorididae*). This nudibranch (lower panel) is known to occur from the Philippines down to Australian waters.



(PHOTO © Adele Wong)



(PHOTO © Michael D. Miller, [The Slug Site](#))

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*Pseudoceros sapphirinus* Newman & Cannon, 1994  
 (upper photo) mimics  
 the colour pattern of *Philineopsis gardineri* (Eliot,  
 1903) (lower photo),  
 a sea slug of the order *Cephalaspidea* (Family:  
*Aglajidae*)  
 which is distributed throughout the Indo-Pacific  
 Ocean.



(PHOTO © Matt Weedon)

(PHOTO © Mary Jane Adams, [The Slug Site](#))



««««  
 One more striking example for polyclad flatworm -  
 chromodorid sea slug mimicry.  
*Pseudoceros laingensis* derived from Batangas,  
 Philippines

(PHOTO © Michael D. Miller, [The Slug Site](#))



««««  
*Chromodoris aureopurpurea* Collingwood, 1881  
 (Family: *Chromodorididae*).  
 This sea slug belongs to a group of very similar  
 chromodorid nudibranchs which are  
 described from the Indo-West Pacific. See the [Sea  
 Slug Forum](#) for more information!

(PHOTO © Bill W. Rudman)

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[Eurylepta sp.](#) displays a striking similarity to numerous phyllidiid and chromodorid sea slugs of the Indo-Pacific. They show a translucent white or bluish-white background with dark blue or black longitudinal lines.

One example is [Chromodoris lochi](#) Rudman, 1982 (lower image)

Family: *Chromodorididae*, Order: *Nudibranchia*



(PHOTOS © Michael D. Miller, [The Slug Site](#))



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Another example for the amazing polyclad - chromodorid mimicry. [Pseudoceros goslineri](#) derived from Astro Labe, Fiji

(PHOTO © Michael D. Miller, [The Slug Site](#))



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[Platydorid formosa](#), Alder & Hancock, 1864, a sea slug of the family *Platydorididae* (Order: *Nudibranchia*).

(PHOTO © Michael D. Miller, [The Slug Site](#))

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Yellow dots on a creamy-whitish ground represent the characteristic hallmark of this [pseudocerotid flatworm](#). It resembles several yellow-dotted sea slugs of the family *Chromodorididae* (Order: *Nudibranchia*).

Examples are [Risbecia pulchella](#) Ruppell & Leuckart, 1828 and [Chromodoris marislae](#) Bertsch, 1973).



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*Risbecia pulchella* Ruppell & Leuckart, 1828  
(Family: *Chromodorididae*, Order: *Nudibranchia*)

(Upper PHOTO © Michael D. Miller, [The Slug Site](#))



««««  
Another striking example of polyclad - chromodorid  
mimicry.

*Pseudoceros zebra* Leuckart 1828, derived from  
North Coast of KwaZulu-Natal, South Africa.

(PHOTO © Valda Fraser)



««««  
*Chromodoris fidelis*, Kelaart, 1858, a sea slug  
of the family *Chromodorididae* (Order:  
*Nudibranchia*).

(PHOTO © Valda Fraser)

»»»»  
*Thysanozoon/Acanthozoon sp.*  
(Family: *Pseudocerotidae*, Order: *Polycladida*)

(PHOTO © Mary Jane Adams)



»»»»  
*Phyllidia ocellata*, (Cuvier, 1804)  
(Family: *Phyllidiidae*, Order: *Nudibranchia*).

(PHOTO © Wolfgang Seifarth)



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*Pseudobiceros gloriosus* Newman & Cannon, 1994  
(Family: *Pseudocerotidae*, Order: *Polycladida*)

(PHOTO © Wolfgang Seifarth)



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*Dendrodoris arborensis* Collingwood, 1881  
(Family: *Dendrodorididae*, Order: *Nudibranchia*)  
derived from Izu Peninsula, Sagami Bay, Japan

(PHOTO © Jun Imamoto)

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