



UNIVERSITÀ
POLITECNICA
DELLE MARCHE

SCIENZE
DISVA - DIPARTIMENTO DI
SCIENZE DELLA VITA E DELL'AMBIENTE



Corso di Laurea in Scienze Biologiche

TESI DI LAUREA TRIENNALE

Thaumoctopus mimicus:
an exercise of cognitive ethology

Thaumoctopus mimicus : un esercizio di etologia cognitiva

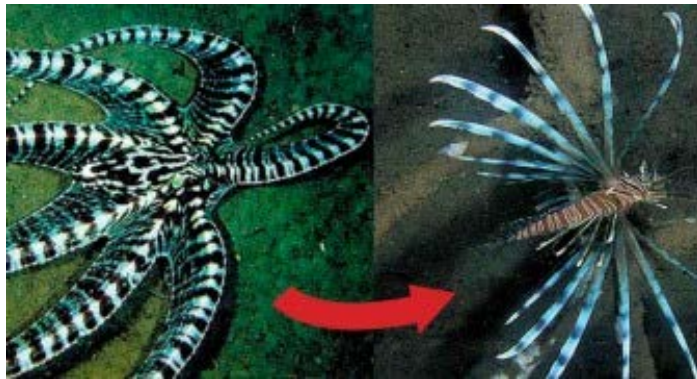
Relatore : Prof.ssa Barbara Calcinai

Candidata: Greta Di Martino

DINAMIC MIMICRY

Lionfish imitation

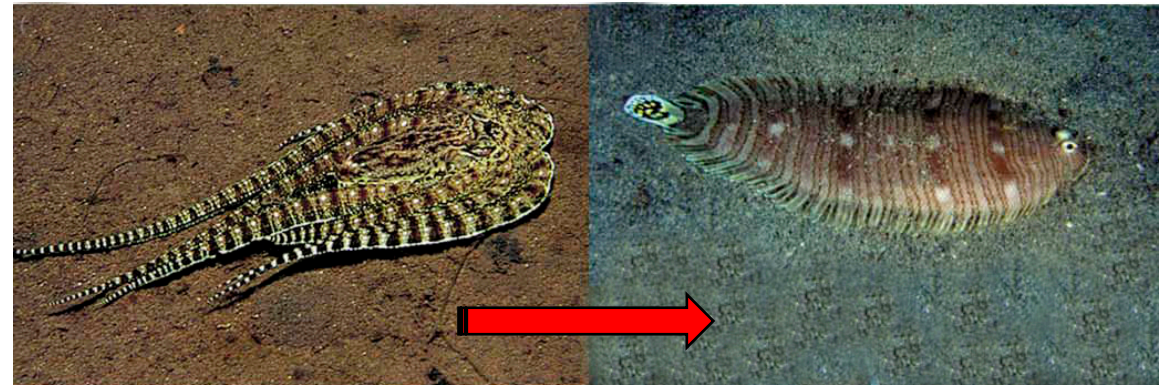
(*Pterois spp.*)



<https://www.guardachevideo.it/video/5059/puo-trasformarsi-in-piu-di-15-specie-diverse:-l-abilita-di-questo-polpo-vi-lascera-a-bocca-aperta>

Flatfish imitation

(*Zebrias spp.*)



<https://imgur.com/gallery/LgY2T/comment/793364227>

DINAMIC MIMICRY species-specific

Fully-Fledged Impersonation



Laticauda colubrina



<https://www.iucnredlist.org/species/176750/7296975>

Partial Impersonation



<https://www.youtube.com/watch?v=H8oQBYw6xxc2>

Tesi di Laurea Triennale di Greta Di Martino A.A. 2018/2019

STATIC MIMICRY

Criptic mimicry:

Homomorphism/ homochromy



Fasmide : *Phyllium giganteum*

<https://www.lacooltura.com/2017/12/mimetismo-forme-colori-sopravvivenza/>

Aggressive mimicry



Mantide orchidea: *Hymenopus coronatus*

<http://ildonodelblog.blogspot.com/2014/03/linganno-della-mantide-orchidea.html>

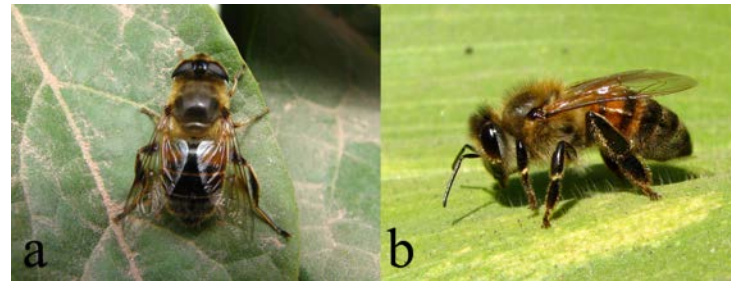
Aposematic mimicry



Polpo: *Hapalochlaena lunulata*

<https://www.lacooltura.com/2017/12/mimetismo-forme-colori-sopravvivenza/>

Batesian mimicry



Eristalis tenax fly (a) rispetto all'*Apis mellifera* (b)

<https://www.mnhn.gob.cl/613/w3-article-87325.html?noredirect=1>

Müllerian mimicry



Zygaena ephialtes (Zygaenidae) e *Amata phegea* (Arctiidae)

https://www.naturamediterraneo.com/forum/topic.asp?TOPIC_ID=86019

Mertensian mimicry



Da sinistra verso destra; *Erythrolamprus* (colubride); *Micrurus*, (elapide) il serpente corallo; *Lampropeltis*, (colubride) il falso corallo

Table 1 Mitchell's (1986) deception levels according to the sender's freedom to act

Levels of deception	Characterised by
Pre-given resemblance	genetic and evolutive pressure on physical appearance
Predetermined behavior	instinctive coordination of perception and action, ruling out the possibility of specialised, learned behaviour

Ex. *Tettigonide*



https://en.wikipedia.org/wiki/Distractio_n_display

Ex. *Killdeer* injury-feigning



https://en.wikipedia.org/wiki/Distractio_n_display

Table 1 Mitchell's (1986) deception levels according to the sender's freedom to act

Levels of deception	Characterised by
Customisation of pre-existing behavioural patterns	learned, intentional acts, though not intentionally deceptive
Intended deception (such as lying)	self-awareness, recognition of the other animal's beliefs about (past) actions, and planning/self-organisation to achieve intended deception

Ex. variety of birds songs



https://it.wikipedia.org/wiki/Fauna_della_Foresta_amazonica

Ex. Chimpanzee deception



<https://www.nationalgeographic.com/news/2015/06/150602-chimp-cooking-evolution-human-brain-science/>

Table 2 Levels on Zlatev's (2009: 193) Mimesis Hierarchy and corresponding incremental acts

Level	Characterised by acts which are
Language	divided (semi)compositionally into meaning sub-acts that systematically relate to other similar acts (as in grammar)
Protolanguage	conventional-normative
Triadic mimesis	intended to stand for some action, object or event for an addressee (and for the addressee to recognise this intention)
Dyadic mimesis	under conscious control and corresponding —either iconically or indexically— to some action, object or event, and at the same being differentiated from it
Proto-mimesis	based on a cross-modal mapping between exteroception (normally dominated by vision) and proprioception (normally dominated by kinesthetics)

Table 3 matching and overlaps between Mitchell (1986) and Zlatev's (2008, 2009) models

Mitchell	Zlatev
First level	—
Second level	Proto-mimesis
Third level	Dyadic mimesis
Fourth level	Triadic mimesis Proto-language Language

Table 4 Semiotic classification of non-human deceptive acts from a pre-mimetic through a proto-mimetic to a dyadic mimetic level

Levels	Semiotic structures And processes	Markers, behaviours,evidence	Examples
Pre-mimetic level	<ul style="list-style-type: none"> • operative intentionality • Basic sense-making • Pre –consciousness • designed deception • innate motor schemas 	<ul style="list-style-type: none"> • Habitation • Fixed response patterns 	Pigmy sea horse
Proto-mimetic level	<ul style="list-style-type: none"> • body schema • perceptual consciousness • receiver-sensitive deception • Flexible but still pre-given imitation • Perceptual consciousness 	<ul style="list-style-type: none"> • Mutual attention • Flexible but limited numbers of models • Degrees of impersonation (not necessarily driven by conscious thinking) 	Chameleon
Dyadic mimetic level	<ul style="list-style-type: none"> • Body image • Basic/primitive reflective consciousness • Self-awareness as «me» • Cognitive empathy 	<ul style="list-style-type: none"> • Volitional control • Imitation learning • Novel imitation models (based on reflective reasoning) • Awareness of the perspective of the other (projection) 	Mimetic octopus

Bibliography:

- José Manuel Ureña Gómez-Moreno (2019). *The 'Mimic' or 'Mimetic' Octopus? A Cognitive-Semiotic Study of Mimicry and Deception in Thaumoctopus Mimicus*
Biosemiotics <https://doi.org/10.1007/s12304-019-09362-y>
Faculty of Philosophy and Arts, Department of English and German Philologies, University of Granada, Cartuja University Campus, 18071 Granada, Spain
- Zlatev, J. (2009). *The semiotic hierarchy: Life, consciousness, signs and language*. *Cognitive Semiotics*, 2009(4), 169–200.
- Norman, M.D., Finn, J. and Tregenza, T. (2001) *Dynamic mimicry in an Indo-Malayan octopus*. *Proceedings of the Royal Society Series B: Biological Sciences*, 268 (1478). pp. 1755-1758. ISSN 1471-2954

Sitography:

- <https://www.guardachevideo.it/video/5059/puo-trasformarsi-in-piu-di-15-specie-diverse:-l-abilita-di-questo-polpo-vi-lascera-a-bocca-aperta>
- <https://www.youtube.com/watch?v=H8oQBYw6xxc2>
- <https://imgur.com/gallery/LgY2T/comment/793364227>
- <https://www.imperialbulldog.com/2015/12/30/lo-straordinario-mimetismo-del-polpo/>
- <http://www.saperescienza.it/news/piante-animati/il-cervello-della-seppia-spiegato-dal-mimetismo-04-12-2018/2267-il-cervello-della-seppia-spiegato-dal-mimetismo-04-12-2018>



Riassunto esteso

Lo studio riportato dall'articolo si concentra sull'imitazione del *Thaumoctopus mimicus* rispetto al serpente marino *Laticauda colubrina*. Si tratta di un mimetismo dinamico, ovvero avente più modelli da simulare. Si osservano infatti nel cefalopode anche imitazioni del lionfish e della sogliola. Risulta essere una forma di mimesi contrapposta a quella statica, ovvero avente un solo modello di imitazione (es. mimetismo criptico). L'inganno del *T. mimicus* viene classificato dall'autore nei criteri di Mitchell e nella gerarchia di Zlatev, avvalendosi di due possibili spiegazioni al fenomeno comportamentale del polpo. In una prima superficiale interpretazione, l'atto mimetico viene classificato come un comportamento predeterminato (2 liv. Mitchell) e una proto-mimesi (1 liv gerarachia di Zlatev). Nella spiegazione successiva invece si rivaluta il polpo mimico come un soggetto avente un'autocoscienza primitiva, che gli consente di mappare consapevolmente il proprio corpo con il mezzo fisico circostante. La nuova definizione del *T.mimicus* riposiziona l'animale nel livello di Zlatev di mimesi diadica. Si propone così una nuova concezione delle capacità semiotico-cognitivo-etologiche del *T.mimicus*, specie di cui l'autore promuove un cambio nome da *mimicus* a «mimeticus».